Reference Type: Book Section
Record Number: 421
Author: ADFG
Year: 1985
Title: Pacific cod life history and habitat requirements southwest and southcentral Alaska
Editor: ADFG
Book Title: *Alaska Habitat Management Guide, Southcentral Region, Volume 1: Life Histories and Habitat Requirements of Fish and Wildlife*
City: Juneau, AK
Volume: 1
Pages: 319-326
Translator: Alaska Department of Fish and Game
Short Title: Pacific cod life history and habitat requirements southwest and southcentral Alaska
Research Notes: Life history on Pacific cod.
URL: http://www.cf.adfg.state.ak.us/geninfo/finfish/grndfish/species/p_cod.pdf
Link to PDF: ADFG_pacific_cod.pdf

Reference Type: Online Multimedia
Record Number: 441
Created By: ADFG
Year: 2005
Title: What kind of fishing boat is that?
Date Accessed: 21 July 2007
Research Notes: Two-page brochure on types of fishing vessels used in Alaska. General summary with drawings.
URL: http://www.cf.adfg.state.ak.us/geninfo/pubs/fv_n_ak/fv_ak1pg.pdf
Link to PDF: ADFG_2005_fishing_vessel_types.pdf
Author Address: Alaska Department of Fish and Game
Access Date: Access Date

Reference Type: Online Multimedia
Record Number: 420
Created By: ADFG
Year: 2005
Title: Wildlife notebook series
Date Accessed: 21 July 2007
Abstract: [WEBPAGE]
Research Notes: General life history info for Alaska fish and game, webpage last updated 19 September 2006.
URL: http://www.adfg.state.ak.us/pubs/notebook/notehome.php
Link to PDF: [WEBPAGE]
Author Address: Alaska Department of Fish and Game

Access Date: Access Date

Reference Type: Report
Record Number: 399
Author: ADFG
Year: 2006
Title: Year 2006 Overview of the Division of Commercial Fisheries
City: Juneau
Institution: Alaska Department of Fish and Game
Pages: 2
Date: 21 July 2007
Short Title: Year 2006 Overview of the Division of Commercial Fisheries
Notes: Financial summary report for FY2005 and predicted FY2007.
Research Notes: This financial report includes a breakdown of income from fisheries broken down by fish species. Revenue is separated into government income and commercial harvest.
URL: http://www.cf.adfg.state.ak.us/geninfo/about/budget/06overview.pdf
Link to PDF: ADFG_06overview.pdf
Author Address: Division of Commercial Fisheries
Caption: Alaska Department of Fish and Game

Reference Type: Online Multimedia
Record Number: 442
Created By: ADFG
Year: 2007
Title: Commercial fishing seasons in Alaska
Date Accessed: 21 July 2007
Research Notes: Graphs of seasonal fishing times.
URL: http://www.cf.adfg.state.ak.us/geninfo/pubs/seasons/season_1.pdf
Link to PDF: ADFG_2007_commercial_fishing_seasons.pdf
Author Address: Alaska Department of Fish and Game
Access Date: Access Date

Reference Type: Online Multimedia
Record Number: 419
Created By: ADFG
Year: 2007
Title: Fish distribution database (FDD)
Date Accessed: 30 July 2007
Research Notes: Definition from Fish Distribution Database, last updated 30 May 2007.
URL: http://www.sf.adfg.state.ak.us/SARR/FishDistrib/FDD_definitions.cfm
Link to PDF: [WEBPAGE]
Author Address: Alaska Department of Fish and Game

Access Date: Access Date

Reference Type: Journal Article
Record Number: 513
Author: Akamatsu, Tomonari; Nakamura, K.; Nitto, H.; Watabe, M.
Year: 1996
Title: Effects of underwater sounds on escape behavior of Steller sea lions
Journal: Fisheries Science
Volume: 62
Issue: 4
Pages: 503-510
Short Title: Effects of underwater sounds on escape behavior of Steller sea lions
Link to PDF: Akamatsu_etal_1996_StellerSeaLion_escape_soundABS.pdf

Reference Type: Journal Article
Record Number: 444
Author: Allen, Sarah G.; Ainsley, David G.; Page, Gary W.; Ribic, Christine A.
Year: 1984
Title: The effect of distribution on harbor seal haul out patterns at Bolinas Lagoon, California
Journal: Fishery Bulletin
Volume: 82
Issue: 3
Pages: 493-500
Date: July 1984
Type of Article: Journal Article
Short Title: Effect of disturbance on habor seals
Research Notes: Responses of seals to variety of disturbances.
Link to PDF: Allen_etal_1984_HarborSeal_BolinasLagoon.pdf

Reference Type: Journal Article
Record Number: 1
Author: Amoser, S.; Ladich, F.
Year: 2003
Title: Diversity in noise-induced temporary hearing loss in otophysine fishes
Journal: Journal of the Acoustical Society of America
Volume: 113
Issue: 4
Pages: 2170-2179
Short Title: Diversity in noise-induced temporary hearing loss in otophysine fishes
Accession Number: ISI:000182007500035
Keywords: AUDITORY SENSITIVITY; ACOUSTIC COMMUNICATION; VOCAL BEHAVIOR; RESPONSES; VOCALIZATION; SOUND; REGENERATION;

EVOLUTION; GOLDFISH; *CARASSIUS AURATUS*; CATFISH; *PIMELODUS PICTUS*; AUDITORY BRAINSTEM RESPONSE; ABR;
Abstract: The effects of intense white noise (159 dB re 1 muPa for 12 and 24 h) on the hearing abilities of two otophysine fish species-the nonvocal goldfish *Carassius auratus* and the vocalizing catfish *Pimelodus pictus* were investigated in relation to noise exposure duration. Hearing sensitivity was determined utilizing the auditory brainstem response (ABR) recording technique. Measurements in the frequency range between 0.2 and 4.0 kHz were conducted prior and directly after noise exposure as well as after 3, 7, and 14 days of recovery. Both species showed a significant loss of sensitivity (up to 26 dB in *C. auratus* and 32 dB in *P. pictus*) immediately after noise exposure, with the greatest hearing loss in the range of their most sensitive frequencies. Hearing loss differed between both species, and was more pronounced in the catfish. Exposure duration had no influence on hearing loss. Hearing thresholds of *C. auratus* recovered within three days, whereas those of *R. pictus* only returned to their initial values within 14 days after exposure in all but one frequency. The results indicate that hearing specialists are affected differently by noise exposure and that acoustic communication might be restricted in noisy habitats.
Notes: J. Acoust. Soc. Am.
Part 1
Research Notes: Example of fish behavior response using ABR.
Link to PDF: Amoser_Ladich_2003_NITTS_fishes.pdf
Author Address: Univ Vienna, Inst Zool, A-1090 Vienna, Austria. Ladich, F, Univ Vienna, Inst Zool, Althanstr 14, A-1090 Vienna, Austria.

Reference Type: Journal Article
Record Number: 2
Author: Amoser, S.; Ladich, F.
Year: 2005
Title: Are hearing sensitivities of freshwater fish adapted to the ambient noise in their habitats?
Journal: Journal of Experimental Biology
Volume: 208
Issue: 18
Pages: 3533-3542
Short Title: Are hearing sensitivities of freshwater fish adapted to the ambient noise in their habitats?
Accession Number: ISI:000232546800015
Keywords: FISH; HEARING SPECIALIZATIONS; EVOLUTION; MASKING; AMBIENT NOISE; AUDITORY EVOKED POTENTIAL; FRESHWATER; CARP; *CYPRINUS CARPIO*; PERCH; *PERCA FLUVIATILIS*
Abstract: In the aquatic environment, hearing is an important sense for the survival of an animal. Sound travels faster and is much less attenuated in water than in air, making it the perfect means for communication over long distances (Hawkins and Myrberg, 1983; Rogers and Cox, 1988). By listening to the background noise in an aquatic habitat, an animal can get biotic information about the position of prey or predators,

potential mates or competitors, as well as abiotic information about currents, coastlines, torrents, wind, etc. (Popper and Fay, 1993; Lagardère et al., 1994). On the other hand, this ambient noise impairs the detection of signals (Hawkins and Myrberg, 1983; Mann and Lobel, 1997). Studies investigating or mentioning the acoustic characteristics of various aquatic habitats often focus on marine environments (e.g. Wenz, 1962; Cato, 1976; Urick, 1983; McConnell et al., 1992; Samuel et al., 2005), including reefs (Tolimieri et al., 2004; Egner and Mann, 2005). Knowledge about ambient noise spectra of freshwaters (lakes, ponds, rivers) is sparse (Bom, 1969; Boussard, 1981; Lugli and Fine, 2003; Lugli et al., 2003; Amoser et al., 2004). Teleost fishes have evolved an astonishing diversity in hearing abilities. Hearing non-specialists or generalists such as several groups of fishes, among them two thirds of all
freshwater fishes, have developed hearing specializations that enhance auditory sensitivity and broaden frequency ranges compared with hearing non-specialists (generalists), which lack such adaptations. It has been speculated that the enhanced sensitivities of these so-called hearing specialists have evolved in quiet habitats such as lakes, backwaters of rivers, slowly flowing streams or the deep sea. To test this hypothesis, noise levels and frequency spectra of four different freshwater habitats near Vienna, Austria (Danube River, Triesting stream, Lake Neusiedl, backwaters of the Danube River), were recorded and played back to native fish species while simultaneously measuring their auditory thresholds using the auditory evoked potential (AEP) recording technique. As a representative of hearing specialists, we chose the common carp (*Cyprinus carpio*, Cyprinidae) and for the hearing generalists the European perch (*Perca fluviatilis*, Percidae). Data show that the carp's hearing is only moderately masked by the quiet habitat noise level of standing waters (mean threshold shift 9 dB) but is heavily affected by stream and river noise by up to 49·dB in its best hearing range (0.5–1.0 kHz). In contrast, the perch's hearing thresholds were only slightly affected (mean up to 12 dB, at 0.1 kHz) by the highest noise levels presented. Our results indicate that hearing abilities of specialists such as carp are well adapted to the lowest noise levels encountered in freshwater habitats and that their hearing is considerably masked in some parts of their distribution range. Hearing in non-specialists such as perch, on the other hand, is only slightly or not at all impaired in all habitats.
Research Notes: Compares fish hearing in noisy and quiet environments.
Link to PDF: Amoser_Ladich_2005_Hearing_adapted_ambient.pdf

Reference Type: Journal Article
Record Number: 3
Author: Amoser, S.; Wysocki, L. E.; Ladich, F.
Year: 2004
Title: Noise emission during the first powerboat race in an Alpine lake and potential impact on fish communities
Journal: Journal of the Acoustical Society of America
Volume: 116
Issue: 6
Pages: 3789-3797
Short Title: Noise emission during the first powerboat race in an Alpine lake and

potential impact on fish communities
Accession Number: ISI:000225914400055
Keywords: GOLDFISH; *CARASSIUS AURATUS*; AUDITORY BRAINSTEM; *GADUS MORHUA L*; UNDERWATER NOISE; ATLANTIC SALMON; HEARING LOSS; SOUNDS; SENSITIVITY; RESPONSES; BEHAVIOR; VESSEL; BOAT; FISH
Abstract: In order to assess the effects of high-speed boating on fish communities, noise levels were measured during the first Class 1 powerboat race on the Austrian Lake Traunsee. The noise spectra were compared to natural ambient noise and hearing abilities of four native fish species. Sound pressure levels (SPLs) were significantly elevated during the training heats and the race compared with natural levels, reaching up to 128 dB re 1 muPa (instantaneous SPL) at a distance of 300 m to the powerboats. Continuous equivalent SPLs were significantly lower during training and the pole position race compared to the race itself because fewer boats were simultaneously on the lake. The hearing abilities of the native hearing specialists and generalists were investigated. While carp and roach (two cyprinids) showed enhanced auditory sensitivity typical for hearing specialists, perch and whitefish were much less sensitive to sounds. Comparisons between power boat noise spectra and audiograms showed that the cyprinids can detect the boats up to several hundred meters distance because the main noise energy is well within the most sensitive hearing range. The hearing generalists, however, probably only perceive the first harmonic of the boat noise at close distances. (C) 2004 Acoustical Society of America.
Notes: J. Acoust. Soc. Am.
Research Notes: Various fish species hearing sensitivity with regards to boat noise.
Link to PDF: Amoser_etal_2004_PowerBoats_AlpineFish.pdf
Author Address: Univ Vienna, Inst Zool, A-1090 Vienna, Austria. Amoser, S, Univ Vienna, Inst Zool, Althanstr 14, A-1090 Vienna, Austria. sonja.amoser@univie.ac.at lidia.wysocki@univie.ac.at friedrich.ladich@univie.ac.at

Reference Type: Report
Record Number: 402
Author: Angliss, R. P.; Outlaw, R. B.
Year: 2006
Title: Alaska marine mammal stock assessments, 2006
Institution: U.S. Department of Commerce, NOAA
Pages: 244
Date: January 2007
Short Title: Alaska marine mammal stock assessments, 2006
Report Number: NOAA Technical Memorandum NMFS-AFSC-168
Link to PDF: Angliss_Outlaw_2006_marine_stock_assessment.pdf

Reference Type: Report
Record Number: 414
Author: APSC
Year: 2007

Title: The Facts: Trans Alaska Pipeline System
City: Anchorage, AK
Institution: general public release
Pages: 103
Short Title: The Facts: Trans Alaska Pipeline System
Notes: Fact book from APSC (Alyeska Pipeline Service Company)
Research Notes: Great bulletized information facts on TAPS and APSC.
URL: http://www.alyeska-pipeline.com/default.asp
Link to PDF: TAPS_Fact_Book_2007.pdf
Author Address: Alyeska Pipeline Service Company
Caption: Alyeska Pipeline Service Company

Reference Type: Journal Article
Record Number: 371
Author: Arveson, P. T.; Vendittis, D. J.
Year: 2000
Title: Radiated noise characteristics of a modern cargo ship
Journal: Journal of the Acoustical Society of America
Volume: 107
Issue: 1
Pages: 118-129
Short Title: Radiated noise characteristics of a modern cargo ship
Abstract: Extensive measurements were made of the radiated noise of M/V OVERSEAS HARRIETTE, a bulk cargo ship (length 173 m, displacement 25 515 tons) powered by a direct-drive low-speed diesel engine—a design representative of many modern merchant ships. The radiated noise data show high-level tonal frequencies from the ship's service diesel generator, main engine firing rate, and blade rate harmonics due to propeller cavitation. Radiated noise directionality measurements indicate that the radiation is generally dipole in form at lower frequencies, as expected. There are some departures from this pattern that may indicate hull interactions. Blade rate source level (174 dB re 1 mPa/m at 9 Hz, 16 knots) agrees reasonably well with a model of fundamental blade rate radiation previously reported by Gray and Greeley, but agreement for blade rate harmonics is not as good. Noise from merchant ships elevates the natural ambient by 20–30 dB in many areas; the effects of this noise on the biological environment have not been widely investigated.
Link to PDF: Arveson_Vendittis_2000_CargoShip_Noise.pdf

Reference Type: Journal Article
Record Number: 340
Author: Au, D.; Perryman, W.
Year: 1982
Title: Movement and speed of dolphin schools responding to an approaching ship
Journal: Fishery Bulletin
Volume: 80

Issue: 2
Pages: 371-379
Type of Article: Article
Short Title: Movement and speed of dolphin schools responding to an approaching ship
Alternate Journal: Fish. Bull.
ISSN: 0090-0656
Accession Number: ISI:A1982PV90900017
Keywords: DOLPHIN; VESSEL
Abstract: Eight dolphin schools of the species *Stenella attenuata*, *S. longirostris* and *S. coeruleoalba* were approached by ship and observed from a helicopter in the eastern Pacific to study their response to the vessel. All schools swam away from the projected track of the approaching ship. Their movement, relative to the ship, followed paths that curved around the ship. Average swimming speeds while avoiding the ship varied from 5.1-8.8 knots. In some cases avoidance apparently began at 6 or more miles away from the ship. The effect of this behavior on shipboard censusing of dolphins is discussed.
Link to PDF: Au_Perryman_1982_dolphin_speed_ship.pdf
Author Address: AU, D, NOAA,NATL MARINE FISHERIES SERV,SW FISHERIES CTR,LA JOLLA LAB,LA JOLLA,CA 92038.
Language: English

Reference Type: Journal Article
Record Number: 352
Author: Au, Whitlow W. L.; Green, Marsha
Year: 2000
Title: Acoustic interaction of humpback whales and whale-watching boats
Journal: Marine Environmental Research
Volume: 49
Pages: 469-481
Short Title: Acoustic interaction of humpback whales and whale-watching boats
Keywords: HUMPBACK WHALE; WHALE-WATCHING; BOAT INTERACTION WITH WHALE; BOAT; DISTURBANCE; BEHAVIOR; EFFECTS-WHOLE ORGANISMS
Abstract: The underwater acoustic noise of five representative whale-watching boats used in the waters of west Maui was measured in order to study the effects of boat noise on humpback whales. The first set of measurements were performed on 9 and 10 March, close to the peak of the whale season. The ambient noise was relatively high with the major contribution from many chorusing humpback whales. Measurements of boat sounds were contaminated by this high ambient background noise. A second set of measurements was performed on 28 and 29 April, towards the end of the humpback whale season. In both sets of measurements, two of the boats were inflatables with outboard engines, two were larger coastal boats with twin inboard diesel engines and the fifth was a small water plane area twin hull (SWATH) ship with inter-island cruise capabilities. The inflatable boats with outboard engines produced very complex sounds with many bands of tonal-like components. The boats with inboard engines produced less intense sounds with fewer tonal bands. One-third octave band measurements of ambient noise measured on 9 March indicated a maximum sound pressure level of

about 123 dB re 1 mPa at 315 Hz. The maximum sound pressure level of 127 dB at 315 Hz was measured for the SWATH ship. One of the boats with outboard engines produced sounds between 2 and 4 kHz that were about 8±10 dB greater than the level of background humpback whale sounds at the peak of the whale season. We concluded that it is unlikely that the levels of sounds produced by the boats in our study would have any grave effects on the auditory system of humpback whales.
Link to PDF: Au_Green_2000_HBack_WhaleWatching.pdf

Reference Type: Journal Article
Record Number: 239
Author: Au, W. W. L.; Lemonds, D. W.; Vlachos, S.; Nachtigall, P. E.; Roitblat, H. L.
Year: 2002
Title: Atlantic bottlenose dolphin (*Tursiops truncatus*) hearing threshold for brief broadband signals
Journal: Journal of Comparative Psychology
Volume: 116
Issue: 2
Pages: 151-157
Date: Jun
Short Title: Atlantic bottlenose dolphin (*Tursiops truncatus*) hearing threshold for brief broadband signals
Accession Number: ISI:000176209900009
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS;* ATLANTIC; HEARING THRESHOLD
Abstract: The hearing sensitivity of an Atlantic bottlenose dolphin (*Tursiops truncatus*) to both pure tones and broadband signals simulating echoes from a 7.62-cm water-filled sphere was measured. Pure tones with frequencies between 40 and 140 kHz in increments of 20 kHz were measured along with broadband thresholds using a stimulus with a center frequency of 97.3 kHz and 88.2 kHz. The pure-tone thresholds were compared with the broadband thresholds by converting the pure-tone threshold intensity to energy flux density. The results indicated that dolphins can detect broadband signals slightly better than a pure-tone signal. The broadband results suggest that an echolocating bottlenose dolphin should be able to detect a 7.62-cm diameter water-filled sphere out to a range of 178 in in a quiet environment.
Link to PDF: Au_etal_2002_Bottlenose_hearing_transients.pdf

Reference Type: Journal Article
Record Number: 237
Author: Au, W. W. L.; Nachtigal, P. E.; Pawloski, J. L.
Year: 1997
Title: Acoustic effects of the ATOC signal (15 Hz, 195 dB) on dolphins and whales
Journal: Journal of the Acoustical Society of America
Volume: 101
Issue: 5

Pages: 2973-2977
Date: May
Short Title: Acoustic effects of the ATOC signal (15 Hz, 195 dB) on dolphins and whales
Accession Number: ISI:A1997WZ04100058
Keywords: ATOC; DOLPHIN; WHALE; *PSEUDORCA CRASSIDENS*; FALSE KILLER WHALE; *GRAMPUS GRISEUS*; RISSO'S DOLPHIN
Abstract: The Acoustic Thermometry of Ocean Climate (ATOC) program of Scripps Institution of Oceanography and the Applied Physics Laboratory, University of Washington, will broadcast a low-frequency 75-Hz phase modulated acoustic signal over ocean basins in order to study ocean temperatures on a global scale and examine the effects of global warming. One of the major concerns is the possible effect of the ATOC signal on marine life, especially on dolphins and whales. In order to address this issue, the hearing sensitivity of a false killer whale (*Pseudorca crassidens*) and a Risso's dolphin (*Grampus griseus*) to the ATOC sound was measured behaviorally. A staircase procedure with the signal levels being changed in1-dB steps was used to measure the animals' threshold to the actual ATOC coded signal. The results indicate that small odontocetes such as the *Pseudorca* and *Grampus* swimming directly above the ATOC source will not hear the signal unless they dive to a depth of approximately 400 m. A sound propagation analysis suggests that the sound-pressure level at ranges greater than 0.5 km will be less than 130 dB for depths down to about 500 m. Several species of baleen whales produce sounds much greater than 170-180 dB. With the ATOC source on the axis of the deep sound channel (greater than 800 m), the ATOC signal will probably have minimal physical and physiological effects on cetaceans. (C) 1997 Acoustical Society of America.
Notes: Part 1
Link to PDF: Au_etal_1997_FX_ATOC_dolphins.pdf

Reference Type: Journal Article
Record Number: 529
Author: Au, Whitlow W. L.; Pack, Adam A.; Lammers, Marc O.; Herman, Louis M.; Deakos, Mark H.; Andrews, Kim
Year: 2006
Title: Acoustic properties of humpback whale songs
Journal: Journal of the Acoustical Society of America
Volume: 120
Issue: 2
Pages: 1103-1110
Short Title: Humpback whale songs
Abstract: A vertical array of five hydrophones was used to measure the acoustic field in the vertical plane of
singing humpback whales. Once a singer was located, two swimmers with snorkel gear were
deployed to determine the orientation of the whale and position the boat so that the array could be

deployed in front of the whale at a minimum standoff distance of at least 10 m. The spacing of the
hydrophones was 7 m with the deepest hydrophone deployed at a depth of 35 m. An eight-channel
TASCAM recorder with a bandwidth of 24 kHz was used to record the hydrophone signals. The
location (distance and depth) of the singer was determined by computing the time of arrival
differences between the hydrophone signals. The maximum source level varied between individual
units in a song, with values between 151 and 173 dB re 1 uPa. One of the purposes of this study
was to estimate potential sound exposure of nearby conspecifics. The acoustic field determined by
considering the relative intensity of higher frequency harmonics in the signals indicated that the
sounds are projected in the horizontal direction despite the singer being canted head downward
anywhere from about 25° to 90°. High-frequency harmonics extended beyond 24 kHz, suggesting
that humpback whales may have an upper frequency limit of hearing as high as 24 kHz.
Link to PDF: Au_etal_2006_Acoustics_Hback_song.pdf

Reference Type: Journal Article
Record Number: 240
Author: Baird, R. W.; Hanson, M. B.; Dill, L. M.
Year: 2005
Title: Factors influencing the diving behaviour of fish-eating killer whales: sex differences and diel and interannual variation in diving rates
Journal: Canadian Journal of Zoology-Revue Canadienne De Zoologie
Volume: 83
Issue: 2
Pages: 257-267
Date: Feb
Short Title: Factors influencing the diving behaviour of fish-eating killer whales: sex differences and diel and interannual variation in diving rates
Accession Number: ISI:000229412400001
Keywords: KILLER WHALE; *ORCINUS ORCA*; TAG; DIVING BEHAVIOR; AGE; SEX
Abstract: Diving behaviour of air-breathing vertebrates may be influenced by a variety of factors including age, body size, and changes in prey behaviour and (or) abundance over both short and long timescales. We studied the diving behaviour of a highly sexually dimorphic odontocete cetacean, the killer whale, *Orcinus orca* (L., 1758), using suction-cup-attached time-depth recorders (TDRs). We tested the hypotheses that dive rates (no. of dives/h greater than or equal to specific depths) of fish-eating killer whales varied between males and females, with age, between day and night, and among pods

and years. Data were used from 34 TDR deployments between 1993 and 2002 in the inshore waters of southern British Columbia, Canada, and Washington, USA. Dive rates did not change with age or differ among pods or between males and females, although analyses restricted to adults showed that adult males dove deep significantly more frequently than adult females during the day. For all whales, dive rates and swim speeds were greater during the day than at night, suggesting decreased activity levels at night. Dive rates to deeper depths during the day decreased over the study, suggesting a long-term change in prey behaviour or abundance, though uncertainty regarding the diet of this population precludes determination of the cause of such changes.
URL: <Go to ISI>://000229412400001
Link to PDF: Baird_etal_2005_Diving_fish-eating_KW.pdf

Reference Type: Journal Article
Record Number: 448
Author: Banner, Arnold; Hyatt, Martin
Year: 1973
Title: Effects of noise on eggs and larvae of two estuarine fishes
Journal: Transactions of the American Fisheries Society
Volume: 102
Issue: 1
Pages: 134-136
Short Title: Effects of noise on eggs and larvae of two estuarine fishes
Abstract: no abstract
Link to PDF: Banner_Hyatt_1973_FXfishEggs_noise.pdf

Reference Type: Journal Article
Record Number: 514
Author: Barimo, John F.; Fine, Michael L.
Year: 1998
Title: Relationship of swim-bladder shape to the directionality pattern of underwater sound in the oyster toadfish
Journal: Canadian Journal of Zoology-Revue Canadienne De Zoologie
Volume: 76
Issue: 1
Pages: 134-143
Short Title: Relationship of swim-bladder shape to the directionality pattern of underwater sound in the oyster toadfish
Abstract: The swim bladder of the oyster toadfish, Opsanus tau, has a distinctive heart shape with two anterior protrusions
separated by a midline cleft. The lateral surfaces contain intrinsic muscles that meet at the caudal midline, but the rostromedial
surface is muscle-free. We hypothesize that swim-bladder design represents a compromise between opposing tendencies

toward (i) an omnidirectional sound source that would optimize a male□s opportunity to attract females from any direction,
and (ii) a directional sound source that would shield the nearby ears during sound production. To determine if the
directionality of toadfish sound is consistent with this hypothesis, boatwhistle advertisement calls of individually identified
males were recorded in the York River, Virginia, by means of two calibrated hydrophones and a waterproof recording system:
one hydrophone was fixed 1 m in front of the fish and the second was roving. Boatwhistles in the horizontal plane propagated
in a modified omnidirectional pattern that was bilaterally symmetrical. The mean sound pressure was 126 dB re: 1 mPa at 0°.
The sound pressure level decreased by approximately 1 dB at ±45°, after which levels increased to 180°, averaging 3□6 dB
greater behind (mean 130 dB) than directly in front of the fish. This pattern is consistent with the hypothesis that sound energy
is reduced at the fish□s ears. The source level and fundamental frequency of the boatwhistle were highly stereotyped, with
coefficients of variation averaging less than 1%, and duration was more variable, with a coefficient of variation of 8%. Grunt
levels overlapped but were slightly lower than boatwhistle values.
Link to PDF: Barimo_Fine_1998_swimbladder_oystertoadfish.pdf

Reference Type: Journal Article
Record Number: 439
Author: Barlow, Jay
Year: 1988
Title: Harbor porpoise: *Phocoena phocoena*, abundance estimation for California, Oregon, and Washington: I. ship surveys
Journal: Fishery Bulletin
Volume: 86
Issue: 3
Pages: 417-432
Date: July 1988
Type of Article: Journal Article
Short Title: Ship surveys of harbor porpoise
Keywords: POPULATION DYNAMICS; NATURE CONSERVATION; FISHERY SURVEYS; ABUNDANCE; METHODOLOGY; MARINE MAMMALS; BYCATCH; *PHOCOENA PHOCOENA*
Abstract: The density and total population size of harbor porpoise along the coasts of California, Oregon, and Washington are estimated from ship surveys using line transect methods. Surveys were completed between September 1984 and May 1986 using teams of 3-5 observers. Data include 852 porpoise groups sighted during 6,590 km of transects. Sighting rates varied more due to effects of sea state than due to the presence of rain, fog, or sun glare. Experiments using additional observers indicate that

approximately 22% of trackline groups were missed by a team of 5 observers. Harbor porpoise density is calculated from transects along the 18 m isobath and is extrapolated to other depth zones based on a model of porpoise abundance as a function of depth. Total population size is estimated as 45,713 (SE = 7,865) animals.
Research Notes: Behavioral responses noted as small part of larger survey. Response to research vessel viewed from helicopter.
Link to PDF: Barlow_1988_HarborPorpoise_CaOrWa_surveys.pdf

Reference Type: Journal Article
Record Number: 6
Author: Barrett-Lennard, Lance G.; Ford, John K. B.; Heise, Kathy A.
Year: 1996
Title: The mixed blessing of echolocation: Differences in sonar use by fish-eating and mammal-eating killer whales
Journal: Animal Behaviour
Volume: 51
Pages: 553-565
Date: Mar
Short Title: The mixed blessing of echolocation: Differences in sonar use by fish-eating and mammal-eating killer whales
Accession Number: ISI:A1996UD88800004
Keywords: KILLER WHALE; *ORCINUS ORCA*; ECHOLOCATION;
Abstract: Despite well-documented experimental evidence of echolocation in toothed whales, virtually nothing is known about the use and functional significance of cetacean sonar in the wild. Here, the patterns of echolocation sounds produced by killer whales, *Orcinus orca*, off British Columbia and Alaska are described. Two sympatric populations with divergent food habits differed markedly in sonar sound production. Individuals belonging to the fish-eating 'resident' population produced trains of characteristic sonar clicks, on average, 4% of the time, 27 times more often than marine mammal-eating 'transient' killer whales. The click trains of residents averaged 7 s, more than twice as long as the trains of transients. Click repetition rates within resident's trains were constant or changed gradually; within transient's trains they often fluctuated abruptly. Transients produced isolated single or paired clicks at an average rate of 12/h, four times as often as residents. In general, the isolated clicks and infrequent, short and irregular trains of transients were less conspicuous against background noise than the sonar of residents. This difference in acoustic crypticity may reflect a flexible response to the probability of alerting prey, because marine mammals have more acute hearing than fish in the frequency range of sonar clicks. In both populations, echolocation use per individual decreased with increasing group size, suggesting the sharing of information between group members. No relationships were found between echolocation activity and water clarity for whales of either population. Transient whales often travelled or foraged without discernibly echolocating, suggesting that passive listening provides cues for prey detection and orientation.
Notes: Part 3
Link to PDF: Barrett-Lennard_1996_Echol_FishEating_MammalEating.pdf

Reference Type: Journal Article
Record Number: 368
Author: Bart, A. N.; Clark, J.; Young, J.; Zohar, Y.
Year: 2001
Title: Underwater ambient noise measurements in aquaculture systems: a survey
Journal: Aquacultural Engineering
Volume: 25
Pages: 99-110
Short Title: Underwater ambient noise measurements in aquaculture systems: a survey
Keywords: AQUACULTURE SYSTEMS; FREQUENCY; SOUND PRESSURE LEVELS; UNDERWATER NOISE; FISH
Abstract: In order to understand the effect of environmental waterborne sound on cultured fish an ambient noise survey was conducted in enclosed recirculating raceways, fiberglass and concrete culture tanks, and in outdoor open ponds. Two distinct low and high frequency regions of sound were observed, above and below 315 Hz one-third octave band. Low frequency sounds were dominant in all systems measured. Overall noise levels were not significantly different between concrete or wooden frame raceways. However, the noise level in the low frequency range was higher by approximately 10 dB re:1 uPa in the concrete raceway. Low frequency noise was particularly high (130 dB re:1 uPa) in fiberglass tanks when compared with that in the concrete tanks (110 dB re: 1uPa). High frequency underwater noise was generated mostly by electrical motors, oscillating and collapsing air bubbles, aeration, and water pump action. Low frequency noise was generated by water flows, ground vibrations, tank wall vibrations and electrical pumps. In the high frequency (1–2 kHz) region, Sound Pressure Levels (SPL) ranged from 100 to 115 dB (re: 1 uPa). In low frequency region (25–1000 Hz), SPL ranged from 125 to 135 dB (re: 1 uPa). These high SPLs at lower frequencies are within the hearing range of most teleost species that have been studied (R.R. Fay and A.M. Simmons, Comparative Hearing : Fishes and Amphibians, Springer, New York, 1999). Subjecting juvenile or adult fish to these high levels of chronic and or acute noise that are present in many hatcheries and culture systems may adversely effect their health and well being.
Link to PDF: Bart_etal_2001_Underwater_ambient_aquaculture.pdf

Reference Type: Journal Article
Record Number: 158
Author: Beale, Colin M.; Monaghan, Pat
Year: 2004
Title: Behavioural responses to human disturbance: a matter of choice?
Journal: Animal Behaviour
Volume: 68
Issue: 5
Pages: 1065-1069
Short Title: Behavioural responses to human disturbance: a matter of choice?

Keywords: ANTHROPOGENIC NOISE; TURNSTONE; *ARENARIA INTERPRES*; BIRDS
Abstract: The strength of an animal's behavioural response to human presence has often been used as an index of an animal's susceptibility to disturbance. However, if behavioural responsiveness is positively related to the animal's condition, this may be an inappropriate index, as individuals showing little or no response may in fact be those with most to lose from changing their behaviour. We tested the link between individual state and responsiveness by manipulating condition via the provision of supplementary food for turnstones, *Arenaria interpres*, on rocky shores. Birds at one site were fed 450 g of mealworms at low tide every day for 3 days while birds at another site acted as a control. On the fourth day, using a standardized disturbance protocol, we recorded flush distances, flight lengths and the amount of time between predator scans for birds in both flocks. After a break of 3 days, the treatments were then swapped between sites and the procedure repeated for a total of six trials. Birds whose condition had been enhanced showed greater responsiveness to standardized human disturbance, flying away at greater distances from the observer, scanning more frequently for predators and flying further when flushed. These findings suggest that our current management of the impact of human disturbance may be based on inaccurate assessments of vulnerability, and we discuss the implications of this for refuge provision.
URL:
http://www.sciencedirect.com/science/article/B6W9W-4DB5745-4/2/dab356c87a5445f8e81ae3901406590e
Link to PDF: Beale_Monaghan_2004_BehavResp_Choice.pdf

Reference Type: Journal Article
Record Number: 160
Author: Beale, Colin M.; Monaghan, Pat
Year: 2004
Title: Human disturbance: people as predation-free predators?
Journal: Journal of Applied Ecology
Volume: 41
Issue: 2
Pages: 335-343
Short Title: Human disturbance: people as predation-free predators?
Electronic Resource Number: doi:10.1111/j.0021-8901.2004.00900.x
Keywords: HUMAN DISTURBANCE; BIRDS; KITTIWAKE; *RISSA TRIDACTYLA*; GUILLEMOT; *URIA AALGE*; PREDATION
Abstract: 1. Human disturbance has been associated with declines in breeding success in numerous species and is of general concern to conservationists. However, the current framework for predicting and minimizing disturbance effects is weak and there is considerable uncertainty about why animals are disturbed by people in the first place. 2. We developed a behavioural model of perceived predation risk as a framework for understanding the effects of disturbance on cliff-nesting birds. This encompassed the concept that the effects of disturbance should increase with increasing numbers of visitors, and decrease with distance from the nest, an insight ignored in current

conservation practice. 3. The predictions of this model were tested using field data on nesting success in two species of seabird, kittiwake *Rissa tridactyla* and guillemot *Uria aalge*. Statistical models of nesting success in both species suggested that perceived predation risk is a good predictor of the effects of disturbance. 4. Synthesis and applications. Our findings suggest that fixed set-back distances and buffer zones are likely to be inappropriate conservation measures in situations where the numbers of visitors to wildlife areas fluctuates spatially and temporally, as is generally the case. In managing access to wildlife areas there is a need to ensure that larger parties of visitors are kept further away from the nesting areas of vulnerable species or that set-back distances are determined for the largest party likely to visit the site. Journal of Applied Ecology (2004) 41, 335 -343
URL: http://www.blackwell-synergy.com/doi/abs/10.1111/j.0021-8901.2004.00900.x
Link to PDF: Beale_Monaghan_2004_PredationFree_Humans.pdf

Reference Type: Journal Article
Record Number: 517
Author: Beier, John C.; Wartzok, Douglas
Year: 1979
Title: Mating behaviour of captive spotted seals (*Phoca largha*)
Journal: Animal Behaviour
Volume: 27
Issue: 3
Pages: 772-781
Short Title: Mating behaviour of captive spotted seals (*Phoca largha*)
Abstract: This study is the first detailed analysis of the underwater mating behaviour of seals . The
courtship behaviour of this species of ice-inhabiting phocid is more complex and variable than that of
seals in other habitats . We observed underwater mating during April and early May in 1973 to 1977 .
Most pre- and post-copulatory behaviours and vocalizations are drawn from the repertoire we observed
throughout the year . For a one-year period we monitored six vocalizations and seven behaviours, four
of which involved interactions between the pair . Nosing and biting interactions and growling and
drumming vocalizations increased significantly two weeks prior to copulation and progressively
increased up to the day of mating.
Link to PDF: Beier_Wartzok_1979_mating_spottedseal.pdf

Reference Type: Journal Article
Record Number: 7
Author: Bejder, L.; Dawson, S. M.; Harraway, J. A.

Year: 1999
Title: Responses by Hector's dolphins to boats and swimmers in Porpoise Bay, New Zealand
Journal: Marine Mammal Science
Volume: 15
Issue: 3
Pages: 738-750
Short Title: Responses by Hector's dolphins to boats and swimmers in Porpoise Bay, New Zealand
Accession Number: ISI:000080863700008
Keywords: HECTOR'S DOLPHIN; NEW ZEALAND; ANTHROPOGENIC; BOAT; VESSEL
Abstract: Theodolite tracking (61 d; 251 h) was used to quantify dolphin reactions to boats and swimmers in the austral summers of 1995-1996 and 1996-1997. Dolphins were accompanied by swimmers (within 200 m) for 11.2% of the total observation time, whereas boats accounted for an additional 12.4%. Dolphins were not displaced by either of these activities. Swimmers caused only weak, non-significant effects, perhaps because dolphins could very easily avoid them. Reactions to the dolphin-watching boat were stronger. Analyses of relative orientation indicate that dolphins tended to approach the vessel in the initial stages of an encounter but became less interested as the encounter progressed. By 70 min into an encounter dolphins were either actively avoiding the boat or equivocal towards it, approaching significantly less often than would be expected by chance. Analyses of group dispersion indicate that dolphins were significantly more tightly bunched when a boat was in the bay.
Link to PDF: Bejder_etal_1999_RX_Hectors-dolphin_boats_NZ.pdf
Author Address: Bejder, Lars ; Dawson, Stephen M. ; Marine Science Department, University of Otago, Dunedin, New Zealand

Reference Type: Journal Article
Record Number: 238
Author: Bejder, L.; Samuels, A.; Whitehead, H.; Gales, N.
Year: 2006
Title: Interpreting short-term behavioural responses to disturbance within a longitudinal perspective
Journal: Animal Behaviour
Volume: 72
Issue: 5
Pages: 1149-1158
Date: Nov
Short Title: Interpreting short-term behavioural responses to disturbance within a longitudinal perspective
Accession Number: ISI:000241942800021
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; VESSEL; BEHAVIOR; TOURISM
Abstract: We documented immediate, behavioural responses of Indo-Pacific bottlenose

dolphins (*Tursiops sp*.) to experimental vessel approaches in regions of high and low vessel traffic in Shark Bay, Western Australia. Experimental vessel approaches elicited significant changes in the behaviour of targeted dolphins when compared with their behaviour before and after approaches. During approaches, focal dolphin groups became more compact, had higher rates of change in membership and had more erratic speeds and directions of travel. Dolphins in the region of low vessel traffic (control site) had stronger and longer-lasting responses than did dolphins in the region of high vessel traffic (impact site). In the absence of additional information, the moderated behavioural responses of impact-site dolphins probably would be interpreted to mean that long-term vessel activity within a region of tourism had no detrimental effect on resident dolphins. However, another study showed that dolphin-watching tourism in Shark Bay has contributed to a long-term decline in dolphin abundance within the impact site (Bejder et al., in press, Conservation Biology). Those findings suggest that we documented moderated responses not because impact-site dolphins had become habituated to vessels but because those individuals that were sensitive to vessel disturbance left the region before our study began. This reinterpretation of our findings led us to question the traditional premise that short-term behavioural responses are sufficient indicators of impacts of anthropogenic disturbance on wildlife.
Notes: Part 5
Link to PDF: Bejder_etal_2006_Long-term_FX_boats_Tursiops_SharkBay.pdf

Reference Type: Journal Article
Record Number: 159
Author: Bejder, Lars; Samuels, Amy; Whitehead, Hal; Gales, Nick; Mann, Janet; Connor, Richard; Heithaus, Mike; Watson-Capps, Jana; Flaherty, Cindy; Krutzen, Michael
Year: 2006
Title: Decline in relative abundance of bottlenose dolphins exposed to long-term disturbance
Journal: Conservation Biology
Volume: 20
Issue: 6
Pages: 1791-1798
Short Title: Decline in relative abundance of bottlenose dolphins exposed to long-term disturbance
Electronic Resource Number: doi:10.1111/j.1523-1739.2006.00540.x
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; VESSEL
Abstract: Studies evaluating effects of human activity on wildlife typically emphasize short-term behavioral responses from which it is difficult to infer biological significance or formulate plans to mitigate harmful impacts. Based on decades of detailed behavioral records, we evaluated long-term impacts of vessel activity on bottlenose dolphins (*Tursiops* sp.) in Shark Bay, Australia.We compared dolphin abundance within adjacent 36-km2 tourism and control sites, over three consecutive 4.5-year periods wherein research activity was relatively

constant but tourism levels increased from zero, to one, to two dolphin-watching operators. A nonlinear logistic model demonstrated that there was no difference in dolphin abundance between periods with no tourism and periods in which one operator offered tours. As the number of tour operators increased to two, there was a significant average decline in dolphin abundance (14.9%; 95% CI=−20.8 to −8.23), approximating a decline of one per seven individuals. Concurrently, within the control site, the average increase in dolphin abundance
was not significant (8.5%; 95% CI=−4.0 to +16.7). Given the substantially greater presence and proximity of tour vessels to dolphins relative to research vessels, tour-vessel activity contributed more to declining dolphin numbers within the tourism site than research vessels. Although this trend may not jeopardize the large, genetically diverse dolphin population of Shark Bay, the decline is unlikely to be sustainable for local dolphin tourism. A similar declinewould be devastating for small, closed, resident, or endangered cetacean populations.
The substantial effect of tour vessels on dolphin abundance in a region of low-level tourism calls into question the presumption that dolphin-watching tourism is benign.
Link to PDF: Bejder_etal_2006_Decline_abundance_Tutr_Disturbance.pdf

Reference Type: Journal Article
Record Number: 241
Author: Bellan, Gerard L.; Bellan-Santini, Denise R.
Year: 2001
Title: A review of littoral tourism, sport and leisure activities: consequences on marine flora and fauna
Journal: Aquatic Conservation-Marine and Freshwater Ecosystems
Volume: 11
Issue: 4
Pages: 325-333
Date: Jul-Aug
Short Title: A review of littoral tourism, sport and leisure activities: consequences on marine flora and fauna
Accession Number: ISI:000170482900015
Keywords: TOURISM
REVIEW
Abstract: 1. A report on the scientific aspects of the consequences of tourism and other leisure activities on the marine flora and fauna has been prepared on behalf of the French Ministry of the Environment. This involved an exhaustive bibliographical review resulting in a series of proposals to address some of the issues highlighted. 2. Our knowledge is too often based on observations of the deeds and misdeeds of tourism along with only a small amount of experimental study. 3. The main proposals are that there should be: (1) a compilation of all studies ordered by and for the State and its decentralized services., local communities and private companies: (2) definition of priority species and ecosystems, (3) observations on the direct and indirect impacts by tourists and sportsmen on the natural environment for each one of the large biotopes; (4) quantification of the impact of recreational Fishing: (5) an integration of biological,

sociological, economic and judicial disciplines in the management of the marine environment.
Link to PDF: Bellan_Bellan-Santini_2001_Littoral_tourism_FX.pdf

Reference Type: Report
Record Number: 397
Author: Blackwell, Susanna B.; Greene, Charles R. Jr.
Year: 2002
Title: Acoustic measurements in Cook Inlet, Alaska during August 2001
Series Title: NMFS Greenridge Report
Pages: 41
Short Title: Acoustic measurements in Cook Inlet, Alaska during August 2001
Keywords: BELUGA WHALE
DELPHINAPTERUS LEUCAS
ANTHROPOGENIC NOISE
VESSEL NOISE
COOK INLET
Abstract: During August 2001 Greeneridge Sciences, Inc., made underwater and in-air recordings
of various sound sources in Cook Inlet, AK. The objective was to quantify the acoustic environment that beluga whales may be subjected to in the Inlet. Sounds were analyzed with respect to their broadband and one-third octave band levels, and their spectral composition.
Repeated measurements of the same source at different distances provided information on transmission loss. Four main types of sound sources were analyzed: (1) overflights by commercial and military aircraft departing or landing at Anchorage International
Airport and Elmendorf Air Force Base, respectively; (2) the Phillips A oil platform located in the northwestern part of Cook Inlet; (3) large and small vessels in Anchorage harbor; and (4) ambient sounds in areas removed from industrial activities.
Recordings were made during aircraft overflights seaward of Anchorage International Airport (ANC), where commercial jets and airplanes were taking off, and Elmendorf Air Force Base (AFB), where military jets (mainly F-15s) were landing. Peak underwater broadband levels during overflights reached 125 dB re 1 µPa at ANC and 135
dB re 1 µPa at the AFB. “Ambient” broadband levels, recorded in the same locations while no overflights were taking place, were higher for the AFB (119 dB re 1 µPa) than for ANC (105 dB re 1 µPa). A-weighted in-air broadband levels reached 95 dBA re 20 µPa for both airports. Spectral composition for both commercial and military jets was broadband in nature with most of the energy below 2 kHz.
Recordings were made at 6 stations located 0.3 to 19 km from the Phillips A oil platform.
Underwater broadband levels were highest 1.2 km from the platform (119 dB re 1 µPa) and decreased with distance, reaching background levels by the farthest station (19

km). Several tones at frequencies of 60 to 105 Hz likely originated at the platform and had
spreading loss terms of -16 to -24 dB per tenfold change in distance. A-weighted broadband
levels in air reached 65 dBA re 20 µPa 0.3 km from the platform and decreased at a rate of -16 dB per tenfold change in distance.
Both large ships (i.e. cargo-bulk carrier Emerald Bulker) and small craft (i.e., Avon rubber boat) were recorded in Anchorage harbor. The highest underwater broadband levels
were obtained while a tug was docking a gravel barge and reached 149 dB re 1 µPa at a
distance of 100 m. Spreading loss terms for most of the underwater recordings in the harbor
area were between -14 and -21 dB re 1 µPa. Beluga whales were observed in the harbor
area close to a cargo-freight ship during one of the recordings, when broadband levels would have been close to 125 dB re 1 µPa. Ship noise was mainly low-frequency in nature, with most of the energy below 1 kHz.
Six locations removed from industrial activities were sampled for ambient sound levels. The lowest broadband underwater levels were obtained at Birchwood, a location up
the Knik Arm which is frequented by beluga whales, and averaged 95 dB re 1 µPa. The highest underwater broadband levels were obtained north of Point Possession during the
incoming tide and reached 124 dB re 1 µPa. These ambient sound levels are comparable to
those recorded in the Beaufort Sea away from industrial activities. When compared to the
Birchwood recording, an ambient recording from Anchorage harbor showed a reasonably
Acoustic Measurements in Cook Inlet, AK August 13, 2002 3
even increase in sound pressure levels of 20-40 dB across all frequencies sampled (4 to
20,000 Hz). In contrast, the highest SPLs in the recording made north of Point Possession
were between 1 and 10 kHz and were attributed to tide noises.
Beluga whales are able to hear an unusually wide range of frequencies, covering most natural and man-made sounds. However, where their hearing is keenest (10-100 kHz) is above the frequency range of most industrial noise, and at low frequencies (<100
Hz) beluga hearing threshold levels may be comparable to or exceed one-hertz band levels
recorded for the industrial activities reported in this study. Therefore, the sound levels measured in Cook Inlet during this study would not be expected to have more than a minor
effect on the whales.

Research Notes: Beluga whales in Cook Inlet did not appear to be bothered by sounds from cargo-freight ship
Link to PDF: Blackwell_Greene_2002_beluga_acoustic.pdf

Reference Type: Journal Article
Record Number: 242
Author: Blackwell, Susanna B.; Greene, Charles R. Jr.
Year: 2005
Title: Underwater and in-air sounds from a small hovercraft
Journal: Journal of the Acoustical Society of America
Volume: 118
Issue: 6
Pages: 3646-3652
Date: Dec
Short Title: Underwater and in-air sounds from a small hovercraft
Accession Number: ISI:000234101000027
Keywords: HOVERCRAFT; VESSEL; BOAT; ALASKA; UNDERWATER ACOUSTIC MEASUREMENT
Abstract: Underwater and in-air recordings were made from a boat anchored near Prudhoe Bay, Alaska, while a Griffon 2000TD hovercraft drove by at or near full power on four passes. At the closest point of approach (CPA, 6.5 m), underwater broadband (10-10 000 Hz) levels reached 133 and 131 dB re: I mu Pa at depths of I and 7 m, respectively. In-air unweighted and A-weighted broadband (10-10 000 Hz) levels reached 104 and 97 dB re: 20 mu Pa, respectively. The hovercraft produced sound at a wide range of frequencies. Both underwater and in air, the largest spectral peak was near 87 Hz, which corresponded to the blade rate of the thrust propeller. In addition, the spectral composition included several harmonics of this frequency. The shaft or blade rate of the lift fan was barely detectable underwater despite its proximity to the water. The hovercraft was considerably quieter underwater than similar-sized conventional vessels and may be an attractive alternative when there is concern over underwater sounds.
Research Notes: Good for relevant solutions, hovercraft much quieter.
Link to PDF: Blackwell_Greene_2005_Hovercraft_noise.pdf

Reference Type: Journal Article
Record Number: 177
Author: Blackwell, Susanna B.; Greene, Charles R. Jr.
Year: 2006
Title: Sounds from an oil production island in the Beaufort Sea in summer: Characteristics and contribution of vessels
Journal: Journal of the Acoustical Society of America
Volume: 119
Issue: 1
Pages: 182-196

Date: Jan
Short Title: Sounds from an oil production island in the Beaufort Sea in summer: Characteristics and contribution of vessels
Accession Number: ISI:000234612600017
Keywords: VESSEL; OIL; BEAUFORT SEA; ALASKA
Abstract: The objective of this study was to determine the levels, characteristics, and range dependence of underwater and in-air sounds produced during the open-water seasons of 2000–2003 by the Northstar oil development, located in nearshore waters of the Alaskan Beaufort Sea. Specifically, sounds originating at the island itself (from construction, drilling, and oil production activities) were compared with sounds produced by vessels performing island support. Sounds were obtained with boat-based recordings (at distances up to 37 km from Northstar), a cabled hydrophone (distance ~450 m), and with autonomous seafloor recorders (distance ~22 km). Vessels (crew boat, tugs, self-propelled barges) were the main contributors to the underwater sound field and were often detectable underwater as much as ~30 km offshore. Without vessels, broadband island sounds reached background values at 2–4 km. Island sound levels showed more variation (lower min, higher max) during construction than during drilling and production. In-air broadband measurements were not affected by the presence of vessels and reached background values 1–4 km from Northstar. However, one airborne tone (81 Hz) believed to originate at Northstar was still detectable in the spectrum 37 km away.
Research Notes: Noise from "island" not helpful but noise relating transport vessels useful.
URL: <Go to ISI>://000234612600017
Link to PDF: Blackwell_Greene_2006_Noise_vessels_summer_Beaufort.pdf

Reference Type: Journal Article
Record Number: 167
Author: Blackwell, Susanna B.; Lawson, J. W.; Williams, M. T.
Year: 2004
Title: Tolerance by ringed seals (*Phoca hispida*) to impact pipe-driving and construction sounds at an oil production island
Journal: Journal of the Acoustical Society of America
Volume: 115
Issue: 5
Pages: 2346-2357
Date: May
Short Title: Tolerance by ringed seals (*Phoca hispida*) to impact pipe-driving and construction sounds at an oil production island
Accession Number: ISI:000221131700058
Keywords: ALASKA; RINGED SEAL; *PHOCA HISPIDA*; PIPE DRIVING; OIL
Abstract: During June and July 2000, impact pipe-driving sounds at Northstar Island (Prudhoe Bay, Alaska) were recorded underwater and in air at distances 63–3000 m from the source. Simultaneously, reactions of nearby ringed seals (in water or on ice) were documented. Pipe-driving pulses were analyzed to determine unweighted peak

and rms sound-pressure levels (SPLs) and sound-exposure levels (SELs). Underwater, mean levels for these parameters reached 157 and 151 dB re: 1 uPa and 145 dB re: 1 uPa2s, respectively, at 63 m. The corresponding values in air were 112 and 96 dB re: 20 uPa and 90 dB re: (20 mPa)2s, respectively. Underwater SPLs were, <180 dB re: 1 uPa at all distances. During 55 h of observation, 23 observed seals exhibited little or no reaction to any industrial noise except approaching Bell 212 helicopters. Ringed seals swam in open water near the island throughout construction activities and as close as 46 m from the pipe-driving operation. Based on current audiometric data for seals, these sounds are expected to be audible to less than 3
km underwater and at least 0.5 km in air. Most likely the seals around Northstar Island were habituated to industrial sounds.
Notes: Part 1
URL: <Go to ISI>://000221131700058
Link to PDF: Blackwell_etal_2004_RingedSeals_PipeDriving.pdf

Reference Type: Online Multimedia
Record Number: 499
Created By: Bland, Roger; Garfield, Newell
Year: 2002
Title: One Year on Pioneer Seamount
URL: http://www.physics.sfsu.edu/~seamount/research/sfsu/ecoo2002/ecoo2002.html
Link to PDF: [WEBPAGE]
Access Date: Access Date

Reference Type: Journal Article
Record Number: 10
Author: Blane, J. M.; Jaakson, R.
Year: 1994
Title: The impact of ecotourism boats on the St. Lawrence beluga whales
Journal: Environmental Conservation
Volume: 21
Issue: 3
Pages: 267-269
Short Title: The impact of ecotourism boats on the St. Lawrence beluga whales
Accession Number: ISI:A1994QB61200016
Keywords: BELUGA WHALE
Author Address: Blane, Jean M. ; Public Review and Assessment, Fed. Environ. Assessment Office, Environ. Can., Hull K1A 0H3, Canada

Reference Type: Book Section
Record Number: 467
Author: Blue, J.E.; Gerstein, E.R.
Year: 2005

Title: The acoustical causes of collisions between marine mammals and vessels
Editor: Medwin, H.
Book Title: *Sounds in the Sea*
City: New York, NY
Publisher: Cabridge Universtiy Press
Pages: 430-444
Short Title: The acoustical causes of collisions between marine mammals and vessels
Link to PDF: Blue_Gerstein_2005_acoustic_cause_collisions.pdf

Reference Type: Journal Article
Record Number: 485
Author: Blumstein, Daniel T.; Fernández-Juricic, Esteban; Zollner, Patrick A.; Garity, Susan C.
Year: 2005
Title: Inter-specific variation in avian responses to human disturbance
Journal: Journal of Applied Ecology
Volume: 42
Pages: 943-953
Short Title: Predicting wildlife responses to tourism
Keywords: ALERT DISTANCE; CONSERVATION BEHAVIOR; DETECTION DISTANCE; ECOTOURISM; FLIGHT INITIATION DISTANCE; RECREATION
Abstract: 1.
Increasing urbanization and recreational activities around and within biodiversity hotspots require an understanding of how to reduce the impacts of human disturbance on more than a single species; however, we lack a general framework to study multiple species. One approach is to expand on knowledge about the theory of anti-predator behaviour to understand and predict how different species might respond to humans.
2.
We reviewed the literature and found that only 21% of studies that used a behavioural approach to study human disturbance focused on multiple species. These studies identified
a number of potential predictive variables.
3.
We developed a simulation model that investigates interspecific variation in different parameters of disturbance with variation in human visitation. We found that fitness-related
responses, such as the quantity of food consumed by a species, are relatively sensitive to
the distance at which animals detect humans, the frequency of disturbance by humans and the interaction of these factors, but are less sensitive to other characteristics.
4.
We examined avian alert distance (the distance animals first orientated to an approaching
threat, a proxy for detection distance) across 150 species, controlling for phylogenetic effects.

We found that larger species had greater alert distances than smaller species, which could increase local spatial and temporal limitations on suitable habitat with increasing human visitation.
5.
Synthesis and applications
. Our results suggest that body size could be a potential
predictor of responses to human disturbance across species, and could be used by managers
to make conservation decisions regarding levels of human visitation to a protected site. We
suggest that three things are essential to develop predictive models of how different species
will respond to human disturbance. First, multiple indicators of disturbance should be studied
to select those with lower intraspecific variation for a given study system. Secondly, the species-specific nature of responses should be identified. Thirdly, life history, natural history
and other correlates with these species-specific responses must be assessed.
Link to PDF: Blumstein_etal_2005_Variation_Avian_Resp.pdf

Reference Type: Journal Article
Record Number: 199
Author: Boebel, O.; Clarkson, P.; Coates, R.; Larter, R.; O'Brien, P. E.; Ploetz, J.; Summerhayes, C.; Tyack, T.; Walton, D. W. H.; Wartzok, D.
Year: 2005
Title: Risks posed to the Antarctic marine environment by acoustic instruments: a structured analysis
Journal: Antarctic Science
Volume: 17
Issue: 4
Pages: 533-540
Date: Dec
Short Title: Risks posed to the Antarctic marine environment by acoustic instruments: a structured analysis
Accession Number: ISI:000233727800007
Keywords: ECHO SOUNDERS; MARINE SURVEY; RISK ANALYSIS; SEISMIC REFLECTION
Abstract: The risks posed by a range of acoustic scientific instruments were assessed by the construction of matrices of scale and likelihood. We recognized six levels of impact ranging from none or short term, minimal behavioural response (Level 1) to multiple injuries and fatalities and/or compromised populations (Level 6) and six levels of likelihood ranging from “Expected in almost all instances” (Level 1) to “cannot see how it could happen” (Level 6). Typical scientific instruments ranging from acoustic releases to large air
gun arrays were assessed. To provide a perspective for the risks of scientific

operations, other activities were also ranked. These included large chemical explosions, submarine detection sonars implicated in some mass strandings of cetaceans and normal Antarctic shipping activities. The conclusion reached was that most scientific instruments pose a similar or lower risk than normal shipping operations. High source-level equipment poses some risk to individual animals' hearing and so should be mitigated. Likewise, survey
planning should be designed to avoid trapping animals in narrow, constricted sea ways. Long term, cumulative impacts are still difficult to detect in areas with greater anthropogenic noise than the Antarctic but we concluded that any possible long term impacts should be mitigated by maintaining the low levels of activity using high source-level equipment through data sharing and survey planning.
URL: <Go to ISI>://000233727800007
Link to PDF: Boebel_etal_2005_FX_science_acoustics_Antarctic.pdf

Reference Type: Journal Article
Record Number: 244
Author: Born, Erik W.; Riget, Frank F.; Dietz, Rume; Andriashek, Dennis
Year: 1999
Title: Escape responses of hauled out ringed seals (*Phoca hispida*) to aircraft disturbance
Journal: Polar Biology
Volume: 21
Issue: 3
Pages: 171-178
Date: Mar
Type of Article: Article
Short Title: Escape responses of hauled out ringed seals (*Phoca hispida*) to aircraft disturbance
Alternate Journal: Polar Biol.
ISSN: 0722-4060
Accession Number: ISI:000079146400007
Keywords: RINGED SEAL; *PHOCA HISPIDA*; AIRCRAFT; BEHAVIOR; ESCAPE BEHAVIOR; GREENLAND; OUT BEHAVIOR; ICE; HELICOPTER
Abstract: Arctic marine mammals may be subject to human-induced disturbance from various air traffic, mostly in connection with exploration and exploitation of non-renewable resources. The escape responses (i.e. leaving the ice) of hauled out ringed seals (*Phoca hispida*) to a low-flying (150 m) fixed-wing twin-engine aircraft (Partenavia PN68 Observer) during strip censuses in eastern Greenland (June 1984) and to a low-flying (150 m) helicopter (Bell 206 III) during reconnaissance in northwestern Greenland (May 1992) were recorded. Overall, 6.0% of the seals (N-tot = 5040) escaped as a reaction to the fixed-wing aircraft. Seals escaped less than about 600 m in front of the aircraft. The overall probability of escaping was 0.21 within a 200-m-wide centre zone, 0.06 on the side of the aircraft (100-300 m from the flight track), and 0.02 between 300 and 500 m from the track. The probability of escaping was found to be influenced by the time of day, relative wind direction and wind chill. Overall,

about 49% of all seals (N-tot = 227 cases) escaped as a response to the helicopter. Seals entered the water a maximum of about 1250 m in front of the aircraft. At wind chill values below 1100 kcal/m(2) h, the probability of escaping was 0.79 in the 200-m-wide centre zone. On the sides the probability of escaping decreased up to about 500 m from the flight track whereafter it remained constant at about 0.30 up to about 1450 m. During the helicopter surveys wind chill was the only environmental factor found to have an additional effect on the probability of escaping. The study indicated that the risk of scaring ringed seals into the water can be substantially reduced if small-type helicopters do not approach them closer than about 1500 m, and small fixed-winged aircraft not closer than about 500 m.
Notes: ISI Document Delivery No.: 176HV
Times Cited: 13
Cited Reference Count: 44
URL: <Go to ISI>://000079146400007
Link to PDF: Born_etal_1999_Escape_ringed_aircraft.pdf
Author Address: Greenland Inst Nat Resources, DK-3900 Nuuk, Greenland. Natl Environm Res Inst, Dept Arctic Environm, DK-2200 Copenhagen N, Denmark. Canadian Wildlife Serv, Edmonton, AB T6H 3S5, Canada.
Born, EW, Greenland Inst Nat Resources, POB 571, DK-3900 Nuuk, Greenland.
Language: English

Reference Type: Journal Article
Record Number: 11
Author: Bowles, Ann E.; Smultea, M.; Wursig, B.; Demaster, D. P.; Palka, D.
Year: 1994
Title: Relative abundance and behavior of marine mammals exposed to transmissions from the Heard Island Feasibility Test
Journal: Journal of the Acoustical Society of America
Volume: 96
Issue: 4
Pages: 2469-2484
Short Title: Relative abundance and behavior of marine mammals exposed to transmissions from the Heard Island Feasibility Test
Accession Number: ISI:A1994PL70800055
Keywords: HEARD ISLAND FEASIBILITY TEST; MARINE MAMMALS; BEHAVIOR; BLUE WHALE; *BALAENOPTERA MUSCULUS*; FIN WHALE; *BALAENOPTERA PHYSALUS*; SPERM WHALE; *PHYSETER MACROCEPHALUS*; SEI WHALE; *BALAENOPTERA BOREALIS*; HOURGLASS DOLPHIN; *LAGENORHYNCHUS CRUCIGER*; PILOT WHALE; *GLOBICEPHALA MELAS*; SOUTHERN BOTTLENOSE DOLPHIN; *HYPEROODON PLANIFRONS*; MINKE WHALE; *BALAENOPTERA ACUTOROSTRATA*; ANTARCTIC FUR SEAL; *ARCTOCEPHALUS GAZELLA*; SOUTHERN ELEPHANT SEAL; *MIROUNGA LEONINA*
Abstract: The Heard Island Feasibility Test source transmitted a hum at 209-220 dB re: 1 uPa at 175-m depth, centered on 57 Hz with a maximum bandwidth of 30 Hz for 1 h of every 3. Experienced marine mammal observers conducted line-transect surveys and monitored marine mammal behavior visually and acoustically in a 70x70 km square

centered on the transmission sitte. Thirty-nine groups of cetaceans and 19 of pinnipeds were sighted from both vessels before the start of transmissions. Thirty-nine groups of cetaceans and 23 of pinnipeds were sighted during transmissions. Blue (*Balaenoptera musculus*), fin (*B. physalus*), and sperm (*Physeter tnacrocephalus*) whales were sighteduring the base line period; blue, sperm, and possibly sei (*B. borealis*) whales were sighted during the transmission period. More schools of hourglass dolphins (*Lagenorhynchus cruciger*) were sighted during transmissions, but fewer groups of pilot whales (*Globicephala melas*), southern bottlenose whales (*Hyperoodon planifrons*), and minke whales (*B. acutorostrata*). The density of all cetaceans was 0.0157 groups/km2 before the transmissions and 0.0166 groups/km2 during. Antarctic fur seals (*Arctocephalus gazella*) and southern elephant seals (*Mirounga leonina*) were seen, but not in sufficient numbers to estimate abundance. One blue whale tracked before, during and after a transmission changed respiration and reorientation rates, but did not avoid the source detectably. Sperm whales and pilot whales were heard in 23% of 1181 min of baseline acoustic surveys; but in none of 1939 min during the transmission period. Both species were heard within 48 h after the end of the test.
Research Notes: Visual and acoustic monitoring of animal behavioral responses to HIFT.
Link to PDF: Bowles_etal_1994_whale_dolphin_seal_HeardIsland.pdf

Reference Type: Report
Record Number: 458
Author: Bowles, Ann E.; Stewart, Brent S.
Year: 1982
Title: Disturbances to the pinnipeds and birds of San Miguel Island, 1979 – 1980
Series Editor: Jehl, J.R.; Cooper, C.F.
Series Title: Potential effects of space shuttle sonic booms on the biota and geology of the California Channel Islands: Research Reports
City: San Diego, CA
Institution: Center for Marine Studies, San Diego State University
Pages: 99-137
Short Title: Disturbances to the pinnipeds and birds of San Miguel Island, 1979 – 1980
Link to PDF: Jehl_Cooper_1980_Channel_Islands_sonic_booms.pdf

Reference Type: Journal Article
Record Number: 245
Author: Bradshaw, Corey J. A.; Evans, Karen; Hindell, Mark A.
Year: 2006
Title: Mass cetacean strandings - a plea for empiricism
Journal: Conservation Biology
Volume: 20
Issue: 2
Pages: 584-586
Date: Apr

Type of Article: Editorial Material
Short Title: Mass cetacean strandings - a plea for empiricism
Alternate Journal: Conserv. Biol.
ISSN: 0888-8892
Accession Number: ISI:000236064200039
Keywords: WHALE STRANDINGS; NEW ZEALAND; TOPOGRAPHY; MORTALITY; MILITARY; WHALE
Notes: ISI Document Delivery No.: 022OB
Times Cited: 0
Cited Reference Count: 22
URL: <Go to ISI>://000236064200039
Link to PDF: Bradshaw_etal_2006_Causes_Stranding.pdf
Author Address: Charles Darwin Univ, Sch Environm Res, Darwin, NT 0909, Australia. Univ Tasmania, Antarctic Wildlife Res Unit, Sch Zool, Hobart, Tas 7001, Australia. Bradshaw, CJA, Charles Darwin Univ, Sch Environm Res, Darwin, NT 0909, Australia. corey.bradshaw@cdu.edu.au
Language: English

Reference Type: Report
Record Number: 422
Author: BREA
Year: 2006
Title: The Contribution of the North American Cruise Industry to the U.S. Economy in 2005
City: Arlington, VA
Institution: International Council of Cruise Lines
Pages: 93
Date: August 2006
Type: Economic Report
Short Title: U.S. Economica Impact Analysis
Abstract: Following a year of robust growth in 2004, the North American cruise industry experienced
a more moderate rate of expansion during 2005. As indicated in Table ES-1, passenger embarkations
at U.S. ports increased by 6.3 percent in 2005 to 8.6 million. This rate of increase
was less than half the 13.9 percent increase during 2004. The slower growth in embarkations
resulted in a reduced rate of growth in passenger and cruise spending. After increasing by
13.8 percent in 2004, the growth in total industry spending declined to 10 percent in 2005,
and totaled $16.18 billion for the year. Because the growth in spending exceeded the growth
in embarkations, global spending on a per passenger basis increased from $1,553 in 2004 to
$1,667 in 2005.

Research Notes: Economic report for 2005 on cruise industry in the US. Section specific to Alaska.
URL: http://www.iccl.org/resources/2005_economic_study.pdf
Link to PDF: BREA_2006_cruise_economic_study.pdf
Author Address: Business Research & Economic Advisors
Caption: Business Research & Economic Advisors

Reference Type: Book Section
Record Number: 339
Author: Brumm, H.; Slabbekoorn, H.
Year: 2005
Title: Acoustic communication in noise
Book Title: *Advances in the Study of Behavior*
City: San Diego
Publisher: Elsevier Academic Press
Volume: 35
Pages: 151-209
Series Title: Advances in the Study of Behavior
Short Title: Acoustic communication in noise
ISBN: 0065-3454
Accession Number: ISI:000234422200004
Keywords: AUDITORY STREAM SEGREGATION; COMODULATION MASKING RELEASE; WREN; T*ROGLODYTES TROGLODYTES*; STARLINGS; *STURNUS VULGARIS*; BUDGERIGARS; *MELOPSITTACUS UNDULATUS*; BLUE-THROATED HUMMINGBIRD; FIELD BINAURAL UNMASKING; SPARROW; *SPIZELLA PUSILLA*; PIGEON; *COLUMBA LIVIA*; WHITE-CROWNED SPARROW
REVIEW
Notes: Review chapter
Research Notes: Describes the impact of noise on animal communication, including masking; most of the available data reviewed is on birds, so the document is most useful for its review and update of general principles.
Link to PDF: GET FROM ANN
Author Address: Univ St Andrews, Sch Biol, St Andrews KY16 9TS, Fife, Scotland. Leiden Univ, Inst Biol, NL-2300 RA Leiden, Netherlands.
Brumm, H, Univ St Andrews, Sch Biol, St Andrews KY16 9TS, Fife, Scotland.
Language: English

Reference Type: Book Section
Record Number: 449
Author: Bryant, Peter J.; Lafferty, Christopher M.; Lafferty, Susan K.
Year: 1984
Title: Reoccupation of Laguna Guerrero Negro, Baja California, Mexico, by gray whales
Editor: Jones, Mary Lou; Swartz, Steven L.; Leatherwood, Stephen
Book Title: *The Gray Whale* Eschrichtius robustus
City: Orlando, FL

Publisher: Academic Press
Pages: 375-387
Short Title: Reoccupation of Laguna Guerrero Negro, Baja California, Mexico, by gray whales
ISBN: 0-12-389180-9
Link to PDF: Bryant_etal_1984_Reoccupation_Grays_Ch15.pdf

Reference Type: Journal Article
Record Number: 246
Author: Buckstaff, K. C.
Year: 2004
Title: Effects of watercraft noise on the acoustic behavior of bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida
Journal: Marine Mammal Science
Volume: 20
Issue: 4
Pages: 709-725
Date: Oct
Type of Article: Article
Short Title: Effects of watercraft noise on the acoustic behavior of bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida
ISSN: 0824-0469
Accession Number: ISI:000224489000003
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; ACOUSTIC COMMUNICATION; WHISTLES; DISTURBANCE RESPONSE; WATERCRAFT; VESSEL; RECEIVED LEVEL; CONSERVATION; WHITE-TAILED DEER; SIGNATURE WHISTLES; *DELPHINAPTERUS LEUCAS*; PLAYBACK EXPERIMENTS; SAMPLING METHODS; MARINE MAMMALS; BOAT; WHALE; SNOWMOBILES; THRESHOLD
Abstract: Watercraft may provide the greatest source of arithropogenic noise for bottlenose dolphins living in coastal waters. A resident community of about 140 individuals near Sarasota, Florida, are exposed to a vessel passing within 100 m approximately every six minutes during daylight hours. I investigated the circumstances under which watercraft traffic may impact the acoustic behavior of this community, specifically looking for short-term changes in whistle frequency range, duration, and rate of production. To analyze whistles and received watercraft noise levels, acoustic recordings were made using two hydrophones towed from an observation vessel during focal animal follows of 14 individual dolphins. The duration and frequency range of signature whistles did not change significantly relative to vessel approaches. However, dolphins whistled significantly more often at the onset of approaches compared to during and after vessel approaches. Whistle rate was also significantly greater at the onset of a vessel approach than when no vessels were present. Increased whistle repetition as watercraft approach may simply reflect heightened arousal, an increased motivation for animals to come closer together, with whistles functioning to promote reunions. It may also be an effective way to compensate for signal masking, maintaining communication in a noisy environment.

Notes: ISI Document Delivery No.: 862KH
Times Cited: 2
Cited Reference Count: 51
URL: <Go to ISI>://000224489000003
Link to PDF: Buckstaff_2004_Watercraft_Bottlenose_Acoustics.pdf
Author Address: Univ Calif Santa Cruz, Dept Ocean Sci, Santa Cruz, CA 95064 USA.
Buckstaff, KC, Mote Marine Lab, 1600 Ken Thompson Pkwy, Sarasota, FL 34236 USA.
kara@mote.org
Language: English

Reference Type: Journal Article
Record Number: 537
Author: Buerkle, U.
Year: 1967
Title: An audiogram of the Atlantic cod, *Gadus morhua* L.
Journal: Journal of the Fisheries Research Board of Canada
Volume: 24
Pages: 2309-2319
Short Title: An audiogram of the Atlantic cod, *Gadus morhua* L.
Link to PDF: Buerkle_1967_audiogram_AtlanticCod.pdf

Reference Type: Journal Article
Record Number: 462
Author: Calambokidis, John; Darling, J.D.; Deecke, V.; Gearin, P.; Gosho, M.; Megill, W.; Tombach, C.M.; Goley, D.; Toropova, C.; Gisborne, B.
Year: 2002
Title: Abundance, range, and movements of a feeding aggregation of gray whales (*Eschrichtius robustus*) from California to southeastern Alaska in 1998
Journal: Journal of Cetacean Research and Management
Volume: 4
Issue: 3
Pages: 267-276
Short Title: Abundance, range, and movements of a feeding aggregation of gray whales (*Eschrichtius robustus*) from California to southeastern Alaska in 1998
Link to PDF: Calambokidis_etal_2002_GrayWhale_movements.pdf

Reference Type: Book Section
Record Number: 533
Author: Calkins, D.G.
Year: 1986
Title: Marine mammals
Editor: Wood, D.W.; Zimmerman, S.T.
Book Title: *The Gulf of Alaska: Physical Environment and Biological Resources*
City: National Oceanographic and Atmospheric Administration, Ocean Assessments

Division, Alaska Office
Pages: 527-558
Short Title: Marine mammals

Reference Type: Journal Article
Record Number: 346
Author: Carey, W. M.
Year: 2006
Title: Sound sources and levels in the ocean
Journal: IEEE Journal of Oceanic Engineering
Volume: 31
Issue: 1
Pages: 61-75
Short Title: Sound sources and levels in the ocean
Keywords: ANSI STANDARDS; ACOUSTIC EMISSION; ACOUSTIC GENERATORS; SONAR; UNDERWATER ACOUSTIC PROPAGATION; ACTIVE SONAR TRANSMISSIONS; CONTINUOUS SOUND SOURCE; NAVAL SONAR SYSTEM OPERATION; OMNIDIRECTIONAL EXPLOSIVE; SONAR SYSTEMS; SOUND LEVELS; SOUND SOURCE MODEL; TRANSIENT SOUND SOURCES; UNDERWATER ACOUSTICS; DECIBEL; ENERGY FLUX SPECTRAL DENSITY; EFSD; LOW FREQUENCY
Abstract: The standard definitions found in the American National Standards on Acoustics are applied to common sound sources used in both underwater acoustics research and naval sonar system operation. Recommended metrics are quantified for both continuous and transient sources of sound. Standard definitions are reviewed with theoretical sound source models. Requisite metrics are derived and applied to examples of energy sources of sound, such as transients from a small omnidirectional explosive, an air gun, a light bulb, and a dolphin click. A generic quantitative model of surface ship sonar system emissions is developed. Active sonar transmissions are analyzed with the requisite quantitative metrics required to characterize these emissions. These results should be useful in environmental assessments, biological experiments, and the sonar system design.
Notes: 0364-9059
Link to PDF: Carey_2006_SoundLevels_IEEE.pdf

Reference Type: Journal Article
Record Number: 531
Author: Cerchio, S.; Dahlheim, Marilyn E.
Year: 2001
Title: Variation in feeding vocalizations of humpback whales Megaptera novaeangliae from southeast Alaska
Journal: Bioacoustics
Volume: 11
Issue: 4

Pages: 277-295
Short Title: Variation in feeding vocalizations of humpback whales Megaptera novaeangliae from southeast Alaska
Link to PDF: Cerchio_Dahlheim_2001_Humpback_feeding_vocs.pdf

Reference Type: Journal Article
Record Number: 543
Author: Chapman, C.J.
Year: 1973
Title: Field studies of hearing in teleost fish
Journal: Helgoländer wissenschaftliche Meeresuntersuchungen
Volume: 24
Pages: 371-390
Short Title: Field studies of hearing in teleost fish
Abstract: KURZFASSUNG: Freilandversuche fiber das H6rverm6gen bei Teleostiern. Versuche fiber
das HSrverm/Sgen verschiedener mariner Fische - des Schellfischs (Melanograrnrnus aeglefinus),
des Pollacks (PoIlachius pollachius), des Kabeljaus (Gadus morhua) und des Lengs (Molva
rnolva) - wurden im Biotop, und zwar in 20 m Tiefe bei Loch Torridon (Schottland) durchgefiihrt.
Die Reaktionen der Fische wurden mit Hilfe einer besonderen Dressurtechnik getestet, wobei dem Tonreiz ein leichter elektrischer Schock folgte; wurde das akustische Signal wahrgenommen,
traten Ver~nderungen im Elektrokardiogramm der Fische auf. Alle 4 Arten wlesen
ein ~ihnliches H~rverm/Sgen auf. Im Niederfrequenzbereich yon etwa 60-300 Hz wurde die h~S&ste Empfindlichkeit registriert. Bei h~Sheren Frequenzen stellte sich eine Verminderung
der Empfindlichkelt ein; nur Molva molva konnte zuverl~issig auf einen Ton yon 550 Hz abgerichtet
werden. Im Bereich niederer Frequenzen waren alle Fische iiuBerst empfindlich; es ergaben sich Hinweise, dab die HiJrschwellen vom Eigenrauschen des Meeres maskiert wurden.
Dies wurde durch Versu&e best{itigt, bei denen die Intensit~it des Eigenrauschens vergrSBert
wurde, die Mith~Srschwellen aber in konstantem Abstand zum St~Srpegel blieben. Ferner wurde
festgestellt, dab die Verde&ung reiner T~Sne wesentlich vermindert wurde, wenn Ton und
St/Srpegel ans verschiedenen Richtungen (ira rechten Winkel zueinander) abgestrahlt wurden.
Daraus ist zu schlieBen, dab die F~ihigkeit, die Richtung der S&allquellen zu unterscheiden, gut
entwi&elt sein diirtte.

Link to PDF: Chapman_1973_hearing_teleostfish.pdf

Reference Type: Journal Article
Record Number: 538
Author: Chapman, C.J.; Hawkins, A.D.
Year: 1973
Title: A field study of hearing in the cod, *Gadus morhua* L
Journal: Journal of Comparative Physiology A-Neuroethology Sensory Neural and Behavioral Physiology
Volume: 85
Issue: 2
Pages: 147-167
Short Title: A field study of hearing in the cod, *Gadus morhua* L
Abstract: 1. Field measurements of hearing in the cod, Gadus morhua L., have shown that these fish are sensitive to pure tones in the frequency range from 30 to 470 Hz with greatest sensitivity in the range 60 to 310 Hz. At the most sensitive frequencies the mean thresholds varied between -18 and -26 dB/~bar (Fig. 4).
2. Variation in the thresholds at most frequencies was related to changes in the level of ambient sea noise (Figs. 5-7). Only in calm sea conditions were unmasked thresholds obtained. The masking effect of noise was confirmed by raising the level artificially. The thresholds increased in proportion to the increase in noise level.
3. The thresholds were largely independent of the distance of the sound source over the range from 1.7 to 50 m, suggesting that cod are sensitive to acoustic pressure. However, a changeover to particle displacement sensitivity was noted at frequencies below 50 Hz when the sound source was moved to within 1 m of the fish (Fig. 9).
4. It is concluded that the swimbladder plays an accessory role in hearing. Differences obtained in the thresholds at different sound source distances may be explained in terms of the displacement sensitivity of the otolith organs. These respond to displacements re-radiated from the swimbladder in the far-field, and to the greater incident displacement in the near-field at very low frequencies.
Link to PDF: Chapman_Hawkins_1973_cod_hearing.pdf

Reference Type: Journal Article
Record Number: 546
Author: Clark, Christopher W.; Clapham, Phillip J.
Year: 2004
Title: Acoustic monitoring on a humpback whale (*Megaptera novaeangliae*) feeding ground shows continual singing into late spring
Journal: Proceedings of the Royal Society of Edinburgh Section B-Biological Sciences
Volume: 271
Pages: 1051-1057
Short Title: Acoustic monitoring on a humpback whale (*Megaptera novaeangliae*) feeding ground shows continual singing into late spring

Keywords: HUMPBACK WHALE; SONG; MATING SYSTEMS; NORTH ATLANTIC;
Abstract: Singing by males is a major feature of the mating system of humpback whales, *Megaptera novaeangliae*
(Borowski). Although a few songs have been opportunistically recorded on the whales' high-latitude feeding
grounds, singing in these regions was thought to be only sporadic. We report results from the first
continuous acoustic monitoring of a humpback whale feeding ground (off Cape Cod, MA, USA) in spring.
Using autonomous sea-floor recording systems, we found singing on a daily basis over the entire 25 day
monitoring period, from 14 May to 7 June 2000. For much of the period, song was recorded 24 h per
day. These results, combined with evidence for aseasonal conceptions in whaling catch data, suggest that
the humpback whale breeding season should no longer be considered as confined to lower-latitude regions
in winter. Rather, we suggest breeding extends geographically and temporally onto feeding grounds into
at least spring and early summer. Singing at these times represents either low-cost opportunistic advertising
by (perhaps relatively few) males to court females that failed to conceive during the winter, and/or possibly
an intrasexual display.
Link to PDF: Clark_Clapham_2004_Song_feeding_Hback_CapeCod.pdf

Reference Type: Journal Article
Record Number: 188
Author: Clark, Christopher W.; Ellison, W. T.
Year: 2000
Title: Calibration and comparison of the acoustic location methods used during the spring migration of the bowhead whale, *Balaena mysticetus*, off Pt. Barrow, Alaska, 1984-1993
Journal: Journal of the Acoustical Society of America
Volume: 107
Issue: 6
Pages: 3509-3517
Date: Jun
Short Title: Calibration and comparison of the acoustic location methods used during the spring migration of the bowhead whale, *Balaena mysticetus*, off Pt. Barrow, Alaska, 1984-1993
Accession Number: ISI:000087508100055
Keywords: BOWHEAD WHALE; *BALAENA MYSTICETUS*
Abstract: Between 1984 and 1993, visual and acoustic methods were combined to census the Bering-Chukchi-Beaufort bowhead whale, *Balaena mysticetus*, population.

Passive acoustic location was based on arrival-time differences of transient bowhead sounds detected on sparse arrays of three to five hydrophones distributed over distances of 1.5–4.5 km along the ice edge. Arrival-time differences were calculated from either digital cross correlation of spectrograms (old method), or digital cross correlation of time waveforms (new method). Acoustic calibration was conducted in situ in 1985 at five sites with visual site position determined by triangulation using two theodolites. The discrepancy between visual and acoustic locations was ,1%–5% of visual range and less than 0.7° of visual bearing for either method. Comparison of calibration results indicates that the new method yielded slightly more precise and accurate positions than the old method. Comparison of 217 bowhead whale call locations from both acoustic methods showed that the new method was more precise, with location errors 3–4 times smaller than the old method. Overall, low-frequency bowhead transients were reliably located out to ranges of 3–4 times array size. At these ranges in shallow water, signal propagation appears to be dominated by the fundamental mode and is not corrupted by multipath.
URL: <Go to ISI>://000087508100055
Link to PDF: Clark_Ellison_2000_Bowhead_tracking.pdf

Reference Type: Journal Article
Record Number: 248
Author: Constantine, Rochelle; Brunton, Dianne H.; Dennis, Todd
Year: 2004
Title: Dolphin-watching tour boats change bottlenose dolphin (*Tursiops truncatus*) behaviour
Journal: Biological Conservation
Volume: 117
Issue: 3
Pages: 299-307
Date: May
Type of Article: Article
Short Title: Dolphin-watching tour boats change bottlenose dolphin (*Tursiops truncatus*) behaviour
Alternate Journal: Biol. Conserv.
ISSN: 0006-3207
Accession Number: ISI:000220702900008
Keywords: DOLPHIN-WATCHING; TOURISM; BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*;HUMAN DISTURBANCE; WHALE; *ORCINUS ORCA*; SAMPLING METHODS; NATIONAL PARK; NEW ZEALAND; RESPONSES; POPULATION; COASTAL; CANADA; BAY; BOAT
Abstract: Over the last decade there has been considerable growth in marine mammal-watching tourism throughout the world. Due to the species use of coastal habitats, bottlenose dolphins are most frequently exposed to dolphin-watching tourism. We conducted boat-based focal follows of schools of bottlenose dolphins to determine the effect of boats on dolphin behaviour. A CATMOD analysis showed that behaviour differed by boat number, in particular, resting behaviour decreased as boat number

increased. Dolphins rested less and engaged in more milling behaviour in the presence of permitted dolphin-watching boats compared to non-permitted boats. An increase from 49 to 70 permitted trips per week and a change in their departure times resulted in a further decrease in resting behaviour. Currently the effects of boats, in particular permitted boats, on dolphin resting behaviour whilst they are in the Bay of Islands, are substantial. In the light of these findings we suggest that current legislation in New Zealand is not affording this isolated population protection from disturbance.
Notes: ISI Document Delivery No.: 810KJ
Times Cited: 9
Cited Reference Count: 62
URL: <Go to ISI>://000220702900008
Link to PDF: Constantine_etal_2004_FX_dolphins_tour-boats.pdf
Author Address: Univ Auckland, Sch Biol Sci, Auckland 1, New Zealand.
Constantine, R, Univ Auckland, Sch Biol Sci, Private Bag 92019, Auckland 1, New Zealand.
r.constantine@auckland.ac.nz
Language: English

Reference Type: Journal Article
Record Number: 299
Author: Cook, Mandy L. H.; Varela, René A.; Goldstein, Juli D.; McCulloch, Stephen D.; Bossart, Gregory D.; Finneran, James J.; Houser, Dorian S.; Mann, David A.
Year: 2006
Title: Beaked whale auditory evoked potential hearing measurements
Journal: Journal of Comparative Physiology a-Neuroethology Sensory Neural and Behavioral Physiology
Volume: 192
Issue: 5
Pages: 489-495
Date: May
Type of Article: Article
Short Title: Beaked whale auditory evoked potential hearing measurements
Alternate Journal: J. Comp. Physiol. A -Neuroethol. Sens. Neural Behav. Physiol.
ISSN: 0340-7594
Accession Number: ISI:000237947300006
Keywords: BEAKED WHALE; *MESOPLODON EUROPAEUS;* HEARING; AUDITORY EVOKED POTENTIAL; ENVELOPE FOLLOWING RESPONSE; MODULATION RATE TRANSFER FUNCTION; BRAIN-STEM RESPONSE; CETACEAN; SENSITIVITY; AUDIOGRAM; MILITARY; STIMULI; JAW
Abstract: Several mass strandings of beaked whales have recently been correlated with military exercises involving mid-frequency sonar highlighting unknowns regarding hearing sensitivity in these species. We report the hearing abilities of a stranded juvenile beaked whale (*Mesoplodon europaeus*) measured with auditory evoked potentials. The beaked whale's modulation rate transfer function (MRTF) measured with a 40-kHz carrier showed responses up to an 1,800 Hz amplitude modulation (AM) rate. The MRTF was strongest at the 1,000 and 1.200 Hz AM rates. The envelope following

response (EFR) input-output functions were non-linear. The beaked whale was most sensitive to high frequency signals between 40 and 80 kHz, but produced smaller evoked potentials to 5 kHz, the lowest frequency tested. The beaked whale hearing range and sensitivity are similar to other odontocetes that have been measured.
URL: <Go to ISI>://000237947300006
Link to PDF: Cook_etal_2006_Beaked_whale_hearing.pdf
Author Address: Univ S Florida, Coll Marine Sci, St Petersburg, FL 33701 USA. Harbor Branch Oceanog Inst Inc, Ft Pierce, FL 34946 USA. USN, Marine Mammal Program, Space & Naval Warfare Syst Ctr, San Diego, CA 92152 USA.
Cook, MLH, Univ S Florida, Coll Marine Sci, 140 7th Ave S, St Petersburg, FL 33701 USA.
mhill@marine.usf.edu
Language: English

Reference Type: Journal Article
Record Number: 249
Author: Corkeron, P. J.
Year: 1995
Title: Humpback whales (*Megaptera novaeangliae*) in Hervey Bay, Queensland - Behavior and responses to whale-watching vessels
Journal: Canadian Journal of Zoology-Revue Canadienne De Zoologie
Volume: 73
Issue: 7
Pages: 1290-1299
Date: Jul
Type of Article: Article
Short Title: Humpback whales (*Megaptera novaeangliae*) in Hervey Bay, Queensland - Behavior and responses to whale-watching vessels
Alternate Journal: Can. J. Zool.-Rev. Can. Zool.
ISSN: 0008-4301
Accession Number: ISI:A1995RZ63100012
Keywords: SOUTHERN GULF; WEST INDIES; WATERS; MAINE; VESSEL; HUMPBACK WHALE; *MEGAPTERA NOVAEANGLIAE*; WHALE-WATCHING; TOURISM; VESSEL; BEHAVIOR
Abstract: The effects of the presence of vessels on the behaviour of humpback whales (*Megaptera novaeangliae*) was studied in Hervey Bay, Queensland, where southward-migrating whales are the focus of a commercial whale-watching industry. The behaviour of whales was observed from a small yacht under sail. Rates of occurrence of units of behaviour for entire pods were obtained from continuous sampling of pods. Pods without calves showed lower rates of behaviour generally when vessels were within 300 m of them. Pods both with and without calves:were more likely to dive rather than slip under when vessels were within 300 m. Hybrid multidimensional scaling of rates of behaviours of pods indicated differences between suites of behaviours exhibited by pods when vessels were within 300 m of them and when they were not. Classification of the patterns of occurrence of behaviours demonstrated that for pods both with and without calves, different units of behaviour tended to occur

together when vessels were within 300 m and when they were not. Whale watching offers a nonlethal commercial use of whales, but in Hervey Bay, whale watching affects the behaviour of whales, which, although migrating, can be involved in breeding ground activities. Whether the short-term behavioural changes described here are accompanied by longer term avoidance of Hervey Bay by humpback whales as they migrate south remains to be determined.
Notes: ISI Document Delivery No.: RZ631
Times Cited: 18
Cited Reference Count: 53
URL: <Go to ISI>://A1995RZ63100012
Author Address: UNIV QUEENSLAND,DEPT ZOOL,BRISBANE,QLD 4072,AUSTRALIA.
CORKERON, PJ, UNIV SYDNEY,DEPT VET ANAT,SYDNEY,NSW 2006,AUSTRALIA.
Language: English

Reference Type: Journal Article
Record Number: 250
Author: Corkeron, P. J.
Year: 2004
Title: Whale watching, iconography, and marine conservation
Journal: Conservation Biology
Volume: 18
Issue: 3
Pages: 847-849
Date: Jun
Type of Article: Editorial Material
Short Title: Whale watching, iconography, and marine conservation
Alternate Journal: Conserv. Biol.
ISSN: 0888-8892
Accession Number: ISI:000221353300034
Keywords: FISHERIES; BEHAVIOR; OCEAN; WHALE-WATCHING; TOURISM; VESSEL
Notes: ISI Document Delivery No.: 819YU
Times Cited: 1
Cited Reference Count: 16
Link to PDF: Corkeron_2004_Whale-watching_Conservation.pdf
Author Address: Norwegian Inst Marine Res, N-9294 Tromso, Norway.
Corkeron, PJ, Norwegian Inst Marine Res, Pb 6404, N-9294 Tromso, Norway.
peter.corkeron@imr.no
Language: English

Reference Type: Journal Article
Record Number: 471
Author: Corwin, Jeffrey T.; Overholtzer, J. Carl
Year: 1997
Title: Fish n’ Chicks: Model recipes for hair-cell regeneration?

Journal: Neuron
Volume: 19
Pages: 951-954
Short Title: Fish n' Chicks: Model recipes for hair-cell regeneration?
Link to PDF: Corwin_Oberholtzer_1997_Fish&Chicks_regenerate.pdf

Reference Type: Journal Article
Record Number: 19
Author: Cosens, Susan E.; Dueck, Larry P.
Year: 1993
Title: Icebreaker noise In Lancaster Sound, NWT, Canada - Implications for marine mammal behavior
Journal: Marine Mammal Science
Volume: 9
Issue: 3
Pages: 285-300
Short Title: Icebreaker noise In Lancaster Sound, NWT, Canada - Implications for marine mammal behavior
Accession Number: ISI:A1993LQ69900006
Keywords: NOISE; MARINE MAMMALS; ICEBREAKER
Link to PDF: Cosens_Dueck_1993_icebreaker_Canada.pdf

Reference Type: Journal Article
Record Number: 293
Author: Costa, Daniel P.; Crocker, Daniel E.; Gedamke, Jason; Webb, Paul M.; Houser, Dorian S.; Blackwell, Susanna B.; Waples, Danielle; Hayes, Sean A.; Le Boeuf, Burney J.
Year: 2003
Title: The effect of a low-frequency sound source (acoustic thermometry of the ocean climate) on the diving behavior of juvenile northern elephant seals, *Mirounga angustirostris*
Journal: Journal of the Acoustical Society of America
Volume: 113
Issue: 2
Pages: 1155-1165
Date: Feb
Type of Article: Article
Short Title: The effect of a low-frequency sound source (acoustic thermometry of the ocean climate) on the diving behavior of juvenile northern elephant seals, *Mirounga angustirostris*
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000180874900047
Keywords: ELEPHANT SEAL; *MIROUNGA ANGUSTIROSTRIS*; HUMPBACK

WHALE; *MEGAPTERA NOVAEANGLIAE*; FORAGING ECOLOGY; BEAUFORT SEA; NOISE; SIGNALS; PINNIPED; ATOC; TAG

Abstract: Changes in the diving behavior of individual free-ranging juvenile northern elephant seals, *Mirounga angustirostris*, exposed to the acoustic thermometry of the ocean climate (ATOC) sound source were examined using data loggers. Data loggers were attached to the animals and measured swim speed, maximum-depth of dive, dive duration, surface interval, descent and ascent rate, and descent and ascent angle along with sound pressure level (SPL): The ATOC sound source was at a depth of 939 m and transmitted at 195 dB re: 1 muPa at 1 m centered at 75 Hz with a 37.5-Hz bandwidth. Sound pressure levels (SPL) measured at the seal during transmissions averaged 128 dB and ranged from 118 to 137 dB re: 1 muPa for the 60-90 Hz band; in comparison to ambient levels of 87-107 dB within this band. In no, case did an animal end its dive or show any other obvious change in behavior upon exposure to the ATOC sound. Subtle changes in diving behavior were detected, however. During exposure, deviations in descent rate were greater than 1 s.d. of the control mean in 9 of 14 seals. Dive depth increased and descent velocity increased in three animals, ascent velocity decreased in two animals, ascent rate increased in one animal and decreased in another, and dive duration decreased in only one animal. There was a highly significant positive correlation between SPL and descent rate. The biological significance of these subtle changes is likely to be minimal. This is the first study to quantify behavioral responses of an animal underwater with simultaneous measurements of SPL of anthropogenic sounds recorded at the animal.

URL: <Go to ISI>://000180874900047

Link to PDF: Costa_etal_2003_FX_ATOC_ESeals.pdf

Author Address: Univ Calif Santa Cruz, Dept Ecol & Evolutionary Biol, Santa Cruz, CA 95064 USA. Univ Calif Santa Cruz, Inst Marine Sci, Santa Cruz, CA 95064 USA. Sonoma State Univ, Dept Biol, Rohnert Pk, CA 94928 USA. Univ Calif Santa Cruz, Dept Ocean Sci, Santa Cruz, CA 95064 USA. Roger Williams Univ, Dept Biol, Bristol, RI 02809 USA. BIOMIMETICA, La Mesa, CA 91942 USA. Greeneridge Sci Inc, Goleta, CA 93117 USA.
Costa, DP, Univ Calif Santa Cruz, Dept Ecol & Evolutionary Biol, Santa Cruz, CA 95064 USA.

Language: English

Reference Type: Conference Proceedings

Record Number: 469

Author: Cox, Mardi; Rogers, Peter H.; Popper, Arthur N.; Saidel, William M.; Fay, Richard R.; Coombs, S.

Year of Conference: 1987

Title: Anatomical effects of intense tone stimulation in the goldfish ear: Dependence on sound pressure level and frequency

Conference Name: 113th Meeting of the Acoustical Society of America

Conference Location: Indianapolis, IN

Volume: 81

Date: 11-15 May 1987

Short Title: Anatomical effects of intense tone stimulation in the goldfish ear:

Dependence on sound pressure level and frequency
Abstract: [ABSTRACT ONLY]
The final results of an experimental investigation to study the extent of frequency regionalization in the ear of goldfish are presented. Goldfish about 6 in. in body length were subjected to intense tones at 250 and 500 Hz, and four different sound-pressure levels. They were placed in a waveguide and constrained as close as possible to a pressure antinode so that the primary response of the inner ear was due to the induced motion of the swimbladder and WeberJan ossicles. Both saccular and lagenar maculae were examined under a scanning electron microscope to determine the location and extent of hair cell damage as a function of frequency and sound-pressure level. The results are not inconsistent with the gross frequency regionalization in the saccular macula of codfish determined by P. S. Enger [Hearing and Sound Communication in Fishes (Springer, New York, 1981), pp. 243-255]. In addition, the results indicate a possible breakdown of the Weberian apparatus at extremely high sound-pressure levels where the primary site of damage switches from the saeeule to lagena. This is consistent with the behavior of the system based on its viscoelastic properties as postulated by R. MeN. Alexander [J. Exp. Biol. 38, 747-757 (1961)]. Work supported in part by ONR and N IH.]
Link to PDF: JASA_1987_meeting.pdf

Reference Type: Journal Article
Record Number: 494
Author: Cox, T.M.; Ragen, T.J.; Read, A.J.; Vos, E.; Baird, R.W.; Balcomb, K.; Caldwell, J.; Cranford, T. W.; Crum, L.; D'Amico, A.; D'Spain, G.; Fernandez, A.; Finneran, James J.; Gentry, Roger L.; Gerth, W.; Gulland, F.; Hildebrand, John A.; Houser, Dorian S.; Hullar, T.; Jepson, P.D.; Ketten, Darlene R.; MacLeod, C.D.; Miller, P.; Moore, Sue E.; Mountain, D.C.; Palka, D. ; Ponganis, P.; Rommel, S.A.; Rowles, T.; Taylor, B.; Tyack, Peter L.; Wartzok, Douglas; Gisiner, Robert; Mead, James G.; Benner, J.
Year: 2005
Title: Understanding the impacts of anthropogenic sound on beaked whales
Journal: Journal of Cetacean Research and Management
Volume: 7
Issue: 3
Pages: 177-187
Short Title: Understanding the impacts of anthropogenic sound on beaked whales
Link to PDF: Cox_etal_2006_BeakedWhale_HumanSound.pdf

Reference Type: Journal Article
Record Number: 252
Author: Croll, David A.; Clark, Christopher W.; Acevedo, Alejandro; Tershy, Bernie; Flores, Sergio; Gedamke, Jason; Urban, Jorge

Year: 2002
Title: Bioacoustics: Only male fin whales sing loud songs - These mammals need to call long-distance when it comes to attracting females
Journal: Nature
Volume: 417
Issue: 6891
Pages: 809-809
Date: Jun
Type of Article: Editorial Material
Short Title: Bioacoustics: Only male fin whales sing loud songs - These mammals need to call long-distance when it comes to attracting females
Alternate Journal: Nature
ISSN: 0028-0836
Accession Number: ISI:000176285600034
Keywords: FIN WHALE; SONG
Notes: ISI Document Delivery No.: 563YM
Times Cited: 11
Cited Reference Count: 13
URL: <Go to ISI>://000176285600034
Link to PDF: Croll_etal_2002_Male_finners_sing.pdf
Author Address: Univ Calif Santa Cruz, Ctr Ocean Hlth, Dept Ecol & Evolutionary Biol, Santa Cruz, CA 95060 USA. Cornell Lab Ornithol, Bioacoust Res Program, Ithaca, NY 14850 USA. Calif Acad Sci, San Francisco, CA 94118 USA. Univ Autonoma Baja Calif Sur, La Paz, BCS, Mexico.
Croll, DA, Univ Calif Santa Cruz, Ctr Ocean Hlth, Dept Ecol & Evolutionary Biol, Santa Cruz, CA 95060 USA.
Language: English

Reference Type: Journal Article
Record Number: 21
Author: Croll, David A.; Clark, Christopher W.; Calambokidis, J.; Ellison, W. T.; Tershy, Bernie
Year: 2001
Title: Effect of anthropogenic low-frequency noise on the foraging ecology of *Balaenoptera* whales
Journal: Animal Conservation
Volume: 4
Pages: 13-27
Date: Feb
Short Title: Effect of anthropogenic low-frequency noise on the foraging ecology of *Balaenoptera* whales
Accession Number: ISI:000168471300002
Keywords: FIN WHALE; *BALAENOPTERA PHYSALUS*; BLUE WHALE; *BALAENOPTERA MUSCULUS*; WHALE; ANTHROPOGENIC
Abstract: The human contribution to ambient noise in the ocean has increased over the past 50 years, and is dominated by low-frequency (LF) sound (frequencies <1000 Hz)

from shipping, oil and gas development, defence-related and research activities. Mysticete whales, including six endangered species, may be at risk from this noise pollution because all species produce and probably perceive low-frequency sound. We conducted a manipulative field experiment to test the effects of loud, LF noise on foraging fin blue (*B. musculus*) and (*Balaenoptera physalus*) whales off San Nicolas Island, California. Naive observers used a combination of attached tracking devices, ship-based surveys, aerial surveys, photo-identification and passive monitoring of vocal behaviour to examine the behaviour and distribution of whales when a loud LF source (US Navy SURTASS LFA) was and was not transmitting. During transmission, 12–30% of the estimated received levels of LFA of whales in the study area exceeded 140 dB re 1 µPa. However, whales continued to be seen foraging in the region. Overall, whale encounter rates and diving behaviour appeared to be more strongly linked to changes in prey abundance associated with oceanographic parameters than to LF sound transmissions. In some cases, whale vocal behaviour was significantly different between experimental and non-experimental periods. However, these differences were not consistent and did not appear to be related to LF sound transmissions. At the spatial and temporal scales examined, we found no obvious responses of whales to a loud, anthropogenic, LF sound. We suggest that the cumulative effects of anthropogenic LF noise over larger temporal and spatial scales than examined here may be a more important consideration for management agencies.
Notes: Part 1
Link to PDF: Croll_etal_2001_AnthroNoise_Balaenoptera.pdf

Reference Type: Journal Article
Record Number: 456
Author: Culik, Boris M.; Koschinski, Sven; Tregenza, Nick; Ellis, Graeme
Year: 2001
Title: Reactions of harbor porpoise (*Phocoena phocoena*) and herring (*Clupea harengus*) to acoustic alarms
Journal: Marine Ecology-Progress Series
Volume: 211
Pages: 255-260
Short Title: Reactions of harbor porpoise (*Phocoena phocoena*) and herring (*Clupea harengus*) to acoustic alarms
Keywords: HARBOR PORPOISE; BYCATCH; MORTALITY; THEODOLITE TRACKING; ACOUSTIC ALARM; PINGER; GILLNETS; NOISE
Abstract: throughout their range. Research conducted since 1994 has shown that acoustic alarms
(pingers) emitting high-frequency pulsed sounds effectively reduce the number of harbor porpoise
Phocoena phocoena casualties in sink gillnets. However, the mechanisms behind the effects of
pingers were still not understood. Until now, advantages and risks associated with their widespread
use could not be evaluated. Here we present the results of 2 field experiments: (1)

theodolite-tracking
of harbor porpoises exposed to a single PICE-pinger in Clayoquot Sound, Vancouver Island,
Canada and (2) herring *Clupea harengus* capture rates in surface gillnets equipped with and without
acoustic alarms (Dukane Netmark 1000, Lien, PICE) in the Baltic Sea herring fishery at Rügen Island,
Germany. Our results show that harbor porpoises do not seem to react to an experimental net in their
foraging area (n = 172 groups, median group size = 2 porpoises). Porpoise distance from the mid-point
of the net was distributed around a median of only 150 m (range 4 to 987 m). A net equipped with an
acoustic alarm, however, was avoided (n = 44 groups) within audible range (distance distribution
median = 530 m, range 130 to 1140 m). The porpoises were thus effectively excluded from the ensonified
area. Herring, one of the main prey species of harbor porpoises, were not affected by the acoustic
alarms tested (n = 25 407 fish captured). The advantages and risks of using acoustic alarms to mitigate
by-catch are discussed.
Link to PDF: Culik_etal_2001_harborporpoise_herring_AHD.pdf

Reference Type: Journal Article
Record Number: 545
Author: Cummings, William C.; Thompson, Paul O.; Cook, Richard
Year: 1968
Title: Underwater sounds of migrating gray whales, *Eschrichtius glaucus* (Cope)
Journal: Journal of the Acoustical Society of America
Volume: 44
Issue: 5
Pages: 1278-1281
Short Title: Underwater sounds of migrating gray whales, *Eschrichtius glaucus* (Cope)
Abstract: Underwater sounds from migrating gray whales were recorded from a bottom-mounted hydrophone array.
Sound-source locations were based upon arrival-time differences and received levels. Visual tracking corroborated
sound data. Moans were the most common of more than 231 whale sounds recorded in the presence
of at least 218 whales. Moans lasted 1.5 sec; their source level was about 126 dB re 0.0002 dyn/cm a at 1 yd;
and they ranged from 20 200 Hz. Underwater bloz:, sounds from surface exhalations were 1.25 sec long,
and they ranged from 15 175 Hz. Infrequent bubble4ype signals, lasting 0.7 sec, were

about 112 dB re 0.0002
dyn/cm a at 1 yd, ranging from 15-305 Hz. Knock sounds were as high as 350 Hz at sound-pressure levels
up to 116 dB re 0.0002 dyn/cm a at 1 yd. Gray whales were soniferous during the day and night. The average
swimming speed of lone migrators was 5.5 kt, based on sound tracks. No characteristic behavior could be
associated with sound production other than blow sounds during exhalations.
Link to PDF: Cummings_etal_1968_GrayWhale_sounds.pdf

Reference Type: Journal Article
Record Number: 253
Author: Curtis, K. R.; Howe, B. M.; Mercer, J. A.
Year: 1999
Title: Low-frequency ambient sound in the North Pacific: Long time series observations
Journal: Journal of the Acoustical Society of America
Volume: 106
Issue: 6
Pages: 3189-3200
Date: Dec
Type of Article: Article
Short Title: Low-frequency ambient sound in the North Pacific: Long time series observations
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000084328700018
Keywords: GULF OF CALIFORNIA; NOISE MEASUREMENTS; UNDERWATER SOUND; BREAKING WAVES; FIN WHALE; OCEAN; BLUE WHALE; RAINFALL; MEXICO; WIND; AMBIENT; VESSEL
Abstract: Long-term statistics of ambient sound in an ocean basin have been derived from 2 years of data collected on 13 widely distributed receivers in the North Pacific. The data consist of single hydrophone spectra (1-500 Hz in l-Hz bands) averaged over 170 s and recorded at 5-min intervals. Cumulative probability distributions of the ambient sound level show that for the open-ocean arrays at 75 Hz, sound levels are 3 dB higher than the median:level 10% of the time and 6 dB higher 1% of the time. For the coastal arrays, sound levels are 7 dB higher than the median level 10% of the time and 15 dB higher 1% of the time. The dearest feature in many of the spectrograms is a strong annual cycle in the 15-22 Hz band with peak signal levels up to 25 dB above the sound floor; this cycle is attributed to the presence and migration of blue and fin whales. On average, whales are detected 43% of the time. Ships are heard 31%-85% of the time on the coastal receivers and 19%-87% of the time on the open-ocean receivers, depending on the receiver. On average, ships are detected 55% of the time. The correlation coefficient between the sound level in the 200-400 Hz band and wind speed, determined from satellite and global meteorological analysis, is on average 0.56 for the coastal receivers and 0.79 for the open-ocean receivers. For some receivers, the sound

level in the 12-15 Hz band is correlated with the sound level in the 200-400 Hz band, with a correlation coefficient of 0.5. (C) 1999 Acoustical Society, of America. [S0001-4966(99)02512-6].
Notes: ISI Document Delivery No.: 266YW
Times Cited: 13
Cited Reference Count: 38
Link to PDF: Curtis_etal_1999_LowF_Ambient_NPAc_TimeSeries.pdf
Author Address: Univ Washington, Appl Phys Lab, Coll Ocean & Fishery Sci, Seattle, WA 98105 USA.
Curtis, KR, Univ Washington, Appl Phys Lab, Coll Ocean & Fishery Sci, Seattle, WA 98105 USA.
Language: English

Reference Type: Book Section
Record Number: 423
Author: Dahlheim, Marilyn E.; Fisher, Dean H.; Schempp, James D.
Year: 1984
Title: Sound production by the gray whale and ambient noise level in Laguna SanIgnacio, Baja California Sur, Mexico
Editor: Jones, Mary Lou; Swartz, Steven L.; Leatherwood, Stephen
Book Title: *The Gray Whale* Eshrichtius robustus
City: Orlando, FL
Publisher: Academic Press
Pages: 511-541
Short Title: Sound production by the gray whale and ambient noise level in Laguna SanIgnacio, Baja California Sur, Mexico
ISBN: 0-12-389180-9
Link to PDF: Dahlheim_etal_1984_SoundProd_Gray_Ch22.pdf

Reference Type: Book Section
Record Number: 455
Author: Dahlheim, Marilyn E.; Ljungblad, D. K.
Year: 1990
Title: Preliminary hearing study on gray whales (Eschrichtius robustus) in the field
Editor: Thomas, Jeanette A.; Kastelein, Ronald A.
Book Title: *Sensory Abilities of Cetaceans*
City: New York, NY
Publisher: Plenum Press
Pages: 335-346
Short Title: Preliminary hearing study on gray whales (Eschrichtius robustus) in the field
Abstract: [BOOK]
Link to PDF: Dahlheim_1990_GrayWhale_Hearing.pdf

Reference Type: Journal Article
Record Number: 424
Author: Dahlheim, Marilyn E.; Schempp, James D.; Swartz, Steven L.; Jones, Mary Lou
Year: 1981
Title: Attraction of gray whales, *Eshrichtius robustus*, to underwater outboard engine noise in Laguna San Ignacio, Baja California Sur, Mexico
Journal: Journal of the Acoustical Society of America
Volume: 70
Issue: S1
Pages: S83-S84
Date: Fall 1981
Type of Article: Contributed paper at 102nd Meeting of Acoustical Society of America
Short Title: Attraction of gray whales, *Eshrichtius robustus*, to underwater outboard engine noise in Laguna San Ignacio, Baja California Sur, Mexico
Abstract: [Abstract] Investigations on gray whales (*Eschrichtius robustus*) in Laguna San Ignacio have previously documented “curious” or “friendly” whale behavior towards vessels. This behavior was encountered during acoustical studies conducted in March 1981 in this lagoon. The initial response appears' triggered by the underwater sound generated from outboard engines. Whales actively seek out the sound source and physically contact slow (2–4 kts) moving small vessels (inflatable Avons, Zodiacs, wooden and aluminum skiffs). Engines kept in idle (running but out of gear) maintained these whales in close proximity for periods up to 3 hours. Some whales terminated this activity when the engine was shut off. These behaviors around vessels were video taped. Sound profiles on engine noise and ambient noise levels were collected and analyzed. This “curious” behavior is prevalent only in areas where whales are repeatedly exposed to small vessel activity. This unique behavior has occurred for the past four years in Laguna San Ignacio, and has only been recently described for Guerrero Negro Lagoon. Instances of similar behavior from other species of cetaceans will be discussed.
Research Notes: page 83-84, abstract
Link to PDF: JASA_1981_meeting.pdf

Reference Type: Journal Article
Record Number: 195
Author: Dalton, R.
Year: 2006
Title: More whale strandings are linked to sonar
Journal: Nature
Volume: 440
Issue: 7084
Pages: 593-593
Date: Mar
Short Title: More whale strandings are linked to sonar
Accession Number: ISI:000236350400011
Keywords: STRANDING; SONAR; WHALE

URL: <Go to ISI>://000236350400011
Link to PDF: Dalton_2006_whale_stranding_sonar.pdf

Reference Type: Journal Article
Record Number: 322
Author: D'Amico, Angela; Bergamasco, A.; Zanasca, P.; Carniel, S.; Nacini, E.; Portunato, N.; Teloni, V.; Mori, C.; Barbanti, R.
Year: 2003
Title: Qualitative correlation of marine mammals with physical and biological parameters in the Ligurian Sea
Journal: IEEE Journal of Oceanic Engineering
Volume: 28
Issue: 1
Pages: 29-43
Date: Jan
Type of Article: Article
Short Title: Qualitative correlation of marine mammals with physical and biological parameters in the Ligurian Sea
ISSN: 0364-9059
Accession Number: ISI:000181871700004
Keywords: MARINE HABITAT; MARINE MAMMALS; REMOTE SENSING; WESTERN MEDITERRANEAN SEA; FIN WHALE; *BALAENOPTERA PHYSALUS*; PLANKTON PRODUCTIVITY; BLACK SEA; MODEL; ABUNDANCE
Abstract: In support of its acoustic risk mitigation policy, NATO SACLANT Undersea Research Centre (SACLANTCEN) is sponsoring a series of sea trials, entitled "Sirena" to collect a multiyear integrated oceanographic, biological, and hydrographic data set, the goal being to explain, based on these parameters, the distribution of marine mammals found in specific locations. By understanding how ocean dynamics affects the distribution and behavior of whales and the organisms forming the food web upon which the whales feed, it may be possible to conduct acoustic exercises in areas of low cetacean density. The first two Sirena multidisciplinary cruises were conducted in the Ligurian Sea in late summer time frame during 1999 and 2000. The focus of this analysis is to determine whether remotely sensed satellite data can indicate nutrient-rich regions in areas where the oceanography is known and to determine if these regions of higher productivity, coupled with knowledge of cetacean presence from all available sources, could be used as an indicator of marine mammal presence for acoustic risk mitigation purposes. For the two years of data examined here, cooler sea-surface temperature data correlated with high levels of chlorophyll production as seen by remotely sensed images. This remotely sensed data correlated well with measured subsurface values of the same parameters. Coincident sightings of three species of marine mammals indicated that in and sperm whales generally preferred the deep, nutrient-rich portion of the basin while Cuvier's beaked whales preferred a submarine canyon where there is a frontal influence, as indicated from satellite data and historical oceanography. This paper is intended as a contribution to the longer term objective of developing the means to accurately predict cetacean presence from physical

oceanographic characteristics.
Notes: ISI Document Delivery No.: 661BQ
Times Cited: 3
Cited Reference Count: 52
URL: <Go to ISI>://000181871700004
Link to PDF: D'Amico_etal_2003_MM_habitat_correlates_Ligurian.pdf
Author Address: SACLANT Undersea Res Ctr, I-19138 La Spezia, Italy. CNR, Inst Studio Dinam Gandi Masse, ISDGM, I-30125 Venice, Italy.
D'Amico, A, SPAWAR Syst Ctr, San Diego, CA 92152 USA.
Language: English

Reference Type: Journal Article
Record Number: 291
Author: David, J. A.
Year: 2006
Title: Likely sensitivity of bottlenose dolphins to pile-driving noise
Journal: Water and Environment Journal
Volume: 20
Issue: 1
Pages: 48-54
Date: Mar
Type of Article: Article
Short Title: Likely sensitivity of bottlenose dolphins to pile-driving noise
Alternate Journal: Water Environ. J.
ISSN: 0951-7359
Accession Number: ISI:000235799300008
Keywords: BANDWIDTH; DOLPHIN; MASKING; NOISE; SOUND; UNDERWATER; VOCALIZATION; *TURSIOPS TRUNCATUS*; PORPOISE; BEHAVIOR; WHISTLES; PILE DRIVER; BOTTLENOSE DOLPHIN;
Abstract: Pile driver-generated noise has the potential to affect dolphin populations adversely as it is detectable up to 40 km from the source. At 9 kHz, this noise is capable of masking strong vocalisations within 10-15 km and weak vocalisations up to approximately 40 km. The masking radius reduces as the frequency increases: 6 km at 5 0 kHz and 1.2 km at 115 kHz. The impacts of masking are expected to be limited by the intermittent nature of pile driver noise, the dolphin's directional hearing, their ability to adjust vocalisation amplitude and frequency, and the structured content of their signals. Behavioural modifications have been observed in response to underwater sounds, including those produced by pile drivers, although in the latter case this may have been due to redistribution of prey species. A range of mitigation measures are proposed that are aimed at reducing the impact of pile driver noise on dolphin populations.
URL: <Go to ISI>://000235799300008
Author Address: CJC Ltd, St Andrews KY16 8PU, Fife, Scotland.
David, JA, CJC Ltd, St Andrews KY16 8PU, Fife, Scotland.
cjc@sunnybraes.co.uk
Language: English

Reference Type: Journal Article
Record Number: 23
Author: De Robertis, Alex.; Wilson, Christopher. D.
Year: 2006
Title: Walleye pollock respond to trawling vessels
Journal: ICES Journal of Marine Science
Volume: 63
Issue: 3
Pages: 514-522
Short Title: Walleye pollock respond to trawling vessels
Accession Number: ISI:000236272000012
Keywords: ACOUSTICS; TRAWL; VESSEL AVOIDANCE; WALLEYE POLLOCK; *THERAGRA CHALCOGRAMMA*; BEHAVIOR RESPONSE; VESSEL; TRAWL; ACOUSTIC BACKSCATTER
Abstract: The potential for fish to avoid survey vessels is a major source of uncertainty in stockassessment surveys. Although walleye pollock (*Theragra chalcogramma*) are the subject of a substantial commercial fishery in the North Pacific, their behavioural responses to approaching survey vessels remain poorly understood. As a first step in an effort to determine if walleye pollock avoid survey vessels engaged in trawling operations, we made pairwise comparisons of acoustic backscatter recorded by survey vessels while free-running and while trawling. Results are presented of acoustic backscatter recorded from NOAA's RV ''Miller Freeman'', which used a midwater trawl during the 1996-2002 eastern Bering Sea surveys, and a chartered commercial fishing vessel, which used a bottom trawl during a survey in 2003 in the Gulf of Alaska. In both cases, average backscatter from a vesselmounted echosounder was significantly higher when free-running than when trawling. These decreases in backscatter are consistent with increased vessel avoidance while trawling. There were no differences in the vertical distribution of backscatter when free-running and trawling, indicating that pollock do not exhibit elevated diving responses when approached by a trawling vessel rather than by a free-running vessel. Although the study indicates that pollock respond to trawling vessels, the nature of the behavioural response cannot be determined with the methods used in this study. Future work should evaluate potential stimuli produced by trawlers to which pollock may react, and should document changes in behaviour that may occur in their presence.
Research Notes: Free-running and trawling in the same vessel (research vessel, commerical vessel) in paired comparisons. No change in depth when vessel passes over when comparing trawling and free-running.
Link to PDF: DeRobertis_Wilson_2006_pollock_resp_trawlers.pdf

Reference Type: Journal Article
Record Number: 254
Author: Di Guardo, G.; Marruchella, G.
Year: 2005
Title: Sonars, gas bubbles, and cetacean deaths

Journal: Veterinary Pathology
Volume: 42
Issue: 4
Pages: 517-517
Date: Jul
Type of Article: Letter
Short Title: Sonars, gas bubbles, and cetacean deaths
Alternate Journal: Vet. Pathol.
ISSN: 0300-9858
Accession Number: ISI:000230282600018
Keywords: WHALE; *DELPHINAPTERUS LEUCAS*; BELUGA WHALE; LAWRENCE ESTUARY; SONAR
Notes: ISI Document Delivery No.: 942KZ
Times Cited: 0
Cited Reference Count: 8
URL: <Go to ISI>://000230282600018
Link to PDF: DiGuardo_2005_sonar_whale.pdf
Author Address: Univ Teramo, Fac Vet Med, Dept Compar Biomed Sci, Teramo, Italy. Di Guardo, G, Univ Teramo, Fac Vet Med, Dept Compar Biomed Sci, Piazza Aldo Moro, Teramo, Italy.
Language: English

Reference Type: Journal Article
Record Number: 24
Author: DiSciara, G. N.; Gordon, J.
Year: 1997
Title: Bioacoustics: A tool for the conservation of cetaceans in the Mediterranean Sea
Journal: Marine and Freshwater Behaviour and Physiology
Volume: 30
Issue: 2
Pages: 125-146
Short Title: Bioacoustics: A tool for the conservation of cetaceans in the Mediterranean Sea
Accession Number: ISI:A1997YF66100003
Keywords: CETACEAN

Reference Type: Journal Article
Record Number: 468
Author: Dohl, P.; Miller, James H.; Cato, D. H.; Andrew, R.K.
Year: 2007
Title: Underwater ambient noise
Journal: Acoustics Today
Volume: 3
Issue: 1
Pages: 23-33

Short Title: Underwater ambient noise
Link to PDF: Dohl_etal_2007_Ocean_vs_Land_Noise.pdf

Reference Type: Journal Article
Record Number: 25
Author: Dorsey, E. M.; Richardson, W. J.; Wursig, B.
Year: 1989
Title: Factors affecting surfacing, respiration, and dive behavior of bowhead whales, *Balaena mysticetus*, summering in the Beaufort Sea
Journal: Canadian Journal of Zoology-Revue Canadienne De Zoologie
Volume: 67
Issue: 7
Pages: 1801-1815
Short Title: Factors affecting surfacing, respiration, and dive behavior of bowhead whales, *Balaena mysticetus*, summering in the Beaufort Sea
Accession Number: ISI:A1989AC47900028
Keywords: BOWHEAD WHALE; *BALAENA MYSTICETUS*; BEHAVIOR; BEAUFORT SEA

Reference Type: Journal Article
Record Number: 26
Author: Draštik, Vladislav; Kubečka, Jan
Year: 2005
Title: Fish avoidance of acoustic survey boat in shallow waters
Journal: Fisheries Research
Volume: 72
Issue: 2-3
Pages: 219-228
Short Title: Fish avoidance of acoustic survey boat in shallow waters
Accession Number: ISI:000228370700008
Keywords: FISH BEHAVIOR; AVOIDANCE; ECHOGRAM SLOPE; ACOUSTIC BIOMASS; ECHOSOUNDER; FISH; VESSEL
Abstract: The avoidance reactions of fish with respect to a survey vessel were studied during horizontal acoustic applications of a Simrad EY500 split-beam echosounder (120 kHz) in two lakes (Wallersee, Balaton) and two reservoirs (Orlik, Rimov). Three methods were used to assess the avoidance reaction of fish to the survey vessel: (1) comparison of acoustically detected fish biomass at different distances, (2) determination of the fish direction vector (echogram slope) with respect to the transducer and (3) direct acoustic observation of fish behaviour in front of the moving vessel. Comparing acoustic biomass in order to demonstrate avoidance reactions is limited. All fish were divided in two groups according to the slope of their movement: with a positive value of slope (fish swimming away from the transducer) and with a negative slope (fish swimming towards the transducer). Fish avoidance caused higher slope values. Most avoidance behaviour was found with small fish (target strength, TS

<−40 dB, 22 cm) at distances under 10 m. Only in the clear lake Wallersee were some indications of avoidance up to a distance of 15m from the survey boat. There were no significant indications of fish avoidance in the Czech reservoirs. Much less avoidance behaviour was found with fish larger than TS >−40 dB. At distances over 10m, the avoidance of small boats (5–6m long, 15–25 HP two-stroke engine) appears not to be a serious problem in shallow waters.
Research Notes: Comparing fish movement in response to vessel noise. Assumed only horizontal avoidance due to shallowness of water in study areas.
Link to PDF: Drastik_Kubecka_2004_fish_vessel_avoidance.pdf

Reference Type: Journal Article
Record Number: 28
Author: Edds, P. L.; Macfarlane, J. A. F.
Year: 1987
Title: Occurrence and general behavior of balaenopterid cetaceans summering in the St. Lawrence Estuary, Canada
Journal: Canadian Journal of Zoology-Revue Canadienne De Zoologie
Volume: 65
Issue: 6
Pages: 1363-1376
Short Title: Occurrence and general behavior of balaenopterid cetaceans summering in the St. Lawrence Estuary, Canada
Accession Number: ISI:A1987J388200011
Keywords: CETACEAN; BALAENOPTERID; CANADA; BEHAVIOR

Reference Type: Journal Article
Record Number: 356
Author: Engås, Arill; Løkkeborg, Svein; Ona, Egil; Soldal, Aud Vold
Year: 1996
Title: Effects of seismic shooting on local abundance and catch rates of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*)
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 53
Pages: 2238-2249
Short Title: Effects of seismic shooting on local abundance and catch rates of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*)
Keywords: FISH; SEISMIC; *GADUS MORHUA; MELANOGRAMMUS AEGLEFINUS;* COD; HADDOCK; ACOUSTICS; TRAWL
Abstract: To determine whether seismic exploration affected abundance or catch rates of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*), acoustic mapping and fishing trials with trawls and longlines were conducted in the central Barents Sea 7 days before, 5 days during, and 5 days after seismic shooting with air guns. Seismic shooting severely affected fish distribution, local abundance, and catch rates in the entire investigation area of 40 x 40 nautical miles.Trawl catches of cod and haddock

and longline catches of haddock declined on average by about 50% (by mass) after shooting started, which agreed with the acoustic abundance estimates; longline catches of cod were reduced by 21%. Reductions in catch rates were observed 18 nautical miles from the seismic shooting area (3 x 10 nautical miles), but the most pronounced reduction occurred within the shooting area, where trawl catches of both species and longline catches of haddock were reduced by about 70% and the longline catches of cod by 45%; a relatively greater reduction was found (in catches and acoustic estimates) for large (>60 cm) than for small fish. Abundance and catch rates did not return to preshooting levels during the 5-day period after seismic shooting ended.
Research Notes: Catch rates compared before, during, after seismic shooting experiments at various distances. Catch rates decreased during and after shooting. Also decreased as you get further away from the shooting.
Link to PDF: Engas_etal_1996_cod_haddock_seismic.pdf

Reference Type: Journal Article
Record Number: 255
Author: Engelhard, Georg H.; van den Hoff, John; Broekman, Martijn; Baarspul, Antonie N. J.; Field, Iain; Burton, Harry R.; Reijnders, Peter J. H.
Year: 2001
Title: Mass of weaned elephant seal pups in areas of low and high human presence
Journal: Polar Biology
Volume: 24
Issue: 4
Pages: 244-251
Date: Apr
Type of Article: Article
Short Title: Mass of weaned elephant seal pups in areas of low and high human presence
Alternate Journal: Polar Biol.
ISSN: 0722-4060
Accession Number: ISI:000170663600005
Keywords: *MIROUNGA LEONINA*; MACQUARIE ISLAND; DECLINING POPULATION; *CALLORHINUS URSINUS*; BREEDING DISPERSAL; HUMAN DISTURBANCE; WEANING MASS; BODY SIZE; SUCCESS; SURVIVAL; ELEPHANT SEAL; HUMAN DISTURBANCE
Abstract: On sub-Antarctic Macquarie Island, we examined pup weaning mass of southern elephant seals in relation to human presence. Pup weaning mass was previously found to be positively associated with 1st-year survivorship. Weaned pups were weighed in a remote area, Middle Beach, and in an area of relatively high human presence, Isthmus East. The areas were reasonably similar in beach topography, wind and surf conditions, numbers of seals present per kilometre of coastline, and numbers of males and females present in harems. For a sub-sample of measured pups, data on the respective maternal size were collected using photogrammetry. Both male and female weaned pups on Middle Beach were significantly heavier than those on Isthmus East. Estimated length of mothers was significantly higher on Middle Beach. In

proportion to their own size, mothers in both areas produced weaners of similar mass, indicating no direct effect of human disturbance on the efficiency of lactation. It remained unclear whether the area differences in maternal and pup size were due to natural or human-related factors.
Notes: ISI Document Delivery No.: 466UB
Times Cited: 12
Cited Reference Count: 64
URL: <Go to ISI>://000170663600005
Link to PDF: Engelhard_etal_2001_Mass_ESeal_pups_human-presence.pdf
Author Address: Univ Groningen, Zool Lab, Ctr Ecol & Evolutionary Studies, NL-9750 AA Haren, Netherlands. Australian Antarctic Div, Kingston, Tas 7050, Australia. Alterra Inst Marine & Coastal Zone Res Team, NL-1790 AD Den Burg, Netherlands.
Engelhard, GH, Univ Groningen, Zool Lab, Ctr Ecol & Evolutionary Studies, POB 14, NL-9750 AA Haren, Netherlands.
Language: English

Reference Type: Book Section
Record Number: 470
Author: Enger, P. S.
Year: 1981
Title: Frequency discrimination in teleosts – central or peripheral?
Editor: Tavolga, W.N.; Popper, Arthur N.; Fay, Richard R.
Book Title: *Hearing and Sound Communication in Fishes*
City: New York, NY
Publisher: Springer-Verlag
Pages: 243-255
Short Title: Frequency discrimination in teleosts – central or peripheral?
Link to PDF: Enger_1981_teleosts_freq_discrimination.pdf

Reference Type: Journal Article
Record Number: 367
Author: Erbe, Christine
Year: 2002
Title: Underwater noise of whale-watching boats and potential effects on killer whales (*Orcinus orca*), based on an acoustic impact model
Journal: Marine Mammal Science
Volume: 18
Issue: 2
Pages: 394-418
Short Title: Underwater noise of whale-watching boats and potential effects on killer whales (*Orcinus orca*), based on an acoustic impact model
Keywords: WHALE-WATCHING; BOAT NOISE; BOAT; KILLER WHALE; *ORCINUS ORCA*; AUDIBILITY; DISTURBANCE; RESPONSIVNESS; MASKING; HEARING LOSS
Abstract: Underwater noise of whale-watching boats was recorded in the popular killer whale-watching region of southern British Columbia and northwestern Washington

State. A software sound propagation and impact assessment model was applied to estimate zones around whale-watching boats where boat noise was audible to killer whales, where it interfered with their communication, where it caused behavioral avoidance, and where it possibly caused hearing loss. Boat source levels ranged from 145 to 169 dB re 1 uPa @ 1 m, increasing with speed. The noise of fast boats was modeled to be audible to killer whales over 16 km, to mask killer whale calls over 14 km, to elicit a behavioral response over 200 m, and to cause a temporary threshold shift (TTS) in hearing of 5 dB after 30-50 min within 450 m. For boats cruising at slow speeds, the predicted ranges were 1 km for audibility and masking, 50 m for behavioral responses, and 20 m for TTS. Superposed noise levels of a number of boars circulating around or following the whales were close to
the critical level assumed to cause a permanent hearing loss over prolonged exposure. These data should be useful in developing whale-watching regulations. This study also gave lower estimates of killer whale call source levels of 105-124 dB re 1 uPa.
Link to PDF: Erbe_2002_orca_tourism.pdf

Reference Type: Journal Article
Record Number: 30
Author: Erbe, Christine; Farmer, David M.
Year: 2000
Title: A software model to estimate zones of impact on marine mammals around anthropogenic noise
Journal: Journal of the Acoustical Society of America
Volume: 108
Issue: 3
Pages: 1327-1331
Date: Sep
Short Title: A software model to estimate zones of impact on marine mammals around anthropogenic noise
Accession Number: ISI:000089230900041
Keywords: ANTHROPOGENIC NOISE; MARINE MAMMALS; MODEL; PROPAGATION
Abstract: Anthropogenic noise impacts marine mammals in a variety of ways. In order to estimate over which ranges this happens, we first need to understand the propagation of noise through the ocean away from the noise source, and, second, understand the relationship between received noise levels and impact thresholds. A software package combining both aspects is presented. (1) A sound propagation model based on ray theory was developed to calculate received noise levels as a function of range, depth, and frequency. (2) Current knowledge of noise impact thresholds for marine mammals was gathered and included in software routines predicting zones of impact on marine mammals around industrial underwater noise sources. As input parameters, this software package requires the source level and spectrum of the noise of interest; physical oceanography data about the local ocean environment such as bathymetry, bottom and surface loss data, and sound speed profiles; and bioacoustical information about the target species in the form of an audiogram, critical auditory

bandwidths, spectra of typical animal vocalizations, reported sound levels of disturbance, and criteria for hearing damage. As output, the software produces data files and plots of the zones of audibility, masking, disturbance, and potential hearing damage around a noise source.
Notes: Part 1
Link to PDF: Erbe_Farmer_2000_Model_estimate_zone_masking.pdf

Reference Type: Journal Article
Record Number: 29
Author: Erbe, Christine; Farmer, David M.
Year: 2000
Title: Zones of impact around icebreakers affecting beluga whales in the Beaufort Sea
Journal: Journal of the Acoustical Society of America
Volume: 108
Issue: 3
Pages: 1332-1340
Date: Sep
Short Title: Zones of impact around icebreakers affecting beluga whales in the Beaufort Sea
Accession Number: ISI:000089230900042
Keywords: MARINE MAMMALS; BEAUFORT SEA; ICEBREAKER; BELUGA WHALE; ANIMAL COMMUNICATION; MASKING; ANTHROPOGENIC NOISE
Abstract: A software model estimating zones of impact on marine mammals around man-made noise [C. Erbe and D. M. Farmer, J. Acoust. Soc. Am. 108, 1327–1331 (2000)] is applied to the case of icebreakers affecting beluga whales in the Beaufort Sea. Two types of noise emitted by the Canadian Coast Guard icebreaker Henry Larsen are analyzed: bubbler system noise and propeller cavitation noise. Effects on beluga whales are modeled both in a deep-water environment and a near-shore environment. The model estimates that the Henry Larsen is audible to beluga whales over ranges of 35–78 km, depending on location. The zone of behavioral disturbance is only slightly smaller. Masking of beluga communication signals is predicted within 14–71-km range. Temporary hearing damage can occur if a beluga stays within 1–4 km of the Henry Larsen for at least 20 min. Bubbler noise impacts over the short ranges quoted; propeller cavitation noise accounts for all the long-range effects. Serious problems can arise in heavily industrialized areas where animals are exposed to ongoing noise and where anthropogenic noise from a variety of sources adds up.
Link to PDF: Erbe_Farmer_2000_zones_impact_icebreaker_beluga.pdf

Reference Type: Journal Article
Record Number: 256
Author: Erbe, Christine; King, Andrew R.; Yedlin, Matthew; Farmer, David M.
Year: 1999
Title: Computer models for masked hearing experiments with beluga whales (*Delphinapterus leucas*)

Journal: Journal of the Acoustical Society of America
Volume: 105
Issue: 5
Pages: 2967-2978
Date: May
Type of Article: Article
Short Title: Computer models for masked hearing experiments with beluga whales (*Delphinapterus leucas*)
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000080310200043
Keywords: BELUGA WHALE; *DELPHINAPTERUS LEUCAS*; HEARING
Abstract: Environmental assessments of manmade noise and its effects on marine mammals need to address the question of how noise interferes with animal vocalizations. Seeking the answer with animal experiments is very time consuming, costly, and often infeasible. This article examines the possibility of estimating results with software models. A matched filter, spectrogram cross-correlation, critical band cross-correlation, and a back-propagation neural network detected a beluga vocalization in three types of ocean noise. performance was compared to masked hearing experiments with a beluga whale [C. Erbe and D. M. Farmer, Deep-Sea Res. II 45, 1373-1388 (1998)]. The artificial neural network simulated the animal data most closely and raised confidence in its ability to predict the interference of a variety of noise sources with a variety of vocalizations.
Notes: ISI Document Delivery No.: 196LQ
Times Cited: 7
Cited Reference Count: 30
URL: <Go to ISI>://000080310200043
Link to PDF: Erbe_etal_1999_Computer_model_masking_beluga.pdf
Author Address: Inst Ocean Sci, Sidney, BC V8L 4B2, Canada. Macquarie Univ, Sch Earth Sci, Sydney, NSW 2109, Australia. Univ British Columbia, Vancouver, BC V6T 1Z4, Canada.
Erbe, C, Inst Ocean Sci, 9860 W Saanich Rd, Sidney, BC V8L 4B2, Canada.
Language: English

Reference Type: Book
Record Number: 447
Author: Estes, James A.; DeMaster, Douglas P.; Doak, Daniel F.; Williams, Terrie M.; Brownell, Robert L., Jr.
Year: 2006
Title: *Whales, Whaling, and Ocean Ecosystems*
City: Berkley, CA
Publisher: University of California Press
Number of Pages: 402
Short Title: *Whales, Whaling, and Ocean Ecosystems*
Link to PDF: Estes_etal_2006_whale_whalingTOC.pdf

Reference Type: Report
Record Number: 493
Author: Evans, D.L.; England, G.R.
Year: 2001
Title: Joint Interim Report: Bahamas Marine Mammal Stranding Event of 15-16 March 2000
Institution: National Oceanic and Atmospheric Administration and U.S. Navy
Pages: 61
Date: December 2001
Short Title: Joint Interim Report: Bahamas Marine Mammal Stranding Event of 15-16 March 2000
Link to PDF: Evans&England_2001_Interim_Bahamas_Report.pdf

Reference Type: Report
Record Number: 418
Author: EVOSTC
Year: 2004
Title: Then and Now - A Message of Hope: 15th Anniversary of the *Exxon Valdez* Oil Spill
Institution: Alaska Department of Fish and Game
Pages: 19
Type: Status Report
Short Title: Then and Now - A Message of Hope: 15th Anniversary of the *Exxon Valdez* Oil Spill
Notes: Exxon Valdez Oil Spill Trustee Council
Research Notes: Status report from EVOSTC, summarizes 2001 NOAA study, status of recovering species & resources.
URL: www.evostc.state.ak.us
Link to PDF: EVOSTC_15th_Aniv_Report.pdf
Author Address: *Exxon Valdez* Oil Spill Trustee Council
Caption: *Exxon Valdez* Oil Spill Trustee Council

Reference Type: Book
Record Number: 544
Author: Fay, Richard R.
Year: 1988
Title: *Hearing in Vertebrates: A Psychophysics Handbook*
City: Winnetka, IL
Publisher: Hill-Fay Associates
Number of Pages: 621
Short Title: *Hearing in Vertebrates: A Psychophysics Handbook*
Link to PDF: Fay_1988_hearing_vertebratesTOC.pdf

Reference Type: Journal Article
Record Number: 335
Author: Finneran, James J.; Carder, Donald A.; Ridgway, Sam H.
Year: 2002
Title: Low-frequency acoustic pressure, velocity, and intensity thresholds in a bottlenose dolphin (*Tursiops truncatus*) and white whale (*Delphinapterus leucas*)
Journal: Journal of the Acoustical Society of America
Volume: 111
Issue: 1
Pages: 447-456
Date: Jan
Type of Article: Article
Short Title: Low-frequency acoustic pressure, velocity, and intensity thresholds in a bottlenose dolphin (*Tursiops truncatus*) and white whale (*Delphinapterus leucas*)
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000173394400043
Keywords: BOTTLENOSE DOLPHIN; HEARING; *TURSIOPS TRUNCATUS*; WHITE WHALE; *DELPHINAPTERUS LEUCAS*; BELUGA WHALE; THRESHOLD
Abstract: The relative contributions of acoustic pressure and particle velocity to the low-frequency, underwater hearing abilities of the bottlenose dolphin (*Tursiops truncatus*) and white whale (*Delphinapterus leucas*) were investigated by measuring (masked) hearing thresholds while manipulating the relationship between the pressure and velocity. This was accomplished by varying the distance within the near field of a single underwater sound projector (experiment I) and using two underwater sound projectors and an active sound control system (experiment II). The results of experiment I showed no significant change in pressure thresholds as the distance between the subject and the sound source was changed. In contrast, velocity thresholds tended to increase and intensity thresholds tended to decrease as the source distance decreased. These data suggest that acoustic pressure is a better indicator of threshold, compared to particle velocity or mean active intensity, in the subjects tested. Interpretation of the results of experiment II (the active sound control system) was difficult because of complex acoustic conditions and the unknown effects of the subject on the generated acoustic field; however, these data also tend to support the results of experiment I and suggest that odontocete thresholds should be reported in units of acoustic pressure, rather than intensity.
URL: <Go to ISI>://000173394400043
Link to PDF: Finneran_etal_2002_LowF_thresholds_Tutr_beluga.pdf
Author Address: Space & Naval Warfare Syst Ctr, San Diego, CA 92152 USA. Finneran, JJ, Sci Applicat Int Corp, Maritime Serv Div, 3990 Old Town Ave,Suite 105A, San Diego, CA 92110 USA.
Language: English

Reference Type: Journal Article
Record Number: 257

Author: Finneran, James J.; Carder, D. A.; Schlundt, C. E.; Ridgway, S. H.
Year: 2005
Title: Temporary threshold shift in bottlenose dolphins (*Tursiops truncatus*) exposed to mid-frequency tones
Journal: Journal of the Acoustical Society of America
Volume: 118
Issue: 4
Pages: 2696-2705
Date: Oct
Type of Article: Article
Short Title: Temporary threshold shift in bottlenose dolphins (*Tursiops truncatus*) exposed to mid-frequency tones
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000232712700061
Keywords: WHALE; *DELPHINAPTERUS LEUCAS*; SINGLE UNDERWATER IMPULSES; MASKED HEARING THRESHOLD; OCTAVE-BAND NOISE; BEHAVIOR RESPONSE; PURE TONES; RECOVERY; BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; TEMPORARY THRESHOLD SHIFT; TTS
Abstract: A behavioral response paradigm was used to measure hearing thresholds in bottlenose dolphins before and after exposure to 3 kHz tones with sound exposure levels (SELs) from 100 to 203 dB re 1 mu Pa-2 s. Experiments were conducted in a relatively quiet pool with ambient noise levels below 55 dB re 1 mu Pa-2/Hz at frequencies above 1 kHz. Experiments 1 and 2 featured 1-s exposures with hearing tested at 4.5 and 3 kHz, respectively. Experiment 3 featured 2-, 4-, and 8-s exposures with hearing tested at 4.5 kHz. For experiment 2, there were no significant differences between control and exposure sessions. For experiments I and 3, exposures with SEL=197 dB re 1/mu Pa-2 s and SEL >= 195 dB re 1 mu Pa-2 s, respectively, resulted in significantly higher TTS4 than control sessions. For experiment 3 at SEL= 195 dB re 1 mu Pa-2 s, the mean TTS4 was 2.8 dB. These data are consistent with prior studies of TTS in dolphins exposed to pure tones and octave band noise and suggest that a SEL of 195 dB re 1 mu Pa-2 s is a reasonable threshold for the onset of TTS in dolphins and white whales exposed to midfrequency tones.
Notes: ISI Document Delivery No.: 976DJ
Times Cited: 3
Cited Reference Count: 32
Link to PDF: Finneran_etal_2005_TTS_Tutr_mid-frequency.pdf
Language: English

Reference Type: Journal Article
Record Number: 329
Author: Finneran, J. J.; Dear, R.; Carder, D. A.; Ridgway, S. H.
Year: 2003
Title: Auditory and behavioral responses of California sea lions (*Zalophus californianus*) to single underwater impulses from an arc-gap transducer
Journal: Journal of the Acoustical Society of America

Volume: 114
Issue: 3
Pages: 1667-1677
Date: Sep
Type of Article: Article
Short Title: Auditory and behavioral responses of California sea lions (*Zalophus californianus*) to single underwater impulses from an arc-gap transducer
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000185269500047
Keywords: CALIFORNIA SEA LION; *ZALOPHUS CALIFORNIANUS*; TEMPORARY THRESHOLD SHIFT; MASKED HEARING THRESHOLD; PURE-TONE THRESHOLD; FUR SEALS; NOISE; EXPOSURE; PINNIPED
Abstract: A behavioral response paradigm was used to measure underwater hearing thresholds in two California sea lions (*Zalophus californianus*) before and after exposure to underwater impulses from an arc-gap transducer. Preexposure and postexposure hearing thresholds were compared to determine if the subjects experienced temporary shifts in their masked hearing thresholds (MTTS). Hearing thresholds were measured at 1 and 10 kHz. Exposures consisted of single underwater impulses produced by an arc-gap transducer referred to as a "pulsed power device" (PPD). The electrical charge of the PPD was varied from 1.32 to 2.77 kJ; the distance between the subject and the PPD was varied over the range 3.4 to 25 in. No MTTS was observed in either subject at the highest received levels: peak pressures of approximately 6.8 and 14 kPa, rms pressures of approximately 178 and 183 dB re: 1 muPa, and total energy fluxes of 161 and 163 dB re: 1 mutPa(2)S for the two subjects. Behavioral reactions to the tests were observed in both subjects. These reactions primarily consisted of temporary avoidance of the site where exposure to the PPD impulse had previously occurred. (C) 2003 Acoustical Society of America.
Notes: ISI Document Delivery No.: 720PQ
Times Cited: 5
Cited Reference Count: 32
Link to PDF: Finneran_etal_2003_AuditoryFX_CSL_arc-gap_transducer.pdf
Author Address: Space & Naval Warfare Syst Ctr, San Diego, CA 92152 USA. Sci Applicat Int Corp, Maritime Serv Div, San Diego, CA 92110 USA.
Finneran, JJ, Space & Naval Warfare Syst Ctr, Code 2351,53560 Hull St, San Diego, CA 92152 USA.
Language: English

Reference Type: Journal Article
Record Number: 330
Author: Finneran, James J.; Schlundt, C. E.; Carder, D. A.; Clark, J. A.; Young, J. A.; Gaspin, J. B.; Ridgway, Sam H.
Year: 2000
Title: Auditory and behavioral responses of bottlenose dolphins (*Tursiops truncatus*) and a beluga whale (*Delphinapterus leucas*) to impulsive sounds resembling distant signatures of underwater explosions

Journal: Journal of the Acoustical Society of America
Volume: 108
Issue: 1
Pages: 417-431
Date: Jul
Type of Article: Article
Short Title: Auditory and behavioral responses of bottlenose dolphins (*Tursiops truncatus*) and a beluga whale (*Delphinapterus leucas*) to impulsive sounds resembling distant signatures of underwater explosions
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000088054100039
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS;* BELUGA WHALE; *DELPHINAPTERUS LEUCAS*; HEARING THRESHOLD; NOISE
Abstract: A behavioral response paradigm was used to measure masked underwater hearing thresholds in two bottlenose dolphins and one beluga whale before and after exposure to impulsive underwater sounds with waveforms resembling distant signatures of underwater explosions. An array of piezoelectric transducers was used to generate impulsive sounds with waveforms approximating those predicted from 5 or 500 kg HEX-1 charges at ranges from 1.5 to 55.6 km. At the conclusion of the study, no temporary shifts in masked-hearing thresholds (MTTSs), defined as a 6-dB or larger increase in threshold over pre-exposure levels, had been observed at the highest impulse level generated (500 kg at 1.7 km, peak pressure 70 kPa); however, disruptions of the animals' trained behaviors began to occur at exposures corresponding to 5 kg at 9.3 km and 5 kg at 1.5 km for the dolphins and 500 kg at 1.9 km for the beluga whale. These data are the first direct information regarding the effects of distant underwater explosion signatures on the hearing abilities of odontocetes. [S0001-4966(00)04807-4].
Notes: ISI Document Delivery No.: 332BV
Times Cited: 13
Cited Reference Count: 41
Research Notes: Masked TTS study on bottlenose dolphin and beluga.
URL: <Go to ISI>://000088054100039
Link to PDF: Finneran_etal_2000_bottlenose_beluga_distant_explosion.pdf
Author Address: Space & Naval Warfare Syst Ctr D351, San Diego, CA 92152 USA. Sci Applicat Int Corp, Maritime Serv Div, San Diego, CA 92110 USA. USN, Ctr Surface Warfare, Indian Head Div, Silver Spring, MD 20903 USA.
Finneran, JJ, Space & Naval Warfare Syst Ctr D351, 49620 Beluga Rd,Room 204, San Diego, CA 92152 USA.
Language: English

Reference Type: Journal Article
Record Number: 333
Author: Finneran, James J.; Schlundt, C. E.; Carder, D. A.; Ridgway, S.H.
Year: 2002
Title: Auditory filter shapes for the bottlenose dolphin (*Tursiops truncatus*) and the white whale (*Delphinapterus leucas*) derived with notched noise

Journal: Journal of the Acoustical Society of America
Volume: 112
Issue: 1
Pages: 322-328
Date: Jul
Type of Article: Article
Short Title: Auditory filter shapes for the bottlenose dolphin (*Tursiops truncatus*) and the white whale (*Delphinapterus leucas*) derived with notched noise
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000176819100034
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS;* WHITE WHALE; *DELPHINAPTERUS LEUCAS;* HEARING THRESHOLD; CRITICAL RATIO; MASKING
Abstract: Auditory filter shapes were estimated in two bottlenose dolphins (*Tursiops truncatus*) and one white whale (*Delphinapterus leucas*) using a behavioral response paradigm and notched noise. Masked thresholds were measured at 20 and 30 kHz. Masking noise was centered at the test tone and had a bandwidth of 1.5 times the tone frequency. Half-notch width to center frequency ratios were 0, 0.125, 0.25, 0.375, and 0.5. Noise spectral density levels were 90 and 105 dB re:1 uPa(2)/Hz. Filter shapes were approximated using a roex(p,r) function; the parameters p and r were found by fitting the integral of the roex(p,r) function to the measured threshold data. Mean equivalent rectangular bandwidths (ERBs) calculated from the filter shapes were 11.8 and 17.1% of the center frequency at 20 and 30 kHz, respectively, for the dolphins and 9.1 and 15.3% of the center frequency at 20 and 30 kHz, respectively, for the white whale. Filter shapes were broader at 30 kHz and 105 dB re:1 uPa(2)/Hz masking noise. The results are in general agreement with previous estimates of ERBs in *Tursiops* obtained with a behavioral response paradigm.
Link to PDF: Finneran_etal_2002_Auditory_filters_Tutr_beluga.pdf
Language: English

Reference Type: Journal Article
Record Number: 32
Author: Finneran, J.J.; Schlundt, C. E.; Dear, R.; Carder, D. A.; Ridgway, S.H.
Year: 2002
Title: Temporary shift in masked hearing thresholds in odontocetes after exposure to single underwater impulses from a seismic watergun
Journal: Journal of the Acoustical Society of America
Volume: 111
Issue: 6
Pages: 2929-2940
Date: Jun
Short Title: Temporary shift in masked hearing thresholds in odontocetes after exposure to single underwater impulses from a seismic watergun
Accession Number: ISI:000176195200045
Keywords: BOTTLENOSE DOLPHIN; *DELPHINAPTERUS LEUCAS*; *TURSIOPS TRUNCATUS*; TONES; NOISE; BEHAVIOR; HEARING; THRESHOLD; WHITE

WHALE; BELUGA WHALE; *DELPHINAPTERUS LEUCAS*; SEISMIC
Abstract: A behavioral response paradigm was used to measure masked underwater hearing thresholds in a bottlenose dolphin (*Tursiops truncatus*) and a white whale (*Delphinapterus leucas*) before and after exposure to single underwater impulsive sounds produced from a seismic watergun. Pre- and postexposure thresholds were compared to determine if a temporary shift in masked hearing thresholds (MTTS), defined as a 6-dB or larger increase in postexposure thresholds, occurred. Hearing thresholds were measured at 0.4, 4, and 30 kHz. MTTSs of 7 and 6 dB were observed in the white whale at 0.4 and 30 kHz, respectively, approximately 2 min following exposure to single impulses with peak pressures of 160 kPa, peak-to-peak pressures of 226 dB re 1 muPa, and total energy fluxes of 186 dB re 1 muPa(2.)s Thresholds returned to within 2 dB of the preexposure value approximately 4 min after exposure. No MTTS was observed in the dolphin at the highest exposure 2 conditions: 207 kPa peak pressure, 228 dB re 1 muPa peak-to-peak pressure, and 188 dB re 1 muPa(2.)s total energy flux. (C) 2002 Acoustical Society of America.
Notes: J. Acoust. Soc. Am.
33
Research Notes: Masked TTS study on bottlenose dolphin and beluga whale.
Link to PDF: Finneran_etal_2002_bottlenose_beluga_MTTS.pdf
Author Address: Space & Naval Warfare Syst Ctr, San Diego, CA 92152 USA. Sci Applicat Int Corp, Maritime Serv Div, San Diego, CA 92110 USA. Finneran, JJ, Space & Naval Warfare Syst Ctr, Code 235,53560 Hull St, San Diego, CA 92152 USA.

Reference Type: Journal Article
Record Number: 33
Author: Fletcher, Stacia; Le Boeuf, Burney J.; Costa, Daniel P.; Tyack, Peter L.; Blackwell, Susanna B.
Year: 1996
Title: Onboard acoustic recording from diving northern elephant seals
Journal: Journal of the Acoustical Society of America
Volume: 100
Issue: 4
Pages: 2531-2539
Short Title: Onboard acoustic recording from diving northern elephant seals
Accession Number: ISI:A1996VN88500059
Keywords: ELEPHANT SEAL; ACOUSTICS; DIVING BEHAVIOR
Abstract: This study was the first phase in a long-term investigation of the importance of low-frequency sound
in the aquatic life of northern elephant seals, Mirounga angustirostris. By attaching acoustic
recording packages to the backs of six translocated juveniles, the aim was to determine the
predominant frequencies and sound levels impinging on them, and whether they actively vocalize
underwater on their return to their rookery at An˜o Nuevo, California, from deep water in

Monterey
Bay. All packages contained a Sony digital audio tape recorder encased in an aluminum housing
with an external hydrophone. Flow noise was minimized by potting the hydrophone in resin to the
housing and orienting it posteriorly. The diving pattern of four seals was recorded with a separate
time–depth recorder or a time–depth–velocity recorder. Good acoustic records were obtained from
three seals. Flow noise was positively correlated with swim speed, but not so high as to mask most
low-frequency sounds in the environment. Dominant frequencies of noise impinging on the seals
were in the range 20–200 Hz. Transient signals recorded from the seals included snapping shrimp,
cetacean vocalizations, boat noise, small explosive charges, and seal swim strokes, but no seal
vocalizations were detected. During quiet intervals at the surface between dives, the acoustic record
was dominated by respiration and signals that appeared to be heartbeats. This study demonstrates
the feasibility of recording sounds from instruments attached to free-ranging seals, and in doing so,
studying their behavioral and physiological response to fluctuations in ambient sounds.
Link to PDF: Fletcher_etal_1996_Eseals_diving.pdf

Reference Type: Journal Article
Record Number: 353
Author: Foote, A. D.; Osborne, R. W.; Hoelzel, A. R.
Year: 2004
Title: Whale-call response to masking boat noise
Journal: Nature
Volume: 428
Pages: 910
Date: 29 April 2004
Short Title: Whale-call response to masking boat noise
Keywords: *ORCINUS ORCA*; KILLER WHALE; WHALE-WATCHING; NOISE; BOAT; VESSEL; TOURISM; MASKING
Research Notes: Killer whale vocal behavior response to whale-watching vessels.
Link to PDF: Foote_etal_2004_orca_tourism_vessel.pdf

Reference Type: Report
Record Number: 451
Author: Francine, J. K.; Awbrey, Frank T.

Year: 1995
Title: Avoiding prohibited species: A proposal to resolve the conflict between the sablefish longline fishery and killer whale conservation in Alaska
City: San Diego, CA
Institution: Hubbs-SeaWorld Research Institute for NOAA Saltonstall-Kennedy Grants Program, Alaska Region
Pages: 51
Short Title: Avoiding prohibited species: A proposal to resolve the conflict between the sablefish longline fishery and killer whale conservation in Alaska
Report Number: NA89ABHSK001

Reference Type: Conference Proceedings
Record Number: 452
Author: Frankel, Adam S.
Year of Conference: 2005
Title: Gray Whales Hear and Respond to a 21-25 kHz High-frequency Whale-finding Sonar
Conference Name: 16th Biennial Conference on the Biology of Marine Mammals
Conference Location: San Diego, CA
Date: 12-18 December 2005
Short Title: Gray Whales Hear and Respond to a 21-25 kHz High-frequency Whale-finding Sonar
Abstract: [ABSTRACT]
A high-frequency whale-finding sonar was tested off Diablo Canyon, CA in January 2004. The sonar (21-25 kHz, 215 dB re 1 µPa at 1m) was designed to detect and track whales, was deployed from a vessel moored in the migration path of southbound gray whales. Two shore stations, north and south of the vessel, visually tracked whale movements with theodolites. The sonar transmitted for half of each day, breaking the day into transmit and control conditions, the order of which was randomized daily. Observers were blind to experimental condition. They did not observe any obvious responses by gray whales to the sonar. Data from the two shorestations were combined to form long whale movement tracks which were then analyzed for differences between transmit and control conditions. The analyses found that the minimum measured separation between the whales and vessel was significantly higher during sonar transmit conditions (1.49 vs. 1.28 km). The relative orientation score (Bowles et al. 1994, JASA) was also significantly lower (0.26 vs. 0.39), indicating avoidance of the source during sonar transmissions. These results suggest that gray whales can detect and respond to high-frequency (21-25 kHz) sound. It is important to note that the responses of the whales were small, deflecting on the order of 200 meters. Furthermore, these responses were not detectable to visual observers during the experiment. This was in contrast to previous studies where gray whale responses to low-frequency sounds were obvious (Tyack and Clark 1998). The comparative difference in these responses suggests that gray whales may be more sensitive to low-frequency sound than high-frequency sound, which is consistent with anatomically-based predictions. Furthermore, there may also be differential behavioral

response to different types of sounds. These findings have implications for the management of anthropogenic sound sources and gray whales, and perhaps all mysticete whales.
Link to PDF: Frankel_2005_Resp_MitigationSonar.pdf

Reference Type: Journal Article
Record Number: 34
Author: Frankel, Adam S.; Clark, Christopher W.
Year: 1998
Title: Results of low-frequency playback of M-sequence noise to humpback whales, *Megaptera novaeangliae*, in Hawai'i
Journal: Canadian Journal of Zoology-Revue Canadienne De Zoologie
Volume: 76
Issue: 3
Pages: 521-535
Date: Mar
Short Title: Results of low-frequency playback of M-sequence noise to humpback whales, *Megaptera novaeangliae*, in Hawai'i
Accession Number: ISI:000074719800017
Keywords: HUMPBACK WHALE; *MEGAPTERA NOVAEANGLIAE*; PLAYBACK EXPERIMENTS; BEHAVIOR; VESSEL
Abstract: The behavior of humpback whales, *Megaptera novaeangliae*, exposed to playback of low-frequency sounds, was examined to test whether animals would respond to this signal when received sound levels exceeded 120 dB re: 1 mPa. The source signal was an M-sequence (essentially a sine wave with a series of phase reversals) centered at 75 Hz with a 30-Hz bandwidth. Behavior and movements of whales were described before, during, and after playback. Eighty-five trials were conducted, of which 50 had an experimental condition of M-sequence playback. Thirty-four were no-sound controls and a single trial used a playback of the Alaska humpback whale feeding call. The received playback sound level at the whales ranged from ambient level (»90 dB) to 130 dB re: 1 mPa (60-90 Hz). A comparison revealed no difference in whale tracks and bearings between control and playback conditions. Behavior rates were examined statistically using independent variables describing pod composition, nearby vessels, and playback sound level. Natural variables of pod composition were the most important factors predicting behavior rates. Vessels had a larger impact and affected more behavioral variables than playback. A slight increase in the duration and distance between successive surfacings was found as the received playback sound level increased. Eleven playbacks in which whales passed within the 120-dB isopleth yielded only three potential responses (one movement away and two toward the sound source) and eight nonresponses. Overall, subtle responses to M-sequence playbacks could only be detected statistically, but the biological significance of these responses is uncertain.
Link to PDF: Frankel_Clark_1998_FX_M-sequence_Hback.pdf

Reference Type: Journal Article
Record Number: 258
Author: Frankel, Adam S.; Clark, Christopher W.
Year: 2000
Title: Behavioral responses of humpback whales (*Megaptera novaeangliae*) to full-scale ATOC signals
Journal: Journal of the Acoustical Society of America
Volume: 108
Issue: 4
Pages: 1930-1937
Date: Oct
Type of Article: Article
Short Title: Behavioral responses of humpback whales (*Megaptera novaeangliae*) to full-scale ATOC signals
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000089894700056
Keywords: HUMPBACK WHALE; *MEGAPTERA NOVAEANGLIAE*; ABUNDANCE; ATOC; VESSEL;
Abstract: Loud (195 dB re 1 mu Pa at 1 m) 75-Hz signals were broadcast with an ATOC projector to measure ocean temperature. Respiratory and movement behaviors of humpback whales off North Kauai, Hawaii, were examined for potential changes in response to these transmissions and to vessels. Few vessel effects were observed, but there were fewer vessels operating during this study than in previous years. No overt responses to ATOC were observed for received levels of 98-109 dB re 1 mu Pa. An analysis of covariance, using the no-sound behavioral rate as a covariate to control for interpod variation, found that the distance and time between successive surfacings of humpbacks increased slightly with an increase in estimated received ATOC sound level. These responses are very similar to those observed in response to scaled-amplitude playbacks of ATOC signals [Frankel and Clark, Can. J. Zool. 76, 521-535 (1998)]. These similar results were obtained with different sound projectors, in different years and locations, and at different ranges creating a different sound field. The repeatability of the findings for these two different studies indicates that these effects, while small, are robust. This suggests that at least for the ATOC signal, the received sound level is a good predictor of response.
Notes: ISI Document Delivery No.: 364LW
Times Cited: 9
Cited Reference Count: 22
URL: <Go to ISI>://000089894700056
Link to PDF: Frankel_Clark_2000_Resp_Hback_ATOC.pdf
Author Address: Cornell Univ, Bioacoust Res Program, Ithaca, NY 14850 USA.
Frankel, AS, Cornell Univ, Bioacoust Res Program, 159 Sapsucker Woods Rd, Ithaca, NY 14850 USA.
Language: English

Reference Type: Book Section

Record Number: 406
Author: Frankel, Adam S.; Mobley, Joseph R., Jr.; Herman, Louis M.
Year: 1995
Title: Estimation of auditory response thresholds in humpback whales using biologically meaningful sounds
Editor: Kastelein, Ronald A.; Thomas, Jeanette A.; Nachtigall, Paul E.
Book Title: *Sensory Systems of Aquatic Mammals*
City: Woerden, The Netherlands
Publisher: De Spil Publishers
Pages: 55-70
Short Title: Estimation of auditory response thresholds
ISBN: 90-72743-05-9
Keywords: SOUND PROPAGATION; HEARING DETECTION THRESHOLD; RESPONSE THRESHOLD; MYSTICETE; HUMPBACK WHALE; *MEGAPTERA NOVAEANGLIAE*
Abstract: Conventional methods for determining auditory detection thresholds in cetaceans have
been limited to psychophysical or evoked potential techniques using captive odontocetes.
Sound playback techniques offer a means to assay response thresholds in free-ranging cetaceans, including mysticetes. Thus far, the use of sound playback to determine response
thresholds has been limited primarily to transmission of anthropogenic noise. In contrast,
playback of conspecific vocalizations offers a mechanism to estimate thresholds of response
to biologically meaningful sound.

Humpback whales were exposed to playbacks of three conspecific vocalizations (song, social sounds, and feeding call), synthetic sounds and a blank tape control. Whales were
observed and tracked from shore. The strongest reaction to playback was a rapid approach
response, which was initiated at ranges as great as 2.8 km from the sound source. Empirical
transmission loss measurements were compared with the Marsh and Schulkin semi-empirical
model. A logarithmic curve fitted to empirical data was used to estimate the received levels for animals at known ranges from the sound source. Whales responded at an estimated
received broadband level as low as 102 dB re 1 uPa for the feeding call, and 106 dB re 1 uPa
for synthetic sound. These estimates of response threshold are potentially biased upwards,
because animals may detect a sound without any discernible response. However, this technique may be the only feasible method for behaviorally estimating auditory

detection
thresholds in free-ranging cetaceans, especially mysticetes.
Notes: Section in a book.
Link to PDF: Frankel_etal_1995_Hback_auditory_playback_natural.pdf

Reference Type: Journal Article
Record Number: 296
Author: Frantzis, A.
Year: 1998
Title: Does acoustic testing strand whales?
Journal: Nature
Volume: 392
Pages: 29-30
Date: Mar
Type of Article: Letter
Short Title: Does acoustic testing strand whales?
Alternate Journal: Nature
ISSN: 0028-0836
Accession Number: ISI:000072373000034
Keywords: WHALE; STRANDING
Abstract: no abstract
URL: <Go to ISI>://000072373000034
Link to PDF: Frantzis_1998_acoustic_strand_whales.pdf
Author Address: Univ Athens, Dept Biol, Zool Lab, Athens 15784, Greece.
Frantzis, A, Univ Athens, Dept Biol, Zool Lab, Athens 15784, Greece.
afratzis@atlas.uoa.gr
Language: English

Reference Type: Journal Article
Record Number: 35
Author: Freitag, Lee E.; Tyack, Peter L.
Year: 1993
Title: Passive acoustic localization of the Atlantic bottle-nosed dolphin using whistles and echolocation clicks
Journal: Journal of the Acoustical Society of America
Volume: 93
Issue: 4
Pages: 2197-2205
Date: Apr
Short Title: Passive acoustic localization of the Atlantic bottle-nosed dolphin using whistles and echolocation clicks
Accession Number: ISI:A1993KX49500054
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; ECHOLOCATION; WHISTLES; ACOUSTICS; HYDROPHONE
Abstract: A method for localization and tracking of calling marine mammals was tested

under realistic field conditions that include noise, multipath, and arbitrarily located sensors. Experiments were performed in two locations using four and six hydrophones with captive Atlantic
bottlenose dolphins (*Tursiops truncatus*). Acoustic signals from the animals were collected in the field using a digital acoustic data acquisition system. The data were then processed off-line to determine relative hydrophone positions and the animal locations. Accurate hydrophone position estimates are achieved by pinging sequentially from each hydrophone to all the others. A two-step least-squares algorithm is then used to determine sensor locations from the calibration data. Animal locations are determined by estimating the time differences of arrival of the dolphin signals at the different sensors. The peak of a matched filter output or the first cycle of the observed waveform is used to determine arrival time of an echolocation click. Cross correlation between hydrophones is used to determine inter-sensor time delays of whistles. Calculation of source location using the time difference of arrival measurements is done using a least-squares solution to minimize error. These preliminary experimental results based on a small set of data show that realistic trajectories for moving animals may be generated from consecutive location estimates.
Notes: Part 1
Link to PDF: Freitag_Tyack_1993_TuTr_localization.pdf

Reference Type: Journal Article
Record Number: 259
Author: Frid, A.; Dill, L.
Year: 2002
Title: Human-caused disturbance stimuli as a form of predation risk
Journal: Conservation Ecology
Volume: 6
Issue: 1
Pages: 16
Date: Jun
Type of Article: Article
Short Title: Human-caused disturbance stimuli as a form of predation risk
Alternate Journal: Conserv. Ecol.
ISSN: 1195-5449
Electronic Resource Number: 11
Artn 11
Accession Number: ISI:000177892600009
Keywords: FLIGHT INITIATION DISTANCE; MEXICAN SPOTTED OWL; *STRIX OCCIDENTALIS LUCIDA*; WOODLAND CARIBOU; HABITAT SELECTION; BIGHORN SHEEP; POPULATION CONSEQUENCES; CUMULATIVE IMPACTS; GRIZZLY BEAR; WILD REINDEER; POWER LINES; HUMAN DISTURBANCE; PREDATION;
Abstract: A growing number of studies quantify the impact of nonlethal human disturbance on the behavior and reproductive success of animals. Athough many are well designed and analytically sophisticated, most lack a theoretical framework for making predictions and for understanding why particular responses occur. Behavioral

ecologists have recently begun to fill this theoretical vacuum by applying economic models of antipredator behavior to disturbance studies. In this emerging paradigm, predation and nonlethal disturbance stimuli create similar trade-offs between avoiding perceived risk and other fitness-enhancing activities, such as feeding, parental care, or mating. A vast literature supports the hypothesis that antipredator behavior has a cost to other activities, and that this trade-off is optimized when investment in antipredator behavior tracks short-term changes in predation risk. Prey have evolved antipredator responses to generalized threatening stimuli, such as loud noises and rapidly approaching objects. Thus, when encountering disturbance stimuli ranging from the dramatic, low-flying helicopter to the quiet wildlife photographer, animal responses are likely to follow the same economic principles used by prey encountering predators. Some authors have argued that, similar to predation risk, disturbance stimuli can indirectly affect fitness and population dynamics via the energetic and lost opportunity costs of risk avoidance. We elaborate on this argument by discussing why, from an evolutionary perspective, disturbance stimuli should be analogous to predation risk. We then consider disturbance effects on the behavior of individuals-vigilance, fleeing, habitat selection, mating displays, and parental investment-as well as indirect effects on populations and communities. A wider application of predation risk theory to disturbance studies should increase the generality of predictions and make mitigation more effective without over-regulating human activities.
Notes: ISI Document Delivery No.: 591QW
Times Cited: 54
Cited Reference Count: 94
URL: <Go to ISI>://000177892600009
Link to PDF: Frid_Dill_2002_HumanDisturbance_PredationRisk.pdf
Author Address: Simon Fraser Univ, Dept Biol Sci, Behav Ecol Res Grp, Burnaby, BC V5A 1S6, Canada.
Frid, A, POB 10357, Whitehorse, YT Y1A 7A1, Canada.
Language: English

Reference Type: Journal Article
Record Number: 36
Author: Fristrup, K. M.; Hatch, L. T.; Clark, Christopher W.
Year: 2003
Title: Variation in humpback whale (*Megaptera novaeangliae*) song length in relation to low-frequency sound broadcasts
Journal: Journal of the Acoustical Society of America
Volume: 113
Issue: 6
Pages: 3411-3424
Date: Jun
Short Title: Variation in humpback whale (*Megaptera novaeangliae*) song length in relation to low-frequency sound broadcasts
Accession Number: ISI:000183448700048
Keywords: GRAY TREE FROGS; BEHAVIOR; HAWAIIAN; CHOICE; ABUNDANCE; INDICATOR; RESPONSES; DURATION; PLAYBACK EXPERIMENTS; WATERS;

HUMPBACK WHALE; SONG; SONAR; *MEGAPTERA NOVAEANGLIAE*
Abstract: Humpback whale song lengths were measured from recordings made off the west coast of the island of Hawai'i in March 1998 in relation to acoustic broadcasts ("pings") from the U.S. Navy SURTASS Low Frequency Active sonar system. Generalized additive models were used to investigate the relationships between song length and time of year, time of day, and broadcast factors. There were significant seasonal and diurnal effects. The seasonal factor was associated with changes in the density of whales sighted near shore. The diurnal factor was associated with changes in surface social activity. Songs that ended within a few minutes of the most recent ping tended to be longer than songs sung during control periods. Many songs that were overlapped by pings, and songs that ended several minutes after the most recent ping, did not differ from songs sung in control periods. The longest songs were sung between 1 and 2 h after the last ping. Humpbacks responded to louder broadcasts with longer songs. The fraction of variation in song length that could be attributed to broadcast factors was low. Much of the variation in humpback song length remains unexplained.

Notes: J. Acoust. Soc. Am.
51
Link to PDF: Fristrup_etal_2003_HBack_Song_Longer_LFA.pdf
Author Address: Cornell Lab Ornithol, Bioacoust Res Program, Ithaca, NY 14853 USA. Cornell Univ, Dept Ecol & Evolutionary Biol, Ithaca, NY 14853 USA. Fristrup, KM, Cornell Lab Ornithol, Bioacoust Res Program, Ithaca, NY 14853 USA.

Reference Type: Journal Article
Record Number: 488
Author: Garrott, Robert A; Eberhardt, L. Lee; Burn, Douglas M.
Year: 1993
Title: Mortality of sea otters in Prince William Sound following the *Exxon Valdez* oil spill
Journal: Marine Mammal Science
Volume: 9
Issue: 4
Pages: 343-359
Short Title: Mortality of sea otters in Prince William Sound following the *Exxon Valdez* oil spill
Keywords: BOOTSTRAPPING; BOAT SURVEYS; CENSUS TECHNIQUES; SIGHTING PROBABILITIES; MORTALITY; POPULATION GROWTH;CONTAMINANTS; *ENHYDRA LTURIS*; IMPACTS OF OIL SPILL; CARCASS RECOVERY RATES; PRINCE WILLIAM SOUND; ALASKA
Abstract: This paper presents an estimate of the total number of sea otters that died as a direct consequence of the oil spill that occurred when the T/V *Exxon Valdez* grounded in Prince William Sound, Alaska on 24 March 1989. We compared sea otter counts conducted from small boats throughout the Sound during the summers of 1984 and 1985 to counts made after the spill during the summer of 1989. We used ratio estimators, corrected for sighting probability, to calculate otter densities and population estimates for portions of the Sound affected by

the oil spill. We estimated the otter population in the portion of Prince William Sound affected by the oil was 6,546 at the time of the spill and that the postspill population in the summer of 1989 was 3,898, yielding a loss estimate of approximately 2,650. Bootstrapping techniques were used to approximate confidence limits on the loss estimate of about 500-5,000 otters. The wide confidence limits are a result of the complex scheme required to estimate losses and limitations of the data. Despite the uncertainty of the loss estimate it is clear that a significant fraction of the otters in the spill zone survived. We observed otters persisting in relatively clean embayments throughout the oil spill zone suggesting that the highly convoluted coastline of Prince William Sound produced refuges that allowed some sea otters in the oil spill area to survive.
Link to PDF: Garrott_etal_1993_Mortality_otters_PWS.pdf

Reference Type: Journal Article
Record Number: 482
Author: Garshelis, D.L.; Johnson, A.M.; Garshelis, J.A.
Year: 1984
Title: Social organization of sea otters in Prince William Sound, Alaska
Journal: Canadian Journal of Zoology-Revue Canadienne De Zoologie
Volume: 62
Pages: 2648-2658
Short Title: Social organization of sea otters in Prince William Sound, Alaska

Reference Type: Journal Article
Record Number: 528
Author: Gedamke, Jason; Costa, Daniel P.; Dunstan, Andy
Year: 2001
Title: Localization and visual verification of a complex minke whale vocalization
Journal: Journal of the Acoustical Society of America
Volume: 109
Issue: 6
Pages: 3038-3047
Short Title: Localization and visual verification of a complex minke whale vocalization
Abstract: A recently described population of minke whales (*Balaenoptera acutorostrata*) offered a unique opportunity to study its acoustic behavior. The often-inquisitive dwarf minke whale is seen on the Great Barrier Reef nearly coincident with its suspected calving and breeding seasons. During drifting encounters with whales, a towed hydrophone array was used to record sounds for subsequent localization of sound sources. Shipboard and in-water observers linked these sounds to the closely circling minke whale. A complex and stereotyped sound sequence, the

‘‘star-wars’’
(SW) vocalization, was recorded during a series of visual and acoustic observations. The SW
vocalization spanned a wide frequency range (50 Hz–9.4 kHz) and was composed of distinct and
stereotypically repeated units with both amplitude and frequency-modulated components.
Broadband source levels between 150 and 165 dB re 1 mPa at 1 m were calculated. Passive acoustic
studies can utilize this distinct vocalization to help determine the behavior, distribution, and
movements of this animal. While the SW vocalization’s function remains unknown, the regularly
repeated and complex sound sequence was common in low latitude, winter month aggregations of
minke whales. At this early stage, the SW vocalization appears similar to the songs of other whale
species and has characteristics consistent with those of reproductive advertisement displays.
Link to PDF: Gedamke_etal_2001_minke_vocs.pdf

Reference Type: Journal Article
Record Number: 319
Author: George, J. C.; Clark, Christopher W.; Carroll, G. M.; Ellison, W.T.
Year: 1989
Title: Observations of the ice-breaking and ice navigation behavior of migrating bowhead whales (*Balaena-mysticetus*) near Point Barrow, Alaska, Spring 1985
Journal: Arctic
Volume: 42
Issue: 1
Pages: 24-30
Date: Mar
Type of Article: Article
Short Title: Observations of the ice-breaking and ice navigation behavior of migrating bowhead whales (*Balaena-mysticetus*) near Point Barrow, Alaska, Spring 1985
Alternate Journal: Arctic
ISSN: 0004-0843
Accession Number: ISI:A1989U042500003
Keywords: BOWHEAD WHALE; *BALAENA MYSTICETUS*; ALASKA; ICEBREAKING; ICE; POINT BARROW
Abstract: During a four-’day period from 28 April to 1 May 1985, we observed bowhead whales breaking up through sea ice in order
to breathe. Our observations were made from grounded sea ice approximately 10 km northeast of Point Barrow, Alaska, during the spring bowhead migration (14 April to 10 June). From acoustic and visual data, it was estimated that 665 whales passed the

observation perches during this four-day period. However, only 117 (17%) whales were seen. The remaining whales either passed underneath the ice or were beyond the range of the visual observers. Whales used their heads, in the area of the blowholes, to push up against the ice (18 cm maximum thickness) and fracture it, creating a hummock of ice in which they were able to respire. Often during such breathing episodes, even at distances of only several hundred meters, the animal was not seen but its blows were clearly audible to the visual observers. Acoustic tracking of whales showed they avoided a large multi-year ice floe seaward of the observation perch. We hypothesize that bowheads use their calls to assess the thickness of ice in their migratory path. In assessing their calls, we suggest the whales can avoid areas where the ice is too thick to break through (to breathe) and/or too thick to provide clearance for them to swim beneath.
Notes: ISI Document Delivery No.: U0425
Times Cited: 17
Cited Reference Count: 35
URL: <Go to ISI>://A1989U042500003
Link to PDF: George_etal_1989_bowhead_icebreaking.pdf
Author Address: CORNELL UNIV,ORNITHOL LAB,ITHACA,NY 14850. MARINE ACOUST,COTUIT,MA 02635.
GEORGE, JC, DEPT WILDLIFE MANAGEMENT,BOX 69,N SLOPE BOROUGH,BARROW,AK 99723.
Language: English

Reference Type: Journal Article
Record Number: 37
Author: Gerlotto, F.; Castillo, J.; Saavedra, A.; Barbieri, M. A.; Espejo, M.; Cotel, P.
Year: 2004
Title: Three-dimensional structure and avoidance behaviour of anchovy and common sardine schools in central southern Chile
Journal: ICES Journal of Marine Science
Volume: 61
Issue: 7
Pages: 1120-1126
Short Title: Three-dimensional structure and avoidance behaviour of anchovy and common sardine schools in central southern Chile
Accession Number: ISI:000224998600015
Keywords: 3-D ACOUSTICS; FISH AVOIDANCE; FISH BEHAVIOR; PELAGIC FISH; SCHOOL STRUCTURE
Abstract: We studied the avoidance behaviour and three-dimensional (3-D) structure of anchovy
(Engraulis ringens) and common sardine (Strangomera bentincki) schools mixed in high concentrations in a coastal area of central southern Chile. Observations were carried out
during an acoustic survey in January 2002 by means of a vertical echosounder and a multibeam
sonar. The sonar harvested around 900 series of 3-D school images, and 3000 2-D

school images were collected with the echosounder. The results showed that all fish aggregations presented the same internal structure, but different global morphologies, from
single small schools (with length three times the height) on the edges of the distribution to
large dense layers (length more than seven times the height) in its centre. Observation of
avoidance in the vertical and horizontal planes indicated that limited vertical diving occurred close to the ship (fish dive from the surface to the 5e10-m depth layer below the
vessel), while no horizontal avoidance was observed.
Link to PDF: Gerlotto_etal_2004_fish_avoidance.pdf

Reference Type: Journal Article
Record Number: 303
Author: Gill, Jennifer A.; Norris, Ken; Sutherland, Willaim J.
Year: 2001
Title: Why behavioural responses may not reflect the population consequences of human disturbance
Journal: Biological Conservation
Volume: 97
Issue: 2
Pages: 265-268
Date: Feb
Type of Article: Article
Short Title: Why behavioural responses may not reflect the population consequences of human disturbance
Alternate Journal: Biol. Conserv.
ISSN: 0006-3207
Accession Number: ISI:000166234000014
Keywords: CONSERVATION; DENSITY DEPENDENCE; HUMAN DISTURBANCE; POPULATION CHANGE; WILDFOWL; WINTER; GEESE; DISTANCES; BIRDS
Abstract: The effect of human disturbance on animals is frequently measured in terms of changes in behaviour in response to human presence. The magnitude of these changes in behaviour is then often used as a measure of the relative susceptibility of species to disturbance; for example species which show strong avoidance of human presence are often considered to be in greater need of protection from disturbance than those which do not. In this paper we discuss whether such changes in behaviour are likely to be good measures of the relative susceptibility of species, and suggest that their use may result in confusion when determining conservation priorities. (C) 2000 Elsevier Science Ltd. All rights reserved.
Notes: ISI Document Delivery No.: 389JC
Times Cited: 55
Cited Reference Count: 26
URL: <Go to ISI>://000166234000014

Link to PDF: Gill_etal_2001_Disturbance_Population_Consequences.pdf
Author Address: Univ E Anglia, Sch Biol Sci, Norwich NR4 7TJ, Norfolk, England. Univ Reading, Sch Anim & Microbial Sci, Reading RG6 6AJ, Berks, England.
Gill, JA, Univ E Anglia, Sch Biol Sci, Norwich NR4 7TJ, Norfolk, England.
Language: English

Reference Type: Journal Article
Record Number: 39
Author: Gisiner, Robert; Harper, Scott; Livingston, Ellen; Simmen, Jeffrey
Year: 2006
Title: Effects of Sound on the Marine Environment (ESME): An underwater noise risk model
Journal: IEEE Journal of Oceanic Engineering
Volume: 31
Issue: 1
Pages: 4-7
Date: Jan
Short Title: Effects of Sound on the Marine Environment (ESME): An underwater noise risk model
Accession Number: ISI:000238710400002
Keywords: ESME; ACOUSTICS; ENVIRONMENT; MARINE MAMMALS; MODEL; NOISE
Abstract: Effects of Sound on the Marine Environment (ESME) is a computer model of the effects of underwater sound on marine life. The modular design behind the ESME model is motivated by the sonar equation, with subcomponent models for characterization of the source, for modeling of sound transmission through a medium, and for receiver properties (e.g., hearing abilities, behavioral responses to sound, and receiver distribution and abundance). Each subcomponent of ESME is intended to capture the current state of understanding in the relevant scientific field and to be capable of being updated as the understanding in the field advances. ESME is envisioned to have three primary applications: 1) retrospective studies of historical data, 2) predictive modeling of anticipated outcomes from a given scenario of sound in a marine environment, and 3) prescriptive guidance for research investments and efforts that will likely have the greatest effect on increasing confidence in decisions about underwater sound use and its effects.

Link to PDF: Gisiner_etal_2006_ESME_sound_marine_environment.pdf

Reference Type: Journal Article
Record Number: 321
Author: Goold, John C.
Year: 1996
Title: Acoustic assessment of populations of common dolphin *Delphinus delphis* in conjunction with seismic surveying
Journal: Journal of the Marine Biological Association of the United Kingdom

Volume: 76
Issue: 3
Pages: 811-820
Date: Aug
Type of Article: Article
Short Title: Acoustic assessment of populations of common dolphin *Delphinus delphis* in conjunction with seismic surveying
Alternate Journal: J. Mar. Biol. Assoc. U.K.
ISSN: 0025-3154
Accession Number: ISI:A1996VF15400021
Keywords: COMMON DOLPHIN; *DELPHINUS DELPHIS BAIRDI*; SEISMIC
Abstract: Common dolphin, *Delphinus delphis (bairdi)*, were monitored acoustically across a survey area of 2747 km(2) during a three month period before, during and after an oil industry two dimensional (2D) seismic reflection survey. Over 900 h of audio survey data were collected and analysed, along with GPS positional data, to reveal trends in presence and distribution of animals. The presence of dolphins was determined from vocalization events on the survey recordings. Dolphin presence was assessed by a system of percentage acoustic contact. This was highest before and after the seismic survey, with common dolphins showing a clear south-westerly skew within the survey area and a probable south-westerly migration of animals between September and December. Acoustic contact with dolphins during the seismic survey also showed a south-westerly skew within the survey area, although percentages were lower. Monitoring during the period of seismic activity was restricted to the immediate vicinity (1-2 km) of the seismic vessel, so percentage contact most likely reflects the response of dolphins to such immediate activity. The overall result suggests an avoidance reaction by common dolphins to air gun emissions, although certain observations suggest tolerance to these sounds outside a 1 km radius of the guns.
Notes: ISI Document Delivery No.: VF154
Times Cited: 6
Cited Reference Count: 5
Link to PDF: Goold_1996_CommonDolphin_seismic.pdf
Author Address: Goold, JC, UNIV COLL N WALES,SCH OCEAN SCI,MENAI BRIDGE LL59 5EY,GWYNEDD,WALES.
Language: English

Reference Type: Journal Article
Record Number: 324
Author: Goold, John C.; Fish, Peter J.
Year: 1998
Title: Broadband spectra of seismic survey air-gun emissions, with reference to dolphin auditory thresholds
Journal: Journal of the Acoustical Society of America
Volume: 103
Issue: 4
Pages: 2177-2184
Date: Apr

Type of Article: Article
Short Title: Broadband spectra of seismic survey air-gun emissions, with reference to dolphin auditory thresholds
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000073274100050
Keywords: DOLPHIN; SEISMIC;
Abstract: Acoustic emissions from a 2120 cubic in, air-gun array were recorded through a towed hydrophone assembly during an oil industry 2-D seismic survey off the West Wales Coast of the British Isles. Recorded seismic pulses were sampled, calibrated, and analyzed post-survey to investigate power levels of the pulses in the band 200 Hz-22 kHz at 750-m, 1-km, 2.2-km, and 8-km range from source. At 750-m range from source, seismic pulse power at the 200-Hz end of the spectrum was 140 dB re: 1 mu Pa-2/Hz, and at the 20-kHz end of the spectrum seismic pulse power was 90 dB re: 1 mu Pa-2/Hz. Although the background noise levels of the seismic recordings were far in excess of ambient, due to the proximity of engine, propeller, and how sources of the ship towing the hydrophone, seismic power dominated the entire recorded bandwidth of 200 Hz-22 kHz at ranges of up to 2 km from the air-gun source. Even at 8-km range seismic power was still clearly in excess of the high background noise levels up to 8 kHz. Acoustic observations of common dolphins during preceding seismic surveys suggest that these animals avoided the immediate vicinity of the air-gun array while firing was in progress, i.e., localized disturbance occurred during seismic surveying. Although a general pattern of localized disturbance is suggested, one specific observation revealed that common dolphins were able to tolerate the seismic pulses at 1-km range from the air-gun array. Given the high broadband seismic pulse power levels across the entire recorded bandwidth, and known auditory thresholds for several dolphin species, we consider such seismic emissions to be clearly audible to dolphins across a bandwidth of tens on kilohertz, and at least out to 8-km range.
Notes: ISI Document Delivery No.: ZJ991
Times Cited: 8
Cited Reference Count: 15
URL: <Go to ISI>://000073274100050
Link to PDF: Goold_Fish_1998_SpectraSeismic_DolphinAud.pdf
Author Address: Univ Coll N Wales, Sch Ocean Sci, Menai Bridge LL59 5EY, Gwynedd, Wales. Univ Coll N Wales, Sch Elect Engn & Comp Syst, Bangor LL57 1UT, Gwynedd, Wales.
Goold, JC, Univ Coll N Wales, Sch Ocean Sci, Menai Bridge, Menai Bridge LL59 5EY, Gwynedd, Wales.
Language: English

Reference Type: Journal Article
Record Number: 327
Author: Goold, John C.; Fish, Peter J.
Year: 1999
Title: Response to "comments on 'broadband spectra of seismic survey air-gun emissions with reference to dolphin auditory threshold'" [J Acoust Soc Am

105,2047-2048(1999)]
Journal: Journal of the Acoustical Society of America
Volume: 105
Issue: 3
Pages: 2049-2050
Date: Mar
Type of Article: Letter
Short Title: Response to "comments on 'broadband spectra of seismic survey air-gun emissions with reference to dolphin auditory threshold'" [J Acoust Soc Am 105,2047-2048(1999)]
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000079078500064
Keywords: DOLPHIN; SEISMIC; AIR GUN; BEHAVIOR
Abstract: In a prior paper, "Broadband spectra of seismic survey air-gun emissions with reference to dolphin auditory thresholds" [Goold and Fish, J. Acoust. Sec. Am. 103, 2177-2184 (1998)] a comparison was drawn between the estimation of sound levels at a distance which unconstrained dolphins would appear to maintain from a seismic air-gun source and the sound threshold at which captive dolphins displayed behavioral changes as reported by Ridgway et al. [Tech. Rpt. 1751, NCCOSC RDTE (1997)]. This prompted comments in the letter above on the validity of the conclusions of the prior paper. In this rebuttal, it is pointed out that uncertainties in the sound levels estimated in the prior paper arising from uncertainties in distance estimation, sound-propagation model, frequency weighting, and allowance for pulse duration are most unlikely to account for the very large difference of 48 dB between Goold and Fish's results and Ridgway's. The differences in criteria for deciding the threshold-behavior suggesting distress in captive dolphins (Ridgway et nl.) and the assumption that dolphins swim to a distance at which the sound is tolerated (Goold and Fish), is the most likely explanation for the difference in the published figures. (C) 1999 Acoustical Society of America. [S0001-4966(99)04003-5].
Notes: ISI Document Delivery No.: 175DW
Times Cited: 0
Cited Reference Count: 2
URL: <Go to ISI>://000079078500064
Link to PDF: Goold_Fish_1999_Comments_Ridgway.pdf
Author Address: Univ Wales, Sch Ocean Sci, Menai Bridge LL59 5EY, Gwynedd, Wales. Univ Wales, Sch Elect Engn & Comp Syst, Bangor LL57 1UT, Gwynedd, Wales. Goold, JC, Univ Wales, Sch Ocean Sci, Menai Bridge LL59 5EY, Gwynedd, Wales.
Language: English

Reference Type: Journal Article
Record Number: 301
Author: Goold, John C.; Whitehead, Hal; Reid, R. J.
Year: 2002
Title: North Atlantic sperm whale, *Physeter macrocephalus*, strandings on the coastlines of the British Isles and Eastern Canada

Journal: Canadian Field-Naturalist
Volume: 116
Issue: 3
Pages: 371-388
Date: Jul-Sep
Type of Article: Article
Short Title: North Atlantic sperm whale, *Physeter macrocephalus*, strandings on the coastlines of the British Isles and Eastern Canada
Alternate Journal: Can. Field-Nat.
ISSN: 0008-3550
Accession Number: ISI:000182545900003
Keywords: SPERM WHALE; *PHYSETER MACROCEPHALUS*; STRANDING; CANADA; BRITISH ISLES; NOISE; POLLUTION; SEISMIC; ATLANTIC; CETACEAN; ISLAND
Abstract: Sperm Whale stranding records for the British Isles and Eastern Canada were analysed to investigate short and long term stranding trends on either side of the North Atlantic Ocean. Annual stranding events across a ten year period from 1988 to 1997 showed no significant trend with time in either the British Isles or eastern Canada, although stranding events were nearly three times as numerous on the Scottish coast during this period than in any other region. Strandings during this period occurred throughout the year in Scotland, Ireland and eastern Canada, but peaked in the autumn and winter periods. Strandings on the English coast were the least numerous and occurred only in the autumn and winter. Decadal analysis of stranding events for the 20th Century as a whole showed significant exponential increases in Sperm Whale strandings in all regions of the British Isles (except England due to small sample size). Decadal stranding events were fitted to an exponential model which revealed a rate of increase of 14%/yr for the British Isles as a whole, beginning at about 1970. The stranding rate on the Scottish coast, 18%/yr, was twice that for Ireland, 9%/yr, with most of the strandings increase occurring in the offshore Scottish Islands. The time series data for eastern Canada was of insufficient extent to conduct a rigorous decadal analysis. Almost all stranded Sperm Whales on the British and East Canadian coasts have been males. Sperm Whale strandings have been most dense, and have increased fastest, in the offshore Scottish islands of Hebrides, Orkney and Shetland. The data support no firm conclusions but valid hypotheses include increased reporting and anthropogenic effects, which may be acting synergistically. The increase in the British data is too dramatic to have been caused solely by a simple increase in Sperm Whale population size.
URL: <Go to ISI>://000182545900003
Author Address: Univ Wales, Inst Environm Sci, Bangor LL57 2UW, Gwynedd, Wales. Dalhousie Univ, Dept Biol, Halifax, NS B3H 4J1, Canada. SAC Vet Sci Div, Inverness IV2 4JZ, Scotland.
Goold, JC, Univ Wales, Inst Environm Sci, Robinson Bldg,Deiniol Rd, Bangor LL57 2UW, Gwynedd, Wales.
Language: English

Reference Type: Journal Article

Record Number: 328
Author: Gordon, J.; Gillespie, D.; Potter, J.; Frantzis, A.; Simmonds, M. P.; Swift, R.; Thompson, D.
Year: 2003
Title: A review of the effects of seismic surveys on marine mammals
Journal: Marine Technology Society Journal
Volume: 37
Issue: 4
Pages: 16-34
Date: Win
Type of Article: Review
Short Title: A review of the effects of seismic surveys on marine mammals
Alternate Journal: Mar. Technol. Soc. J.
ISSN: 0025-3324
Accession Number: ISI:000220657800003
Keywords: BOTTLENOSE DOLPHIN; *DELPHINAPTERUS LEUCAS*; BEHAVIOR RESPONSE; *BALAENA MYSTICETUS*; HEARING THRESHOLD; *TURSIOPS TRUNCATUS*; PLASMA CORTISOL; BOWHEAD WHALE; ELEPHANT SEAL; BELUGA WHALE; SEISMIC; AIR GUN; MARINE MAMMALS
Abstract: This review highlights significant gaps in our knowledge of the effects of seismic air-gun noise on marine mammals. although the characteristics of the seismic signal at different ranges and depths and at higher frequencies are poorly understood, and there are often insufficient data to identify the appropriate acoustic propagation models to apply in particular conditions, these uncertainties are modest compared with those associated with biological factors. Potential biological effects of air gun noise include physical/physiological effects, behavioral disruption, and indirect effects associated with altered prey availability physical/physiological effects could include hearing threshold shifts and auditory damage as well as non-auditory disruption, and can be directly caused by sound exposure or the result of behavioral changes in response to sounds, e.g. recent observations suggesting that exposure to loud noise may result in decompression sickness. Direct information on the extent to which seismic pulses could damage hearing are difficult to obtain and as a consequence the impacts on hearing remain poorly known. Behavioral data have been collected for a few species in a limited range of conditions. responses, including startle and fright, avoidance, and changes in behaviour and vocalization patterns, have been observed in baleen whales, odontocetes, and pinnipeds and in some case these have occurred at ranges of tens or hundreds of kilometers. however, behavioral observations are typically variable, some findings are contradictory, and the biological significance of these effects has not been measured. Where feeding, orientation, hazard avoidance, migration or social behaviour are altered, it is possible that populations could be adversely affected. There may also be serious long-term consequences due to chronic exposure, and sound could affect marine mammals indirectly by changing the accessibility of their prey species. A precautionary approach to management and regulation must be recommended. While such large degrees of uncertainty remain, this may results in restrictions to operational practices but these could be relaxed if key uncertainties are clarified by appropriate research.

Notes: ISI Document Delivery No.: 809TA
Times Cited: 0
Cited Reference Count: 114
URL: <Go to ISI>://000220657800003
Author Address: Univ St Andrews, Gatty Marine Lab, Sea Mammal Res Unit, St Andrews KY16 9AJ, Fife, Scotland. Natl Univ Singapore, Acoust Res Lab, Singapore 0511, Singapore. Univ Greenwich, Inst Nat Resources, London SE18 6PF, England. Univ Aberdeen, Aberdeen AB9 1FX, Scotland.
Gordon, J, Univ St Andrews, Gatty Marine Lab, Sea Mammal Res Unit, St Andrews KY16 9AJ, Fife, Scotland.
Language: English

Reference Type: Journal Article
Record Number: 41
Author: Graham, N.; Jones, E. G.; Reid, D. G.
Year: 2004
Title: Review of technological advances for the study of fish behaviour in relation to demersal fishing trawls
Journal: ICES Journal of Marine Science
Volume: 61
Issue: 7
Pages: 1036-1043
Short Title: Review of technological advances for the study of fish behaviour in relation to demersal fishing trawls
Accession Number: ISI:000224998600003
Keywords: BEHAVIOR; FISHERY ACOUSTICS; SELECTIVITY; SURVEY TRAWLS; TRAWL INSTRUMENTATION
Abstract: In demersal trawling, there is a need to develop more species-selective trawls to minimize
discarding in multispecies fisheries. This requires observational tools that can operate at depths and light levels encountered by the commercial fleets. There is a growing tendency
towards more fishery-independent stock-assessment methods using survey trawls to provide
population indices. This requires the ability to quantify the herding and capture efficiency
by species and age groups of such gears. A range of optical and acoustic observation techniques has been developed over the past few decades to assist in these goals. In this
paper we update the review of technologies presented at the ICES Symposium on Fish Behaviour in Relation to Fishing Operations held in 1992. Since then, considerable advances in optical, acoustic, and data-processing technology have been made.
Link to PDF: Graham_etal_2004_fish_trawls.pdf

Reference Type: Journal Article

Record Number: 461
Author: Grebmeier, Jacqueline M.; Overland, James E.; Moore, Sue E.; Farley, Ed V.; Carmack, Eddy C.; Cooper, Lee W.; Frey, Karen E.; Helle, John H.; McLaughlin, Fiona A.; McNutt, S. Lyn
Year: 2006
Title: A major ecosystem shift in the northern Bering Sea
Journal: Science
Volume: 311
Pages: 1461-1464
Short Title: A major ecosystem shift in the northern Bering Sea
Abstract: Until recently, northern Bering Sea ecosystems were characterized by extensive seasonal sea ice
cover, high water column and sediment carbon production, and tight pelagic-benthic coupling of
organic production. Here, we show that these ecosystems are shifting away from these characteristics. Changes in biological communities are contemporaneous with shifts in regional
atmospheric and hydrographic forcing. In the past decade, geographic displacement of marine
mammal population distributions has coincided with a reduction of benthic prey populations, an
increase in pelagic fish, a reduction in sea ice, and an increase in air and ocean temperatures.
These changes now observed on the shallow shelf of the northern Bering Sea should be expected to
affect a much broader portion of the Pacific-influenced sector of the Arctic Ocean.
Link to PDF: Grebmeier_etal_2006_EcosystemShift_Bering Sea.pdf

Reference Type: Unpublished Work
Record Number: 405
Author: Green, Marsha; Green, Ronald G.
Year: 1990
Title of Work: Short-term impact of vessel traffic on the Hawaiian humpback whale (*Megaptera movaeangliae*)
Pages: 4
Abstract: Increasing levels of tourism in the past decade and the resulting increase in vessel traffic in the habitat of
humpback whales in Hawaii have caused heightened scientific and public concern around the impact of boats
on this endangered species. There is little evidence to suggest either a marked increase or decrease in the
number of humpback whales since their protection by international agreement in 1966. Baker et al, 1987
suggest the lack of recovery may be due to a depressed reproductive rate of female humpback whales. The

causes of this depressed reproductive success are not known at present but may be related to the increase of
vessel traffic.
The near-shore areas appear to be preferred habitat for cow/calf pods throughout the Hawaiian islands (Herman
and Antinoja, 1977, Glockner-Ferrari and Ferreri, 1985). Evidence indicates that cow/calf pair prefer the
shallow, protected waters for resting, nursing, and possibly avoiding sharks and disturbance by other whales
(Glockner-Ferrari and Ferreri, 1985). However, Ferrari's 1985 data indicates that cow/calf pods have been
moving offshore since 1977. Abandonment of the near-shore waters could be harmful to the recovery of the
Hawaiian humpback whale population as the area available for calving may be a critical factor in determining
the eventual size of the population.
In addition to indirect evidence provided by the changes in whale distribution, other studies indicate that boat
traffic also has an immediate impact on the behavior of humpback whales. Both Baker et al's (1982, 1983)
observations in Alaska and Bauer et al's (1986) research in Hawaii indicate that approaching vessels result in
short-term changes in humpback whale behavior including increased time spent underwater and movement
away from the path of the vessel. There are several instances when gray whales abandoned certain bays or
lagoons and researchers argued that it was due to increased vessel traffic (Gand, 1974, Gilmore and Ewing,
1954).
It is essential that the humpbacks' preferred wintering grounds, and especially the near-shore waters, continue
to be available if the species is to reach its optimum population level. Consequently, we began a long term
research project to further asses the impact of vessel traffic on the distribution and behavior of the endangered
Hawaiian humpback whale. This paper reports the results of the first phase of this project.
Link to PDF: Green_Green_1990_humpback_vessel_hawaii.pdf

Reference Type: Journal Article
Record Number: 261
Author: Greene, Charles R.; McLennan, Miles Wm.; Norman, Robert G.; McDonald, Trent L.; Jakubczak, Rray S.; Richardson, W. John
Year: 2004
Title: Directional frequency and recording (DIFAR) sensors in seafloor recorders to

locate calling bowhead whales during their fall migration
Journal: Journal of the Acoustical Society of America
Volume: 116
Issue: 2
Pages: 799-813
Date: Aug
Type of Article: Article
Short Title: Directional frequency and recording (DIFAR) sensors in seafloor recorders to locate calling bowhead whales during their fall migration
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000223281800016
Keywords: BOWHEAD WHALE; *BALAENA MYSTICETUS*; OIL PRODUCTION; DIFAR; DASAR; DIRECTIONAL AUTONOMOUS SEAFLOOR ACOUSTIC RECORDERS
Abstract: Bowhead whales, *Balaena mysticetus*, migrate west during fall similar to 10-75 km off the north coast of Alaska, passing the petroleum developments around Prudhoe Bay. Oil production operations on an artificial island 5 km offshore create sounds heard by some whales. As part of an effort to assess whether migrating whales deflect farther offshore at times with high industrial noise, an acoustical approach was selected for localizing calling whales. The technique incorporated DIFAR (directional frequency and recording) sonobuoy techniques. An array of 11 DASARs (directional autonomous seafloor acoustic recorders) was built and installed with unit-to-unit separation of 5 km. When two or more DASARs detected the same call, the whale location was determined from the bearing intersections. This article describes the acoustic methods used to determine the locations of the calling bowhead whales and shows the types and precision of the data acquired. Calibration transmissions at GPS-measured times and locations provided measures of the individual DASAR clock drift and directional orientation. The standard error of the bearing measurements, at distances of 3-4 km was similar to1.35degrees after corrections for gain imbalance in the two directional sensors. During 23 days in 2002, 10 587 bowhead calls were detected and 8383 were localized.
Notes: ISI Document Delivery No.: 845YQ
Times Cited: 1
Cited Reference Count: 23
URL: <Go to ISI>://000223281800016
Link to PDF: Greene_etal_2004_bowhead_DIFAR.pdf
Author Address: Greeneridge Sci Inc, Goleta, CA 93117 USA. Western EcoSyst Technol Inc, Cheyenne, WY 82001 USA. BP Explorat Co Ltd, Anchorage, AK 99519 USA. LGL Ltd Environm Res Associates, King City, ON L7B 1A6, Canada.
Greene, CR, Greeneridge Sci Inc, 1411 Firestone Rd, Goleta, CA 93117 USA.
cgreene@greeneridge.com
Language: English

Reference Type: Journal Article
Record Number: 308

Author: Greene, Charles R.; Richardson, W. John
Year: 1988
Title: Charateristics of marine seismic survey sounds in the Beaufort Sea
Journal: Journal of the Acoustical Society of America
Volume: 83
Issue: 6
Pages: 2246-2254
Date: Jun
Type of Article: Article
Short Title: Charateristics of marine seismic survey sounds in the Beaufort Sea
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:A1988P021000029
Keywords: SEISMIC; BEAUFORT SEA; HYDROPHONE; BOAT; AIRCRAFT; AIR GUN; GAS GUN
Abstract: Geophysical survey vessels emit very intense pulses of underwater sound at intervals of several seconds; these noise pulses are sometimes detectable at very long ranges. Sound pulses from geophysical surveys were recorded in shallow parts of the Beaufort Sea during August and September of 1980-1984. Hydrophones deployed from a quiet boat were the primary sensors, but aircraft-deployed sonobuoys were also used. Water depths for the boat-recorded data were 9-130 m, but mostly < 50 m. Sources studied included a single air gun and arrays of sleeve exploders, open bottom gas guns and air guns. Peak source levels were said to be as high as 248 dB re: 1 pPa-m. Received levels from air gun arrays were as high as 179 dB re: I pPa at range 1.9 km. For ranges > 4 km, best-fit equations for maximum (rms) received levels in dB generally were obtained by assuming cylindrical spreading [-- 10*log(range)] and a term linear in range corresponding to an absorption loss or scattering term. The coefficients of the linear term varied from -- 0.61 to -- 2.33 dB/km, increasing in magnitude for shallower water. Pulses received at ranges greater than 3-4 km were usually 0.25-0.75 s long. These pulses often began with a bottom-traveling wave whose energy was concentrated below 100 Hz. The waterborne energy showed the geometrical dispersion that results from the summation of many sound rays that are reflected between the surface and the bottom: high frequencies (generally below 500 Hz) arrived first, followed by gradually lower frequencies. The result was a down-frequency chirplike sound. At short ranges the signal energy was concentrated at frequencies below 100 Hz. The reactions of bowhead whales to these signals are described in a companion article [Richardson et al., J. Acoust. Soc. Am. 79, 117-1128 (1986)].
Notes: ISI Document Delivery No.: P0210
Times Cited: 11
Cited Reference Count: 14
Research Notes: Candaian Beaufort Sea (not Alaskan). Two types of hydrophone arrays. Shallow sea, air guns.
URL: <Go to ISI>://A1988P021000029
Link to PDF: Greene_Richardson_1988_Beaufort_seismic.pdf
Author Address: LGL LTD ENVIRONM RES ASSOCIATES,KING CITY L0G 1K0,ONTARIO,CANADA.

GREENE, CR, GREENERIDGE SCI INC,4512 VIA HUERTO,SANTA BARBARA,CA 93110.
Language: English

Reference Type: Conference Proceedings
Record Number: 480
Author: Grella, L.; Mortenson, J.; Brown, M.; Roletto, J.; Culp, L.
Year of Conference: 2001
Title: SEALS: Harbor Seal Protection and Disturbance Study
Editor: Spradlin, T.R.; Nitta, E.T.; Lewandowski, J.K.; Barre, L.M.; Brix, K.; Norberg, B.
Conference Name: 14th Biennial Conference on the Biology of Marine Mammals
Conference Location: Vancouver, BC
Series Title: Viewing Marine Mammals in the Wild: A Workshop to Discuss Responsible Guidelines and Regulations for Minimizing Disturbance
Date: 28 November 2001
Short Title: SEALS: Harbor Seal Protection and Disturbance Study
Link to PDF: Spradin_etal_2001_view_MarMam.pdf

Reference Type: Journal Article
Record Number: 465
Author: Guénette, Sylvie; Heymans, Sheila J.J.; Christensen, Villy; Trites, Andrew W.
Year: 2006
Title: Ecosystem models show combined effects of fishing, predation, competition, and ocean productivity on Steller sea lions (*Eumetopias jubatus*) in Alaska
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 63
Issue: 11
Pages: 2495-2517
Short Title: Ecosystem models show combined effects of fishing, predation, competition, and ocean productivity on Steller sea lions (*Eumetopias jubatus*) in Alaska
Link to PDF: Guenette_etal_2006_stellersealion_effects.pdf

Reference Type: Journal Article
Record Number: 509
Author: Hall, John D.; Johnson, C. Scott
Year: 1972
Title: Auditory thresholds of a killer whale *Orcinus orca* Linnaeus
Journal: Journal of the Acoustical Society of America
Volume: 90
Issue: 3
Pages: 1665-1667
Short Title: Auditory thresholds of a killer whale *Orcinus orca* Linnaeus
Abstract: Using standard operant conditioning techniques, a killer whale, Oreinns orca Linnaeus, was trained to

respond to pure-tone auditory signals by pushing a response manipulandum. An audiogram was obtained
for frequencies between 500 Hz and 31 kHz. Greatest sensitivity to the signal was observed at 15 kHz at a
level of --70+5 dB re I dyn/cm 2. The observed upper limit of hearing was 32 kHz. At no time during
training or testing did the animal respond to an undistorted signal above 32 kHz. Frequencies below 500 Hz
were not tested, owing to high ambient tank noise levels
Link to PDF: Hall_Johnson_1972_KW_Hearing.pdf

Reference Type: Journal Article
Record Number: 43
Author: Handegard, Nils Olav; Tjøstheim, Dag
Year: 2005
Title: When fish meet a trawling vessel: examining the behaviour of gadoids using a free-floating buoy and acoustic split-beam tracking
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 62
Issue: 10
Pages: 2409-2422
Short Title: When fish meet a trawling vessel: examining the behaviour of gadoids using a free-floating buoy and acoustic split-beam tracking
Accession Number: ISI:000232856100022
Keywords: FISH; VESSEL; TRAWL; BEHAVIOR; GADOIDS; ACOUSTICS
Abstract: The reaction of individual gadoids to a bottom-trawling vessel has been observed in situ in the Barents Sea using a free-floating buoy and acoustic target-tracking methods. More than 20 000 tracks were analysed in terms of velocity changes in vertical, athwarthship, and alongship direction relative to the vessel, the warps, and the trawl, respectively. The fish starts diving about 15 min before vessel passing. This coincides with the time the trawl is running and not with the gradual increase in vessel noise caused by the approaching vessel. The change in horizontal movement is more gradual and is directed away from the vessel in the alongship direction, but towards the vessel in the athwarthship direction. The strongest and sharpest response is related to the trawl warps. A strong herding in front of the warps is seen. Closer to the bottom, an athwarthship herding reaction is seen away from the trawl doors or possibly the lower parts of the warps. There were only minor differences when grouping the tracks according to light level, fish size, and fish density.
Research Notes: Fish behavioral response to trawling vessels examining horizontal and vertical movement. The strongest vertical response occurs after the vessel has passed and the vessel noise has decreased. For directional movement towards and away from the ship (athwartship), fish swim towards the ship before it passes then away from the ship after it passes. They swam away faster than they swam towards it. The strongest resonse (vertical and horizontal) occurs after the vessel has passed and the vessel noise has decreased. They suggest that fish responsd to a change in noise level

whether it is an increase or decrease.
Link to PDF: Handegard_Tjøstheim_2005_gadoid_rx_trawler.pdf

Reference Type: Journal Article
Record Number: 518
Author: Hanggi, Evelyn B.; Schusterman, Ronald J.
Year: 1994
Title: Underwater acoustic displays and individual variation in male harbour seals, *Phoca vitulina*.
Journal: Animal Behaviour
Volume: 48
Issue: 6
Pages: 1275-1283
Short Title: Underwater acoustic displays and individual variation in male harbour seals, *Phoca vitulina*.
Link to PDF: Hanggi_Schusterman_1994_harborseal_vocs_underwater.pdf

Reference Type: Book
Record Number: 466
Author: Harris, C.M.
Year: 1994
Title: *Handbook of Acoustical Measurements and Noise Control*
City: New York, NY
Publisher: American Institute of Physics
Number of Pages: 3532
Short Title: *Handbook of Acoustical Measurements and Noise Control*
Link to PDF: Harris_1994_handbook_acousticTOC.pdf

Reference Type: Journal Article
Record Number: 262
Author: Harris, R. E.; Miller, G. W.; Richardson, W. John
Year: 2001
Title: Seal responses to airgun sounds during summer seismic surveys in the Alaskan Beaufort Sea
Journal: Marine Mammal Science
Volume: 17
Issue: 4
Pages: 795-812
Date: Oct
Type of Article: Article
Short Title: Seal responses to airgun sounds during summer seismic surveys in the Alaskan Beaufort Sea
ISSN: 0824-0469

Accession Number: ISI:000171809200008
Keywords: RINGED SEAL; *PHOCA HISPIDA*; BEAUFORT SEA; ALASKA; ARCTIC; SEISMIC; AIR GUN; UNDERWATER NOISE; BEHAVIOR; HARASSMENT
Abstract: Numbers, sighting distances, and behavior of seals were studied during a nearshore seismic program off northern Alaska in July-September 1996. We observed from the seismic vessel for 885.6 h, including all periods (day and night) when airguns operated and many periods without airguns. Of 422 seals seen, 421 were seen in daylight; 91.8% were ringed seals, 7.3% were bearded seals, and 0.9% were spotted seals. About 79% were first seen within 250 m of the seismic boat, and sighting rate declined rapidly at lateral distances > 50 m. During daylight, seals were seen at nearly identical rates (0.60-0.63/h) during periods with no airguns firing, one airgun, and a "full-array" of 8-11 120-in(3) airguns. However, seals tended to be farther away (P < 0.0001) during full-array seismic. There was partial avoidance of the zone < 150 rn from the boat during full-array seismic, but seals apparently did not move much beyond 250 m. "Swimming away" was more common during full-array than no-airgun periods, but relative frequencies of five behaviors did not differ significantly among distance categories. Airgun operations were interrupted 112 times when seals were sighted within safety radii (150-250 m). The National Marine Fisheries Service specified these radii in the Incidental Harassment Authorization issued for the project; they are based on a 190 dB re I mu Pa (rms) criterion for broadband received level. Methods for estimating numbers of seals potentially affected by the seismic program are described, and effectiveness of monitoring and mitigation is discussed. There is an urgent need for more data on effects of strong seismic pulses on seals.
Notes: ISI Document Delivery No.: 486GC
Times Cited: 3
Cited Reference Count: 24
URL: <Go to ISI>://000171809200008
Link to PDF: Harris_etal_2001_seal_RX_seismic_Beaufort.pdf
Author Address: LGL Ltd, Environm Res Associates, King City, ON L7B 1A6, Canada.
Richardson, WJ, LGL Ltd, Environm Res Associates, 22 Fisher St,POB 280, King City, ON L7B 1A6, Canada.
Language: English

Reference Type: Book Section
Record Number: 410
Author: Harvey, James T.; Dahlheim, Marilyn E.
Year: 1994
Title: Cetaceans in oil
Editor: Loughlin, Thomas R.
Book Title: *Marine Mammals and the* Exxon Valdez
City: San Diego, CA
Publisher: Academic Press
Pages: 257-264
Short Title: Cetaceans in oil
ISBN: 0-12-456160-8
Abstract: [Back Cover]

The oil spill disaster that occurred when the *Exxon Valdez* ran aground has become part of the iconography of ecological disaster. This book synthesizes previously confidential data only recently released by the U.S. government. The data concerns the effects of this nightmarish spill on marine mammals, such as sea otters, harbor seals, killer whales, and humpback whales. Because many of the book's contributors were on site within 24 hours of this 11 million gallon catastrophe, the book is a unique longitudinal study of the demise of an ecosystem due to a single acute environmental perturbation. These certain-to-be-influential results reported here should assist marine biologists, pathologists, toxicologists, environmentalists, engineers, and coastal planners in assessing the nature of this now legendary disaster.
Notes: This is part of a book and is not included in the PDF section.
Link to PDF: Harvey_Dahlheim_1994_cetaceans_oil.pdf

Reference Type: Journal Article
Record Number: 302
Author: Harwood, John
Year: 2002
Title: Mitigating the effects of acoustic disturbance in the oceans
Journal: Aquatic Conservation-Marine and Freshwater Ecosystems
Volume: 12
Issue: 5
Pages: 485-488
Date: Sep-Oct
Type of Article: Editorial Material
Short Title: Mitigating the effects of acoustic disturbance in the oceans
Alternate Journal: Aquat. Conserv.-Mar. Freshw. Ecosyst.
ISSN: 1052-7613
Accession Number: ISI:000178430200001
Keywords: OCEAN; DISTURBANCE; ACOUSTICS
URL: <Go to ISI>://000178430200001
Link to PDF: Harwood_2002_Mitigating_FX_disturbance.pdf
Author Address: Univ St Andrews, Ctr Conservat Sci, St Andrews, Fife, Scotland.
Harwood, J, Univ St Andrews, Ctr Conservat Sci, St Andrews, Fife, Scotland.
Language: English

Reference Type: Journal Article
Record Number: 263
Author: Hastie, G. D.; Wilson, B.; Tufft, L. H.; Thompson, P. M.
Year: 2003
Title: Bottlenose dolphins increase breathing synchrony in response to boat traffic
Journal: Marine Mammal Science
Volume: 19
Issue: 1
Pages: 74-84
Date: Jan

Type of Article: Article
Short Title: Bottlenose dolphins increase breathing synchrony in response to boat traffic
ISSN: 0824-0469
Accession Number: ISI:000180198700005
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; SYNCHRONY; SCOTLAND; SAC; CONSERVATION; DISTURBANCE; SURFACING PATTERN; CALVES; BEHAVIOR; WHALE; PATTERN; VESSEL; BAY
Abstract: To minimize potential impacts of boat traffic on the behavior of cetaceans it is important to assess short-term behavioral responses to boats and interpret the long-term consequences of these. Anecdotal descriptions of synchronous behavior in cetaceans are particularly frequent with reports of individuals within schools surfacing to breathe in a coordinated fashion being common. However, quantitative descriptions are rare. This study begins by quantifying synchronous breathing patterns of bottlenose dolphins off northern Scotland. We investigate possible functions of synchrony such as feeding patterns and presence of calves. We then test whether the presence of boat traffic in an area used intensively by dolphins affects their breathing synchrony. Although the majority of dolphin schools observed showed random breathing patterns, 30.5 % of schools showed synchronous breathing. There was no variation in this behavior with respect to identifiable feeding activities. However, synchrony was significantly negatively related to the presence of calves in the school (chi(2) = 7.17, df = 1, P = 0.007) and significantly positively related to the presence of boat traffic in the study area (chi(2) = 13.85, df = 1, P = 0.0002). Such consistent short-term behavioral responses by dolphins may potentially accumulate to produce longer-term consequences both for individuals and the whole population.
Notes: ISI Document Delivery No.: 631ZQ
Times Cited: 4
Cited Reference Count: 42
Research Notes: Example of behavioral change in presence of boats. Mostly small craft (< 10 m) but some large vessels (> 10 m). Also looked at other stimuli (presence of fish, number of calves, school size).
URL: <Go to ISI>://000180198700005
Link to PDF: Hastie_etal_2003_RespSynchrony_Tutr_Boats.pdf
Author Address: Univ Aberdeen, Dept Zool, Lighthouse Field Stn, Cromarty, Ross, England. Univ St Andrews, NERC, Sea Mammal Res Unit, Gatty Marine Lab, St Andrews KY16 8LB, Fife, Scotland.
Hastie, GD, Univ Aberdeen, Dept Zool, Lighthouse Field Stn, Cromarty, Ross, England.
Language: English

Reference Type: Journal Article
Record Number: 400
Author: Hastings, Mardi C.; Popper, Arthur N.; Finneran, James J.; Lanford, Pamela J.
Year: 1996
Title: Effects of low-frequency underwater sound on hair cells of the inner ear and lateral line of the teleost fish *Astronotus ocellatus*
Journal: Journal of the Acoustical Society of America

Volume: 99
Issue: 3
Pages: 1759-1766
Date: March 1996
Type of Article: Article
Short Title: Effects of sound on fish
Keywords: ACOUSTIC MEASUREMENTS; AUDITORY ORGANS; FISHES; SOUND WAVES; STIMULI; UNDERWATER; HEARING; SOUND SOURCES; SEM; TONES; OSCAR; *ASTRONOTUS OCELLATUS*
Abstract: Fish (*Astronotus ocellatus*, the oscar) were subject to pure tones in order to determine the effects of sound at levels typical of man-made sources on the sensory epithelia of the ear and the lateral line. Sounds varied in frequency (60 or 300 Hz), duty cycle (20% or continuous), and intensity (100, 140, or 180 dB re: 1 μPa). Fish were allowed to survive for 1 or 4 days posttreatment. Tissue was then evaluated using scanning electron microscopy to assess the presence or absence of ciliary bundles on the sensory hair cells on each of the otic endorgans and the lateral line. The only damage that was observed was in four of five fish stimulated with 300-Hz continuous tones at 180 dB re: 1 μPa and allowed to survive for 4 days. Damage was limited to small regions of the striola of the utricle and lagena. There was no damage in any other endorgan, and the size and location of the damage varied between specimens. No damage was observed in fish that had been allowed to survive for 1 day poststimulation, suggesting that damage may develop slowly after exposure.
Research Notes: Physiological effects of sound (tones) on the oscar fish. Control fish - no damage. Fish that survived to 4 days had some damage in at least one ear (low levels of damage). Possible reasons for low damage (and not high damage) - regeneration (unlikely), and/or time to show extreme damage greater than 4 days. They suggest 220-240 dB re: 1μPa at 300 Hz to show extensive damage
Link to PDF: Hastings_etal_1996_fish_ear.pdf

Reference Type: Journal Article
Record Number: 438
Author: Hatakeyama, Yoshimi; Ishii, Ken; Akamatsu, Tomonari
Year: 1994
Title: A review of studies on attempts to reduce the entanglement of the Dall's porpoise, *Phocoenoides dalli*, in the japanese salmon gillnet fishery
Journal: International Whaling Commission
Issue: Special Issue 15
Pages: 549-563
Date: 1994
Type of Article: Journal Article
Short Title: Japenese salmon gillnet fishery
Link to PDF: Hatakeyama_etal_1994_DallsPorpoise_gillnet.pdf

Reference Type: Journal Article

Record Number: 540
Author: Hawkins, A.D.; Johnstone, A. D. F.
Year: 1978
Title: The hearing of the Atlantic salmon, *Salmo salar*
Journal: Journal of Fish Biology
Volume: 13
Issue: 6
Pages: 655-673
Short Title: The hearing of the Atlantic salmon, *Salmo salar*
Link to PDF: Hawkins_Johnstone_1978_hearing_Salmon.pdf

Reference Type: Journal Article
Record Number: 325
Author: Hazelwood, R. A.; Connelly, J.
Year: 2005
Title: Estimation of underwater noise - a simplified method
Journal: Underwater Technology
Volume: 26
Issue: 3
Pages: 97-103
Type of Article: Article
Short Title: Estimation of underwater noise - a simplified method
Alternate Journal: Underw. Technol.
ISSN: 0141-0814
Accession Number: ISI:000235391900005
Keywords: ENVIRONMENTAL IMPACT ASSESSMENT; MARINE EQUIPMENT NOISE; NOISE POWER LEVELS; SHALLOW WATER TRANSMISSION; MIXED LAYER DUCT; UNDERWATER AUDIOMETRY; MASKING BANDWIDTH; RADIATED NOISE; SPECTRA; VESSEL
Abstract: A set of procedures has been developed to allow preliminary estimates to be made of underwater noise and its effects on marine species. They do not require detailed acoustic survey data, either of the site or of the proposed plant. However, they still facilitate the comparison of different project proposals to assist in the optimisation of equipment layout and routing. Noise may be due to specific sources, such as ships and marine equipment, or assessed as a general background level. Some aspects of acoustic analysis applicable to more detailed environmental impact assessments are also described, particularly relevant when comparing noise spectra with audiometry data appropriate to different species of wildlife.
Notes: ISI Document Delivery No.: 013EF
Times Cited: 0
Cited Reference Count: 21
URL: <Go to ISI>://000235391900005
Author Address: R&V Hazelwood Associates LLP, Guildford, Surrey, England. Metoc Plc, Liphook, England.
Hazelwood, RA, R&V Hazelwood Associates LLP, Guildford, Surrey, England.

Language: English

Reference Type: Conference Proceedings
Record Number: 460
Author: Hildebrand, John A.
Year of Conference: 2007
Title: Large Vessels as Sound Sources I: Radiated Sound and Ambient Noise in Nearshore/Continental Shelf Environments
Conference Name: Potential Application of Vessel-Quieting Technology on Large Commercial Vessels
Conference Location: NOAA Main Campus, Science Center, Silver Spring, MD
Publisher: NOAA
Date: 1-2 May 2007
Short Title: Large Vessels as Sound Sources I: Radiated Sound and Ambient Noise in Nearshore/Continental Shelf Environments
Abstract: Noise generation by large vessels will be described, as well as the contribution of vessel
noise to ocean ambient noise. Ambient noise in the deep-water North Pacific basin has been increasing at a rate of about 3 dB per decade for the past four decades. Repeat ambient noise measurements suggest that basin-wide increases in the number of commercial ships, as well as increased noise from individual ships, have contributed to deep-water ambient noise. Repeated measurements at a shallow-water (110 m) site near San Clemente Island reveal increased noise associated with local shipping. Local ships were observed in 31 percent of recordings collected in 1963 and in 89 percent of recordings in 2005-2006. However, when noise from local ships is excluded from the 2005-2006 recordings, median sound levels were the same as those observed in the absence of ships during 1963, suggesting that deep-water ship noise does not propagate
to this shallow water site.
Link to PDF: session1_hildebrand.pdf

Reference Type: Journal Article
Record Number: 45
Author: Hirst, Andrew G.; Rodhouse, Paul G.
Year: 2000
Title: Impacts of geophysical seismic surveying on fishing success
Journal: Reviews in Fish Biology and Fisheries
Volume: 10
Issue: 1
Pages: 113-118
Type of Article: Journal Article
Short Title: Impacts of geophysical seismic surveying on fishing success
Accession Number: ISI:000089139200005
Keywords: FISH; SEISMIC
Abstract: [INTRODUCTION]

Over many years acoustic sources of various types have been used in the search for oil and gas in the marine environment. These sources have included sub-marine explosions and airgun blasts, which in turn have been shown in the laboratory, in large scale enclosures, and in situ, to have lethal and sub-lethal effects upon marine mammals, birds and fishes (Richmond and Jones, 1973; Yelverton et al., 1973; Sakaguchi et al., 1976; Wright, 1982; Linton et al., 1985; Sverdrup et al., 1994; Goold, 1996).
Although explosive charges were commonly used until the 1960s, by 1985, 97% of seismic surveys used airgun devices (Holliday et al., 1987), and we therefore concentrate on the latter in this review. Organisms may not only be immediately killed on exposure to
airgun detonations (Turnpenny and Nedwell, 1994; McCauley, 1994), but their mortality may also be delayed as a result of direct physiological damage, or indirectly from increased predation. The effects of close range airgun discharge on short-term (i.e. minutes to days) mortality of eggs, juvenile and adult fish have been examined in some detail and reviewed in Turnpenny and Nedwell (1994), and impacts of airguns at close range are briefly considered herein for completeness. Our objective is to review effects on
a larger spatial and temporal scale than is typical for close range studies, specifically for the first time bring together published information on fish catch success.
Research Notes: Good summary table of effects on catch rates of fish, molluscs, crustacea. Summarized from other studies. Very high source levels, often > 200 dB re: 1 uPa. Exposure usually over ~5 days, catch rates observed from 1 day to several days. One instance of very high increase in catch rate (525% for ~12 hrs), shallow water (150-250 m).
Link to PDF: Hirst_Rodhouse_2000_FX_seismic_fishing.pdf

Reference Type: Journal Article
Record Number: 413
Author: Hobbs, Roderick C.; Waite, Janice M.; Rugh, David J.
Year: 2000
Title: Beluga, *Delphinapterus leucas*, group sizes in Cook Inlet, Alaska, basedon observer counts and aerial vidoe
Journal: Marine FIsheries Review
Volume: 62
Issue: 3
Pages: 46-59
Short Title: Beluga, *Delphinapterus leucas*, group sizes in Cook Inlet, Alaska, basedon observer counts and aerial vidoe
Abstract: Beluga, Delphinap terus leucas, groups were videotaped concurrent observer counts during annual NMFS aerial surveys of Cook Inlet, Alaska, from 1994 to 2000. The videotapes provided permanent records of whale groups that could be examined and compared to group size estimates made by aerial observers. Examination of the video recordings resulted in 275 counts of 79 whale groups. The McLaren formula was used to account for whales missed while they were underwater (average correction

factor 2.03; SD=0.64). A correction for whales missed due to video resolution was developed by using a second, paired video camera that magnified images relative to the standard video. This analysis showed that some whales were missed either because their image size fell below the resolution of the standard video recording or because two whales surfaced so close to each other that their images appeared to be one large whale. The correction method that resulted depended on knowing the average whale image size in the videotapes. Image sizes were measured for 2,775 whales from 275 different passes over whale groups. Corrected group sizes were calculated as the product of the original count from video, the correction factor for whales missed underwater, and the correction factor for whales missed due to video resolution (averaged 1.17 ; SD=0.06). A regression formula was developed to estimate group sizes from aerial observer counts; independent variables were the aerial counts and an interaction term relative to encounter rate (whales per second during the counting of a group), which were regressed against the respective group sizes as calculated from the videotapes. Significant effects of encounter rate, either positive or negative, were found for several observers. This formula was used to estimate group size when video was not available. The estimated group sizes were used in the annual abundance estimates.
Link to PDF: Hobbs_etal_2000_beluga_CookInlet.pdf

Reference Type: Book Section
Record Number: 47
Author: Hofer, H.; East, M. L.
Year: 1998
Title: Biological conservation and stress
Editor: Slater, Peter; Møller, Anders; Manfred, Milinski
Book Title: *Advances in the Study of Behavior: Stress and Behavior*
Publisher: Academic Press
Volume: 27
Pages: 405-525
Series Title: Advances In The Study Of Behavior
Short Title: Biological conservation and stress
Accession Number: ISI:000079287200010
Keywords: STRESS

Reference Type: Journal Article
Record Number: 264
Author: Hofman, R. J.
Year: 2003
Title: Marine sound pollution: Does it merit concern?
Journal: Marine Technology Society Journal
Volume: 37
Issue: 4
Pages: 66-77
Date: Win

Type of Article: Article
Short Title: Marine sound pollution: Does it merit concern?
Alternate Journal: Mar. Technol. Soc. J.
ISSN: 0025-3324
Accession Number: ISI:000220657800007
Keywords: *MEGAPTERA NOVAEANGLIAE*; HUMPBACK WHALE
Notes: ISI Document Delivery No.: 809TA
Times Cited: 0
Cited Reference Count: 44
URL: <Go to ISI>://000220657800007
Language: English

Reference Type: Journal Article
Record Number: 337
Author: Houser, Dorian S.
Year: 2006
Title: A method for modeling marine mammal movement and behavior for environmental impact assessment
Journal: IEEE Journal of Oceanic Engineering
Volume: 31
Issue: 1
Pages: 76-81
Date: Jan
Type of Article: Article
Short Title: A method for modeling marine mammal movement and behavior for environmental impact assessment
ISSN: 0364-9059
Accession Number: ISI:000238710400008
Keywords: BEHAVIOR; COMPUTER SIMULATION; ENVIRONMENTAL IMPACT; MARINE MAMMALS; MODEL; MOVEMENT; ANTHROPOGENIC NOISE; ESME
Abstract: Estimating the impact of anthropogenic sound on marine animals entails consideration of animal location in the vertical and horizontal planes and the behavior of the animal (e.g., breeding, foraging, migration) at the time of sound exposure. To approach more realistic impact estimates, the effects of sound on the marine environment (ESME) model incorporates a simulation program that permits fine-scale control over simulated marine animal (animat) movement and behavior. The simulation program, known as the Marine Mammal Movement and Behavior (3MB), module, provides user control over animals that is scaleable to available information about the species of concern. Movement and behavior is stochastically determined by sampling from distributions describing rates of movement in the horizontal and vertical planes, direction of travel, time at the surface between dives, time at depth, and time in and transition between behavioral states. Influence of behavior over each of the other distributions is permitted. As knowledge of marine animal behavior, movement, and ecology increases, the flexibility and level of control provided by such models will increase the potential for realistic impact estimates.
Notes: ISI Document Delivery No.: 059CH

Times Cited: 2
Cited Reference Count: 13
URL: <Go to ISI>://000238710400008
Link to PDF: Houser_2006_model_marmam_behavior.pdf
Author Address: BIOMIMETICA, La Mesa, CA 91942 USA.
Houser, DS, BIOMIMETICA, La Mesa, CA 91942 USA.
biomimetica@cox.net
Language: English

Reference Type: Journal Article
Record Number: 503
Author: Houser, Dorian S.; Howard, R.; Ridgway, Sam H.
Year: 2001
Title: Can diving-induced tissue nitrogen supersaturation increase the chance of acoustically driven bubble growth in marine mammals?
Journal: Journal of Theoretical Biology
Volume: 213
Issue: 2
Pages: 183-195
Short Title: Can diving-induced tissue nitrogen supersaturation increase the chance of acoustically driven bubble growth in marine mammals?
Abstract: The potential for acoustically mediated causes of stranding in cetaceans (whales and dolphins)
is of increasing concern given recent stranding events associated with anthropogenic acoustic
activity. We examine a potentially debilitating non-auditory mechanism called recti"ed di!usion.
Recti"ed di!usion causes gas bubble growth, which in an insoni"ed animal may produce emboli, tissue separation and high, localized pressure in nervous tissue. Using the results of
a dolphin dive study and a model of recti"ed di!usion for low-frequency exposure, we demonstrate that the diving behavior of cetaceans prior to an intense acoustic exposure may
increase the chance of recti"ed di!usion. Speci"cally, deep diving and slow ascent/descent
speed contributes to increased gas-tissue saturation, a condition that ampli"es the likelihood
of recti"ed di!usion. The depth of lung collapse limits nitrogen uptake per dive and the surface
interval duration in#uences the amount of nitrogen washout from tissues between dives. Model results suggest that low-frequency recti"ed di!usion models need to be advanced, that
the diving behavior of marine mammals of concern needs to be investigated to identify at-risk
animals, and that more intensive studies of gas dynamics within diving marine mammals

should be undertaken.
Link to PDF: Houser_etal_2001_marmam_bubbles_nitrogen.pdf

Reference Type: Journal Article
Record Number: 128
Author: Irvine, A. B.; Scott, M. D.; Wells, Randall S.; Kaufmann, J. H.
Year: 1981
Title: Movements and activities of the Atlantic bottlenose dolphin, *Tursiops-truncatus*, near Sarasota, Florida
Journal: Fishery Bulletin
Volume: 79
Issue: 4
Pages: 671-688
Short Title: Movements and activities of the Atlantic bottlenose dolphin, *Tursiops-truncatus*, near Sarasota, Florida
Accession Number: ISI:A1981NJ01200006
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*
Link to PDF: Irvine_etal_1981_TuTr_SarasotaFL.pdf

Reference Type: Journal Article
Record Number: 265
Author: Jahoda, Maddalena; Lafortuna, Claudio L.; Biassoni, Nicoletta; Almirante, Carla; Azzellino, Arianna; Panigada, Simone; Zanardelli, Margherita; Di Sciara, Giuseppe Notarbartolo
Year: 2003
Title: Mediterranean fin whale's (*Balaenoptera physalus*) response to small vessels and biopsy sampling assessed through passive tracking and timing of respiration
Journal: Marine Mammal Science
Volume: 19
Issue: 1
Pages: 96-110
Date: Jan
Type of Article: Article
Short Title: Fin whales response to disturbance
Alternate Journal: Mar. Mamm. Sci.
ISSN: 0824-0469
Accession Number: ISI:000180198700007
Keywords: *BALAENOPTERA PHYSALUS*; FIN WHALE; HUMAN DISTURBANCE; LASER RANGE FINDER; PASSIVE TRACKING; BEHAVIOR; WHALE-WATCHING; MEDITERRANEAN; TIMING OF RESPIRATION; HUMPBACK WHALE; *MEGAPTERA NOVAEANGLIAE*; *MEGANYCTIPHANES NORVEGICA*; ENERGY EXPENDITURE; SURFACE SWARMS; SEA;ABUNDANCE; DIVE; SIZE
Abstract: Twenty-five fin whales (*Balaenoptera physalus*) were individually studied in their Ligurian Sea feeding grounds to describe and measure short-term responses to

the close approach of a fast-moving inflatable craft from which biopsy samples were collected. Passive tracking was performed with a new technique based on simultaneous determination of (1) position of the observation vessel, (2) laser-measured distance between the target animal and the observation vessel, and (3) azimuth of the target animal with respect to the observation vessel. Tracking was combined with timing of the surfacing intervals. Two different swimming-surfacing patterns supposed to be related to feeding and traveling, respectively, were observed. Supposed feeding whales reacted to disturbance by changing their behavior into traveling. Two different avoidance strategies were performed simultaneously by the whales: travel at increased velocity and reduction of the time spent at the surface. After the disturbance ceased, the surfacing activity never completely reverted to predisturbance conditions during one hour of postexposure control and supposed feeding behavior appeared to be suspended indefinitely. Our results suggest the need for whale watching regulations in the Ligurian Sea, particularly as far as presumed feeding whales are concerned.
Notes: ISI Document Delivery No.: 631ZQ
Times Cited: 5
Cited Reference Count: 35
Research Notes: Fin whale behavioral response to approach by small vessel (inflated boat).
URL: <Go to ISI>://000180198700007
Link to PDF: Jahoda_etal_2003_finwhale_vessel_avoidance.pdf
Author Address: Tethys Res Inst, Acquario Civico, I-20121 Milan, Italy. CNR, Inst Bioimmagini Fisiol Mol, I-20090 Milan, Italy.
Jahoda, M, Tethys Res Inst, Acquario Civico, Via GB Gadio 2, I-20121 Milan, Italy.
Language: English

Reference Type: Journal Article
Record Number: 342
Author: Janik, V. M.; Thompson, P. M.
Year: 1996
Title: Changes in surfacing patterns of bottlenose dolphins in response to boat traffic
Journal: Marine Mammal Science
Volume: 12
Issue: 4
Pages: 597-602
Date: Oct
Type of Article: Article
Short Title: Changes in surfacing patterns of bottlenose dolphins in response to boat traffic
ISSN: 0824-0469
Accession Number: ISI:A1996VL33400011
Keywords: WATERS; BOTTLENOSE DOLPHIN; TURSIOPS TRUNCATUS
Notes: ISI Document Delivery No.: VL334
Times Cited: 24
Cited Reference Count: 12
Research Notes: Short report on bottlenose dolphin behavioral reactions due to

approaching vessels (small).
URL: <Go to ISI>://A1996VL33400011
Link to PDF: Janik_2000_SL_ActiveSpace_Tutr.pdf
Author Address: UNIV ABERDEEN,DEPT ZOOL,CROMARTY FIRTH IV11 8YJ,ROSS,SCOTLAND.
Janik, VM, UNIV ST ANDREWS,SCH BIOL & MED SCI,ST ANDREWS KY16 9TS,FIFE,SCOTLAND.
Language: English

Reference Type: Journal Article
Record Number: 48
Author: Jelinski, D. E.; Krueger, C. C.; Duffus, D. A.
Year: 2002
Title: Geostatistical analyses of interactions between killer whales (*Orcinus orca*) and recreational whale-watching boats
Journal: Applied Geography
Volume: 22
Issue: 4
Pages: 393-411
Short Title: Geostatistical analyses of interactions between killer whales (*Orcinus orca*) and recreational whale-watching boats
Accession Number: ISI:000179646300004
Keywords: BRITISH COLUMBIA; GEOSTATISTICS; KILLER WHALE; MARINE GEOGRAPHY; NON-CONSUMPTIVE WILDLIFE RECREATION; *ORCINUS ORCA*; SPATIAL ANALYSIS; WHALE-WATCHING; WILDLIFE DISTURBANCE; VESSEL; TOURISM
Abstract: Johnstone Strait in coastal British Columbia, Canada, is a core habitat for seasonal concentrations of killer whales (*Orcinus orca*), which have attracted considerable attention from commercial whale-watching operators and recreational boaters. Within the Strait lies the Robson Bight–Michael Bigg Ecological Reserve, a marine reserve set aside as critical habitat for killer whales and closed to recreational boat traffic. The geography of encounters between killer whales and seven types of whale-watching vessels (including kayaks, charter and pleasure craft) in and near this reserve was analysed with a suite of geostatistics in a geographic information system (GIS) vector environment. Reserve boundary violation was high among most user groups, with kayakers being the most frequent offenders. Motorized vessels had significantly longer contact times with whales compared to kayaks and sailboats. Motorized vessels showed the travel characteristic of deliberate tracking of whales. The movements of killer whales also appear to be affected by boats. These results have important implications for killer whale conservation and management in areas where they are subject to intensive whale-watching activities, and possible chronic disturbance.
Research Notes: Killer whale behavioral response to vessels (variety of types from kayaks to whale-watching boats); directional movement toward open waters.
Link to PDF: Jelinski_etal_2002_Interactions_KW_whale-watching.pdf

Reference Type: Journal Article
Record Number: 191
Author: Jepson, P. D.; Arbelo, M.; Deaville, R.; Patterson, I. A. P.; Castro, P.; Baker, J. R.; Degollada, E.; Ross, H. M.; Herraez, P.; Pocknell, A. M.; Rodriguez, F.; Howie, F. E.; Espinosa, A.; Reid, R. J.; Jaber, J. R.; Martin, V.; Cunningham, A. A.; Fernandez, A.
Year: 2003
Title: Gas-bubble lesions in stranded cetaceans - Was sonar responsible for a spate of whale deaths after an Atlantic military exercise?
Journal: Nature
Volume: 425
Issue: 6958
Pages: 575-576
Date: Oct
Short Title: Gas-bubble lesions in stranded cetaceans - Was sonar responsible for a spate of whale deaths after an Atlantic military exercise?
Accession Number: ISI:000185801000025
Keywords: GAS BUBBLE; CETACEAN; MILITARY; SONAR; STRANDING; CUVIER'S BEAKED WHALE; *ZIPHIUS CAVIROSTRIS*; BLAINVILLE'S BEAKED WHALE; *MESOPLODON DENSIROSTRIS*; GERVAIS' BEAKED WHALE; *MESOPLODON EUROPAEUS*
Research Notes: Examining gas bubble lesions in variety of stranded whale species after active Navy sonar. Inconclusive.
URL: <Go to ISI>://000185801000025
Link to PDF: Jepson_etal_2003_cetacean_gasbubble_sonar.pdf

Reference Type: Journal Article
Record Number: 202
Author: Jepson, P. D.; Deaville, R.; Patterson, I. A. P.; Pocknell, A. M.; Ross, H. M.; Baker, J. R.; Howie, F. E.; Reid, R. J.; Colloff, A.; Cunningham, A. A.
Year: 2005
Title: Acute and chronic gas bubble lesions in cetaceans stranded in the United Kingdom
Journal: Veterinary Pathology
Volume: 42
Issue: 3
Pages: 291-305
Date: May
Short Title: Acute and chronic gas bubble lesions in cetaceans stranded in the United Kingdom
Accession Number: ISI:000229083200006
Keywords: GAS BUBBLE LESION; CETACEAN; RISSO'S DOLPHIN; *GRAMPUS GRISEUS*; COMMON DOLPHIN; *DELPHINUS DELPHIS*; BLAINVILLE'S BEAKED WHALE; *MESOPLODON DENSIROSTRIS*; HARBOR PORPOISE; *PHOCOENA PHOCOENA*; GAS BUBBLE

Abstract: The first evidence suggestive of in vivo gas bubble formation in cetacea, including eight animals stranded in the UK, has recently been reported. This article presents the pathologic findings from these eight UK-stranded cetaceans and two additional UK-stranded cetacean cases in detail. Hepatic gas-filled cavitary lesions (0.2–6.0 cm diameter) involving approximately 5–90% of the liver volume were found in four (two juvenile, two adult) Risso's dolphins (*Grampus griseus*), three (two adult, one juvenile) common dolphins (*Delphinus delphis*), an adult Blainville's beaked whale (*Mesoplodon densirostris*), and an adult harbour porpoise (*Phocoena phocoena*). Histopathologic examination of the seven dolphin cases with gross liver cavities revealed variable degrees of pericavitary fibrosis, microscopic, intrahepatic, spherical, nonstaining cavities (typically 50–750 mm in diameter) consistent with gas emboli within distended portal vessels and sinusoids and associated with hepatic tissue compression, hemorrhages, fibrin/organizing thrombi, and foci of acute hepatocellular necrosis. Two common dolphins also had multiple and bilateral gross renal cavities (2.0–9.0 mm diameter) that, microscopically, were consistent with acute (n 5 2) and chronic (n 5 1) arterial gas emboli-induced renal infarcts. Microscopic, bubblelike cavities were also found in mesenteric lymph node (n 5 4), adrenal (n 5 2), spleen (n 5 2), pulmonary associated lymph node (n 5 1), posterior cervical lymph node (n 5 1), and thyroid (n 5 1). No bacterial organisms were isolated from five of six cavitated livers and one of one cavitated kidneys. The etiology and pathogenesis of these lesions are not known, although a decompressionrelated mechanism involving embolism of intestinal gas or de novo gas bubble (emboli) development derived from tissues supersaturated with nitrogen is suspected.
URL: <Go to ISI>://000229083200006
Link to PDF: Jepson_etal_2005_cetaceans_gas_bubble.pdf

Reference Type: Journal Article
Record Number: 266
Author: Johnson, Chris J.; Boyce, Mark S.; Case, Ray L.; Cluff, H. Dean; Gau, Robert J.; Gunn, Anne; Mulders, Robert
Year: 2005
Title: Cumulative effects of human developments on arctic wildlife
Journal: Wildlife Monographs
Volume: 160
Pages: 1-36
Date: Jul
Type of Article: Review
Short Title: Cumulative effects of human developments on arctic wildlife
Alternate Journal: Wildl. Monogr.
ISSN: 0084-0173
Accession Number: ISI:000233385200001
Keywords: ARCTIC; BARREN-GROUND CARIBOU; *CANIS LUPUS*; CUMULATIVE EFFECTS; GRAY WOLF; GRIZZLY BEAR; *GULO GULO*; HUMAN DISTURBANCE; *RANGIFER TARANDUS GROENLANDICUS*; RESOURCE SELECTION FUNCTION; URSUS ARCTOS; WOLVERINE; RESOURCE SELECTION FUNCTION; GRIZZLY

BEAR; *RANGIFER TARANDUS PLATYRHYNCHUS*; MULTIPLE SPATIAL SCALES; WOODLAND CARIBOU; HABITAT SELECTION; MOUNTAIN CARIBOU; LOGISTIC REGRESSION; BRITISH COLUMBIA

Abstract: Recent discoveries of diamondiferous kimberlite deposits in the Canadian central Arctic led to unprecedented levels of mineral exploration and development. The cumulative effects of such activities are all issue of concern for government regulatory agencies, regional and international conservation organizations, wildlife managers, and indigenous peoples. We investigated the impacts Of human activities and associated infrastructure oil the distribution of Arctic wildlife in 190,000 km² of the Taiga Shield and Southern Arctic ecozones 400 kill northeast of Yellowknife, Northwest Territories, Canada. We used covariates for vegetation, interspecific interactions, and human disturbance features to develop seasonal resource-selection models for barren-ground caribou (*Rangifer tarandus groenlandicus*), gray wolves (*Canis lupus*), grizzly bears (*Ursus arctos*), and wolverines (*Gulo gulo*). We used all information-theoretic approach to select I I seasonal models for the 4 species. Nine models were good predictors of species Occurrence and vegetation covariates were important components of all models. Mines and other major developments had the largest negative affect oil species occurrence, followed by exploration activities, and Outfitter camps. We did not, however, record strong avoidance responses by all species during all seasons to each disturbance type (i.e., major developments, mineral exploration sites, outfitter camps) and for some models carnivores selected for disturbance features (i.e., occurred closer to sites than comparison random locations). We used a geographic information system (GIS) to extrapolate each seasonal resource-selection model to the study area and quantified the reduction ill habitat effectiveness as a function of modeled and hypothetical disturbance coefficients. Across all models, grizzly bears and wolves demonstrated the strongest negative response to disturbance and corresponding reduction in habitat effectiveness, followed by caribou and wolverines. The largest seasonal effect was recorded for caribou during the post-calving period, where model coefficients suggested a 37% reduction in the area of the highest quality habitats and an 84% increase in the area of the lowest quality habitats. This is the first study to demonstrate the Cumulative effects of multiple sources of human disturbance for caribou, wolves, bears, and wolverines found across the Canadian central Arctic. Resource selection models and corresponding maps of important habitats can lie used to guide and evaluate future development proposals and can serve as a component of a regional environmental assessment. However, inferences from large-scale modeling efforts should be carefully evaluated when making detailed prescriptive recommendations. Study design, sample size, reliability of GIS data, and accuracy of model predictions are important considerations when evaluating the strength and scale of inference of correlative resource selection Studies Such as this. We recommend that regional cumulative effects analyses serve as the coarsest framework for understanding the impacts of human developments on wide-ranging animals. Monitoring and research should be conducted at various behavioral scales leading to a body of knowledge that fully describes the range and strength of impacts resulting from cumulative effects.

Notes: ISI Document Delivery No.: 985NR
Times Cited: 0
Cited Reference Count: 147

URL: <Go to ISI>://000233385200001
Link to PDF: Johnson_etal_2005_arctice_wildlife_human.pdf
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Language: English

Reference Type: Journal Article
Record Number: 175
Author: Johnson, C. S.
Year: 1991
Title: Hearing thresholds for periodic 60-KHz tone pulses in the beluga whale
Journal: Journal of the Acoustical Society of America
Volume: 89
Issue: 6
Pages: 2996-3001
Date: Jun
Short Title: Hearing thresholds for periodic 60-KHz tone pulses in the beluga whale
Accession Number: ISI:A1991FP53600053
Keywords: BELUGA WHALE; *DELPHINAPTERUS LEUCAS*; MASKED THRESHOLD
Abstract: Masked thresholds for periodic 60-kHz tone pulses were measured for the beluga whale (*Delphinapterus leucas*) for tone pulse durations of 0.025, 0.1, 0.3, 0.8, and 1.6 ms, and with repetition times ranging from 770 ms to continuous tones. In addition, masked thresholds were also measured for single pulse stimuli of 0.025, 0.1, 0.3, 0.8, 1.6, 10, 50, 200, and 1000 ms in duration. The data analysis used with human data was not adequate for the three shortest periodic tone stimuli and a rectangular filter, energy detection, model was used for these cases. The integration time estimated from the single tone pulse data (20 ms) was much longer than those obtained from the periodic tone pulse results. Whale integration times for periodic pulses were found to vary almost directly with pulse duration, unlike those reported humans, which are constant and independent of pulse duration. A system bandwith of 1000 Hz was found to fit the data, a bandwidth much smaller than the critical ratio (2400 Hz) previously reported for the beluga whale.
URL: <Go to ISI>://A1991FP53600053
Link to PDF: Johnson_1991_Thresholds_60Hz_beluga.pdf

Reference Type: Journal Article
Record Number: 49
Author: Johnson, M. P.; Tyack, Peter L.
Year: 2003
Title: A digital acoustic recording tag for measuring the response of wild marine mammals to sound
Journal: IEEE Journal of Oceanic Engineering

Volume: 28
Issue: 1
Pages: 3-12
Date: Jan
Short Title: A digital acoustic recording tag for measuring the response of wild marine mammals to sound
Accession Number: ISI:000181871700002
Keywords: EFFECTS OF NOISE; MARINE MAMMALS; TAGS; UNDERWATER ACOUSTIC MEASUREMENT; ANTHROPOGENIC; NORTHERN RIGHT WHALE; *EUBALAENA GLACIALIS*; SPERM WHALE; *PHYSETER MACROCEPHALUS;* TAG
Abstract: Definitive studies on the response of marine mammals to anthropogenic sound are hampered by the short surface time and deep-diving lifestyle of many species. A novel archival tag, called the DTAG, has been developed to monitor the behavior of marine mammals, and their response to sound, continuously throughout the dive cycle. The tag contains a large array of solid-state memory and records continuously from a built-in hydrophone and suite of sensors. The sensors sample the orientation of the animal in three dimensions with sufficient speed and resolution to capture individual fluke strokes. Audio and sensor recording is synchronous so the relative timing of sounds and motion can be determined precisely. The DTAG has been attached to more than 30 northern right whales (*Eubalaena glacialis*) and 20 sperm whales (*Physeter macrocephalus*) with recording duration of up to 12 h per deployment. Several deployments have included sound playbacks to the tagged whale and a transient response to at least one playback is evident in the tag data.
Link to PDF: Johnson_Tyack_2003_whales_DTAG.pdf

Reference Type: Journal Article
Record Number: 50
Author: Jørgensen, Roar; Handegard, Nils Olav; Gjosaeter, Harald; Slotte, Aril
Year: 2004
Title: Possible vessel avoidance behaviour of capelin in a feeding area and on a spawning ground
Journal: Fisheries Research
Volume: 69
Issue: 2
Pages: 251-261
Short Title: Possible vessel avoidance behaviour of capelin in a feeding area and on a spawning ground
Accession Number: ISI:000224329100010
Keywords: AVOIDANCE; CAPELIN; PREDATOR; ACOUSTIC BUOY; *MALLOTUS VILLOSUS*; VESSEL; BEHAVIOR; FISH
Abstract: The avoidance reactions of Barents Sea capelin (*Mallotus villosus*) to Norwegian research vessels were studied by means of the Bergen Acoustic Buoy (BAB), which was equipped with a Simrad EK60 echo-sounder operating at a frequency of 38 kHz. BAB experiments were carried out in the capelin's feeding area in the Barents Sea in the autumn and on its spawning grounds in Varangerfjord in Northern

Norway in early spring. The vessel approached the BAB at normal survey speed (approximately 11 knots), eventually passing it at a short distance (5–25 m). Changes in the volume scattering coefficient and in the centre of the depth distribution under the BAB were analysed. There was no significant influence of the avoidance reactions of capelin to survey vessels on the volume scattering coefficient, either in the feeding area or on the spawning ground. However, there were indications of changes in the centre of depth distribution (diving) before the pass, especially in dense concentrations on the spawning grounds. An analysis of the time of start, maximum and end of a possible avoidance reaction using a fitted polynomial, indicated that there might be an avoidance reaction with a defined start, but not a defined end within a ± 5 min range. The authors propose that the selective process relating to capelin might favour maximising its ability to flourish by concentrating on feeding and reproduction.
Research Notes: Testing capelin hearing in breeding and feeding grounds. No significant influence on fish density. Nighttime sampling showed significant decrease in volume backscattering, small sample size. Changes in diving behavior before the vessel passed were seen in spawning grounds.
Link to PDF: Jorgensen_etal_2004_capelin_avoid_vessel.pdf

Reference Type: Journal Article
Record Number: 377
Author: Kastak, C. R.; Schusterman, R. J.
Year: 1996
Title: Temporary threshold shift in a harbor seal (*Phoca vitulina*)
Journal: Journal of the Acoustical Society of America
Volume: 100
Issue: 3
Pages: 1905-1908
Short Title: Temporary threshold shift in a harbor seal (*Phoca vitulina*)
Keywords: HARBOR SEAL; *PHOCA VITULINA*; TEMPORARY THRESHOLD SHIFT; TTS
Abstract: During in-air auditory threshold testing, a harbor seal was inadvertently exposed to broadband construction noise for 6 days, averaging 6 to 7 h of intermittent exposure per day. When tested immediately upon cessation of the noise, a temporary threshold shift (TTS) of 8 dB at 100 Hz was
evident. In addition, the animal's false alarm rate increased from 7% in the pre-exposure session to 30% in the post-exposure test session. Following 1 week of recovery, the subject's threshold was within 2 dB of its original level, and the false alarm rate was less than 10%. The data suggest that TTS can be induced in seals, and that our subject may have suffered from tinnitus, resulting in a reduced ability to distinguish signal-present from signal-absent trials.
Research Notes: TTS study on harbor seal
Link to PDF: Kastak_Schusterman_1996_harborseal_TTS.pdf

Reference Type: Journal Article

Record Number: 378
Author: Kastak, C. R.; Schusterman, R. J.; Southall, B. L.; Reichmuth, C. J.
Year: 1999
Title: Underwater temporary threshold shift induced by octave-band noise in three species of pinniped
Journal: journal of the Acoustical Society of America
Volume: 106
Issue: 2
Pages: 1142-1148
Short Title: Underwater temporary threshold shift induced by octave-band noise in three species of pinniped
Abstract: Pure-tone sound detection thresholds were obtained in water for one harbor seal (*Phoca vitulina*), two California sea lions (*Zalophus californianus*), and one northern elephant seal (*Mirounga angustirostris*) before and immediately following exposure to octave-band noise. Additional thresholds were obtained following a 24-h recovery period. Test frequencies ranged from 100 Hz to 2000 Hz and octave-band exposure levels were approximately 60–75 dB SL (sensation level at center frequency). Each subject was trained to dive into a noise field and remain stationed underwater during a noise-exposure period that lasted a total of 20–22 min. Following exposure, three of the subjects showed threshold shifts averaging 4.8 dB (*Phoca*), 4.9 dB (*Zalophus*), and 4.6 dB (*Mirounga*). Recovery to baseline threshold levels was observed in test sessions conducted within 24 h of noise exposure. Control sessions in which the subjects completed a simulated noise exposure produced shifts that were significantly smaller than those observed following noise exposure. These results indicate that noise of moderate intensity and duration is sufficient to induce TTS under water in these pinniped species.
Research Notes: TTS study on harbor seal, seal lion, elephant seal.
Link to PDF: Kastak_etal_1999_pinniped_TTS.pdf

Reference Type: Journal Article
Record Number: 332
Author: Kastak, D.; Southall, B. L.; Schusterman, R. J.; Kastak, C. R.
Year: 2005
Title: Underwater temporary threshold shift in pinnipeds: Effects of noise level and duration
Journal: Journal of the Acoustical Society of America
Volume: 118
Issue: 5
Pages: 3154-3163
Date: Nov
Type of Article: Article
Short Title: Underwater temporary threshold shift in pinnipeds: Effects of noise level and duration
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966

Accession Number: ISI:000233281300046
Keywords: DOLPHIN; *TURSIOPS TRUNCATUS*; MASKED HEARING THRESHOLD; BOTTLENOSE DOLPHIN; *DELPHINAPTERUS LEUCAS*; EXPOSURE; ENERGY; INTENSITY; MASKING; PATTERN; CALIFORNIA SEA LION; *ZALOPHUS CALIFORNIANUS*; HARBOR SEAL; *PHOCA VITULINA*; NORTHERN ELEPHANT SEAL; *MIROUNGA ANGUSTIROSTRIS*; TEMPORARY THRESHOLD SHIFT; TTS
Abstract: Behavioral psychophysical techniques were used to evaluate the residual effects of underwater noise on the hearing sensitivity of three pinnipeds: a California sea lion (*Zalophus californianus*), a harbor seal (*Phoca vitulina*), and a northern elephant seal (*Mirounga angustirostris*). Temporary threshold shift (TTS), defined as the difference between auditory thresholds obtained before and after noise exposure, was assessed. The subjects were exposed to octave-band noise centered at 2500 Hz at two sound pressure levels: 80 and 95 dB SL (re: auditory threshold at 2500 Hz). Noise exposure durations were 22, 25, and 50 min. Threshold shifts were assessed at 2500 and 3530 Hz. Mean threshold shifts ranged from 2.9-12.2 dB. Full recovery of auditory sensitivity occurred within 24 h of noise exposure. Control sequences, comprising sham noise exposures, did not,result in significant mean threshold shifts for any subject. Threshold shift magnitudes increased with increasing noise sound exposure level (SEL) for two of the three subjects. The results underscore the importance of including sound exposure metrics (incorporating sound pressure level and exposure duration) in order to fully assess the effects of noise on marine mammal hearing. (c) 2005 Acoustical Society of America.
Research Notes: Sea lion, harbor seal, elephant seal. Testing for TTS.
URL: <Go to ISI>://000233281300046
Link to PDF: Kastak_etal_2005_pinniped_TTS.pdf
Author Address: Univ Calif Santa Cruz, Inst Marine Sci, Long Marine Lab, Santa Cruz, CA 95060 USA. NOAA, Acoust Program, Natl Marine Fisheries Serv, Off Protect Resources, Silver Spring, MD 20910 USA.
Kastak, D, Univ Calif Santa Cruz, Inst Marine Sci, Long Marine Lab, 100 Shaffer Rd, Santa Cruz, CA 95060 USA.
Language: English

Reference Type: Journal Article
Record Number: 411
Author: Kastelein, Ronald A.; Bunskoek, Paulien; Hagedoorn, Monique; Au, Whitlow W. L.; De Haan, Dick
Year: 2002
Title: Audiogram of a harbor porpoise (*Phocoena phocoena*) measured with narrow-band frequency-modulated signals
Journal: Journal of the Acoustical Society of America
Volume: 112
Issue: 1
Pages: 334-344
Date: July 2002
Short Title: Audiogram of a harbor porpoise
Keywords: HARBOR PORPOISE; *PHOCOENA PHOCOENA*; AUDIOGRAM

Abstract: The underwater hearing sensitivity of a two-year-old harbor porpoise was measured in a pool using standard psycho-acoustic techniques. The go/no-go response paradigm and up–down staircase psychometric method were used. Auditory sensitivity was measured by using narrow-band frequency-modulated signals having center frequencies between 250 Hz and 180 kHz. The resulting audiogram was U-shaped with the range of best hearing (defined as 10 dB within maximum sensitivity) from 16 to 140 kHz, with a reduced sensitivity around 64 kHz. Maximum sensitivity (about 33 dB re 1 mPa) occurred between 100 and 140 kHz. This maximum sensitivity range corresponds with the peak frequency of echolocation pulses produced by harbor porpoises (120–130 kHz). Sensitivity falls about 10 dB per octave below 16 kHz and falls off sharply above 140 kHz (260 dB per octave). Compared to a previous audiogram of this species (Andersen, 1970), the present audiogram shows less sensitive hearing between 2 and 8 kHz and more sensitive hearing between 16 and 180 kHz. This harbor porpoise has the highest upper-frequency limit of all odontocetes investigated. The time it took for the porpoise to move its head 22 cm after the signal onset (movement time) was also measured. It increased from about 1 s at 10 dB above threshold, to about 1.5 s at threshold.
Link to PDF: Kastelein_etal_2002_harborporpoise_audiogram.pdf

Reference Type: Journal Article
Record Number: 267
Author: Kastelein, Ronald A.; de Haan, D.; Vaughan, N.; Staal, C.; Schooneman, N. M.
Year: 2001
Title: The influence of three acoustic alarms on the behaviour of harbour porpoises (*Phocoena phocoena*) in a floating pen
Journal: Marine Environmental Research
Volume: 52
Issue: 4
Pages: 351-371
Date: Oct
Type of Article: Article
Short Title: The influence of three acoustic alarms on the behaviour of harbour porpoises (*Phocoena phocoena*) in a floating pen
Alternate Journal: Mar. Environ. Res.
ISSN: 0141-1136
Accession Number: ISI:000171702800003
Keywords: HARBOR PORPOISE; *PHOCOENA PHOCOENA*; BEHAVIOR; BYCATCH; DOLPHIN; FISHERIES; FISHING; NETS; ODONTOCETE; PINGER; BAY OF FUNDY; CATCH; REDUCE
Abstract: Harbour porpoise bycatch may be reduced by deterring porpoises from nets acoustically. In this study, two harbour porpoises were subjected to three acoustic alarms. The effect of each alarm was judged by comparing the animals' position and respiration rate during a test period with that during a baseline period. The XP-10 alarm produced 0.3 s tonal signals randomly selected from a set of 16 with fundamental frequencies between 9 and 15 kHz, with a constant pulse interval of 4.8 s (duty cycle

6%). The 2MP alarm produced 0.3 s tonal signals randomly selected from a set of 16 with similar fundamental frequencies but with random pulse intervals of between 2 and 5 s (duty cycle 8%). The frequency spectra and source levels of the 2MP and XP-10 alarms varied depending on the signal selected. The HS20-80 alarm produced a constant, but asymmetrical frequency modulated sinewave between 20 and 80 kHz with total pulse duration of 0.3 s, with random pulse intervals of between 2 and 5 s (duty cycle 4.6%). The porpoises reacted to all three alarms by swimming away from them and by increasing their respiration rate. The XP-10, which on average had the highest source level, had the strongest effect.
Notes: ISI Document Delivery No.: 484RF
Times Cited: 6
Cited Reference Count: 32
URL: <Go to ISI>://000171702800003
Link to PDF: Kastelein_etal_2001_Phph_resp_net-alarm_pens.pdf
Author Address: Harderwijk Marine Mammal Pk, NL-3841 AB Harderwijk, Netherlands. Netherlands Inst Fishery Res, DLO, RIVO, NL-1970 AB Ijmuiden, Netherlands. Univ Bristol, Sch Biol Sci, Bristol BS8 1UG, Avon, England. Kastelein, RA, Harderwijk Marine Mammal Pk, Strandblvd Oost 1, NL-3841 AB Harderwijk, Netherlands.
Language: English

Reference Type: Journal Article
Record Number: 412
Author: Kastelein, Ronald A.; Rippe, H. T.; Vaughan, N.; Schooneman, N. M.; Verboom, W. C.; De Haan, Dick
Year: 2000
Title: The effects of acoustic alarms on the behavior of harbor porpoises (*Phocoena phocoena*) in a floating pen.
Journal: Marine Mammal Science
Volume: 16
Issue: 1
Pages: 46-64
Date: January 2000
Short Title: Pingers
Keywords: ODONTOCETE; FISHERIES; NETS; BYCATCH; PINGER; ACOUSTIC ALARM
Abstract: In an attempt to test the effectiveness of sounds in deterring harbor porpoises from nets and reducing porpoise bycatch in gill net fisheries, two harbor porpoises, kept in a large floating pen at Neeltje Jans, The Netherlands, were subjected to 3 different underwater sounds. The effect of each sound was judged by comparing the animals' behavior during a 15-min test period with that during a 1 5-min baseline period immediately before the test and a 15-min recovery period immediately after the test. The effects of the alarms were quantified as the distance between the porpoises' surfacings and the alarm and the animals' respiration rates. Each alarm was tested in two positions in the pen. The behavior observed was related to the sound-pressurelevel distribution in the pen. All three alarms: the standard Dukane alarm (a

commercially available alarm with a regular pulse interval of 4.3 sec used to deter dolphins from fishing nets), the random Dukane alarm (the same alarm with random pulse interval of between 2 and 30 sec), and the “bird alarm” (a sound from a generator) resulted in increases in both the distance of the animals’ surfacings from the alarms and their respiration rates. The standard Dukane alarm and the bird alarm were more effective than the random Dukane alarm in inducing the animals to swim away from the sound source.
Link to PDF: Kastelein_etal_2000_harborporpoise_pingers.pdf

Reference Type: Journal Article
Record Number: 52
Author: Kastelein, Ronald A.; van der Heul, S.; Verboom, Wim C.; Triesscheijn, R. J. V.; Jennings, N. V.
Year: 2006
Title: The influence of underwater data transmission sounds on the displacement behaviour of captive harbour seals (*Phoca vitulina*)
Journal: Marine Environmental Research
Volume: 61
Issue: 1
Pages: 19-39
Date: Feb
Short Title: The influence of underwater data transmission sounds on the displacement behaviour of captive harbour seals (*Phoca vitulina*)
Accession Number: ISI:000234690100002
Keywords: ACOUSTICS; ANTHROPOGENIC NOISE; DETERRENCE; ECOLOGY; HYDRODYNAMICS; PINNIPED; PHOCID; SHIPPING LANES; VESSEL; ACME; MARINE MAMMALS; HARBOR SEAL; *PHOCA VITULINA*
Abstract: To prevent grounding of ships and collisions between ships in shallow coastal waters, an underwater data collection and communication network (ACME) using underwater sounds to encode and transmit data is currently under development. Marine mammals might be affected by ACME sounds since they may use sound of a similar frequency (around 12 kHz) for communication, orientation, and prey location. If marine mammals tend to avoid the vicinity of the acoustic transmitters, they may be kept away from ecologically important areas by ACME sounds. One marine mammal species that may be affected in the North Sea is the harbour seal (*Phoca vitulina*). No information is available on the effects of ACME-like sounds on harbour seals, so this study was carried out as part of an environmental impact assessment program. Nine captive harbour seals were subjected to four sound types, three of which may be used in the underwater acoustic data communication network. The effect of each sound was judged by comparing the animals location in a pool during test periods to that during baseline periods, during which no sound was produced. Each of the four sounds could be made into a deterrent by increasing its amplitude. The seals reacted by swimming away from the sound source. The sound pressure level (SPL) at the acoustic discomfort threshold was established for each of the four sounds. The acoustic discomfort threshold is defined as the boundary between the areas that the animals generally occupied during

the transmission of the sounds and the areas that they generally did not enter during transmission. The SPLs at the acoustic discomfort thresholds were similar for each of the sounds (107 dB re 1 lPa). Based on this discomfort threshold SPL, discomfort zones at sea for several source levels (130–180 dB re 1 lPa) of the sounds were calculated, using a guideline sound propagation model for shallow water. The discomfort zone is defined as the area around a sound source that harbour seals are expected to avoid. The definition of the discomfort zone is based on behavioural discomfort, and does not necessarily coincide with the physical discomfort zone. Based on these results, source levels can be selected that have an acceptable effect on harbour seals in particular areas. The discomfort zone of a communication sound depends on the sound, the source level, and the propagation characteristics of the area in which the sound system is operational. The source level of the communication system should be adapted to each area (taking into account the width of a sea arm, the local sound propagation, and the importance of an area to the affected species). The discomfort zone should not coincide with ecologically important areas (for instance resting, breeding, suckling, and feeding areas), or routes between these areas.
Link to PDF: Kastelein_etal_2006_FX_data-xmission_noise_Phvi.pdf

Reference Type: Journal Article
Record Number: 431
Author: Kastelein, Ronald A.; van Schie, Robbert; Verboom, Wim C.; de Haan, Dick
Year: 2005
Title: Underwater hearing sensitivity of a male and female Steller sea lion (*Eumetopias jubatus*)
Journal: Journal of the Acoustical Society of America
Volume: 118
Issue: 3
Pages: 1820-1829
Date: September 2005
Type of Article: Journal Article
Short Title: Underwater hearing in Steller sea lions
Keywords: STELLER SEA LION; *EUMETOPIAS JUBATUS*; HEARING; MARINE MAMMALS; SEA LION; HEARING THRESHOLD; AUDIOGRAM
Abstract: The unmasked underwater hearing sensitivities of an 8-year-old male and a 7-year-old female
Steller sea lion were measured in a pool, by using behavioral psychophysics. The animals were
trained with positive reinforcement to respond when they detected an acoustic signal and not to
respond when they did not. The signals were narrow-band, frequency-modulated stimuli with a
duration of 600 ms and center frequencies ranging from 0.5 to 32 kHz for the male and from
4 to 32 kHz for the female. Detection thresholds at each frequency were measured by varying signal

amplitude according to the up–down staircase method. The resulting underwater audiogram (50%
detection thresholds) for the male Steller sea lion showed the typical mammalian U-shape. His
maximum sensitivity (77 dB re: 1 uPa, rms) occurred at 1 kHz. The range of best hearing (10 dB
from the maximum sensitivity) was from 1 to 16 kHz (4 octaves). Higher hearing thresholds
(indicating poorer sensitivity) were observed below 1 kHz and above 16 kHz. The maximum
sensitivity of the female (73 dB re: 1 uPa, rms) occurred at 25 kHz. Higher hearing thresholds
(indicating poorer sensitivity) were observed for signals below 16 kHz and above 25 kHz. At
frequencies for which both subjects were tested, hearing thresholds of the male were significantly
higher than those of the female. The hearing sensitivity differences between the male and female
Steller sea lion in this study may be due to individual differences in sensitivity between the subjects
or due to sexual dimorphism in hearing.
Research Notes: Go/No-Go responses from captive-raised trained sea lions.
Link to PDF: Kastelein_etal_2005_stellersealion_hearing_audiogram.pdf

Reference Type: Journal Article
Record Number: 53
Author: Kastelein, Ronald A.; Verboom, Wim C.; Muijsers, M.; Jennings, N. V.; van der Heul, S.
Year: 2005
Title: The influence of acoustic emissions for underwater data transmission on the behaviour of harbour porpoises (*Phocoena phocoena*) in a floating pen
Journal: Marine Environmental Research
Volume: 59
Issue: 4
Pages: 287-307
Date: May
Short Title: The influence of acoustic emissions for underwater data transmission on the behaviour of harbour porpoises (*Phocoena phocoena*) in a floating pen
Accession Number: ISI:000226354600002
Keywords: ACOUSTICS; ANTHROPOGENIC NOISE; DETERRENCE; DOLPHIN; ECOLOGY; HYDRODYNAMICS; ONDONTOCETE; ACME; MARINE MAMMALS; HARBOR PORPOISE; *PHOCOENA PHOCOENA*
Abstract: To prevent grounding of ships and collisions between ships in shallow coastal waters, an underwater data collection and communication network is currently under development: Acoustic Communication network for Monitoring of underwater

Environment in coastal
areas (ACME). Marine mammals might be affected by ACME sounds since they use sounds of similar frequencies (around 12 kHz) for communication, orientation, and prey location. If marine mammals tend to avoid the vicinity of the transmitters, they may be kept away from
ecologically important areas by ACME sounds. One marine mammal species that may be affected in the North Sea is the harbour porpoise. Therefore, as part of an environmental impact assessment program, two captive harbour porpoises were subjected to four sounds,
three of which may be used in the underwater acoustic data communication network. The effect of each sound was judged by comparing the animals' positions and respiration rates during a test period with those during a baseline period. Each of the four sounds could be
made a deterrent by increasing the amplitude of the sound. The porpoises reacted by swimming away from the sounds and by slightly, but significantly, increasing their respiration rate. From the sound pressure level distribution in the pen, and the distribution of the animals
during test sessions, discomfort sound level thresholds were determined for each sound. In combination with information on sound propagation in the areas where the communication system may be deployed, the extent of the 'discomfort zone' can be estimated for several
source levels (SLs). The discomfort zone is defined as the area around a sound source that harbour porpoises are expected to avoid. Based on these results, SLs can be selected that have an acceptable effect on harbour porpoises in particular areas. The discomfort zone of a communication sound depends on the selected sound, the selected SL, and the propagation characteristics of the area in which the sound system is operational. In shallow, winding coastal water courses, with sandbanks, etc., the type of habitat in which the ACME sounds
will be produced, propagation loss cannot be accurately estimated by using a simple propagation model, but should be measured on site. The SL of the communication system should be adapted to each area (taking into account bounding conditions created by narrow channels, sound propagation variability due to environmental factors, and the importance of an area to the affected species). The discomfort zone should not prevent harbour porpoises from spending sufficient time in ecologically important areas (for instance feeding areas), or routes towards these areas.
Link to PDF: Kastelein_etal_2005_UW_data-xmission_Phph_pen.pdf

Reference Type: Journal Article
Record Number: 541
Author: Kelly, Joseph C.; Nelson, Donald R.
Year: 1975
Title: Hearing thresholds of the horn shark, *Heterodontus francisci*
Journal: Journal of the Acoustical Society of America
Volume: 58
Issue: 4

Pages: 905-909
Short Title: Hearing thresholds of the horn shark, *Heterodontus francisci*
Abstract: Horn sharks were conditioned to pure-tone audio signals in two different laboratory test situations. In the
first experiment, conducted in a small, air-speaker-driven enclosure, four sharks were conditioned to cross a
barrier to avoid electrical shock. The sharks responded from 25 to 160 Hz, with the lowest pressure
threshold at 40 Hz. The second experiment, conducted in a large tank with an underwater speaker, used
four different sharks and employed a heart-rate technique in which shock and sound were paired to elicit
conditioned bradycardia. These sharks responded over a similar frequency range of 20 to 160 Hz. When
tested at two subject-to-transducer distances, their acoustic pressure thresholds increased with distance
while their acoustic particle-motion thresholds remained the same. The lowest pressure threshold was at 40
Hz (12 dBp. b), and the lowest pm'ticle-motion threshold was at 80 Hz, with a displacement of 1.4X 10 -6
cm and a velocity of 7X 10 -4 cm/sec (104 uvar).
Link to PDF: Kelly_Nelson_1975_hornshark_hearing_threshold.pdf

Reference Type: Journal Article
Record Number: 403
Author: Ketten, Darlene R.
Year: 1994
Title: Functional analyses of whale ears: adaptations for underwater hearing
Journal: IEEE Journal of Oceanic Engineering
Short Title: Functional analyses of whale ears: adaptations for underwater hearing
Keywords: MARINE MAMMALS; HEARING
Abstract: The echolocation ability of several dolphin species is well documented, but little is known about hearing characteristics of most marine mammals. This paper describes the major features of the peripheral auditory system in both large and small whales and presents a three-dimensional morphometric analysis of the inner ear in 12 species. Correlation analyses of inner ear morphometry vs. hearing characteristics in terrestrial and aquatic species for which audiograms are available were applied to dolphin and whale data to derive estimates of hearing ranges of larger, non-captive whales.
Link to PDF: Ketten_1994_IEEE_AdaptationsUnderwater.pdf

Reference Type: Journal Article
Record Number: 433
Author: Ketten, Darlene R.

Year: 1998
Title: Marine mammal ears: an anatomical perspective on underwater hearing
Journal: Journal of the Acoustical Society of America
Volume: 103
Issue: 5
Pages: 2938
Date: May 1998
Short Title: Marine mammal ears: an anatomical perspective on underwater hearing
Abstract: Analyzing structure and function in specialized ears can produce new insights into fundamental hearing mechanisms and lead to
technological advances. Research into dolphin echolocation is a classic example. Recently, however, concerns over anthropogenic
sounds in the oceans pushed us to develop a broader knowledge of marine mammal hearing, and, in the last five years, hearing
research on marine mammals expanded considerably. The resulting data on their hearing, ear anatomy, and vocalizations suggest that
marine mammal ears are more diverse and complex than previously expected, with acoustic capabilities spanning infra to ultrasonic
ranges. Seals are amphibious hearers with middle and inner ears similar to land carnivores, while the ears of whales are strikingly
different and are adapted exclusively to hearing underwater. Consistent with high sound speeds in water, specialized fats, not air-filled
canals, conduct sound to the ear, and both middle and inner ears are located well outside the skull. Vestibular components are reduced,
consistent with cervical fusion related to hydrodynamic body shapes; but their cochlear components, particularly the auditory fibers,
are hypertrophied. Neural hypertrophy may be adaptive for high background noise, but may also be related to exceptional signal
processing mechanisms in both infra and ultrasonic whales.
Link to PDF: Ketten_1998_marinemammals_ears.pdf

Reference Type: Book Section
Record Number: 434
Author: Ketten, Darlene R.
Year: 2000
Title: Cetacean ears
Editor: Au, Whitlow W. L.; Popper, Arthur N.; Fay, Richard R.
Book Title: *Hearing in Whales and Dolphins*
City: New York, NY
Publisher: Springer-Verlag
Pages: 43-108
Short Title: Cetacean ears
ISBN: 0-38-94906-2
Abstract: [BOOK]

Reference Type: Journal Article
Record Number: 54
Author: Klimley, A. P.; Beavers, S. C.
Year: 1998
Title: Playback of acoustic thermometry of ocean climate (ATOC)-like signal to bony fishes to evaluate phonotaxis
Journal: Journal of the Acoustical Society of America
Volume: 104
Issue: 4
Pages: 2506-2510
Short Title: Playback of acoustic thermometry of ocean climate (ATOC)-like signal to bony fishes to evaluate phonotaxis
Accession Number: ISI:000076374400063
Keywords: ATOC; PLAYBACK EXPERIMENTS; FISH
Abstract: The aim of this study was to evaluate whether acoustic thermometry of ocean climate (ATOC)
signals have a positive or negative phonotactic effect on the behavior of fish present near the sound
source at Pioneer Seamount off Central California. We played back an ATOC-like signal to three
species of rockfish kept within a 1532-m field enclosure in Bodega Bay, California. Each subject
was observed during a 25-min ‘‘silent’’ control period followed immediately by a test period
comprised of a 5-min ‘‘ramp-up,’’ in which the sound level increased gradually to a peak level, and
a 20-min period at constant peak level. The amount of time that each subject spent in 15 zones, each
1 m wide, at increasing distances from the sound transducer, was observed. It was suspended in
midwater at the center of zone 1, the deepest portion of the enclosure. We observed little movement
by fish in response to the playback of the ATOC signal. The subjects remained in zones 1 and 2,
despite sound pressure levels present of 145.1–153.0 dB re: 1 mPa. Little difference existed in the
behavior of fish during sound playback period and the ‘‘silent’’ control period. The median time
interval that fishes occupied zone 1 was 100% of the experiment duration for both test and control
periods (i.e., 6 of 11 subjects in the former remained exclusively within that zone versus 7 of 11
subjects in the latter).
Research Notes: Laboratory experiments, observing time fish spend in sections of enclosure in relation to signal source. ATOC-like signal, lower output than expect

(123-153 dB, not 195 dB). Fish showed no response to playback.
Link to PDF: Klimley_Beavers_1998_BonyFish_RX_ATOC.pdf

Reference Type: Journal Article
Record Number: 369
Author: Knudsen, F. R.; Enger, P. S.; Sand, O.
Year: 1994
Title: Avoidance responses to low frequency sound in downstream migrating Atlantic salmon smolt, *Salmo salar*
Journal: Journal of Fish Biology
Volume: 45
Issue: 2
Pages: 227-233
Short Title: Avoidance responses to low frequency sound in downstream migrating Atlantic salmon smolt, *Salmo salar*
Keywords: *SALMO SALAR*; ATLANTIC SALMON; FISH; ACOUSTIC BARRIER
Abstract: The possibility of using intense sound as an acoustic barrier for downstream migrating smolt of the Atlantic salmon (*Salmo salar*) was studied by observing, the reactions of smolt to 10 and 150 Hz sounds in a small river. At the observation site the river branched into a main course and a minor channel, the latter rejoining the main stream after 30 m. The sound sources were positioned at the lower end of the channel. The number of smolt re-entering the mam stream at the lower end of the channel was recorded during alternating periods with and without sound. Intense 150 Hz sound had no observable effects on the smolt, even at intensities 114 dB above the hearing threshold at this frequency. At intensities above 1.0. 10-2ms-2 the 10 Hz sound was an effective deterrent for the smolt, which turned and left the channel at the upstream branching point.

Reference Type: Journal Article
Record Number: 55
Author: Koschinski, Sven; Culik, Boris M.; Henriksen, Oluf D.; Tregenza, Nick; Ellis, Graeme; Jansen, Christoph; Kathe, Günter
Year: 2003
Title: Behavioural reactions of free-ranging porpoises and seals to the noise of a simulated 2 MW windpower generator
Journal: Marine Ecology-Progress Series
Volume: 265
Pages: 263-273
Short Title: Behavioural reactions of free-ranging porpoises and seals to the noise of a simulated 2 MW windpower generator
Accession Number: ISI:000188774900023
Keywords: HARBOR PORPOISE; *PHOCOENA PHOCOENA;* HARBOR SEAL; *PHOCA VITULINA*; NOISE; OFFSHORE WINDPOWER; ENVIRONMENTAL ASSESSMENT

Abstract: Operational underwater noise emitted at 8 m s–1 by a 550 kW WindWorld wind-turbine was recorded from the sea and modified to simulate a 2 MW wind-turbine. The sound was replayed from an audio CD through a car CD-player and a J-13 transducer. The maximum sound energy was emitted between 30 and 800 Hz with peak source levels of 128 dB (re 1 µPa2 Hz–1 at 1 m) at 80 and 160 Hz (1/3-octave centre frequencies). This simulated 2 MW wind-turbine noise was played back on calm days (<1 Beaufort) to free-ranging harbour porpoises *Phocoena phocoena* and harbour seals *Phoca vitulina* in Fortune Channel, Vancouver Island, Canada. Swimming tracks of porpoises and surfacings of seals were recorded with an electronic theodolite situated on a clifftop 14 m above sea level. Echolocation activity of harbour porpoises close to the sound source was recorded simultaneously via an electronic click detector placed below the transducer. In total we tracked 375 porpoise groups and 157 seals during play-back experiments, and 380 porpoise groups and 141 surfacing seals during controls. Both species showed a distinct reaction to wind-turbine noise. Surfacings in harbour seals were recorded at larger distances from the sound source (median = 284 vs 239 m during controls; p = 0.008, Kolmogorov-Smirnov test) and closest approaches increased from a median of 120 to 182 m (p < 0.001) in harbour porpoises. Furthermore, the number of time intervals during which porpoise echolocation clicks were detected increased by a factor of 2 when the sound source was active (19.6% of all 1 min intervals as opposed to 8.4% of all intervals during controls; p < 0.001).These results show that harbour porpoises and harbour seals are able to detect the low-frequency sound generated by offshore wind-turbines. Controlled exposure experiments such as the one described here are a first step to assess the impact on marine mammals of the new offshore wind-turbine industry.
Link to PDF: Koschinski_etal_2003_Porp_Seals_Windpower.pdf

Reference Type: Journal Article
Record Number: 56
Author: Kremser, Ulrich; Klemm, Peter; Kotz, Wolf-Dietrich
Year: 2005
Title: Estimating the risk of temporary acoustic threshold shift, caused by hydroacoustic devices, in whales in the Southern Ocean
Journal: Antarctic Science
Volume: 17
Issue: 1
Pages: 3-10
Date: Mar
Short Title: Estimating the risk of temporary acoustic threshold shift, caused by hydroacoustic devices, in whales in the Southern Ocean
Accession Number: ISI:000228018700002
Keywords: ANTARCTIC TREATY; ENVIRONMENTAL PROTECTION; HYDROSWEEP; MITIGATION MEASURE; PARASOUND; MARINE MAMMALS; BLUE WHALE;SPERM WHALE; BEAKED WHALE; VESSEL;
Abstract: There is a potential threat to marine mammals from acoustic signals emitted by hydroacoustic devices. The impact on the hearing of marine mammals depends on

the technical parameters of the instruments and on the exposure of the animal to noise pulses, as well as on the properties of the biological system, that is to say, on the anatomy and the audiogram of the animal. Here, the blue whale, the sperm whale and the beaked whale are taken as examples in an investigation of the potential exposure to noise pulses from the hydroacoustic instruments Hydrosweep and Parasound. Diving depths of the whales and relative speeds of the animals with respect to the survey vessels are taken into account, as well as the area impacted by the equipment, in estimating the level of sound needed to produce “temporary threshold shift” in an animal. The results suggest that auditory damage is only likely if animals pass the transducer at close range and that the impact on marine mammals can be mitigated by implementing prior detection and shut down procedures.
Link to PDF: Kremser_etal_2005_TTS_Hydrosweep.pdf

Reference Type: Journal Article
Record Number: 542
Author: Kritzler, H.; Wood, L.
Year: 1961
Title: Provisional audiogram for the shark, *Carcharhinus leucas*
Journal: Science
Volume: 133
Pages: 1480-1482
Short Title: Provisional audiogram for the shark, *Carcharhinus leucas*

Reference Type: Report
Record Number: 432
Author: Kruse, Gordon H.; Crow, Morgen; Krygier, Earl E.; Lloyd, Denby S.; Pitcher, Kenneth W.; Rea, Lorrie D.; Ridgway, Michelle; Small, Robert J.; Stinson, Jay; Wynne, Kate M.
Year: 2001
Title: A review of proposed fishery management actions and the decline of Steller sea lions *Eumetopias jubatus* in Alaska: a report by the Alaska Steller sea lion restoration team
City: Juneau, AK
Institution: ADFG (Alaska Department of Fish and Game),
Pages: 116
Date: August 2001
Type: Regional Information Report
Short Title: A review of proposed fishery management actions and the decline of Steller sea lions *Eumetopias jubatus* in Alaska: a report by the Alaska Steller sea lion restoration team
Report Number: 5J01-04
Link to PDF: Kruse_etal_2001_stellersealion_status_fishery.pdf

Reference Type: Journal Article
Record Number: 57
Author: Krutzikowsky, Gregory K.; Mate, Bruce R.
Year: 2000
Title: Dive and surfacing characteristics of bowhead whales (*Balaena mysticetus*) in the Beaufort and Chukchi seas
Journal: Canadian Journal of Zoology-Revue Canadienne De Zoologie
Volume: 78
Issue: 7
Pages: 1182-1198
Short Title: Dive and surfacing characteristics of bowhead whales (*Balaena mysticetus*) in the Beaufort and Chukchi seas
Accession Number: ISI:000088272900009
Keywords: BOWHEAD WHALE; *BALAENA MYSTICETUS*; BEAUFORT SEA
Abstract: We received data from eight bowhead whales (Balaena mysticetus) equipped with satellite-monitored radio
tags for 3–33 days. Of 42 306 dives made by the eight whales during 1695 h, 9573 were sounding dives (>1 min duration).
The mean duration of sounding dives for individuals varied from 6.9 to 14.1 min (mean = 10.4 ± 2.4 min, n =
8). Five whales made dives ³61 min; the longest dives for the other three lasted 56, 45, and 32 min. Five tags measured
maximum depths of 29 499 dives during 1220 h and time at depth during 1228 h. All five whales dived >100 m;
the deepest dive was 352 m. Whales spent most of their time at depths £16 m, but three whales spent most of their
time at depths >48 m during some sampling periods. Mean surfacing rates ranged from 18.2 to 47.0/h (mean = 26.2 ±
9.0/h, n = 8). Tags were exposed to air for 4.0–7.3% of the time (mean = 5.5 ± 0.95%, n = 8), and whales were potentially
visible from aircraft for 8.5–16.4% of the time (mean = 11.1 ± 2.4%, n = 8). Three whales made longer
sounding dives and had lower surfacing rates when in ³90% ice cover. No consistent diel patterns were found.
Link to PDF: Krutzikowski_Mate_2000_Diving_bowhead_Beaufort.pdf

Reference Type: Journal Article
Record Number: 297
Author: Krysl, P.; Cranford, T. W.; Wiggins, S. M.; Hildebrand, John A.
Year: 2006
Title: Simulating the effect of high-intensity sound on cetaceans: Modeling, approach and a case study for Cuvier's beaked whale (*Ziphius cavirostris*)
Journal: Journal of the Acoustical Society of America
Volume: 120
Issue: 4

Pages: 2328-2339
Date: Oct
Type of Article: Article
Short Title: Simulating the effect of high-intensity sound on cetaceans: Modeling, approach and a case study for Cuvier's beaked whale (*Ziphius cavirostris*)
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000241258400058
Keywords: DOLPHIN; *TURSIOPS TRUNCATUS*; *DELPHINUS DELPHIS*; ELASTOGRAPHY; REFINEMENT; TISSUE; ANATOMY; CUVIER'S BEAKED WHALE; *ZIPHIUS CAVIROSTRIS*
Abstract: A finite element model is formulated to study the steady-state vibration response of the anatomy of a whale (Cetacea) submerged in seawater. The anatomy was reconstructed from a combination of two-dimensional (2D) computed tomography (CT) scan images, identification of Hounsfield units with tissue types, and mapping of mechanical properties. A partial differential equation model describes the motion of the tissues within a Lagrangean framework. The computational model was applied to the study of the response of the tissues within the head of a neonate Cuvier's beaked whale *Ziphius cavirostris*. The characteristics of the sound stimulus was a continuous wave excitation at 3500 Hz and 180 dB re: 1 mu Pa received level, incident as a plane wave. We model the beaked whale tissues embedded within a volume of seawater. To account for the finite dimensions of the computational volume, we increased the damping for viscous shear stresses within the water volume, in an attempt to reduce the contribution of waves reflected from the boundaries of the computational box. The mechanical response of the tissues was simulated including: strain amplitude; dissipated power; and pressure. The tissues are not likely to suffer direct mechanical or thermal damage, within the range of parameters tested. (c) 2006 Acoustical Society of America.
URL: <Go to ISI>://000241258400058
Link to PDF: Krysl_etal_2006_beakedwhale.pdf
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Krysl, P, Univ Calif San Diego, Scripps Inst Oceanog, 9500 Gilman Dr 0085, La Jolla, CA 92093 USA.
pkrysl@ucsd.edu
Language: English

Reference Type: Book
Record Number: 483
Author: Kryter, K.D.
Year: 1994
Title: *Handbook of Hearing and the Effects of Noise*
City: San Diego, CA
Publisher: Academic Press
Number of Pages: 673
Short Title: *Handbook of Hearing and the Effects of Noise*

Link to PDF: Kryter_1994_handbook_hearingTOC.pdf

Reference Type: Thesis
Record Number: 478
Author: Kucey, L.
Year: 2005
Title: Human Disturbance and the Hauling Out Behaviour of Steller Sea Lions (*Eumetopias jubatus*)
Academic Department: Department of Zoology
University: Universtiy of British Columbia
Date: May 2005
Thesis Type: Masters
Short Title: Human Disturbance and the Hauling Out Behaviour of Steller Sea Lions (*Eumetopias jubatus*)
Abstract: There is considerable interest in assessing and mitigating disruptive effects of humans on
the behaviour of marine mammals, especially for species with uncertain or decreasing population trends. Steller sea lions (Eumetopias jubatus) have been under intensive study
throughout their range over the past few decades in an attempt to identify the causes of a
large population decline in the Gulf of Alaska and Aleutian Islands. Consequently, disturbance due to scientific research has also increased at rookeries and haulouts. The purpose of my study was to determine if there were measurable short-term effects of
human disturbance on the numbers of Steller sea lions using terrestrial sites. Numbers and
composition of sea lions were documented for 2 □ 3 week periods in southeast Alaska and
British Columbia during summer (n = 8 sites) and winter / spring (n = 6 sites). They revealed considerable daily variation in numbers of sea lions hauled out within and among
study sites that was related in part to prevailing environmental conditions. However, counts
could not be corrected to account for environmental influences on the total numbers of sea
lions using haulouts.
Hauling out trends were examined for pre- and post-disturbance periods across multiple sites over two seasons. Predetermined research disturbances occurred to collect scats at the
haulouts, and to brand pups at the rookery. Three methods were explored to assess local
population recovery that addressed both quantitative and temporal aspects of sea lions returning to the study locations. Disturbances resulted in significantly fewer sea lions using

haulouts during the post-disturbance period. Variation in the numbers of animals using the
haulouts increased following the disturbance, but rates of change in daily numbers did not
differ significantly between periods. Six of ten disturbed sites reached full recovery (100%
of the pre-disturbance mean) on average 4.3 days after the research disturbance.
To determine if individual behaviour was affected by disturbance, sea lions arriving on shore were followed to determine normal patterns of interactions and behaviour. Significant
differences were noted in hauling out behaviour between animals that remained on land and
those that returned to the water. Sea lions that returned to the water exhibited higher rates
of behaviour and interactions with other animals during the week that followed the disturbance. Seasonal differences were also noted in the rates of behaviour and interactions
iii
that may be indicative of certain times of the year when sea lions are more sensitive to human presence and disturbance.
Increasing levels of human□sea lion contact are expected as more and more people visit the
remote coastal habitat of Steller sea lions. Future studies are needed to assess the influence
of disturbance on sea lion redistribution within a critical recovery period, as well as to determine the physiological effects that sea lions experience with repeated human disturbance. Disturbance studies are an important aspect of conservation initiatives because
they can help guide policies and establish restrictions to protect wild populations from human intrusion.
Link to PDF: Kucey_2005_HumanDisturbance_MS_UBC.pdf

Reference Type: Book Section
Record Number: 479
Author: Kucey, L.; Trites, A. W.
Year: 2006
Title: A Review of the Potential Effects of Disturbance on Sea Lions: Assessing Response and Recovery
Editor: Trites, A. W.; DeMaster, Douglas P.; Fritz, L.W.; Gelatt, T.S.; Rea, Lorrie D.; Wynne, Kate M.
Book Title: *Sea Lions of the World*
City: Anchorage, AK
Pages: 581-589
Series Title: 22nd Lowell Wakefield Fisheries Symposia Series
Short Title: A Review of the Potential Effects of Disturbance on Sea Lions: Assessing

Response and Recovery
Link to PDF: Kucey_Trites_2006_SeaLion_disturbance.pdf

Reference Type: Journal Article
Record Number: 362
Author: Lagardere, J.P.
Year: 1982
Title: Effects of noise on growth and reproduction of *Crangon crangon* in rearing tanks
Journal: Marine Biology
Volume: 71
Pages: 177-185
Short Title: Effects of noise on growth and reproduction of *Crangon crangon* in rearing tanks
Keywords: *CRANGON CRANGON*; BROWN SHRIMP; ACOUSTICS; REPRODUCTION; STRESS
Abstract: Brown shrimp, *Crangon crangon* (L.), were reared in Angoulins, France from April to June 1981. Rearing in a soundproof box reproduced acoustical conditions similar to those prevailing in the shrimps' original environment. Growth and reproduction were compared to those of shrimp from the same source but reared in acoustical conditions prevailing in a thermoregulated aquarium; other experimental conditions were identical. In the aquarium, the noise-level attained 30 dB in the 25 to 400 Hz frequency range; this permanently high sound-level resulted in a significant reduction in growth and reproduction rates of the shrimp. To a lesser degree, noise also appears to increase aggression (cannibalism) and mortality rate and to decrease food uptake. These symptoms are extremely similar to those induced by adaptation to stress.
Link to PDF: Lagardere_1982_FX_noise_shrimp.pdf

Reference Type: Journal Article
Record Number: 436
Author: Laist, David W.; Knowlton, Amy R.; Mead, James G.; Collet, Anne S.; Podesta, Michela
Year: 2001
Title: Collisions between ships and whales
Journal: Marine Mammal Science
Volume: 17
Issue: 1
Pages: 35-75
Date: January 2001
Type of Article: Journal Article
Short Title: Ship collisions
Keywords: MORTALITY; STRANDING; SHIP COLLISIONS; SPECIES CONSERVATION; RIGHT WHALE
Abstract: Although collisions with motorized ships are a recognized source of whale mortality, little has been done to compile information on the frequency of

their occurrence or contributing factors. We searched historical records and computerized stranding databases for evidence of ship strikes involving great whales (i.e., baleen whales and the sperm whale). Historical records suggest that ship strikes fatal to whales first occurred late in the 1800s as ships began to reach speeds of 13-15 kn, remained infrequent until about 1950, and then increased during the 1950s-1970s as the number and speed of ships increased. Of 11 species known to be hit by ships, fin whales (Balaenoptera physalus) are struck most frequently; right whales (Eubalaena glacialis and E. australis), humpback whales (Megaptera novaeangliae), sperm whales (Physeter catodon), and gray whales (Eschrichtius robustus) are hit commonly. In some areas, one-third of all fin whale and right whale strandings appear to involve ship strikes. To assess contributing factors, we compiled descriptions of 58 collisions. They indicate that all sizes and types of vessels can hit whales; most lethal or severe injuries are caused by ships 80 m or longer; whales usually are not seen beforehand or are seen too late to be avoided; and most lethal or severe injuries involve ships travelling 14 kn or faster. Ship strikes can significantly affect small populations of whales, such as northern right whales in the western North Atlantic. In areas where special caution is needed to avoid such events, measures to reduce the vessel speed below 14 kn may be beneficial.
Research Notes: Review of documented and ancedotal accounts of ship strikes on whales.
Link to PDF: Laist_etal_2001_ship_strike_whale.pdf

Reference Type: Journal Article
Record Number: 508
Author: Lammers, Marc O.; Au, Whitlow W. L.; Herzing, D.L.
Year: 2003
Title: The broadband social acoustic signaling behavior of spinner and spotted dolphins
Journal: Journal of the Acoustical Society of America
Volume: 114
Issue: 3
Pages: 1629-1639
Short Title: The broadband social acoustic signaling behavior of spinner and spotted dolphins
Abstract: The main Hawaiian Islands are the principal wintering grounds of North Pacific humpback
whales. Although, their numbers are recovering, humpback whales continue to face a variety of anthropogenic threats. Arguably the most visible impacts are from collisions with
vessels. One of the mandates of the Final Recovery Plan for the Hawaiian humpback whale
is to investigate vessel collisions and assess the degree to which this threat impacts the population.
· The Hawaiian Islands are quite isolated in the Pacific and are highly dependent on

vessel
traffic for many forms of commerce. It is to be expected that some collisions between vessels and whales take place in Hawaiian waters. To date very little analytical attention has been paid to incidents locally, which makes it difficult to gauge the severity of the issue
from both a conservation and safety standpoint.

· This study examines the occurrence of whale/vessel collisions in Hawaii from two perspectives. First, the available historical information is presented on the number and location of collisions described in media reports and government records since 1975. Secondly, the experiences and opinions of local mariners on the issue of whale/vessel collisions is analyzed based on responses obtained from questionnaires disseminated to
professional mariners across the State.

· Twenty-two whale/vessel collisions were publicly reported between 1975 and 2003. Maui
had the highest incidence of collisions, while Kauai had the lowest. There was an increase
in the number of reported collisions over the period examined. Only two incidents were reported between 1975 and 1984, six between 1985 and 1994, and thirteen between 1995
and 2003.

· Approximately 150 questionnaires were distributed in person and via email to experienced
mariners in the Hawaiian Islands. Fifty-eight (58) completed questionnaires were returned
via mail or email.

· 31 out of 58 respondents (53.4%) answered that they were aware of one or more collisions
taking place between a vessel and a whale during the period between 1998 and 2002. Of
these, almost two thirds (64.5%) reported that they knew of 1-2 incidents. Nine (29.0%) knew of 3-5 incidents, 1 (0.03%) knew of 6-8 incidents and 1 reported knowing about more
than 12 incidents. By and large the most incidents were reported occurring in the Maui, Molokai and Lanai region.

· The majority of respondents implicated medium sized boats ranging from 31 to 60 feet in
length with top speeds between 10 and 30 knots. Large (61-100 ft) boats were also frequently involved, whereas small (< 31 ft) and very large (> 100 ft) vessels comprised only 16% of all reports combined.

· 45 (78.9%) respondents expressed at least some level of concern over the issue of whale/ship collisions in Hawaii. One third (33.3%) indicated they were “very” concerned about the issue, close to half (45.6%) said they were “somewhat” concerned and approximately one fifth (21.1%) replied they had no concerns at all.

· 51 respondents expressed an opinion about the percentage of whale/ship collisions they

believe get reported. Almost half (24 respondents; 47.1%) estimated that less than one quarter of incidents get reported to the media or local authorities, 8 (15.7%) answered 26-
50%, 5 (9.8%) answered 51-75% and 14 (27.5%) believed reporting was close to 100%.

- 56 respondents offered an opinion regarding whether/how improvements could be made to the reporting process of whale/ship collisions. The most common suggestion was to allow anonymous reports to be made. Also popular were suggestions for a public awareness campaign and the establishment of a toll- free hotline for reporting. 12 respondents (21.4%) felt no improvements were needed.
- The results presented indicate that whale/vessel collisions in Hawaiian waters are occurring with increased frequency and will likely continue to increase unless steps are taken to actively mitigate the problem.
- There are likely a number factors contributing to the increasing rate of incidents. Probably the most significant is that the number of humpback whales wintering in Hawaiian waters has been steadily increasing over the past three decades. Ano ther likely factor is the parallel increase in the number of vessels transiting through and/or occupying areas preferred by whales, such as the a west Maui region where the whale population is among the densest in Hawaii.
- Since collisions were reported for both slow and fast moving craft, it suggests that, in at least some situations, the whales were either not aware of the vessel's presence or could not resolve it's proximity and/or vector of travel based on the available acoustic cues.
- Additionally, because behavioral processes related to reproduction are the primary preoccupation of humpback whales while in Hawaii, some individuals may simply be less reactive to distraction from nearby human activities than they would be under other circumstances.
- Because the findings presented indicate that certain areas are more problematic than others, it appears important that an understanding of whale distribution and habitat use patterns become an integral part of any future management effort.
- Information on collisions is presently quite scattered and not comprehensive. Therefore, no data management system exists that could be used to gauge the effectiveness of any future mitigation efforts. Establishing a centralized database with a publicized means to accept

anonymous reports is likely the most effective way to address this problem.
Link to PDF: Lammers_etal_2003_Whale_Vessel_Collisions_HI.pdf

Reference Type: Conference Proceedings
Record Number: 481
Author: Lelli, B.; Harris, D.E.
Year of Conference: 2001
Title: Human Disturbances Affect Harbor Seal Haul-out Behavior: Can The Law Protect These Seals From Boaters?
Editor: Spradlin, T.R.; Nitta, E.T.; Lewandowski, J.K.; Barre, L.M.; Brix, K.; Norberg, B.
Conference Name: 14th Biennial Conference on the Biology of Marine Mammals
Conference Location: Vancouver, BC
Series Title: Viewing Marine Mammals in the Wild: A Workshop to Discuss Responsible Guidelines and Regulations for Minimizing Disturbance
Date: 28 November 2001
Short Title: Human Disturbances Affect Harbor Seal Haul-out Behavior: Can The Law Protect These Seals From Boaters?
Link to PDF: Spradin_etal_2001_view_MarMam.pdf

Reference Type: Journal Article
Record Number: 58
Author: Lemon, Michelle; Lynch, Tim P.; Cato, Douglas H.; Harcourt, Robert G.
Year: 2006
Title: Response of travelling bottlenose dolphins (*Tursiops aduncus*) to experimental approaches by a powerboat in Jervis Bay, New South Wales, Australia
Journal: Biological Conservation
Volume: 127
Issue: 4
Pages: 363-372
Short Title: Response of travelling bottlenose dolphins (*Tursiops aduncus*) to experimental approaches by a powerboat in Jervis Bay, New South Wales, Australia
Accession Number: ISI:000234960900001
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS ADUNCUS*; POWERBOAT; BOAT; VESSEL
Abstract: Powerboats are potentially a significant source of disturbance to coastal cetaceans. Information
is scarce, however, on the nature of interactions between powerboats and dolphins, particularly when both surface and acoustic behaviour are combined. The surface behaviour
and acoustic response of travelling dolphins to approaches by a powerboat were assessed by a series of experimental trials between November 2001 and November 2003
in Jervis Bay, New South Wales, Australia. Dolphin behaviour was monitored continuously

from an independent research boat before, during and after a powerboat approached (n = 12). Treatments were interspersed with control observations (n = 12). Changes in surface
behaviour indicated differences between the treatment and control periods (z = 2.24, p = 0.025), with dolphins tending to alter their surface behaviour when exposed to the powerboat
approach. Analysis also revealed a change in the direction of travel by dolphin groups when approached (z = 3.22, p = 0.001). Changes in surface behaviour occurred at vessel
approach distances outside the minimum approach distance of 30 m for recreational and commercial vessels, as proposed by the New South Wales National Parks and Wildlife
Service. In contrast, there were no changes in dolphin whistle rates (F3,12 = 0.74, p = 0.54) or
the duration of echolocation click bouts (F3,12 = 0.76, p = 0.59) when approached. These findings
indicate that powerboats do affect the surface behaviour and direction of travelling inshore bottlenose dolphins in Jervis Bay; however it appears that this impact is not reflected in their acoustic behaviour.
Link to PDF: Lemon_etal_2006_Bottlenose_RX_powerboats_JervisBay.pdf

Reference Type: Journal Article
Record Number: 309
Author: Lesage, V.; Barrette, C.; Kingsley, M. C. S.; Sjare, B.
Year: 1999
Title: The effect of vessel noise on the vocal behavior of Belugas in the St. Lawrence River estuary, Canada
Journal: Marine Mammal Science
Volume: 15
Issue: 1
Pages: 65-84
Date: Jan
Type of Article: Article
Short Title: The effect of vessel noise on the vocal behavior of Belugas in the St. Lawrence River estuary, Canada
ISSN: 0824-0469
Accession Number: ISI:000077568300004
Keywords: *DELPHINAPTERUS LEUCAS*; BELUGA WHALE; ODONTOCETE; WHALE; NOISE; DISTURBANCE; VOCALIZATION; BEHAVIOR; ST. LAWRENCE RIVER; COMMUNICATION; VOCALIZATION; UNDERWATER; FERRY; MOTORBOAT; BOAT
Abstract: During June-July 1991, we monitored the vocal behavior of belugas before, during, and after exposure to noise from a small motorboat and a ferry to determine if there were any consistent patterns in their vocal behavior when exposed to these two familiar, but different sources of potential disturbance. Vocal responses were observed

in all trials and were more persistent when whales were exposed to the ferry than to the small boat. These included (1) a progressive reduction in calling rate from 3.4-10.5 calls/whale/min to 0.0 or <1.0 calls/whale/min while vessels were approaching; (2) brief increases in the emission of falling tonal calls and the three pulsed-tone call types; (3) at distances <1 km, an increase in the repetition of specific calls, and (4) a shift in frequency bands used by vocalizing animals from a mean frequency of 3.6 kHz prior to exposure to noise to frequencies of 5.2-8.8 kHz when vessels were close to the whales.
Notes: ISI Document Delivery No.: 147KZ
Times Cited: 21
Cited Reference Count: 39
Research Notes: Beluga behavioral resonse to vessels.
URL: <Go to ISI>://000077568300004
Link to PDF: Lesage_etal_1999_Vessel_Vocal_Belugas.pdf
Author Address: Univ Laval, Dept Biol, St Foy, PQ G1K 7P4, Canada. Fisheries & Oceans Canada, St Johns, NF A1C 5X1, Canada.
Lesage, V, Fisheries & Oceans Canada, Maurice Lamontagne Inst, POB 1000,850 Route Mer, Mt Joli, PQ G5H 3Z4, Canada.
Language: English

Reference Type: Online Multimedia
Record Number: 525
Created By: Lloyd's Register
Year: 2001
Title: Lloyd's Register
URL: http://www.lr.org
Link to PDF: [WEBPAGE]
Access Date: Access Date

Reference Type: Journal Article
Record Number: 446
Author: Løkkeborg, Svein; Soldal, Aud Vold
Year: 1993
Title: The influence of seismic exploration with airgun on cod (*Gadus morhua*) behaviour and catch rates
Journal: ICES Marine Science Symposia
Volume: 196
Pages: 62-67
Type of Article: Journal Article
Short Title: The influence of seismic exploration with airgun on cod (*Gadus morhua*) behaviour and catch rates

Reference Type: Journal Article
Record Number: 59
Author: Lugli, M.; Yan, H. Y.; Fine, M. L.

Year: 2003
Title: Acoustic communication in two freshwater gobies: the relationship between ambient noise, hearing thresholds and sound spectrum
Journal: Journal of Comparative Physiology A-Neuroethology Sensory Neural and Behavioral Physiology
Volume: 189
Issue: 4
Pages: 309-320
Short Title: Acoustic communication in two freshwater gobies: the relationship between ambient noise, hearing thresholds and sound spectrum
Accession Number: ISI:000183543500008
Keywords: *PADOGOBIUS MARTENSII; GOBIUS NIGRICANS;* AUDIOGRAM; FISH; SWIMBLADDER; SOUND PRODUCTION; STREAM AMBIENT NOISE
Abstract: Two freshwater gobies *Padogobius martensii* and *Gobius nigricans* live in shallow (5–70 cm) stony streams, and males of both species produce courtship sounds. A previous study demonstrated high noise levels near waterfalls, a quiet window in the noise around 100 Hz at noisy locations, and extremely short-range propagation of noise and goby signals. To investigate the relationship of this acoustic environment to communication, we determined audiograms for both species and measured parameters of courtship sounds produced in the streams. We also deflated the swimbladder in *P. martensii* to determine its effect on frequency utilization in sound production and hearing. Both species are maximally sensitive at 100 Hz and produce low frequency sounds with main energy from 70 to 100– 150 Hz. swimbladder deflation does not affect auditory threshold or dominant frequency of courtship sounds and has no or minor effects on sound amplitude. Therefore, both species utilize frequencies for hearing and sound production that fall within the low-frequency quiet region, and the equivalent relationship between auditory sensitivity and maximum ambient noise levels in both species further suggests that ambient noise shapes hearing sensitivity.

Research Notes: Example of fish hearing range using ABR.
Link to PDF: Lugli_etal_2003_Ambient_FX_hearing_gobies.pdf

Reference Type: Journal Article
Record Number: 60
Author: Lusseau, David
Year: 2003
Title: Effects of tour boats on the behavior of bottlenose dolphins: Using Markov chains to model anthropogenic impacts
Journal: Conservation Biology
Volume: 17
Issue: 6
Pages: 1785-1793
Short Title: Effects of tour boats on the behavior of bottlenose dolphins: Using Markov chains to model anthropogenic impacts
Accession Number: ISI:000186869700036

Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; ANTHROPOGENIC; BOAT; TOURISM; BEHAVIOR
Abstract: Nature-based tourism activities have been developing over the last decade, but it is still difficult to manage these activities sustainably. This sector is increasingly focusing on whales and dolphins in coastal communities, but the exact effects of these activites are unclear. Markov chain modeling may help researchers assess the effects of tourism activities on the behavioral budget of small cetaceans. Matrix models have been used widely in population ecology to provide successful management guidelines. From June 2000 to August 2001, I collected information on the behavioral state of bottlenose dolphin (*Tursiops* spp.) schools from a population residing in Doubtful Sound, Fiordland, New Zealand. In addition, I recorded the occurrence of boat and dolphin interactions. I then calculated the transition probabilities of passing from one behavior to another by using a first-order, time-discrete Markov chain model. Behavioral transitions during which a boat-dolphin interaction occurred were compiled in an “impact” chain. All other transitions were tallied in a control chain. I then quantified the effect of boat-dolphin interactions during behavioral transitions by comparing the behavioral transition probabilities of both chains. Socializing and resting behaviors were disrupted by interactions with boats to a level that raises concern. Both the duration of bouts and the total amount of time spent in both these behavioral states were substantially decreased. Dolphins were significantly more likely to be traveling after an interaction with a boat. However, the overall behavioral budget of the population was not significantly affected. Therefore, the bottlenose dolphin population seems to be able to sustain the present level of boat interactions because of its low intensity. More effort is needed to develop prognosis analyses in order to understand how the effect of boat interactions on dolphins changes with variations in intensity.
Link to PDF: Lusseau_2003_FX_tour-boats_Tutr_behavior.pdf

Reference Type: Journal Article
Record Number: 268
Author: Lusseau, David
Year: 2004
Title: The hidden cost of tourism: Detecting long-term effects of tourism using behavioral information
Journal: Ecology and Society
Volume: 9
Issue: 1
Pages: 2
Date: Jun
Type of Article: Article
Short Title: The hidden cost of tourism: Detecting long-term effects of tourism using behavioral information
Alternate Journal: Ecol. Soc.
ISSN: 1195-5449
Accession Number: ISI:000228025100003
Keywords: BOTTLENOSE DOLPHIN; DOUBTFUL SOUND; NEW ZEALAND; BOAT;

RESPONSES; BAY; PROPORTION; STRATEGIES; MODEL; VESSEL; *TURSIOPS TRUNCATUS*; TOURISM
Abstract: Increasingly, whales and dolphins are the focus of tourism activities in many coastal locations. Although these activities can affect individuals and populations of cetaceans, the biological significance and hence the cost of these impacts are as yet largely unknown. This study assessed the effects of boat interactions on the behavioral budget of two populations of bottlenose dolphins (*Tersiops truncatus*) living in similar fjords but exposed to different levels of tourism activities. This comparison makes it possible to assess the costs of short-term avoidance strategies and the threshold at which those strategies are no longer effective. The effects of boat interactions were the same in both fjords. The resting state was the most sensitive to interactions; socializing was less sensitive. Short-term displacement was a typical response to boat exposure: dolphins were more likely to travel after an interaction with a vessel. Although the behavioral budgets of these populations were significantly altered during interactions with boats, their overall behavioral budgets were unchanged. Dolphins in Milford Sound actively avoided boat interactions, possibly to maintain their overall behavioral budget unchanged. This active avoidance led to avoidance of the area. Characteristics of dolphin-boat interactions in Milford Sound suggest that the advantages gained by short-term avoidance are lost if, on average, fewer than 68 min elapse between successive interactions with boats. If dolphin-boat interactions were more frequent than this, the dolphins switched to a longer-term response: area avoidance.
URL: http://www.ecologyandsociety.org/vol9/iss1/art2/
Link to PDF: Lusseau_2004_Hidden_Cost_of_Tourism.pdf
Language: English

Reference Type: Journal Article
Record Number: 61
Author: Lusseau, David
Year: 2005
Title: Residency pattern of bottlenose dolphins *Tursiops spp.* in Milford Sound, New Zealand, is related to boat traffic
Journal: Marine Ecology-Progress Series
Volume: 295
Pages: 265-272
Short Title: Residency pattern of bottlenose dolphins *Tursiops spp.* in Milford Sound, New Zealand, is related to boat traffic
Accession Number: ISI:000230671800023
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; NEW ZEALAND; VESSEL; BEHAVIOR; TOURISM IMPACT; TOURISM; AREA AVOIDANCE; HABITAT USE
Abstract: A population of bottlenose dolphins inhabits 7 of the 14 fjords that compose Fiordland, New Zealand. One of these fjords, Milford Sound, supports a large tourism industry that results in intense boat traffic. Bottlenose dolphins regularly visited Milford Sound and tour boats interacted with them during these visits. I studied the factors affecting the frequency of visits to Milford Sound by relating the residency pattern of dolphins in this fjord to oceanographic parameters and variations in boat traffic between

December 1999 and February 2002. Boat traffic was the only variable that could explain the frequency of dolphin visits to Milford Sound. Dolphins spent less time in Milford Sound during seasons of intense boat traffic. Moreover, when dolphins visited this fjord, they spent more time at the entrance of the fjord when boat traffic was intense, out of the reach of tour boats. It seems that dolphins avoid Milford Sound when traffic is heavy. This avoidance could have long-term implications for the demography of the population.
Link to PDF: Lusseau_2005_Residency_Milford-NZ_Tutr.pdf

Reference Type: Journal Article
Record Number: 270
Author: Lusseau, David
Year: 2006
Title: The short-term behavioral reactions of bottlenose dolphins to interactions with boats in Doubtful Sound, New Zealand
Journal: Marine Mammal Science
Volume: 22
Issue: 4
Pages: 802-818
Date: Oct
Type of Article: Article
Short Title: The short-term behavioral reactions of bottlenose dolphins to interactions with boats in Doubtful Sound, New Zealand
ISSN: 0824-0469
Accession Number: ISI:000240663000002
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; TOURISM IMPACT; BEHAVIOR; WHALE; *ORCINUS ORCA*; TOUR BOATS; WATCHING BOATS; RESPONSES; MODEL; BAY; VESSEL; TOURISM
Abstract: Doubtful Sound is home to one of the southernmost resident populations of bottlenose dolphins (*Tursiops sp.*). This population regularly interacts with scenic cruises. During these interactions, dolphins tend to horizontally and vertically avoid vessels, especially when the behavior of these vessels is intrusive. This study aimed at understanding the behavioral reactions of individuals to these interactions that lead to the disruption of the school's behavioral state. Observing the behavioral events performed by individuals during an interaction can help define the short-term reactions elicited by the boat presence. I recorded the behavioral events performed by all individuals of focal schools. The frequency of occurrence of all events was compared depending on the presence of vessels, their behavior, and the behavioral state of the focal school. Dolphins tended to perform more side flops while interacting with powerboats, a behavior which may be used as a non-vocal communication tool. Moreover, the movement of dolphins became more erratic during interactions with all types of vessels. These effects increased when the boats were more intrusive while interacting. This study shows that the impact of interaction with boats can be minimized if the vessels respect the guidelines in place.
Notes: ISI Document Delivery No.: 086GY

Times Cited: 1
Cited Reference Count: 29
URL: <Go to ISI>://000240663000002
Link to PDF: Lusseau_2006_TuTr_BehRXN_boats.pdf
Author Address: Univ Otago, Dept Zool, Dunedin, New Zealand.
Lusseau, D, Dalhousie Univ, Dept Biol, 1355 Oxford St, Halifax, NS B3H 4J1, Canada.
d.lusseau@dal.ca
Language: English

Reference Type: Journal Article
Record Number: 271
Author: Lusseau, David; Higham, J. E. S.
Year: 2004
Title: Managing the impacts of dolphin-based tourism through the definition of critical habitats: the case of bottlenose dolphins (*Tursiops spp.*) in Doubtful Sound, New Zealand
Journal: Tourism Management
Volume: 25
Issue: 6
Pages: 657-667
Date: Dec
Type of Article: Article
Short Title: Managing the impacts of dolphin-based tourism through the definition of critical habitats: the case of bottlenose dolphins (*Tursiops spp.*) in Doubtful Sound, New Zealand
Alternate Journal: Tourism Manage.
ISSN: 0261-5177
Accession Number: ISI:000224631900002
Keywords: ECOTOURISM; TOURISM; DOLPHIN; CRITICAL HABITAT; SPATIAL ECOLOGY; IMPACT MANAGEMENT; NEW ZEALAND; WHALE; *ORCINUS ORCA*; CONCEPTUAL FRAMEWORK; PROTECTED AREAS; BEHAVIOR; BOAT; VESSEL; CONSERVATION; AVOIDANCE; RESPONSES; BAY; ANTHROPOGENIC NOISE; MARINE MAMMALS
Abstract: Marine ecotourism in New Zealand presents a challenging tourism-environment management context. This is demonstrated in the case of Doubtful Sound (New Zealand) where the recent proliferation of tour operators has brought pressures to bear upon a population of bottlenose dolphins resident in the sound. Strict methodologies are necessary to objectively interpret responses to tourism-induced anthropogenic impacts upon cetaceans. Previous research in this field has established that boat interactions with dolphins in Doubtful Sound affect the behavioural budget of the dolphin population, and that dolphins are more sensitive to interactions with boats when they are resting and to a lesser extent when they are socialising. This article reports on a programme of research that employed observational data to explore the applicability of tourism management techniques grounded in spatial ecology. The data provided scientific evidence that determining critical habitat through spatio-ecological analysis is a powerful tool to protect marine mammals in New Zealand, and elsewhere,

from biologically significant tourism-induced impacts. The delineation of multi-levelled marine sanctuaries may, therefore, be an effective approach to managing the impacts of tourism upon marine mammals.
Notes: ISI Document Delivery No.: 864KH
Times Cited: 1
Cited Reference Count: 67
URL: <Go to ISI>://000224631900002
Link to PDF: Lusseau_Higham_2004_Managing_FX_tourism_Tutr_Doubtful.pdf
Author Address: Univ Otago, Sch Business, Dept Tourism, Dunedin, New Zealand. Univ Aberdeen, Lighthouse Field Stn, Cromarty IV11 8YJ, Ross Shire, Scotland. Higham, JES, Univ Otago, Sch Business, Dept Tourism, POB 56, Dunedin, New Zealand.
d.lusseau@abdn.ac.uk jhigham@business.otago.ac.nz
Language: English

Reference Type: Journal Article
Record Number: 366
Author: Luttbeg, B.; Kerby, J. L.
Year: 2005
Title: Are scared prey as good as dead?
Journal: Trends in Ecology and Evolution
Volume: 20
Issue: 8
Pages: 416-418
Short Title: Are scared prey as good as dead?
Keywords: PREDATION;
Abstract: Predators affect prey and their resources by changing the density and traits (e.g. morphology and behavior) of those prey. Ecological studies and models of community dynamics, however, typically only incorporate how changes in prey densities, rather than their traits, affect community dynamics. In a recent meta-analysis, Preisser et al. show that trait effects are as large, if not larger than density effects. This strongly suggests that trait effects should be integrated into empirical and theoretical studies.
Link to PDF: Luttbeg_Kerby_2005_ScaredPrey_Dead.pdf

Reference Type: Journal Article
Record Number: 62
Author: Lynch, James F.
Year: 2003
Title: Special issue on marine mammals and noise
Journal: IEEE Journal of Oceanic Engineering
Volume: 28
Issue: 2
Pages: 161-162
Date: Apr

Short Title: Special issue on marine mammals and noise
Accession Number: ISI:000183992600001
Keywords: MARINE MAMMALS
Link to PDF: Lynch_2003_editors_note.pdf

Reference Type: Journal Article
Record Number: 65
Author: Madsen, P. T.
Year: 2005
Title: Marine mammals and noise: Problems with root mean square sound pressure levels for transients
Journal: Journal of the Acoustical Society of America
Volume: 117
Issue: 6
Pages: 3952-3957
Date: Jun
Short Title: Marine mammals and noise: Problems with root mean square sound pressure levels for transients
Accession Number: ISI:000229718500064
Keywords: MARINE MAMMALS; NOISE
Abstract: Current mitigation levels for noise transients impinging on marine mammals are specified by rms pressures. The rms measure critically relies upon choosing the size of averaging window for the squared pressures. Derivation of this window is not standardized, which can lead to 2–12 dB differences in rms sound pressure for the same wave forms. rms pressure does not represent the energy of the noise pulse and it does not prevent exposure to high peak pressures. Safety levels for transients should therefore be given by received peak–peak sound pressure and energy flux density instead of rms sound pressure levels.
Link to PDF: Madsen_2005_RMS_SPL_transients.pdf

Reference Type: Journal Article
Record Number: 63
Author: Madsen, P. T.; Johnson, Mark P.; Miller, P. J. O.; Soto, N. A.; Lynch, James F.; Tyack, Peter L.
Year: 2006
Title: Quantitative measures of air-gun pulses recorded on sperm whales (*Physeter macrocephalus*) using acoustic tags during controlled exposure experiments
Journal: Journal of the Acoustical Society of America
Volume: 120
Issue: 4
Pages: 2366-2379
Date: Oct
Short Title: Quantitative measures of air-gun pulses recorded on sperm whales (*Physeter macrocephalus*) using acoustic tags during controlled exposure experiments

Accession Number: ISI:000241258400061
Keywords: SPERM WHALE; *PHYSETER MACROCEPHALUS*; TAG; AIR GUN; SEISMIC
Abstract: The widespread use of powerful, low-frequency air-gun pulses for seismic seabed exploration has raised concern about their potential negative effects on marine wildlife. Here, we quantify the sound exposure levels recorded on acoustic tags attached to eight sperm whales at ranges between 1.4 and 12.6 km from controlled air-gun array sources operated in the Gulf of Mexico. Due to multipath propagation, the animals were exposed to multiple sound pulses during each firing of the array with received levels of analyzed pulses falling between 131–167 dB re. 1 uPa (pp) [111–147 dB re. 1 uPa (rms) and 100–135 dB re. 1 uPa2s] after compensation for hearing sensitivity using the M-weighting. Received levels varied widely with range and depth of the exposed animal precluding reliable estimation of exposure zones based on simple geometric spreading laws. When whales were close to the surface, the first arrivals of air-gun pulses contained most energy between 0.3 and 3 kHz, a frequency range well beyond the normal frequencies of interest in seismic exploration.
Therefore air-gun arrays can generate significant sound energy at frequencies many octaves higher than the frequencies of interest for seismic exploration, which increases concern of the potential
Notes: Madsen, P. T. Johnson, M. Miller, P. J. O. Soto, N. Aguilar Lynch, J. Tyack, P.
Link to PDF: Madsen_etal_2006_Quantitative_seismic_pulses_on_sperm-whales.pdf

Reference Type: Journal Article
Record Number: 64
Author: Madsen, P. T.; Wahlberg, Magnus; Tougaard, J.; Lucke, K.; Tyack, Peter L.
Year: 2006
Title: Wind turbine underwater noise and marine mammals: implications of current knowledge and data needs
Journal: Marine Ecology-Progress Series
Volume: 309
Pages: 279-295
Short Title: Wind turbine underwater noise and marine mammals: implications of current knowledge and data needs
Accession Number: ISI:000237020200023
Keywords: MARINE MAMMALS; WIND TURBINE; PILE DRIVER; UNDERWATER NOISE; IMPACT ZONES; MASKING; WIND FARM; VESSEL
Abstract: The demand for renewable energy has led to construction of offshore wind farms with high-power turbines, and many more wind farms are being planned for the shallow waters of the world’s marine habitats. The growth of offshore wind farms has raised concerns about their impact on the marine environment. Marine mammals use sound for foraging, orientation and communication and are therefore possibly susceptible to negative effects of man-made noise generated from constructing and operating large offshore wind turbines. This paper reviews the existing literature and assesses zones of impact from different noise-generating activities in conjunction with wind farms on 4 representative shallow-water species of marine mammals. Construction

involves many types of activities that can generate high sound pressure levels, and pile-driving seems to be the noisiest of all. Both the literature and modeling show that pile-driving and other activities that generate intense impulses during construction are likely to disrupt the behavior of marine mammals at ranges of many kilometers, and that these activities have the potential to induce hearing impairment at close range. The reported noise levels from operating wind turbines are low, and are unlikely to impair hearing in marine mammals. The impact zones for marine mammals from operating wind turbines depend on the low-frequency hearing-abilities of the species in question, on sound-propagation conditions, and on the presence of other noise sources such as shipping. The noise impact on marine mammals is more severe during the construction of wind farms than during their operation.
Link to PDF: Madsen_etal_2006_Wind-turbine_Review.pdf

Reference Type: Journal Article
Record Number: 310
Author: Mann, David A.; Lu, Zhongmin M.; Hastings, Mardi C.; Popper, Arthur N.
Year: 1998
Title: Detection of ultrasonic tones and simulated dolphin echolocation clicks by a teleost fish, the American shad (*Alosa sapidissima*)
Journal: Journal of the Acoustical Society of America
Volume: 104
Issue: 1
Pages: 562-568
Date: Jul
Type of Article: Article
Short Title: Detection of ultrasonic tones and simulated dolphin echolocation clicks by a teleost fish, the American shad (*Alosa sapidissima*)
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000074592700059
Keywords: MOTION; AMERICAN SHAD; *ALOSA SAPIDISSIMA*; FISH; HEARING; ULTRASONIC;
Abstract: The authors previously reported that American shad (*Alosa sapidissima*) can detect sounds from 100 Hz to 180 kHz, with two regions of best sensitivity, one from 200 to 800 Hz and the other from 25 to 150 kHz [Mann et al., Nature 389, 341 (1997)]. These results demonstrated ultrasonic hearing by shad, but thresholds at lower frequencies were potentially masked by background noise in the experimental room. In this study, the thresholds of the American shad in a quieter and smaller tank, as well as thresholds for detecting simulated echolocation sounds of bottlenosed dolphins was determined. Shad had lower thresholds for detection (from 0.2 to 0.8 kHz) in the quieter and smaller tank compared with the previous experiment, with low-frequency background noise but similar thresholds at ultrasonic frequencies. Shad were also able to detect echolocation clicks with a threshold of 171 dB re: 1 mu Pa peak to peak. If spherical spreading and an absorption coefficient of 0.02 dB/m of dolphin echolocation clicks are assumed, shad should be able to detect echolocating *Tursiops truncatus* at

ranges up to 187 m. The authors propose that ultrasonic hearing evolved in shad in response to selection pressures from echolocating odontocete cetaceans.
Notes: ISI Document Delivery No.: ZY164
Times Cited: 22
Cited Reference Count: 39
URL: <Go to ISI>://000074592700059
Link to PDF: Mann_etal_1998_Echolocation_shad.pdf
Author Address: Univ Maryland, Dept Zool, College Pk, MD 20742 USA. Ohio State Univ, Dept Mech Engn, Columbus, OH 43210 USA.
Popper, AN, Univ Maryland, Dept Zool, College Pk, MD 20742 USA.
Language: English

Reference Type: Journal Article
Record Number: 506
Author: Mann, David A.; Lu, Zhongmin M.; Popper, Arthur N.
Year: 1997
Title: A clupeid fish can detect ultrasound
Journal: Nature
Volume: 48
Pages: 341
Short Title: A clupeid fish can detect ultrasound
Abstract: no abstract
Link to PDF: Mann_etal_1997_clupeid_fish_ultrasound.pdf

Reference Type: Journal Article
Record Number: 491
Author: Manuck, Stephen B.; Marsland, Anna L.; Kaplan, Jay R.; Williams, J. Koudy
Year: 1995
Title: The pathogenicity of behavior and its neuroendocrine mediation: An example from coronary artery disease
Journal: Psychosomatic Medicine
Volume: 57
Pages: 275-283
Short Title: The pathogenicity of behavior and its neuroendocrine mediation: An example from coronary artery disease
Abstract: Although it is frequently hypothesized that perturbations of the body's principal axes of neuroendocrine
response, especially the sympathetic-adrenomedullary and pituitary-adrenocortical systems, mediate psychosocial
influences on disease, evidence directly supporting this hypothesis is sparse at best and, for most
disease entities, nonexistent. In this article, we illustrate a research strategy aimed at elucidating the role of
behavior in disease pathogenesis by focusing on a single pathologic process—disease of the coronary

vasculature—and emphasizing experimental evidence linking such disease to both behavior and sympathoadrenal
activation in nonhuman primates. In cynomolgus monkeys, it is found that several psychosocial
variables, e.g., social instability, behavioral dominance (in males), and subordination (in females), promote
coronary atherogenesis, either independently or in interaction. Animals exhibiting a heightened cardiac
responsivity to stress (reactions of probable sympathetic origin) also develop the most extensive coronary
lesions and beta-adrenoreceptor blockade prevents the behavioral exacerbation of atherosclerosis. Social
stress causes injury to arterial endothelium (also preventable by adrenoreceptor blockade) and, among
chronically stressed animals, impairs endothelium-dependent vasomotor responses of the coronary arteries.
It is suggested that similar research programs might elucidate the influence of behavior and neuroendocrine
factors on the pathogenesis of other disease states and conditions, including susceptibility to infection.
Key words: Stress, sympathetic nervous system, coronary artery disease.
Link to PDF: Manuck_etal_1995_behavior_coronary_artery_disease.pdf

Reference Type: Report
Record Number: 520
Author: MARAD
Year: 2005
Title: Vessel Calls at U.S. and World Ports
Institution: U.S. Department of Transportation Maritime Administration, Office of Statistical and Economic Analysis
Date: April 2006
Short Title: Vessel Calls at U.S. and World Ports
URL: www.marad.dot/marad_statistics
Link to PDF: MARAD_2005_Statistics_Shipping_US.pdf
Caption: USDoT Maritime Administration

Reference Type: Report
Record Number: 521
Author: MARAD
Year: 2007
Title: North American Cruises, 1st Quarter 2007
Institution: U.S. Department of Transportation Maritime Administration, Office of Policy and Plans
Date: 1st Quarter, 2007

Short Title: North American Cruises, 1st Quarter 2007
URL: www.marad.dot/marad_statistics
Link to PDF: MARAD_2007_Statistics_CruiseShips.pdf
Caption: USDoT Maritime Administration

Reference Type: Thesis
Record Number: 443
Author: Mazzuca, Lori L.
Year: 2001
Title: Potential Effects of Low Frequency Sound (LFS) from Commercial Vessels on Large Whales
Academic Department: School of Marine Affairs
University: University of Washington
Number of Pages: 70
Date: 2001
Thesis Type: Masters
Short Title: Potential Effects of Low Frequency Sound (LFS) from Commercial Vessels on Large Whales
Abstract: [ABSTRACT]
Low-frequency sound (LFS) emitted into the ocean by commercial vessels is an environmental perturbation that may have significant adverse effects on large whales, as they have evolved the ability to produce low-frequency sounds and highly adapted ears specialized for hearing underwater. Ambient noise is persistent background sound that is predominantly low-frequency (LF) and that has no single originating source or point. Today, ambient noise is dominates by aggregate ship traffic. Roughly 85% to 90% of the highlevels of LFS radiated into the water by commercial vessels results from propeller cavitations, and is in roughly the same frequency range as calls produced by large whales. Noise from distant shipping dominates frequencies from about 10-300 Hz worldwide, particularly in the 10-40 Hz frequency band. Fundamental frequency and harmonic components related to the propeller blade rate of commercial vessels dominate that infrasonic band. (1-20Hz).

Noise generated from ships is a function of ship size and speed. The larger, heavier, and faster a vessel, the louder the vessel. Large commercial vessels and supertankers (> 135m) today produce source levels about 160-190 dB re 1?Pa-m, and future trends in cargo ship design emphasize increasing ship size and ship speed. Shipping traffic more than doubled LF ambient noise from 1950-2000, increasing ambient noise levels by as much as 10-16 dB (10-40 times increase in sound pressure level), from that of a prepropeller shipping ocean. The world's merchant fleet also expanded during that time, nearly tripling in numbers and sextupling in gross tonnage. Future trends in commercial shipping predict an additional increase. The effects of such noise include no perceivable effects, masking important biological sounds, and inflicting irreparable damage to one or more animals. Large whales are potentially at risk because they are especially dependent upon hearing in the lower frequencies and they use vast ocean areas. In addition, eight species of large whale are currently listed as endangered under U.S. law,

which requires that the U.S. government not authorize any activities that could jeopardize their continued existence or adversely affect their critical habitat.

Further research is necessary to obtain information on hearing thresholds, the effects of masking, and the effects of noise levels on a global scale to levels that are considered benign to manage LF ambient noise levels on a global scale to levels that are considered benign to large whales, is an important step towards habitat conservation for large whales. Policy analysis indicates that existing international law and institutional infrastructure already provide an adequate framework to prescribe rules and standards in regulating the acoustic pollution from ships.
Research Notes: Abstract only.

Reference Type: Journal Article
Record Number: 66
Author: McCauley, Robert D.; Fewtrell, Jane; Popper, Arthur N.
Year: 2003
Title: High intensity anthropogenic sound damages fish ears
Journal: Journal of the Acoustical Society of America
Volume: 113
Issue: 1
Pages: 638-642
Date: Jan
Short Title: Effects of anthropogenic sounds on fish ears
Accession Number: ISI:000180485000061
Keywords: FISH; AIR GUN; HEARING
Abstract: Marine petroleum exploration involves the repetitive use of high-energy noise sources, air-guns, that produce a short, sharp, low-frequency sound. Despite reports of behavioral responses of fishes and marine mammals to such noise, it is not known whether exposure to air-guns has the potential to damage the ears of aquatic vertebrates. It is shown here that the ears of fish exposed to an operating air-gun sustained extensive damage to their sensory epithelia that was apparent as ablated hair cells. The damage was regionally severe, with no evidence of repair or replacement of damaged sensory cells up to 58 days after air-gun exposure.
Research Notes: Example of damage caused to hearing in pink snapper (and other hearing generalists including salmon, cod, tuna, haddock). Seismic air gun does cause damage to fish ears. Some damage is seen shortly after seismic event and it worsens over several months.
Link to PDF: McCauley_etal_2003_snapper_hearingdamage.pdf

Reference Type: Journal Article
Record Number: 272
Author: McConnell, S. O.; Schilt, M. P.; Dworski, J. G.
Year: 1992
Title: Ambient noise measurements from 100 Hz to 80 KHz in an Alaskan fjord

Journal: Journal of the Acoustical Society of America
Volume: 91
Issue: 4
Pages: 1990-2003
Date: Apr
Type of Article: Article
Short Title: Ambient noise measurements from 100 Hz to 80 KHz in an Alaskan fjord
ISSN: 0001-4966
Accession Number: ISI:A1992HP36700021
Keywords: OCEAN; ALASKA; NOISE
Abstract: Measurements covering a broad frequency range from 100 Hz to 80 kHz have been made in Behm Canal, Alaska. This site represents a fairly deep embayment (400 m) with soft bottom (porosity of about 0.8) and, hence, the noise detected at the hydrophones is affected negligibly by multipath contributions except possibly at the lowest frequencies. Data were gathered over a wide range of wind speeds (0 to 15 m/s) and during periods of rain and snow. Several unique and noteworthy results were obtained. Foremost was the observation that the wind-generated noise level measured during the winter was approximately 5 dB lower than during the summer for the same wind speeds and air-sea temperature differences (air temperature about the same as or colder than the sea surface). The summer data agree well with the most recent published measurements and are approximately 2 dB higher than the standard Knudsen/Wenz reference spectra. It appeared that below-freezing air temperatures and snow were responsible for the 5 dB offset between the summer and winter data. Most reported wind noise measurements are restricted to frequencies less than 20 kHz. Those that go beyond this frequency display a noticeable hump above the usual - 17 dB/decade power-law slope, and the Behm Canal measurements show that this hump continues to 80 kHz where the spectrum rejoins the extension of the canonical power-law slope.
Notes: ISI Document Delivery No.: HP367
Times Cited: 6
Cited Reference Count: 25
Part 1
URL: <Go to ISI>://A1992HP36700021
Link to PDF: McConnell_etal_1992_Ambient_Alaskan_Fjord.pdf
Author Address: DAVID TAYLOR RES CTR,PUGET SOUND DETACHMENT,BREMERTON,WA 98314. UNIV WASHINGTON,COLL OCEAN & FISHERY SCI,APPL PHYS LAB,SEATTLE,WA 98105.
MCCONNELL, SO, ARETE ASSOCIATES,POB 8050,LA JOLLA,CA 92038.
Language: English

Reference Type: Journal Article
Record Number: 344
Author: McDonald, M. A.; Hildebrand, John A.; Wiggins, S. M.
Year: 2006
Title: Increases in deep ocean ambient noise in the northeast pacific west of San Nicolas Island, California

Journal: Journal of the Acoustical Society of America
Volume: 120
Issue: 2
Pages: 711-718
Date: Aug
Type of Article: Article
Short Title: Increases in deep ocean ambient noise in the northeast pacific west of San Nicolas Island, California
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000239835400018
Keywords: AMBIENT NOISE; HUMPBACK WHALE; SOUND CHANNEL; VESSEL; NOISE
Abstract: Recent measurement at a previously studied location illustrates the magnitude of increases in ocean ambient noise in the Northeast Pacific over the past four decades. Continuous measurements west of San Nicolas Island, California, over 138 days, spanning 2003-2004 are compared to measurements made during the 1960s at the same site. Ambient noise levels at 30-50 Hz were 10-12 dB higher (95% CI=2.6 dB) in 2003-2004 than in 1964-1966, suggesting an average noise increase rate of 2.5-3 dB per decade. Above 50 Hz the noise level differences between recording periods gradually diminished to only 1-3 dB at 100-300 Hz. Above 300 Hz the 1964-1966 ambient noise levels were higher than in 2003-2004, owing to a diel component which was absent in the more recent data. Low frequency (10-50 Hz) ocean ambient noise levels are closely related to shipping vessel traffic. The number of commercial vessels plying the world's oceans approximately doubled between 1965 and 2003 and the gross tonnage quadrupled, with a corresponding increase in horsepower. Increases in commercial shipping are believed to account for the observed low-frequency ambient noise increase. (c) 2006 Acoustical Society of America.
Notes: ISI Document Delivery No.: 074TT
Times Cited: 0
Cited Reference Count: 38
Research Notes: Good comparison to Wenz 1964-65 data. Explains some of the possibilities behind increase in ocean noise.
Link to PDF: McDonald_etal_2006_Increases_OceanNoise.pdf
Language: English

Reference Type: Journal Article
Record Number: 510
Author: McDonald, M.A.; Moore, Sue E.
Year: 2002
Title: Calls recorded from North Pacific right whales (*Eubalaena japonica*) in the eastern Bering Sea
Journal: Journal of Cetacean Research and Management
Volume: 4
Issue: 3
Pages: 261-266

Short Title: Calls recorded from North Pacific right whales (*Eubalaena japonica*) in the eastern Bering Sea
Link to PDF: McDonald_Moore_2002_RightWhale_vocs.pdf

Reference Type: Journal Article
Record Number: 490
Author: McEwen, Bruce S.
Year: 1998
Title: Protective and damaging effects of stress mediators
Journal: New England Journal of Medicine
Volume: 338
Issue: 3
Pages: 171-179
Date: 15 January 2998
Short Title: Protective and damaging effects of stress mediators
Abstract: no article
Link to PDF: McEwen_1998_FX_stress_mediators.pdf

Reference Type: Journal Article
Record Number: 475
Author: McEwen, Bruce S.
Year: 2006
Title: Stressed or stressed out: What is the difference?
Journal: Journal of Psychiatry and Neuroscience
Volume: 30
Issue: 5
Pages: 315-318
Short Title: Stressed or stressed out: What is the difference?
Abstract: The term “allostasis” has been coined to clarify ambiguities associated with the word “stress.” Allostasis refers to the adaptive processes
that maintain homeostasis through the production of mediators such as adrenalin, cortisol and other chemical messengers. These mediators
of the stress response promote adaptation in the aftermath of acute stress, but they also contribute to allostatic overload, the wear
and tear on the body and brain that result from being “stressed out.” This conceptual framework has created a need to know how to improve
the efficiency of the adaptive response to stressors while minimizing overactivity of the same systems, since such overactivity results
in many of the common diseases of modern life. This framework has also helped to demystify the biology of stress by emphasizing
the protective as well as the damaging effects of the body’s attempts to cope with the challenges known as stressors.
Link to PDF: McEwen_2006_stress.pdf

Reference Type: Journal Article
Record Number: 502
Author: McEwen, Bruce S.; Wingfield, J.C.
Year: 2003
Title: The concept of allostasis in biology and biomedicine
Journal: Hormones and Behavior
Volume: 43
Pages: 2-15
Short Title: The concept of allostasis in biology and biomedicine
Abstract: Living organisms have regular patterns and routines that involve obtaining food and carrying out life history stages such as breeding, migrating, molting, and hibernating. The acquisition, utilization, and storage of energy reserves (and other resources) are critical to lifetime reproductive success. There are also responses to predictable changes, e.g., seasonal, and unpredictable challenges, i.e., storms and natural disasters. Social organization in many populations provides advantages through cooperation in providing basic necessities and beneficial social support. But there are disadvantages owing to conflict in social hierarchies and competition for resources. Here we discuss the concept of allostasis, maintaining stability through change, as a fundamental process through which organisms actively adjust to both predictable and unpredictable events. Allostatic load refers to the cumulative cost to the body of allostasis, with allostatic overload being a state in which serious pathophysiology can occur. Using the balance between energy input and expenditure as the basis for applying the concept of allostasis, we propose two types of allostatic overload. Type 1 allostatic overload occurs when energy demand exceeds supply, resulting in activation of the emergency life history stage. This serves to direct the animal away from normal life history stages into a survival mode that decreases allostatic load and regains positive energy balance. The normal life cycle can be resumed when the perturbation passes. Type 2 allostatic overload begins when there is sufficient or even excess energy consumption accompanied by social conflict and other types of social dysfunction. The latter is the case in human society and certain situations affecting animals in captivity. In all cases, secretion of glucocorticosteroids and activity of other mediators of allostasis such as the autonomic nervous system, CNS neurotransmitters, and inflammatory cytokines wax and wane with allostatic load. If allostatic load is chronically high, then pathologies develop. Type 2 allostatic overload does not trigger an escape response, and can only be counteracted through learning and changes in the social structure.
Link to PDF: McEwen_Wingfield_2003_Allostasis_biology.pdf

Reference Type: Journal Article

Record Number: 273
Author: McHugh, R.; McLaren, D.; Wilson, M.; Dunbar, R.
Year: 2005
Title: The underwater environment - A fluctuating acoustic medium rich in marine life. Implications for active military sonar
Journal: Acta Acustica United with Acustica
Volume: 91
Issue: 1
Pages: 51-60
Date: Jan-Feb
Type of Article: Article
Short Title: The underwater environment - A fluctuating acoustic medium rich in marine life. Implications for active military sonar
Alternate Journal: Acta Acust. United Acust.
ISSN: 1610-1928
Accession Number: ISI:000227288700005
Keywords: SYSTEMS; SONAR; MARINE MAMMALS
Abstract: Naval operations are increasingly likely to take place in littoral waters, where sonar conditions are normally unfavourable. At the same time, there is a growing need to consider possible harm to marine life, particularly mammals, from sonar transmissions. This review based on a literature survey addresses both aspects with the aim of identifying technologies and strategies that can be recommended for the military use of active sonar in the littoral. In the absence of a single clear-cut solution, an embracing framework is suggested as an approach to future military sonar design and operation.
Notes: ISI Document Delivery No.: 901NH
Times Cited: 0
Cited Reference Count: 46
URL: <Go to ISI>://000227288700005
Author Address: Heriot Watt Univ, Edinburgh, Midlothian, Scotland.
McHugh, R, Heriot Watt Univ, Edinburgh, Midlothian, Scotland.
Language: English

Reference Type: Journal Article
Record Number: 532
Author: McSweeney, D.J.; Chu, K.C.; Dolphin, W.F.; Guinee, L.N.
Year: 1989
Title: North Pacific humpback whale songs: A comparison of Southeast Alaskan feeding ground songs with Hawaiian wintering ground songs
Journal: Marine Mammal Science
Volume: 5
Issue: 2
Pages: 139-148
Short Title: North Pacific humpback whale songs: A comparison of Southeast Alaskan feeding ground songs with Hawaiian wintering ground songs
Keywords: *MEGAPTERA NOVAEANGLIAE*; HUMPBACK WHALE; NORTH PACIFIC;

HAWAII; SOUTHEASTERN ALASKA; COMMUNICATION; SONGS
Abstract: Humpback whales sing long, complex songs on their wintering grounds. On 25 August 1979 and 3 September 1981, we made recordings of humpback whale songs in southeastern Alaska, showing that humpback whales also sing on the summer feeding grounds. Both these Alaskan samples are songs in that they are repeating cyclical sound patterns and follow the known structure for humpback whale song. The Alaskan songs contain all the same material sung in the same order as that heard off Mexico and Hawaii in the surrounding wintering seasons. However, song, theme and some phrase durations are abbreviated in the Alaskan songs. The recording of these two songs represents the full sample of song recorded from 155 days over five years of atrempting to record humpback whale song in Alaskan waters.
Link to PDF: McSweeney_etal_1989_NPac_Hback_Songs_Winter_Summer.pdf

Reference Type: Book
Record Number: 500
Author: Medwin, H.; Clay, C.S.
Year: 1998
Title: *Fundamentals of Acoustical Oceanography*
City: San Diego, CA
Publisher: Academic Press
Number of Pages: 712
Short Title: *Fundamentals of Acoustical Oceanography*
Link to PDF: Medwin_Clay_fundamentals_acoustic_oceanTOC.pdf

Reference Type: Journal Article
Record Number: 464
Author: Merrick, R.L.; Loughlin, Thomas R.
Year: 1997
Title: Foraging behavior of adult female and young-of-the-year Steller sea lions in Alaskan waters.
Journal: Canadian Journal of Zoology-Revue Canadienne De Zoologie
Volume: 75
Issue: 5
Pages: 776-786
Short Title: Foraging behavior of adult female and young-of-the-year Steller sea lions in Alaskan waters.
Link to PDF: Merrick_Loughlin_1997_StellerSeaLion_foraging_AK.pdf

Reference Type: Journal Article
Record Number: 67
Author: Michaud, R.; Béland, P.
Year: 2001

Title: Looking for trends in the endangered St. Lawrence Beluga population - A critique of Kingsley, MCS 1998. Population index estimates for the St. Lawrence Belugas, 1973-1995. Marine mammal science 14 : 508-530
Journal: Marine Mammal Science
Volume: 17
Issue: 1
Pages: 206-212
Short Title: Looking for trends in the endangered St. Lawrence Beluga population - A critique of Kingsley, MCS 1998. Population index estimates for the St. Lawrence Belugas, 1973-1995. Marine mammal science 14 : 508-530
Accession Number: ISI:000165886400015
Keywords: BELUGA WHALE
Abstract: no abstract
Link to PDF: Michaud_Beland_2001_critique_beluga_StLawrence.pdf

Reference Type: Journal Article
Record Number: 311
Author: Miksis, J. L.; Grund, M. D.; Nowacek, D. P.; Solow, A. R.; Connor, R. C.; Tyack, P. L.
Year: 2001
Title: Cardiac responses to acoustic playback experiments in the captive bottlenose dolphin (*Tursiops truncatus*)
Journal: Journal of Comparative Psychology
Volume: 115
Issue: 3
Pages: 227-232
Date: Sep
Type of Article: Article
Short Title: Cardiac responses to acoustic playback experiments in the captive bottlenose dolphin (*Tursiops truncatus*)
Alternate Journal: J. Comp. Psychol.
ISSN: 0735-7036
Accession Number: ISI:000171258100002
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; HEART RATE; ORIENTING RESPONSE
Abstract: Acoustic recordings were used to investigate the cardiac responses of a captive dolphin (*Tursiops truncatus*) to sound playback stimuli. A suction-cup hydrophone placed on the ventral midline of the dolphin produced a continuous heartbeat signal while the dolphin was submerged. Heartbeats were timed by applying a matched-filter to the phonocardiogram. Significant heart rate accelerations were observed in response to playback stimuli involving conspecific vocalizations compared with baseline rates or tank noise playbacks, This method documents that objective psychophysiological measures can be obtained for physically unrestrained cetaceans. In addition, the results are the 1st to show cardiac responses to acoustic stimuli from a cetacean at depth. Preliminary evidence suggests that the cardiac response patterns of

dolphins are consistent with the physiological defense and startle responses in terrestrial mammals and birds.
Notes: ISI Document Delivery No.: 476ZF
Times Cited: 3
Cited Reference Count: 28
Research Notes: Captive bottlenose dolphins and beluga whales. Acoustic recordings of heart rate in response to playback of familiar sounds.
URL: <Go to ISI>://000171258100002
Link to PDF: Miksis_etal_2001_Cardiac_RX_Tutr_Playback.pdf
Author Address: Univ Massachusetts, Dept Biol, Dartmouth, MA USA. Woods Hole Oceanog Inst, Dept Biol, Woods Hole, MA 02543 USA. Woods Hole Oceanog Inst, Dept Appl Ocean Phys & Engn, Woods Hole, MA 02543 USA. Woods Hole Oceanog Inst, Marine Policy Ctr, Woods Hole, MA 02543 USA.
Miksis, JL, Univ Rhode Isl, Grad Sch Oceanog, Box 200,S Ferry Rd, Narragansett, RI 02882 USA.
Language: English

Reference Type: Conference Proceedings
Record Number: 498
Author: Miller, James H.; Bowles, Ann E.; Gentry, Roger L.; Ellison, William T.; Finneran, James J.; Greene, Charles R. Jr.; Kastak, David; Ketten, Darlene R.; Tyack, Peter L.; Nachtigall, Paul E.; Richardson, W. John; Thomas, Jeanette A.
Year of Conference: 2005
Title: Strategies for weighting exposure in the development of acoustic criteria for marine mammals
Conference Name: Joint 150th Meeting of the Acoustical Society of Amera/NOISE-CON
Conference Location: Minneapolis, MN
Volume: 118
Pages: 2019
Date: 17-21 October 2005
Short Title: Strategies for weighting exposure in the development of acoustic criteria for marine mammals
Abstract: The Noise Exposure Criteria Group has been developing noise exposure criteria for marine mammals. Although the primary focus of the effort is development of criteria to prevent injury, the Group has also emphasized the development of exposure metrics that can be used to predict injury with accuracy and precision. Noise exposure metrics for humans have proven to be more effective when they account for psychophysical properties of the auditory system, particularly loudness perception. Usually noise is filtered using the A-weighting function, an idealized curve based on the human 40-phon equal loudness function. However, there are no empirical studies to show whether a comparable procedure for animals will improve predictions. The Noise Exposure Criteria Group panel has proposed to weight noise data by functions that admit sound throughout the frequency range of hearing in five marine mammal groupings—low frequency cetaceans (mysticetes), midfrequency cetaceans, high-frequency cetaceans, pinnipeds in air, and pinnipeds in water. The algorithm for

the functions depends only on the upper and lower frequency limits of hearing and does not differentially weight frequencies based on sensitivity within the range. This procedure is considered conservative. However, if the human case may be taken as a model, it is not likely to produce precise predictions. Empirical data are essential to finding better estimators of exposure.
Link to PDF: JASA_2005_meeting_B.pdf

Reference Type: Journal Article
Record Number: 304
Author: Miller, P. J. O.; Biassoni, Nicoletta; Samuels, A.; Tyack, Peter L.
Year: 2000
Title: Whale songs lengthen in response to sonar
Journal: Nature
Volume: 405
Issue: 6789
Pages: 903-903
Date: Jun
Type of Article: Article
Short Title: Whale songs lengthen in response to sonar
Alternate Journal: Nature
ISSN: 0028-0836
Accession Number: ISI:000087732700035
Keywords: HUMPBACK WHALE; *MEGAPTERA NOVAEANGLIAE*; SONG; WHALE; SONAR
Notes: ISI Document Delivery No.: 326JT
Times Cited: 22
Cited Reference Count: 9
URL: <Go to ISI>://000087732700035
Link to PDF: Miller_etal_2000_HBack_LengthenSong_Sonar.pdf
Author Address: Woods Hole Oceanog Inst, Dept Biol, Woods Hole, MA 02543 USA. Chicago Zool Soc, Daniel F & Ada L Rice Conservat Biol & Res Ctr, Brookfield, IL 60513 USA.
Miller, PJO, Woods Hole Oceanog Inst, Dept Biol, Woods Hole, MA 02543 USA.
Language: English

Reference Type: Journal Article
Record Number: 474
Author: Misund, O.A.; Øvredal, J.T.; Hafsteinsson, M.T.
Year: 1996
Title: Reactions of herring schools to the sound field of a survey vessel
Journal: Aquatic Living Resources
Volume: 9
Pages: 5-11
Short Title: Reactions of herring schools to the sound field of a survey vessel
Keywords: VESSEL NOISE; FISH SCHOOL; HERRING; AVOIDANCE; SWIMMING

BEHAVIOR; SONAR
Abstract: The underwater sound of RN "Johan Hjort" as a function of aspect angle has been mapped by cruising
along parallel transects at various distances from the recording unit. At frequencies over 125 Hz there was
a minimum in front of the vessel, and lobes of higher intensity on both sides. About 20% of the herring
schools recorded during a survey in the North Sea seemed to react to the survey vessel. The distance at
which the schools reacted varied from about 25 m and up to about 1000 m in front of the vessel. Within
a sector of 20" on each side of the path of the vessel, the fraction of schools reacting increased to about
50%. Most of the schools that reacted seem to be herded in front of the vessel. This reaction pattern
may indicate either that the schools reacted to the higher sound intensity to the side of the vessel or that
the pattern occurred because of a "pursuit effect". Despite the apparent herding, more than 40% of the
schools in front of the vessel were not recorded by the echo sounder. It is therefore argued that horizontal
avoidance close to the vessel may have caused an underestimation of the biomass of herring of about 20%.
Link to PDF: Misund_etal_1996_Herring_React_SurveyVessel.pdf

Reference Type: Report
Record Number: 347
Author: Mitson, Ron B.
Year: 1995
Title: Underwater Noise of Research Vessels: Review and Recommendations
City: Lowestoft, Suffolk, UK
Institution: [ICES] International Council for the Exploration of the Sea
Pages: 1-61
Date: May 1995
Short Title: Underwater Noise of Research Vessels: Review and Recommendations
Report Number: 209
Keywords: VESSEL; NOISE; FISH
URL:
http://www.anp.gov.br/guias_r8/sismica_r8/Bibliografia/Mitson%201995%20-%20Underwater%20noise%20of%20research%20vessels.pdf
Author Address: ACOUSTEC

Reference Type: Journal Article
Record Number: 69

Author: Mitson, Ron B.; Knudsen, Hans P.
Year: 2003
Title: Causes and effects of underwater noise on fish abundance estimation
Journal: Aquatic Living Resources
Volume: 16
Issue: 3
Pages: 255-263
Short Title: Causes and effects of underwater noise on fish abundance estimation
Accession Number: ISI:000185139400020
Keywords: VESSEL NOISE; VESSEL AVOIDANCE; FISH DETECTION
Abstract: The power of modern research vessels using diesel engines means significant levels of noise may be radiated underwater. At low frequencies a surveying vessel must not cause fish avoidance behaviour when it is using trawl or acoustic assessment methods. All the main
mechanisms that form the essential propulsion system are described and discussed in terms of underwater radiated noise. Diesel engines, generators and propulsion motors contribute significantly to the low frequency spectrum and an illustration is given of underwater noise when an unsuitable propulsion system is used. Avoidance behaviour by a herring school is shown due to a noisy vessel, by contrast there is an example of no reaction of herring to a noise-reduced vessel. Propellers are major sources of both low and high frequency noise. The latter should not reduce echo sounder detection range, nor contaminate echo integrator recordings. Underwater noise levels from four vessels with different machinery and propulsion characteristics are seen in relation to ambient noise levels at 18 kHz. Fish detection is examined in relation to sea background noise and vessel self-noise. Calculated detection ranges for fish target strength classes from –30 to –60 dB at 38 kHz are shown for six vessels travelling at 11 knots, based on self-noise measurements. Echo sounder noise levels from several vessels at 120 and 200 kHz are tabulated. Beyond 100 kHz the effect of vessel-radiated noise is usually insignificant; levels up to that frequency are proposed in the International Council for the Exploration of the Sea (ICES) Cooperative Research Report No. 209 of 1995.
Research Notes: Comparing standard vessels to modified vessels and fish behavior responses.
Link to PDF: Mitson_Knudsen_2003_FX_UW_noise_FishAbundance.pdf

Reference Type: Journal Article
Record Number: 274
Author: Mobley, Joseph R., Jr.
Year: 2005
Title: Assessing responses of humpback whales to North Pacific Acoustic Laboratory (NPAL) transmissions: Results of 2001-2003 aerial surveys north of Kauai
Journal: Journal of the Acoustical Society of America
Volume: 117
Issue: 3
Pages: 1666-1673

Date: Mar
Type of Article: Article
Short Title: Assessing responses of humpback whales to North Pacific Acoustic Laboratory (NPAL) transmissions: Results of 2001-2003 aerial surveys north of Kauai
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000227574800014
Keywords: HUMPBACK WHALE; *MEGAPTERA NOVAEANGLIAE*; ABUNDANCE; PLAYBACK; WATERS; SOUND; ATOC
Abstract: Eight aerial surveys were flown north of the Hawaiian island of Kauai during 2001 when the North Pacific Acoustic Laboratory (NPAL) source was not transmitting, and during 2002 and 2003 when it was. All surveys were performed during the period of peak residency of humpback whales (Feb-Mar). During 2002 and 2003, surveys commenced immediately upon cessation of a 24-h cycle of transmissions. Numbers and distribution of whales observed within 40 km of the NPAL source during 2001 (source off) were compared with those observed during 2002 and 2003 (source on). A total of 75 sightings was noted during 2001, as compared with 81 and 55-during 2002 and 2003, respectively. Differences in sighting rates (sightings/km) across years were not statistically significant. Assessment of distributional changes relied upon comparisons of three measures: (a) location. depths; (b) distance from the NPAL source; and (c) distance offshore. None of the distributional comparisons revealed statistically significant differences across years. Several possible interpretations are examined: (a) whales have habituated to the NPAL signal; (b) insufficient statistical power exists in the present design to detect any effects; and (c) the effects are short-lived and become undetectable shortly after the cessation of transmissions.
Notes: ISI Document Delivery No.: 905NG
Times Cited: 1
Cited Reference Count: 28
Part 2
URL: <Go to ISI>://000227574800014
Link to PDF: Mobley_2005_Resp_Hback_NPAL-ATOC.pdf
Author Address: Univ Hawaii W Oahu, Pearl City, HI 96782 USA.
Mobley, JR, Univ Hawaii W Oahu, 96-129 Ala Ike, Pearl City, HI 96782 USA.
jmobley@hawaii.edu
Language: English

Reference Type: Journal Article
Record Number: 292
Author: Monteiro-Neto, Cassiano; Ávila, Francisco José C.; Alves, Tarcísio T., Jr.; Araújo, Douglas Silva; Campos, Alberto Alves; Martins, Aline Maria A.; Parente, Cristian Leite; Furtado-Neto, Manuel A. Andrade; Lien, Jon
Year: 2004
Title: Behavioral responses of *Sotalia fluviatilis* (Cetacea, Delphinidae) to acoustic pingers, Fortaleza, Brazil
Journal: Marine Mammal Science
Volume: 20

Issue: 1
Pages: 145-151
Date: Jan
Type of Article: Article
Short Title: Behavioral responses of *Sotalia fluviatilis* (Cetacea, Delphinidae) to acoustic pingers, Fortaleza, Brazil
ISSN: 0824-0469
Accession Number: ISI:000188255500008
Keywords: *SOTALIA FLUVIATILIS*; CETACEA; ALARMS
Abstract: no abstract
URL: <Go to ISI>://000188255500008
Link to PDF: Monteiro-neto_etal_2004_tucuxi_pinger.pdf
Author Address: Univ Fed Fluminense, Dept Biol Marinha, BR-24001970 Niteroi, RJ, Brazil. Grp Estudo Cetaceos Ceara, BR-61600000 Caucaia, CE, Brazil. Univ Fed Ceara, Dept Engn Pesca, BR-60035600 Fortaleza, Ceara, Brazil. Mem Univ Newfoundland, Whale Res Grp, St Johns, NF A1C 5S7, Canada.
Monteiro-Neto, C, Univ Fed Fluminense, Dept Biol Marinha, Caixa Postal 100 644, BR-24001970 Niteroi, RJ, Brazil.
monteiro@vm.uff.br
Language: English

Reference Type: Journal Article
Record Number: 206
Author: Moore, M. J.; Early, G. A.
Year: 2004
Title: Cumulative sperm whale bone damage and the bends
Journal: Science
Volume: 306
Issue: 5705
Pages: 2215-2215
Date: Dec
Short Title: Cumulative sperm whale bone damage and the bends
Accession Number: ISI:000225950000033
Keywords: SPERM WHALE; *PHYSETER MACROCEPHALUS*
URL: <Go to ISI>://000225950000033
Link to PDF: Moore_Early_2004_spermwhale_bends.pdf

Reference Type: Journal Article
Record Number: 277
Author: Moore, S. E.
Year: 2000
Title: Variability of cetacean distribution and habitat selection in the Alaskan arctic, autumn 1982-91
Journal: Arctic
Volume: 53

Issue: 4
Pages: 448-460
Date: December 2000
Type of Article: Article
Short Title: Variability of cetacean distribution and habitat selection in the Alaskan arctic, autumn 1982-91
Alternate Journal: Arctic
ISSN: 0004-0843
Accession Number: ISI:000166201700010
Keywords: ALASKA; ARCTIC; BEAUFORT SEA; BOWHEAD WHALE; CHUKCHI SEA; GRAY WHALE; HABITAT SELECTION; WHITE WHALE; COD; *BOREOGADUS SAIDA*; INTERANNUAL VARIABILITY; BERING STRAIT; CLIMATIC CHANGE; AERIAL SURVEY; ICE EXTENT; WATERS; OCEAN; CETACEAN; BELUGA WHALE; ICE
Abstract: Ten years (1982-91) of autumn sighting data from aerial surveys offshore northern Alaska were analyzed to investigate variability in cetacean distribution and habitat selection. Habitat selection indices were calculated for bowhead, white, and gray whales in heavy, moderate, and light ice conditions; and for high, moderate, and low transport (inflow) conditions at Bering Strait. Bowhead whales selected shallow inner-shelf waters during moderate and light ice, and deeper slope habitat in heavy ice conditions (chi (2), p < 0.05 - 0.001). White whales selected slope habitat (<chi>(2), p < 0.001), and gray whales selected coastal/shoal and shelf/trough habitat (<chi>(2), p < 0.025 - 0.001), in all ice conditions. In the Alaskan Beaufort Sea, bowheads selected shelf waters and white whales chose slope waters, without regard to transport conditions (<chi>(2), P < 0.01 - 0.001). In the northern Chukchi Sea, gray whales selected coastal/shoal habitat in high transport conditions (<chi>(2), p < 0.005), and shelf/trough habitat (<chi>(2), p < 0.001) during moderate and low transport conditions. Variability in distribution and habitat selection among these species is likely linked to prey availability at dissimilar trophic levels, although this hypothesis has yet to be rigorously tested.
Notes: ISI Document Delivery No.: 388UP
Times Cited: 10
Cited Reference Count: 69
URL: <Go to ISI>://000166201700010
Link to PDF: Moore_2000_cetacean_distribution_AK.pdf
Author Address: Scripps Inst Oceanog, SAIC, Maritime Serv Div, San Diego, CA 92110 USA.
Moore, SE, NOAA, Natl Marine Fisheries Serv, AFSC, Natl Marine Mammal Lab, 7600 Sand Point Way NE, Seattle, WA 98115 USA.
Language: English

Reference Type: Journal Article
Record Number: 278
Author: Moore, Sue E.; Clarke, Janet T.
Year: 1992
Title: Patterns of bowhead whale distribution and abundance near Barrow, Alaska, in

fall 1982-1989
Journal: Marine Mammal Science
Volume: 8
Issue: 1
Pages: 27-36
Date: Jan
Type of Article: Article
Short Title: Patterns of bowhead whale distribution and abundance near Barrow, Alaska, in fall 1982-1989
ISSN: 0824-0469
Accession Number: ISI:A1992HD20800003
Keywords: BOWHEAD WHALE; *BALAENA MYSTICETUS*; WHALING; ALASKA; BARROW; AERIAL SURVEY; ESKIMOS; OCS; DEVELOPMENT; CANADA; BEAUFORT SEA
Abstract: Although the distribution and relative abundance of bowhead whales varied annually within the fall whaling area near Barrow, Alaska, the distance of whales from shore was not significantly different among years 1982-1989 (ANOVA, F = 0.5, P > 0.5). The minimum detectable distance for the ANOVA was 12 km (alpha = 0.05, beta = 0.1). Annual median distance of random bowhead sightings from shore ranged from 23 to 39 km, with an eight-year median of 32 km. Highest annual bowhead sighting rates were positively associated with the proportion of feeding whales, indicating that whale feeding opportunities may affect the availability of whales within hunting range each fall.
Notes: ISI Document Delivery No.: HD208
Times Cited: 5
Cited Reference Count: 29
Link to PDF: Moore_Clarke_1992_bowhead_BarrowAK.pdf
Author Address: MOORE, SE, SCI APPLICAT INT CORP,DIV MARITIME SCI,2845-D NIMITZ BLVD,SAN DIEGO,CA 92106.
Language: English

Reference Type: Journal Article
Record Number: 226
Author: Moore, S. E.; DeMaster, Douglas P.; Dayton, P. K.
Year: 2000
Title: Cetacean habitat selection in the Alaskan Arctic during summer and autumn
Journal: Arctic
Volume: 53
Issue: 4
Pages: 432-447
Date: Dec
Short Title: Cetacean habitat selection in the Alaskan Arctic during summer and autumn
Accession Number: ISI:000166201700009
Keywords: ALASKA; ARCTIC; BEAUFORT SEA; BOWHEAD WHALE; *BALAENA MYSTICETUS*; CHUKCHI SEA; GRAY WHALE; HABITAT SELECTION; WHITE WHALE; *DELPHINAPTERUS LEUCAS*

Abstract: Ten years (1982-91) of sighting data from aerial surveys offshore of northern Alaska were analyzed to investigate seasonal variability in cetacean habitat selection. Distinct habitats were described for bowhead whales (*Balaena mysticetus*), white whales (*Delphinapterus leucas*), and gray whales (*Eschrichtius robustus*) on the basis of habitat selection ratios calculated for bathymetric and ice cover regimes. In summer, bowheads selected continental slope waters and moderate ice conditions; white whales selected slope and basin waters and moderate to heavy ice conditions; and gray whales selected coastal/shoal waters and open water. In autumn, bowheads selected inner shelf waters and light ice conditions; white whales selected outer shelf and slope waters and moderate to heavy ice; and gray whales selected coastal and shoal/trough habitats in light ice and open water. Habitat differences among species were significant in both seasons (ANOVA $F > 28$, $p < 0.00001$). Interseasonal depth and ice cover habitats were significantly different for bowhead whales ($p < 0.00002$), but not for gray whales ($p > 0.35$). White whale depth habitat was significantly different between seasons ($p < 0.00002$), but ice cover habitat was not ($p < 0.08$).
URL: <Go to ISI>://000166201700009
Link to PDF: Moore_etal_2000_cetacean_habitat_AK.pdf

Reference Type: Journal Article
Record Number: 496
Author: Moore, Sue E.; Grebmeier, Jacqueline M.; Davies, Jeremy R.
Year: 2003
Title: Gray whale distribution relative to forage habitat in the northern Bering Sea: Current conditions and retrospective summary
Journal: Canadian Journal of Zoology-Revue Canadienne De Zoologie
Volume: 81
Issue: 4
Pages: 734-742
Short Title: Gray whale distribution relative to forage habitat in the northern Bering Sea: Current conditions and retrospective summary
Abstract: Hundreds of gray whales (Eschrichtius robustus) stranded dead along beaches from Mexico to Alaska in
1999 and 2000. The cause of the mortalities remains unknown, but starvation resulting from a reduction in prey, especially
in the Chirikov Basin, was suggested as the cause. In the 1980s, the Chirikov Basin was considered a prime gray
whale feeding area, but there has been no recent comprehensive assessment of whale or prey distribution and abundance.
In 2002, a 5-day survey for gray whales revealed restricted distribution in the basin and a 3- to 17-fold decline
in sighting rates. To put these data in context, a retrospective summary of gray whale and benthic fauna distribution
and abundance was undertaken. During the 1980s, gray whale sighting rates in the Chirikov Basin were highly variable.
Ampeliscid amphipods dominated the benthos where gray whale sighting rates were

highest. Available measures
of biomass suggest a downturn in amphipod productivity from 1983 to 2000, when estimates of gray whale population
size were increasing, suggesting that the whales simply expanded their foraging range. We encourage long-term study
of the Chirikov Basin as a location where predator–prey responses to changing ocean climate can be researched, because
decadal time series data are available.
Link to PDF: Moore_etal_2003_graywhale_forage_habitat.pdf

Reference Type: Journal Article
Record Number: 231
Author: Moore, S. E.; Stafford, K. M.; Mellinger, David K.; Hildebrand, John A.
Year: 2006
Title: Listening for large whales in the offshore waters of Alaska
Journal: Bioscience
Volume: 56
Issue: 1
Pages: 49-55
Date: Jan
Short Title: Listening for large whales in the offshore waters of Alaska
Accession Number: ISI:000234491500011
Keywords: WHALE; ACOUSTICS; RECORDERS; REMOTE SENSING; ALASKA; NOAA; BLUE WHALE; FIN WHALE; HUMPBACK WHALE; NORTH PACIFIC RIGHT WHALE; BOWHEAD WHALE; SPERM WHALE; NORTH PACIFIC GRAY WHALE
Abstract: In 1999, the first phase of a multiyear program was initiated at the National Oceanic and Atmospheric Administration's National Marine Mammal Laboratory and Pacific Marine Environmental Laboratory to advance the use of passive acoustics for the detection and assessment of large whales in offshore Alaskan waters. To date, autonomous recorders have been successfully deployed in the Gulf of Alaska (1999–2001), the southeastern Bering Sea (2000–present), and the western Beaufort Sea (2003–2004). Seasonal occurrences of six endangered species (blue, fin, humpback, North Pacific right, bowhead, and sperm whales) have been documented on the basis of call receptions in these remote ocean regions. In addition, eastern North Pacific gray whale calls were detected in the western Beaufort Sea from October 2003 through May 2004. Here we provide an overview of this suite of research projects and suggest the next steps for applying acoustic data from long-term recorders to the assessment of large whale populations.
URL: <Go to ISI>://000234491500011
Link to PDF: Moore_etal_2006_Whales_offshore_AK.pdf

Reference Type: Journal Article
Record Number: 497
Author: Moore, Sue E.; Wynne, Kate M.; Kinney, Jaclyn Clement; Grebmeier,

Jacqueline M.
Year: 2007
Title: Gray whale occurrence and forage southeast of Kodiak Island, Alaska
Journal: Marine Mammal Science
Volume: 23
Issue: 2
Pages: 419-428
Short Title: Gray whale occurrence and forage southeast of Kodiak Island, Alaska
Abstract: no abstract
Link to PDF: Moore_etal_2007_GrayWhale_Kodiak.pdf

Reference Type: Journal Article
Record Number: 70
Author: Morton, A. B.; Symonds, H. K.
Year: 2002
Title: Displacement of *Orcinus orca* (L.) by high amplitude sound in British Columbia, Canada
Journal: ICES Journal of Marine Science
Volume: 59
Issue: 1
Pages: 71-80
Short Title: Displacement of *Orcinus orca* (L.) by high amplitude sound in British Columbia, Canada
Accession Number: ISI:000173358800006
Keywords: BRITISH COLUMBIA; LONG-TERM CHANGE; NOISE; KILLER WHALE; *ORCINUS ORCA*; HARBOR SEAL; *PHOCA VITULINA*; JOHNSTONE STRAIT; BROUGHTON ARCHIPELAGO; AHD
Abstract: Whale displacement by acoustic ‘‘pollution’’ has been diffcult to document, even in cases where it is strongly suspected, because noise effects can rarely be separated from other stimuli. Two independent studies on the natural history of killer whales (*Orcinus orca*) monitored frequency of whale occurrence from January 1985 through December 2000 in two adjacent areas: Johnstone Strait and the Broughton Archipelago. Four high-amplitude, acoustic harassment devices (AHDs) were installed throughout 1993 on already existing salmon farms in the Broughton Archipelago, in attempts to deter predation on fish pens by harbour seals (*Phoca vitulina Linnaeus*). While whale occurrence was relatively stable in both areas until 1993, it then increased slightly in the Johnstone Strait area and declined significantly in the Broughton Archipelago while AHDs were in use. Both mammal-eating and fish-eating killer whales were similarly impacted. Acoustic harassment ended in the Broughton Archipelago in May 1999 and whale occurrence re-established to baseline levels. This study concludes that whale displacement resulted from the deliberate introduction of noise into their environment.
Link to PDF: Morton_Symonds_2002_Displacement_KW_BC.pdf

Reference Type: Journal Article
Record Number: 71
Author: Mossbridge, Julia A.; Thomas, Jeanette A.
Year: 1999
Title: An "acoustic niche" for antarctic killer whale and leopard seal sounds
Journal: Marine Mammal Science
Volume: 15
Issue: 4
Pages: 1351-1357
Short Title: An "acoustic niche" for antarctic killer whale and leopard seal sounds
Accession Number: ISI:000083402100040
Keywords: KILLER WHALE; LEOPARD SEAL; ANTARCTIC
Abstract: no abstract
Link to PDF: Mossbridge_Thomas_1999_orca_leopardseal_sounds.pdf

Reference Type: Journal Article
Record Number: 279
Author: Moulton, Valerie D.; Richardson, W. John; Elliott, Robert E.; McDonald, Trent L.; Nations, Chris; Williams, Michael T.
Year: 2005
Title: Effects of an offshore oil development on local abundance and distribution of ringed seals (*Phoca hispida*) of the Alaskan Beaufort Sea
Journal: Marine Mammal Science
Volume: 21
Issue: 2
Pages: 217-242
Date: Apr
Type of Article: Article
Short Title: Effects of an offshore oil development on local abundance and distribution of ringed seals (*Phoca hispida*) of the Alaskan Beaufort Sea
ISSN: 0824-0469
Accession Number: ISI:000228570200003
Keywords: RINGED SEAL; *PHOCA HISPIDA*; OIL; MONITORING; AERIAL SURVEY; DISTRIBUTION; POWER ANALYSIS; POISSON REGRESSION; MULTIVARIATE ANALYSIS; IMPACT; BEAUFORT SEA; ALASKA; BEARDED SEAL; DENSITY; ICE; PREDATION; BEHAVIOR; HABITAT; ISLAND; LAIR
Abstract: This study investigates how densities of ringed seals were affected by construction and oil production activities at Northstar, an artificial island built in the nearshore Alaskan Beaufort Sea. Intensive and replicated aerial surveys of seals on landfast ice were conducted during six spring seasons: for three seasons before island construction began (1997-1999); after a winter of intensive island construction (2000); and after more limited construction plus drilling (2001) and drilling plus oil production (2002). A Poisson regression model was used to examine seal densities relative to distance from Northstar after allowance for environmental covariates. Post hoc power analysis indicated that the study design and Poisson regression approach had high

power to detect small-scale changes in seal densities near Northstar if such changes had occurred. However, seal densities during spring were not significantly affected by proximity to Northstar in 2000-2002. Habitat, temporal, and weather factors did have significant effects on seal densities. This study shows that effects of the Northstar oil development on local distribution of basking ringed seals are no more than slight, and are small relative to the effects of natural environmental factors. An understanding of environmental effects is essential when assessing potential impacts of industrial activity on ringed seals.
Notes: ISI Document Delivery No.: 918TJ
Times Cited: 1
Cited Reference Count: 38
URL: <Go to ISI>://000228570200003
Link to PDF: Moulton_etal_2005_ringedseal_OffshoreOil.pdf
Author Address: LGL Ltd, Environm Res Associates, St John, NF A1B 4A5, Canada. Western Ecosyst Technol Inc, Cheyenne, WY 82001 USA. LGL Alaska Res Associates Inc, Anchorage, AK 99518 USA.
Moulton, VD, LGL Ltd, Environm Res Associates, 388 Kenmount Rd,POB 13248 Stn A, St John, NF A1B 4A5, Canada.
vmoulton@lgl.com
Language: English

Reference Type: Journal Article
Record Number: 168
Author: Moulton, V. D.; Richardson, W. John; McDonald, T. L.; Elliott, R. E.; Williams, M. T.
Year: 2002
Title: Factors influencing local abundance and haulout behaviour of ringed seals (*Phoca hispida*) on landfast ice of the Alaskan Beaufort Sea
Journal: Canadian Journal of Zoology-Revue Canadienne De Zoologie
Volume: 80
Issue: 11
Pages: 1900-1917
Date: Nov
Short Title: Factors influencing local abundance and haulout behaviour of ringed seals (*Phoca hispida*) on landfast ice of the Alaskan Beaufort Sea
Accession Number: ISI:000180573800007
Keywords: RINGED SEAL; *PHOCA HISPIDA*; BEAUFORT SEA; ALASKA; ICE; HAULOUT; WEATHER
Abstract: This study investigates how the local abundance of ringed seals (*Phoca hispida*) on landfast ice of the central Alaskan Beaufort Sea is related to habitat factors and how the haulout behaviour of seals is influenced by temporal and weather factors. An understanding of these relationships is required before the potential impacts of industrial activity on ringed seals can be assessed. Intensive and replicated aerial surveys employing strip transect methodology were conducted during the springs of 1997–1999. Data were examined with $\chi 2$ tests and Poisson regression. The overall observed densities of ringed seals over water depths >3 m was 0.43, 0.39, and 0.63

seals/km2 in 1997–1999, respectively. Significantly more seals occurred over intermediate water depths, especially 10–20 m. In all years, seals were widely distributed on the landfast ice, but during breakup, higher numbers of seals occurred near the ice edge. Densities were significantly lower in areas with high ice deformation and extensive melt water. There was no consistent relationship between seal sightings and time of day within the 10:00–18:00 period with surveys. The peak period of haulout occurred around 1 and 2 June. Significantly more ringed seals were observed on warm, cloudy days. There was no indication that limited winter industrial activity, including ice roads and Vibroseis, occurring within the study area in 1997–1999 significantly affected ringed seal density in spring.
URL: <Go to ISI>://000180573800007
Link to PDF: Moulton_etal_2002_Ringed-seal_landfast_Beaufort.pdf

Reference Type: Journal Article
Record Number: 171
Author: Moulton, V. D.; Richardson, W. John; Williams, M. T.; Blackwell, Susanna B.
Year: 2003
Title: Ringed seal densities and noise near an icebound artificial island with construction and drilling
Journal: Acoustics Research Letters Online
Volume: 4
Issue: 4
Pages: 112-117
Date: Oct
Short Title: Ringed seal densities and noise near an icebound artificial island with construction and drilling
Accession Number: ISI:000189162100001
Keywords: RINGED SEAL; *PHOCA HISPIDA*; DRILLING; ALASKA; BEAUFORT SEA; ACOUSTICS
Abstract: A monitoring program documented densities of ringed seals, *Phoca hispida*, before and during development of the Northstar oil field in the central Alaskan Beaufort Sea. Aerial surveys of seals on landfast ice were conducted during the springs of 1997 to 1999 (pre-construction) and 2000–2001 (construction and drilling). Acoustic and vibration data were acquired during the ice-covered seasons of 2000 and 2001. Underwater sounds, in-air sounds, and iceborne vibrations from Northstar were above background levels to distances of 1–5, 0.5–4, and 1–4 km, respectively. However, seal densities close to Northstar in 2000 and 2001 were not reduced relative to those farther away or during the 1997 to 1999 period.
URL: <Go to ISI>://000189162100001
Link to PDF: Moulton_etal_2003_ringedseal_drilling_AK.pdf

Reference Type: Journal Article
Record Number: 354
Author: Myrberg, A. A.

Year: 1990
Title: Effects of man-made noise on the behavior of marine animals
Journal: Environment International
Volume: 16
Issue: 4-6
Pages: 575-586
Short Title: Effects of man-made noise on the behavior of marine animals
Keywords: ANTHROPOGENIC NOISE; MARINE ANIMALS; ACOUSTICS; UNDERWATER; PETROLEUM PROSPECTING; ENVIRONMENTAL IMPACT; NOISE POLLUTION; FISH; MARINE MAMMALS
Abstract:
Reports of the effects of man-made noise on the behavior and related processes of marine animals are widely scattered among a variety of literature sources. This report brings much of this literature together and attempts a synthesis by a comparative analysis of the results obtained from taxonomically diverse species. Mammals and fishes are emphasized since little is known about the subject in other groups. Field studies have shown aversion by various baleen and toothed whales to the noise accompanying offshore petroleum exploration and production. Variation in response involves: level of source-noise to that of the ambient, degree of naivete of the animals to the source-noise, on-going activity at the time of exposure and, to an uncertain degree, the species involved. Although seals and their relatives have not been adequately examined regarding their response to underwater noise, individuals have been shown to be clearly susceptible (anatomically based) to high levels of such noise. Studies have also shown the deleterious effects of even moderate noise levels on hearing in fishes. Aversion to various types of man-made noise has been noted several times, with associated levels being similar to those noted when similar responses were recorded by whales. Finally, several studies have documented abnormal growth and reproductive processes in several species of fin-and shellfish due to high levels of man-made noise. Such findings should be of concern to the field of aquaculture, since it is dependent on such fundamental processes.
Research Notes: Marine mammals and fish responses to noise.
Link to PDF: Myrberg_1990_FX_Anthropogenic_MMs.pdf

Reference Type: Journal Article
Record Number: 390
Author: Nachtigall, P.E.; Supin, A.Y.; Pawloski, J.; Au, Whitlow W. L.
Year: 2004
Title: Temporary threshold shifts after noise exposure in the bottlenose dolphin (*Tursiops truncatus*) measured using auditory evoked potentials.
Journal: Marine Mammal Science
Volume: 20
Issue: 4
Pages: 673-687
Date: October
Short Title: Temporary threshold shifts after noise exposure in the bottlenose dolphin

(*Tursiops truncatus*) measured using auditory evoked potentials.
Keywords: auditory evoked potential
TTS
Hearing damage
Bottlenose Dolphin
Tursiops truncatus
Abstract: The time course of recovery from temporary threshold shift (TTS) was measured in a bottlenose dolphin, *Tursiops truncatus*, using an evoked-potential procedure. The envelope-following response (EFR), which is a rhythmic train of auditory brainstem responses (ABR) to sinusoidally amplitude-modulated tones, was used as an indicator of the sound reception by the animal. Variation of the intensity of the stimulus allowed us to measure the animal's hearing via EFR thresholds. During each session, following an initial measure of threshold, the trained animal voluntary positioned itself within a hoop 1 m underwater while a 160 dB re 1 muPa noise of a 4- 11 kHz bandwidth was presented for 30 min. After the noise exposure, thresholds were measured again at delays of 5, 10, 15, 25, 45, and 105 min. Measurements were made at test frequencies of 8, 11.2, 16, 22.5, and 32 kHz. The maximum TTS occurred 5 min after exposure and rapidly recovered with a rate of around 1.5 dB per doubling of time. TTS Occurred at test frequencies from 8 to 16 kHz, with the maximum at 16 kHz. TTS was negligible at 22.5 kHz and absent at 32 kHz.
Link to PDF: Nachtigall_etal_2004_TTS_Dolphin_AEP.pdf

Reference Type: Report
Record Number: 505
Author: Nedwell, J.R.; Edwards, B.; Turnpenny, A.W.H.; Gordon, J. C. D.
Year: 2004
Title: Fish and Marine Mammal Audiograms: A Summary of Available Information
City: Hampshire, UK
Institution: ChevronTexaco, Ltd., TotalFinaElf Exploration UK PLC, DSTL, Department of Trade and Industry, and Shell UK Exploration and Production Ltd.
Date: 3 September 2004
Short Title: Fish and Marine Mammal Audiograms: A Summary of Available Information
Report Number: 534R0214
Link to PDF: Nedwel_etal_2004l_Fish_Mammals_534R0214.pdf
Author Address: Subacoustech, Ltd.

Reference Type: Report
Record Number: 401
Author: NOAA
Year: 1994
Title: Marine Mammal Protection Act of 1972 Annual Report
Institution: National Oceanic and Atmospheric Administration
Pages: 1-167
Date: 31 December 1994

Type: Annual Report
Short Title: Marine Mammal Protection Act of 1972 Annual Report
Research Notes: 1994 amendments to MMPA include Alaska Native Take of Marine Mammals (Chapter VII). Bowhead whales, Northern fur seals, Steller sea lions, harbor seals, beluga whales. Subsistence Take.

"While each stock of marine mammals will require individual plans that address the differing cultural uses, the plans will have similar goals. These goals include establishing a flexible management process combining Federal resource management policies with traditional cultural perspectives, preserving and enhancing stocks through determining mutually acceptable harvest levels, fostering development of subsistence harvest self-regulation and monitoring, increasing local participation in scientific research and year round monitoring by user communities, and encouraging educational outreach programs both within the Natives communities and beyond."
URL: http://www.nmfs.noaa.gov/pr/pdfs/laws/mmpa_annual_1994.pdf
Link to PDF: MMPA_1994_annual_report.pdf
Caption: National Oceanic and Atmospheric Administration

Reference Type: Online Multimedia
Record Number: 417
Created By: NOAA
Year: 2001
Title: The *Exxon Valdez* oil spill: how much oil remains?
Date Accessed: 20 July 2007
Abstract: [WEBPAGE] - no abstract
Research Notes: 2001 NOAA study, funded by *Exxon Valdez* Oil Spill Trustee Council (EVOSTC). NOAA Alaska Fisheries Science Center website, last updated date unknown.
URL: http://www.afsc.noaa.gov/Quarterly/jas2001/feature_jas01.htm
Link to PDF: NOAA_Exxon_HowMuch_2001.pdf
Author Address: National Oceanic and Atmospheric Administration
Access Date: Access Date

Reference Type: Generic
Record Number: 524
Author: NOAA; NMFS
Year: 2005
Title: 70 *Federal Register* 1871
Secondary Title: Notice of Intent to Prepare and Environmental Impact Statement
Date: 11 January 2005
Short Title: 70 *Federal Register* 1871

Reference Type: Generic

Record Number: 523
Author: NOAA; NMFS
Year: 2006
Title: 71 *Federal Register* 77694
Secondary Title: Proposed Endangered Status for North Pacific Right Whale
Volume: 50 CFR Part 2004
Date: 27 December 2006
Short Title: 71 *Federal Register* 77694

Reference Type: Journal Article
Record Number: 435
Author: Nowacek, Douglas P.; Johnson, Mark P.; Tyack, Peter L.
Year: 2004
Title: North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alerting stimuli
Journal: Proceedings of the Royal Society Section B-Biological Sciences
Volume: 271
Pages: 227-231
Short Title: North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alerting stimuli
Keywords: *EUBALAENA GLACIALIS*; SHIP STRIKE; CONTROLLED EXPOSURE EXPERIMENT; PLAYBACK
Abstract: North Atlantic right whales were extensively hunted during the whaling era and have not recovered. One
of the primary factors inhibiting their recovery is anthropogenic mortality caused by ship strikes. To assess
risk factors involved in ship strikes, we used a multi-sensor acoustic recording tag to measure the responses
of whales to passing ships and experimentally tested their responses to controlled sound exposures, which
included recordings of ship noise, the social sounds of conspecifics and a signal designed to alert the
whales. The whales reacted strongly to the alert signal, they reacted mildly to the social sounds of conspecifics,
but they showed no such responses to the sounds of approaching vessels as well as actual vessels.
Whales responded to the alert by swimming strongly to the surface, a response likely to increase rather
than decrease the risk of collision.
Research Notes: Controlled exposure experiments on wild right whales in Bay of Fundy. DTAG to record whale behavior. Playback of right whale vocalizations, vessel noise, alert sound, silent stimulus. No significant response seen in diving behavior in response to silent stimulus, vocalizations, or vessel noise. 5 of 6 whales significantly responded to alert signal by abandoning foraging dive prematurely, shallow-angled high power ascent, stay at surface for abnormally long time. 6th whale no detectable

response. Response to alert signal good but it brought them closer to the surface therefore making a strike more likely, especially if there is more than one vessel in the area.
Link to PDF: Nowacek_etal_2004_NARight_ShipNoise.pdf

Reference Type: Journal Article
Record Number: 281
Author: Nowacek, Douglas P.; Tyack, Peter L.; Wells, Randall S.
Year: 2001
Title: A platform for continuous behavioral and acoustic observation of free-ranging marine mammals: Overhead video combined with underwater audio
Journal: Marine Mammal Science
Volume: 17
Issue: 1
Pages: 191-199
Date: Jan
Type of Article: Article
Short Title: A platform for continuous behavioral and acoustic observation of free-ranging marine mammals: Overhead video combined with underwater audio
ISSN: 0824-0469
Accession Number: ISI:000165886400014
Keywords: BOTTLENOSE DOLPHIN; *BALAENA MYSTICETUS*; BOWHEAD WHALE; BEAUFORT SEA; SAMPLING METHODS; PATTERN; ARRAY; BOAT; BEHAVIOR
Abstract: no abstract
Notes: ISI Document Delivery No.: 383ML
Times Cited: 9
Cited Reference Count: 39
URL: <Go to ISI>://000165886400014
Link to PDF: Nowacek_etal_2001_marmam_behavior_sampling.pdf
Author Address: Woods Hole Oceanog Inst, Dept Biol, Woods Hole, MA 02543 USA.
Mote Marine Lab, Chicago Zool Soc, Sarasota, FL 34236 USA.
Nowacek, DP, Mote Marine Lab, 1600 Ken Thompson Pkwy, Sarasota, FL 34236 USA.
Language: English

Reference Type: Journal Article
Record Number: 343
Author: Nowacek, S. M.; Wells, R. S.; Solow, A. R.
Year: 2001
Title: Short-term effects of boat traffic on bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida
Journal: Marine Mammal Science
Volume: 17
Issue: 4
Pages: 673-688
Date: Oct

Type of Article: Article
Short Title: Short-term effects of boat traffic on bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida
Alternate Journal: Mar. Mamm. Sci.
ISSN: 0824-0469
Accession Number: ISI:000171809200001
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; FLORIDA; DISTURBANCE RESPONSE; BOAT; INTERBREATH INTERVAL; CONSERVATION; DOLPHIN; PERSONAL WATERCRAFT; RESPONSES; DISTURBANCE; BEHAVIOR; PATTERN; VESSEL
Abstract: Coastal cetaceans are subject to potential injury or disturbance from vessels. In Sarasota, Florida, where about 120 resident bottlenose dolphins, *Tursiops truncatus*, share the inshore waters with over 34,000 registered boats, disturbance potential is high. We assessed specific behavioral responses of individual dolphins to boat traffic. We conducted focal animal behavioral observations during opportunistic and experimental boat approaches involving 33 well-known identifiable individual bottlenose dolphins. Dolphins had longer interbreath intervals (IBI) during boat approaches compared to control periods (no boats within 100 m). Treatment IBI length was inversely correlated with distance to the nearest boat in opportunistic observations. During 58 experimental approaches to 18 individuals, a video system suspended from a tethered airship was used to observe subsurface responses of focal dolphins as boats under our control, operating at specified speeds, were directed near dolphins. Dolphins decreased interanimal distance, changed heading, and increased swimming speed significantly more often in response to an approaching vessel than during control periods, Probability of change for both interanimal distance and heading increased when dolphins were approached while in shallow water. Our findings provide additional support for the need to consider disturbance in management plans for cetacean conservation.
Notes: ISI Document Delivery No.: 486GC
Times Cited: 19
Cited Reference Count: 38
Research Notes: Bottlenose dolphine behavioral responses to approaching vessels.
URL: <Go to ISI>://000171809200001
Link to PDF: Nowacek_etal_2001_bottlenose_vessel.pdf
Author Address: Mote Marine Lab, Chicago Zool Soc, Sarasota, FL 34236 USA.
Woods Hole Oceanog Inst, Woods Hole, MA 02543 USA.
Nowacek, SM, Mote Marine Lab, Chicago Zool Soc, 1600 Ken Thompson Pkwy, Sarasota, FL 34236 USA.
Language: English

Reference Type: Book
Record Number: 385
Author: NRC
Year: 2003
Title: *Ocean Noise and Marine Mammals*
City: Washington, D.C.
Publisher: National Academy Press

Number of Pages: 192
Translator: National Research Council
Short Title: *Ocean Noise and Marine Mammals*
ISBN: 0-309-08536-5
Notes: National Research Council
Link to PDF: NRC_2003_ocean_noise_marmamTOC.pdf

Reference Type: Book
Record Number: 391
Author: NRC
Year: 2005
Title: *Marine Mammal Populations and Ocean Noise*
City: Washington, D.C.
Publisher: National Academy Press
Number of Pages: 126
Translator: National Research Council
Short Title: *Marine Mammal Populations and Ocean Noise*
ISBN: 0-309-09449-6
Notes: National Research Council
Link to PDF: NRC_2005_BiologicallySignificantFX.pdf

Reference Type: Book Section
Record Number: 450
Author: O'Corry-Crowe, Greg M.; Dizon, Andrew E.; Suydam, R. S.; Lowry, Lloyd F.
Year: 2002
Title: Molecular genetic studies of population structure and movement patterns in migratory species: The beluga whale, *Delphinapterus leucas*, in the western neoarctic
Editor: Pfeiffer, Carl J.
Book Title: *Molecular and Cell Biology of Marine Mammals*
City: Malabar, Florida
Publisher: Kreiger Publishing Company
Short Title: Molecular genetic studies of population structure and movement patterns in migratory species: The beluga whale, *Delphinapterus leucas*, in the western neoarctic
URL: http://www.krieger-publishing.com/Pfeiff814.pdf

Reference Type: Journal Article
Record Number: 539
Author: Offutt, George C.
Year: 1973
Title: Structures for the detection of acoustic stimuli in the Atlantic codfish, *Gadus morhua*
Journal: Journal of the Acoustical Society of America
Volume: 56

Issue: 2
Pages: 665-671
Short Title: Structures for the detection of acoustic stimuli in the Atlantic codfish, *Gadus morhua*
Abstract: Codfish, Gadus rnorhua, were classically conditioned to respond to tonal stimuli with a change in
heart rate. Thresholds were obtained at frequencies from 10 to 600 Hz. Sensitivity of receptors was
determined by ablation operations. The sacculus had the lowest thresbold at 150 Hz (-35 dB re 1
p. bar) and the lagena and utriculus might have successively higher thresholds. One fish was about 9
dB less sensitive at 150 Hz after swim-bladder ablation. A piezoelectric transduction mechanism was
hypothesized for the sacculus. The lateral line might detect the acoustic stimulus and be most
sensitive at 75 Hz to particle velocity (-14 dB re 1 uvar).
Link to PDF: Offutt_1973_codfish_acoustic_stimuli.pdf

Reference Type: Journal Article
Record Number: 495
Author: Olesiuk, Peter F.; Nichol, Linda M.; Sowden, Margaret H.; Ford, John K. B.
Year: 2002
Title: Effect of the sound generated by an acoustic harassment device on the relative abundance and distribution of harbor porpoises, *Phocoena phocoena*, in Retreat Passage, British Columbia
Journal: Marine Mammal Science
Volume: 18
Issue: 4
Pages: 843-862
Short Title: Effect of the sound generated by an acoustic harassment device on the relative abundance and distribution of harbor porpoises, *Phocoena phocoena*, in Retreat Passage, British Columbia
Keywords: HARBOR PORPOISE; *PHOCOENA PHOCOENA*; SOUND; ACOUSTIC HARASSMENT DEVICE; BRITISH COLUMBIA
Abstract: We describe an experiment conducted to assess the impact of the sound generated
by an acoustic harassment device (AHD) on the relative abundance and distribution of harbor porpoises (Phocoena phocoena) in Retreat Passage, British Columbia. During control periods when the AHD was inactive, the mean number of porpoises observed in the study area was 0.39 for broad area scans conducted with the naked eye and 0.48 for narrow sector scans conducted with binoculars. Abundance declined precipitously when the AHD was activated, to 0.007 porpoises per broad area scan and 0.018 per narrow sector scan. The mean number of porpoise resightings while tracking their movements also

declined from 12.2 to 13.6 per sighting during control periods to 1.1-1.9 per sighting when the AHD was activated, which suggested that the few porpoises that ventured into the study area spent less time within it when the AHD was activated. The effect of the AHD diminished with distance. No porpoises were observed within 200 m of the AHD when it was accivated. The number of sightings and resightings observed when it was activated was less than 0.2% of the number expected had there been no AHD effect at a range of 200-399 m, 1.4% the number expected at a range of 400-599 m, varied between 2.5% and 3.3% of the number expected at a range of 600-2,499 m, and was 8.1% the number expected at a range of 2,500-3,500 m, which suggested that the impact of the AHD extended beyond our maximum sighting range of 3.5 km.
Link to PDF: Olesiuk_etal_2002_harborporpoise_AHD.pdf

Reference Type: Thesis
Record Number: 364
Author: Ollervides, F. J.
Year: 2001
Title: Gray whale and boat traffic: Movement, vocal, and behavioral responses in Bahia Magdalena, Mexico
Academic Department: Wildlife and Fisheries Sciences
University: Texas A&M
Degree: Doctor of Philosophy
Advisor: Wursig, B.; Evans, William E.
Date: 2001
Thesis Type: Ph.D
Short Title: Gray whale and boat traffic: Movement, vocal, and behavioral responses in Bahia Magdalena, Mexico
Keywords: *ESCHRICHTIUS ROBUSTUS*; GRAY WHALE; ACOUSTICS; VOCALIZATION
Abstract: Theodolite surveys, acoustic recordings, and behavioral sampling were conducted from January to May for 4 consecutive years 1997-2000 to assess temporal and spatial overlap of whale-watching activities and gray whales, *Eschrichtius robustus*, that are present seasonally in Bahía Magdalena, México. Data on occurrence and movements of whales and boats were collected with a Sokkisha DT20E theodolite from Magdalena Island (24.32°N, 112.03°W) and from San Carlos Pier (24.47°N, 112.07°W). A total of 691 scans were analyzed with Aardvark 1.2.4 and Pythagoras 1.2.1 computer software. Acoustic data were collected with an 8104 B&K hydrophone and 2635 B&K preamplifier connected to a Marantz 430 recorder aboard a research skiff. A total of 2884 minutes of field recordings from the skiff were analyzed with Canary 1.2 computer software and 906 minutes of behavioral data were collected concurrently. While boat traffic did not affect overall number of whales, pod speed, linearity and reorientation movements of whales were different, and the speed of travel for individual whales was slower during boat presence than absence. Ambient noise throughout Bahía Magdalena varied as a function of bottom depth and boat traffic. Whale vocalizations changed in response to ambient noise levels, which increased due to boats. Eleven distinct gray

whale call types were identified and coded BMC1 through BMC11, and specific characteristics in each signal type, such as central frequency, bandwidth, duration, and high and low frequencies, were contrasted in the presence and absence of boats. Whale behavioral responses varied with type of approach by boats. Approaches that were fast or close (direct) resulted in more fluke down dives, rolling, and change in heading. Approaches that were slow or far (indirect) resulted in more head raises and fluke and flipper swishes. In summary, although acoustic and behavioral response of whales varied with location, pod size and composition, activity, and age, short-term effects of boat traffic are evident. Because of this, continued assessment of the cumulative effects of increased boat traffic in the Bahía Magdalena Complex is recommended. Changes to the present whale-watching regulations are suggested.
Research Notes: Gray whale behavioral responses to whale-watching vessels.
Link to PDF: Ollervides_2001_graywhale_tourism.pdf

Reference Type: Journal Article
Record Number: 283
Author: Orams, Mark B.
Year: 2000
Title: Tourists getting close to whales, is it what whale-watching is all about?
Journal: Tourism Management
Volume: 21
Issue: 6
Pages: 561-569
Date: Dec
Type of Article: Article
Short Title: Tourists getting close to whales, is it what whale-watching is all about?
Alternate Journal: Tourism Manage.
ISSN: 0261-5177
Accession Number: ISI:000087497100002
Keywords: ECOTOURISM; TOURISM; WHALE-WATCHING; SATISFACTION; TANGALOOMA; RECREATIONAL USE; VESSEL; BOAT
Abstract: To date research on whale-watching has tended to focus on impacts on the whales. Management approaches often rely on minimum approach distances. An associated assumption is that whale-watchers wish to get close to whales. Studies of motivation for other recreational activities show that humans seldom undertake recreational activities for simplistic reasons. Thus, this study was developed to determine the influences over whale-watchers' enjoyment, more specifically, to assess the importance of the geographical proximity of whales. Twelve whale-watch cruises at Tangalooma, Australia were surveyed and 704 questionnaires analysed. Results showed the number of whales and their behaviour, numbers of fellow passengers, cruise duration, boat construction and sea-sickness influenced satisfaction. The geographical proximity of the whales was not a major influence. Many whale-watchers (35 per cent) returned satisfied even when no whales were sighted. Whale-watching is not simply about getting close to whales, many other variables are important. A better understanding of the watchers, as well as the whales, will assist in the sustainable

management of this growing tourism industry. (C) 2000 Elsevier Science Ltd. All rights reserved.
Notes: ISI Document Delivery No.: 322EK
Times Cited: 4
Cited Reference Count: 42
URL: <Go to ISI>://000087497100002
Link to PDF: Orams_2000_tourism_whales.pdf
Author Address: Massey Univ, Ctr Tourism Res, N Shore MSC, New Zealand.
Orams, MB, Massey Univ, Ctr Tourism Res, Private Bag 102 904, N Shore MSC, New Zealand.
Language: English

Reference Type: Journal Article
Record Number: 73
Author: Patel, Ruben; Handegard, Nils Olav; Godo, Olav Rune
Year: 2004
Title: Behaviour of herring (*Clupea harengus L.*) towards an approaching autonomous underwater vehicle
Journal: ICES Journal of Marine Science
Volume: 61
Issue: 7
Pages: 1044-1049
Short Title: Behaviour of herring (*Clupea harengus L.*) towards an approaching autonomous underwater vehicle
Accession Number: ISI:000224998600004
Keywords: ACOUSTIC SAMPLING; AUTONOMOUS UNDERWATER VEHICLE; AUV; AVOIDANCE DISTANCE; OVER-WINTERING HERRING
Abstract: The reaction of schooling wintering herring (Clupea harengus L.) in Ofotfjord in northern
Norway is studied when approached by an autonomous underwater vehicle (AUV) with electrical propulsion. The reaction of herring is recorded running the AUV in the beam of the mother vessel's 38-kHz echosounder and in more detail with an onboard 120-kHz echosounder. The results indicate an insignificant reaction of herring to the approaching AUV, although some variations were observed depending on the experimental set-up. Technical uncertainty in the recordings close to the AUV transducer creates some ambiguity in the results. No reaction could be identified from the ship's sounder when the
AUV passed under the vessel. Processing of the onboard echosounder data suggests a mean
avoidance distance of 8.0 m in these experiments. In a realistic autonomous survey situation
it is assumed that the AUV can approach as closely as 5e10 m to herring schools without
affecting the acoustic observation, which makes it a potentially useful platform for hydroacoustic research and survey. More systematic studies are needed to precisely define

the threshold reaction distance to the AUV, and the work should be conducted with transducers on a more silent platform than RV ‘‘Johan Hjort’’, which was used in this study.
Link to PDF: Patel_etal_2004_herring_underwater_vehicle.pdf

Reference Type: Journal Article
Record Number: 74
Author: Patenaude, Nathalie J.; Richardson, W. John; Smultea, Mari A.; Koski, William R.; Miller, Gary W.; Würsig, Bernd; Greene, Charles R. Jr.
Year: 2002
Title: Aircraft sound and disturbance to bowhead and beluga whales during spring migration in the Alaskan Beaufort Sea
Journal: Marine Mammal Science
Volume: 18
Issue: 2
Pages: 309-335
Short Title: Aircraft sound and disturbance to bowhead and beluga whales during spring migration in the Alaskan Beaufort Sea
Accession Number: ISI:000175164000001
Keywords: BOWHEAD WHALE; *BALAENA MYSTICETUS;* BELUGA WHALE; *DELPHINAPTERUS LEUCAS*; ALASKA; BEAUFORT SEA; ARCTIC; AIRCRAFT DISTURBANCE; AIRCRAFT SOUND; UNDERWATER NOISE; HELICOPTER; BEHAVIOR
Abstract: Short-term behavioral responses of bowhead whales (Balaena mystzcetzs) and
beluga whales (Delphinapteras leacas) to a Bell 2 12 helicopter and Twin Otter fixed-wing aircraft were observed opportunistically during four spring seasons (1989-1991 and 1994). Behaviors classified as reactions consisted of short surfacings, immediate dives or turns, changes in behavior state, vigorous swimming, and breaching.
The helicopter elicited fewer detectable responses by bowheads (14% of 63 groups) than by belugas (38% of 40). Most observed reactions by bowheads (63%) and belugas (86%) occurred when the helicopter was at altitudes 5150 m and lateral distances 5250 m. Belugas reacted significantly more frequently during overflights at lateral distances 5250 m than at longer lateral distances (P = 0.004). When the helicopter was on the ice with engines running, 7 of 14 groups of belugas reacted, up to 320 m away, sometimes with smallscale (5100 m) diversion; only 1 of 8 groups of bowheads reacted.
For the fixed-wing aircraft, few bowheads (2.2%) or belugas (3.2%) were observed to react to overflights at altitudes 60-460 m. Most observed reactions by bowheads (73%) and belugas (70%) occurred when the fixed-wing aircraft was at altitudes 1182 m and lateral distances 5250 m. However, the proportions reacting, especially to low-altitude flights (e.g., 5 182 m), were underestimated for both species because observation opportunities were brief. Even so, reactions were more common when the aircraft was low (5182 m):

P = 0.009 for belugas, P = 0.06 for bowheads. There was little if any reaction by bowheads when the aircraft circled at altitude 460 rn and radius 1 km. Aircraft sounds measured underwater at depths 3 m and 18 m showed that a Bell 212 helicopter was 7-17.5 dB noisier than a Twin Otter (10-500 Hz band). Bell 212 sound consisted mainly of main rotor tones ahead of the helicopter and tail rotor tones behind it. Twin Otter sound contained fewer prominent tones. Peak sound level as received underwater was inversely related to aircraft altitude, and received levels at 3 m depth averaged 2.5 dB higher than at 18 m depth. The dominant low-frequency components of aircraft sound are presumed to be readily audible to bowheads. For belugas, these components may be inaudible, or at most only weakly audible. Midfrequency sound components, visual cues, or both, are probably important in eliciting beluga reactions to aircraft.
Link to PDF: Patenaude_etal_2002_bowhead_beluga_aircraft.pdf

Reference Type: Journal Article
Record Number: 76
Author: Pavan, G.; Borsani, J. F.
Year: 1997
Title: Bioacoustic research on cetaceans in the Mediterranean Sea
Journal: Marine and Freshwater Behaviour and Physiology
Volume: 30
Issue: 2
Pages: 99-123
Short Title: Bioacoustic research on cetaceans in the Mediterranean Sea
Accession Number: ISI:A1997YF66100002
Keywords: CETACEAN

Reference Type: Journal Article
Record Number: 77
Author: Petel, T. D. V.; Terhune, J. M.; Hindell, M. A.; Giese, M. A.
Year: 2006
Title: An assessment of the audibility of sound from human transport by breeding Weddell seals (*Leptonychotes weddellii*)
Journal: Wildlife Research
Volume: 33
Issue: 4
Pages: 275-291
Short Title: An assessment of the audibility of sound from human transport by breeding Weddell seals (*Leptonychotes weddellii*)
Accession Number: ISI:000238559200003
Keywords: WEDDELL SEAL; *LEPTONYCHOTES WEDDELLII*; ANTHROPOGENIC NOISE; AIRCRAFT; OHV
Abstract: Anthropogenic noise generated through travel in the Antarctic has the

potential to affect the region's wildlife. Weddell seals (*Leptonychotes weddellii*) in particular can be exposed to anthropogenic noise because they live under, and breed on, the fast ice on which humans travel. To investigate the potential effects of anthropogenic noise on Weddell seals we developed sound profiles for pedestrian travel, over-snow vehicles, aircraft and watercraft operating at various distances and altitudes from breeding seals. The received 1/3-octave noise levels were then related to an assumed detection threshold for the Weddell seal. We found that most noise levels generated by the pedestrian, quad (4-wheeled, all-terrain vehicle) and Hagglunds (tracked, all-terrain vehicle) were commonly categorised in the inaudible and barely audible range of detection (both in-air and underwater), while noise levels generated by the helicopter, Twin Otter aircraft and Zodiac boat were categorised more commonly in the barely audible and clearly audible range. Experimental underwater recordings of vocal behaviour of Weddell seals exposed to continuous low-amplitude over-snow vehicle noise (i.e. Hagglund operation) were also made. Weddell seals underwater did not alter individual call types in response to low-level Hagglunds noise, but they did decrease their calling rate.
Link to PDF: Petel_etal_2006_Audibility_transport_WeddellSeals.pdf

Reference Type: Journal Article
Record Number: 78
Author: Peters, Kimberly A.; Otis, David L.
Year: 2005
Title: Using the risk-disturbance hypothesis to assess the relative effects of human disturbance and predation risk on foraging American oystercatchers
Journal: Condor
Volume: 107
Issue: 3
Pages: 716-725
Short Title: Using the risk-disturbance hypothesis to assess the relative effects of human disturbance and predation risk on foraging American oystercatchers
Accession Number: ISI:000231194500023
Keywords: AMERICAN OYSTERCATCHER; BOAT; DISTURBANCE; *HAEMATOPUS PALLIATUS*; RISK-DISTURBANCE HYPOTHESIS; VIGILANCE
Abstract: The risk-disturbance hypothesis asserts
that animals perceive human disturbance similar to
nonlethal predation stimuli, and exhibit comparable responses
in the form of optimization tradeoffs. However,
few studies have examined how natural predation elicit such responses. We observed American Oystercatcher
(Haematopus palliatus) vigilance behavior
from September–December 2002 on the Cape Romain
National Wildlife Refuge, South Carolina. A set of
models was constructed based on 340 focal-animal
samples and models revealed relationships between
vigilance behavior, predator density, and boat activity.

Oystercatchers increased vigilance in response to aerial predators, particularly late in the season when predator species composition was dominated by Northern Harriers (Circus cyaneus). At a broader temporal scale, oystercatchers exhibited the highest vigilance rates during simultaneous peaks in boating disturbance and Osprey (Pandion haliaetus) activity. Due to this temporal overlap of stimuli, it is difficult to interpret what may have been driving the observed increased in vigilance. Foraging rates appeared to be primarily driven by habitat and tidal stage indicating that time lost to vigilance did not effectively reduce intake. Taken together, these findings provide some support for the risk-disturbance hypothesis, underscore the sensitivity of disturbance studies to temporal scale, and draw attention to the potential confounding effects of natural predation risk.
Link to PDF: Peters_Otis_2005_oystercatcher_human_disturb.pdf

Reference Type: Journal Article
Record Number: 338
Author: Phoel, W. C.; Meehan, J. M.; Hotaling, J. M.
Year: 1997
Title: Modern fisheries research vessel requirements and acquisition strategies
Journal: Marine Technology Society Journal
Volume: 31
Issue: 4
Pages: 44-48
Date: Win
Type of Article: Article
Short Title: Modern fisheries research vessel requirements and acquisition strategies
Alternate Journal: Mar. Technol. Soc. J.
ISSN: 0025-3324
Accession Number: ISI:000071902000007
Keywords: VESSEL; FISHERIES
Abstract: Fisheries research vessels (FRVs) are characterized by their capability to conduct stock assessments and biological sampling of fish, shellfish, marine mammals and other species as well as to collect related oceanographic samples and data on the sane cruise. They are required to tow large mid-water and bottom trawls, conduct hydroacoustic surveys, cast and recover biological and oceanographic samplers and instrumentation, and have laboratories and facilities for processing the samples and data. The existing U.S. fleet of eight FRVs, all owned and operated by the National Oceanic and Atmospheric Administration (NOAA), has become functionally obsolete with reliability and safety decreasing while maintenance costs are increasing. A new fleet of multifunctional ships, capable of supporting 24-hour, interdisciplinary research is

required. Foreign countries with vested interests in fishery resources have invested heavily to build new fleets of FRVs with modern capabilities including the universal requirement for quiet vessels with low underwater radiated noise, modern research laboratories and instrumentation, sea-kindliness for manipulative experimentation and modern safety standards, (e.g. USCG, ABS, SOLAS, FCC, USPHS, for U.S. FRVs). The projected future needs for fisheries data and how these FRVs will contribute to the health and management of the National and World fisheries will be discussed. The process which NOAA is pursuing to obtain long-term availability of these FRVs has many considerations. Securing the funding commitment for appropriated funds, or long-term contract authority, to assure the continued availability of these ships to maintain the essential stock assessment data series complicates the procurement process. This paper includes the scientific needs and requirements' definition and their relationships to ship design, equipment features and schedule complications which are accompanied with Government procurement considerations and project execution. Also discussed is the desired acquisition strategy being fostered, the management approach to reducing procurement risks and costs, and the procurement schedule conflict with the realities of funding authority availability for such a fleet of FRV's to be brought on line.
Notes: ISI Document Delivery No.: YW137
Times Cited: 0
Cited Reference Count: 3
URL: <Go to ISI>://000071902000007
Author Address: Phoel Associates Inc, Toms River, NJ USA. NOAA, Natl Marine Fisheries Serv, Off Sci & Technol, Silver Spring, MD USA. NOAA, Syst Acquisit Off, Silver Spring, MD USA.
Phoel, WC, Phoel Associates Inc, Toms River, NJ USA.
Language: English

Reference Type: Journal Article
Record Number: 210
Author: Piantadosi, C. A.; Thalmann, E. D.
Year: 2004
Title: Pathology - Whales, sonar and decompression sickness
Journal: Nature
Volume: 428
Pages: 6984
Date: 15 April 2004
Short Title: Pathology - Whales, sonar and decompression sickness
Electronic Resource Number: DOI 10.1038/nature02527
Accession Number: ISI:000220823800028
Keywords: WHALE; SONAR
URL: <Go to ISI>://000220823800028
Link to PDF: Piantadosi_etal_2004_Letter_whale-sonar_bends.pdf

Reference Type: Journal Article
Record Number: 501

Author: Popper, Arthur N.; Clarke, N.L.
Year: 1976
Title: The auditory system of goldfish (*Carassius auratus*): Effects of intense acoustic stimulation
Journal: Comparative Biochemistry and Physiology A-Molecular and Integrative Physiology
Volume: 53
Pages: 11-18
Short Title: The auditory system of goldfish (*Carassius auratus*): Effects of intense acoustic stimulation
Abstract: 1. Behavioral investigations were made of the effects of intense pure tone stimulation on
auditory thresholds for the goldfish (Carassius auratus).
2. Results indicate that different sumulation frequencies have a different effect on the test frequencies
whde each of the test frequencies had the same degree of threshold shift after stimulation to each
of the stimulation frequencies.
3. Results are interpreted to indicate that the teleost inner ear responds m a relatively complex
fashion to different stimulating frequencies and this may indicate some degree of spatial signal analysis
m the inner ear.
Link to PDF: Popper_Clarke_1976_FX_intense_noise_goldfish.pdf

Reference Type: Journal Article
Record Number: 284
Author: Popper, Arthur N.; Fewtrell, Jane; Smith, Michael E.; McCauley, Robert D.
Year: 2003
Title: Anthropogenic sound: Effects on the behavior and physiology of fishes
Journal: Marine Technology Society Journal
Volume: 37
Issue: 4
Pages: 35-40
Date: Win
Type of Article: Article
Short Title: Anthropogenic sound: Effects on the behavior and physiology of fishes
Alternate Journal: Mar. Technol. Soc. J.
ISSN: 0025-3324
Accession Number: ISI:000220657800004
Keywords: GOLDFISH; *CARASSIUS AURATUS*; AUDITORY SENSITIVITY; NOISE; HEARING; LINE; EAR; SEISMIC; FISH
Abstract: Anthropogenic sound in the marine environment continues to increase. Sound sources range from increased vessel traffic to transient but intense sounds such as those produced by seismic air guns, pile driving, or some sonars. While most interest

in anthropogenic sounds has focused on marine mammals, there, is an increasing concern regarding the impact of such sounds on fishes and marine invertebrates. Since the inner ear hearing receptors of fishes, are similar to those of marine mammals, any effects, seen on the hearing receptors of marine mammals may also be found in fishes and vice versa. Despite increasing interest in the effects of sounds on fishes, this issue has only been addressed on the most limited scale. Here we review the current literature in this area. It has been reported that high sound levels can damage the inner ear sensory cells, produce hearing loss (threshold shifts), elicit stress responses, and alter the behavior of fishes. At least in terms of hearing loss, these effects are modulated by exposure sound level and duration. The effects of various types of sound (e.g., impulsive vs. continuous) and long-term impacts of how anthropogenic sounds affect the behavior and ecology of fishes need exploration in the future.
Notes: ISI Document Delivery No.: 809TA
Times Cited: 1
Cited Reference Count: 42
Research Notes: Damage to fish ears; compares fish ears to mammal ears; seismic air guns; behavior response of fish to noise.
URL: <Go to ISI>://000220657800004
Link to PDF: Popper_etal_2003_fish_hearing_airgun.pdf
Author Address: Univ Maryland, Dept Biol & Neurosci, College Pk, MD 20742 USA. Univ Maryland, Cognit Sci Program, College Pk, MD 20742 USA. Curtin Univ Technol, Aquat Sci Res Unit, Bentley, WA 6102, Australia. Curtin Univ Technol, Ctr Marine Sci & Technol, Bentley, WA 6102, Australia.
Popper, AN, Univ Maryland, Dept Biol & Neurosci, College Pk, MD 20742 USA.
Language: English

Reference Type: Book Section
Record Number: 515
Author: Popper, Arthur N.; Rogers, Peter H.; Saidel, William M.; Cox, Mardi
Year: 1998
Title: Role of the fish ear in sound processing
Editor: Atema, J.; Fay, Richard R.; Popper, Arthur N.; Tavolga, W.N.
Book Title: *Sensory Biology of Aquatic Animals*
City: New York, NY
Publisher: Springer-Verlag
Pages: 687-710
Short Title: Role of the fish ear in sound processing
Link to PDF: Popper_etal_1998_fish_ear_sound_processing.pdf

Reference Type: Journal Article
Record Number: 82
Author: Popper, A. N.; Smith, M. E.; Cott, P. A.; Hanna, B. W.; MacGillivray, A. O.; Austin, M. E.; Mann, D. A.
Year: 2005
Title: Effects of exposure to seismic airgun use on hearing of three fish species

Journal: Journal of the Acoustical Society of America
Volume: 117
Issue: 6
Pages: 3958-3971
Short Title: Effects of exposure to seismic airgun use on hearing of three fish species
Accession Number: ISI:000229718500065
Keywords: SEISMIC; FISH; NORTHERN PIKE; *ESOX LUCIUS*; BROAD WHITEFISH; *COREGONUS NASUS*; LAKE CHUB; *COUESIUS PLUMBEUS*; AIR GUN; AUDITORY BRAINSTEM RESPONSE; ABR; TEMPORARY THRESHOLD SHIFT; TTS
Abstract: Seismic airguns produce considerable amounts of acoustic energy that have the potential to affect marine life. This study investigates the effects of exposure to a 730 in.3 airgun array on hearing of three fish species in the Mackenzie River Delta, the northern pike (*Esox lucius*), broad whitefish (*Coregonus nasus*), and lake chub (*Couesius plumbeus*). Fish were placed in cages in the 1.9 m of water and exposed to five or 20 airgun shots, while controls were placed in the same cage but without airgun exposure. Hearing in both exposed and control fish were then tested using the auditory brainstem response (ABR). Threshold shifts were found for exposed fish as compared to controls in the northern pike and lake chub, with recovery within 24 hours of exposure, while there was no threshold shift in the broad whitefish. It is concluded that these three species are not likely to be substantially impacted by exposure to an airgun array used in a river seismic survey. Care must be taken, however, in extrapolation to other species and to fishes exposed to airguns in deeper water
or where the animals are exposed to a larger number of airgun shots over a longer period of time.
Research Notes: Seismic air gun exposure to pike, whitefish and chub using ABR in a river. Compares hearing sensitivities in the three species.
Link to PDF: Popper_etal_2005_pike_whitefish_chub_seismic_ABR.pdf

Reference Type: Book Section
Record Number: 519
Author: Poulter, T.C.
Year: 1968
Title: Underwater vocalization and behavior of pinnipeds
Editor: Harrison, R.J.; Hubbard, R.C.; Peterson, R.S.; Rice, C.E.; Schusterman, R. J.
Book Title: *The Behavior and Physiology of Pinnipeds*
City: New York, NY
Publisher: Appleton-Century-Crofts
Short Title: Underwater vocalization and behavior of pinnipeds

Reference Type: Online Multimedia
Record Number: 416
Created By: PWSSC
Year: 2004
Title: PWSSC Location

Date Accessed: 30 July 2007
Abstract: [WEBPAGE] - no abstract
Notes: Prince William Sound Science Center
Research Notes: Copyright of webpage is 2004, no information found on when data was most recently updated. General information about location of PWS.
URL: http://www.pwssc.gen.ak.us/about/location.shtml
Link to PDF: [WEBPAGE]
Author Address: Prince William Sound Science Center
Access Date: Access Date

Reference Type: Journal Article
Record Number: 84
Author: Rabin, Lawrence A.; Coss, Richard G.; Owings, Donald H.
Year: 2006
Title: The effects of wind turbines on antipredator behavior in California ground squirrels (*Spermophilus beecheyi*)
Journal: Biological Conservation
Volume: 131
Issue: 3
Pages: 410-420
Short Title: The effects of wind turbines on antipredator behavior in California ground squirrels (*Spermophilus beecheyi*)
Accession Number: ISI:000239139400006
Keywords: CALIFORNIA GROUND SQUIRREL; *SPERMOPHILUS BEECHEYI*
Abstract: Electricity-generating wind turbines are an attractive energy source because they are
renewable and produce no emissions. However, they have at least two potentially damaging
ecological effects. Their rotating blades are hazardous to raptors which occasionally fly into them. And wind turbines are very noisy when active, a feature that may interfere with the lives of animals beneath them. We studied California ground squirrels (*Spermophilus beecheyi*) in the Altamont Pass Wind Resource Area of Northern California.
These squirrels emit vocalizations that alert others to the presence of a predator, and so may be forced to compensate for turbine noise by modifying antipredator behavior. We compared the antipredator behavior of squirrels at two sites, one close to and the other far from turbines, and under two conditions, during baseline and playback of conspecific alarm calls. We generated composite two variables using principle components analysis,
one representing vigilance and one representing another cautionary antipredator tactic, for further statistical comparisons. Animals at the Turbine site exhibited elevated levels of vigilance and showed increased caution demonstrated in part, by returning to the area near their burrows during alarm calling. We conclude that this site difference is probably caused by the disparity in turbine noise, since predator abundance, group size, and vegetation type and density were similar for the two sites. Though population level

impacts of these behavioral differences remain to be explored, our results indicate that behavioral impacts of turbines on wildlife should be considered during future turbine development.
Link to PDF: Rabin_etal_2006_windturbines_squirrels.pdf

Reference Type: Journal Article
Record Number: 85
Author: Radford, Craig A.; Jeffs, Andrew G.; Tindle, Chris T.; Cole, Russell G.; Montgomery, John C.
Year: 2005
Title: Bubbled waters: The noise generated by underwater breathing apparatus
Journal: Marine and Freshwater Behaviour and Physiology
Volume: 38
Issue: 4
Pages: 259-267
Short Title: Bubbled waters: The noise generated by underwater breathing apparatus
Accession Number: ISI:000234545700004
Keywords: SCUBA; UNDERWATER NOISE; FISH BEHAVIOR
Abstract: Underwater breathing apparatus (UBA) has played a vital role in the study of aquatic environments, and is commonly used in visual census of mobile aquatic animals. The possibility of artifacts arising from diver presence and from the noise produced by UBA have long been recognised but not systematically studied. Here we analyse the noise produced by the three types of UBA used for research; self-contained underwater breathing apparatus (SCUBA), semi-enclosed circuit re-breather (SECR), and fully enclosed circuit re-breather (FECR) systems. There were significant differences in the source levels (SL) produced by the different UBA for both mean SL ($p < 0.001$) and mean peak SL ($p < 0.001$). SCUBA produced the most noise followed by SECR and FECR (161 ± 1, 131 ± 2, and 108 ± 1 dB re 1 Pa at 1 m, ±S.E.). Much of the sound produced by all three UBA was at low frequencies (<200 Hz), the range in which the hearing organs of fish and decapod crustaceans are most sensitive. Calculations indicated that the UBA are likely to be detectable by fishes at considerable distances depending on natural ambient noise levels.
Link to PDF: Radford_etal_2005_SCUBA_noise.pdf

Reference Type: Journal Article
Record Number: 527
Author: Rankin, S.; Barlow, Jay
Year: 2005
Title: Source of the North Pacific “boing” sound attributed to minke whales
Journal: Journal of the Acoustical Society of America
Volume: 118
Issue: 5
Pages: 3346-3351
Short Title: Source of the North Pacific “boing” sound attributed to minke whales

Abstract: During a recent cetacean survey of the U.S. waters surrounding the Hawaiian Islands, the probable
source of the mysterious “boing” sound of the North Pacific Ocean was identified as a minke whale,
Balaenoptera acutorostrata. Examination of boing vocalizations from three research surveys
confirms previous work that identified two distinct boing vocalization types in the North Pacific. The
eastern boing _n=22_ has a pulse repetition rate of 92 s−1 and a duration of 3.6 s and was found only
east of 138°W. The central boing _n=106_ has a pulse repetition rate of 115 s−1 and a duration of
approximately 2.6 s and was found only west of 135°W. Central boing vocalizations produced by
a single source _n=84_ indicate that variation in repetition rate and duration of the calls of the
individual were not significantly different than the variation among individuals of the same boing
type. Despite a slight latitudinal overlap in the vocalizations, pulse repetition rates of the eastern and
central boings were distinct.
Link to PDF: Rankin_Barlow_2005_Minke_whale_Boing.pdf

Reference Type: Journal Article
Record Number: 86
Author: Reeder, DeeAnn M.; Kramer, Kristin M.
Year: 2005
Title: Stress in free-ranging mammals: Integrating physiology, ecology, and natural history
Journal: Journal of Mammalogy
Volume: 86
Issue: 2
Pages: 225-235
Short Title: Stress in free-ranging mammals: Integrating physiology, ecology, and natural history
Accession Number: ISI:000228501700001
Keywords: CORTICOSTERONE; CORTISOL; ECOLOGY; GLUCOCORTICOID; HYPOTHALAMIC-PITUITARY-ADRENAL AXIS; NATURAL HISTORY; PHYSIOLOGY; MAMMALS; STRESS
Abstract: We review developments in the study of stress in free-ranging mammals and summarize the physiological and
behavioral components of the stress response. Both the sympathetic nervous system response and the regulation
and reactivity of the hypothalamic–pituitary–adrenal (HPA) axis are discussed. In particular, we describe how the

activity of the HPA axis at baseline levels follows circadian and circannual rhythms in ways that allow animals to
respond to predictable environmental changes, focusing largely on the endpoint of this axis, the glucocorticoid
hormones cortisol and corticosterone. Superimposed upon these rhythms are the elevated glucocorticoid levels
characteristic of the stress response, which allow an animal to respond to unpredictable social, physical, or
environmental challenges. Methods used to explore the stress response in free-ranging mammals are described.
Both inter- and intraspecific variation in the stress response as they relate to the environment are discussed. Finally,
how the regulation and reactivity of the HPA axis varies by life-history stage and sex in mammals is reviewed,
focusing on reproduction and development.
Link to PDF: Reeder_Kramer_2005_mammals_stress.pdf

Reference Type: Book
Record Number: 398
Author: Reeves, Randall R.; Stewart, Brent S.; Clapham, Phillip J.; Powell, James A.
Year: 2002
Title: *Guide to Marine Mammals of the World*
City: New York
Publisher: Alfred A. Knopf
Number of Pages: 527
Edition: 1
Short Title: *Guide to Marine Mammals of the World*
ISBN: 0-375-41141-0
Abstract: [Table of Contents]

Notes: National Audobon Society species guide. This is a book and not included in the PDF resources.
Link to PDF: Reeves_etal_2002_Guide_MarMamTOC.pdf

Reference Type: Journal Article
Record Number: 363
Author: Regnault, Michèle; Lagardère, Jean-Paul
Year: 1983
Title: Effects of ambient noise on the metabolic level of *Crangon crangon* (Decapoda, Natantia)
Journal: Marine Ecology-Progress Series
Volume: 11
Pages: 71-78
Short Title: Effects of ambient noise on the metabolic level of *Crangon crangon* (Decapoda, Natantia)
Keywords: *CRANGON CRANGON*; BROWN SHRIMP;
Abstract: Preliminary observations indicated that the shrimp *Crangon crangon* (L.) appeared to be affected by the level of the ambient noise expressed as sound pressure. The significance of its metabolic response was studied by comparing its ammonia excretion rate under usual laboratory conditions E (= +25 dB pbar-1) to its rate under sound-proof conditions C (= -4 dB pbar-1). The relationship between these 2 measured excretion rates was expressed by the equation: E = 1.225 C - 0.01329 (r = 0.81). Thus a mean 30dB-increased sound pressure led to a 22 % increase of the ammonia excretion rate; simultaneously, a 15 % increase of the O2, consumption rate was noticed. The metabolic response to a high ambient noise level was fully expressed within a few hours and there was no evidence for any adaptative reduction of metabolic rates over the

period of observation (5 d). Shrimp size and/or age as much as the noise spectrum should be taken into account when metabolic responses of *C. crangon* to its acoustic environment are considered.
Link to PDF: Regnault_Lagardere_1983_shrimp_ambient_noise.pdf

Reference Type: Journal Article
Record Number: 286
Author: Rendell, L. E.; Gordon, J. C. D.
Year: 1999
Title: Vocal response of long-finned pilot whales (*Globicephala melas*) to military sonar in the Ligurian Sea
Journal: Marine Mammal Science
Volume: 15
Issue: 1
Pages: 198-204
Date: Jan
Type of Article: Article
Short Title: Vocal response of long-finned pilot whales (*Globicephala melas*) to military sonar in the Ligurian Sea
ISSN: 0824-0469
Accession Number: ISI:000077568300012
Keywords: PILOT WHALE; *GLOBICEPHALA MELAENA MELAENA*; SONAR; VOCALIZATION; BEHAVIOR
Notes: ISI Document Delivery No.: 147KZ
Times Cited: 5
Cited Reference Count: 10
URL: <Go to ISI>://000077568300012
Link to PDF: Rendell_Gordon_1999_Pilot-whale_resp_sonar_Ligurian.pdf
Author Address: Univ Oxford, Dept Zool, Wildlife Conservat Res Unit, Oxford OX1 3PS, England.
Rendell, LE, Univ Oxford, Dept Zool, Wildlife Conservat Res Unit, S Parks Rd, Oxford OX1 3PS, England.
Language: English

Reference Type: Journal Article
Record Number: 87
Author: Rendell, L. E.; Matthews, J. N.; Gill, A.; Gordon, J. C. D.; Macdonald, D. W.
Year: 1999
Title: Quantitative analysis of tonal calls from five odontocele species, examining interspecific and intraspecific variation
Journal: Journal of Zoology
Volume: 249
Pages: 403-410
Short Title: Quantitative analysis of tonal calls from five odontocele species, examining interspecific and intraspecific variation

Accession Number: ISI:000084429000004
Keywords: CETACEAN; VOCALIZATION; INTRASPECIFIC VARIATION; DISCRIMINANT ANALYSIS; PILOT WHALE; *MACRORHYNCHUS*; FALSE KILLER WHALE; *CRASSIDENS*; LONG-FINNED PILOT WHALE; *MELAS*; WHITE-BEAKED DOLPHIN; *ALBIROSTRIS*; RISSO'S DOLPHIN; *GRISEUS*
Abstract: Whistle vocalizations of five odontocete cetaceans, the false killer whale *P. crassidens*, short-finned pilot whale *G. macrorhynchus*, long-finned pilot whale *G. melas*, white-beaked dolphin *L. albirostris* and Risso's dolphin *G. griseus*, were analysed and summarized quantitatively. Recordings were acquired from a number of locations and encounters. Signifcant differences were found between species and, to a lesser extent, between locations. The calls of the two pilot whale species are distinct despite their close relatedness, and similar size and morphology. This may be due to selection pressures to maintain distinctiveness. The variance was partitioned into between-species, between-location (within species) and within-location factors. For the frequency variables, variation between-species is high relative to variation between locations. Thus geographic variation is a relatively minor effect, compared to the many processes which cause interspecific differences. The within-location component includes such factors as social context, behaviour and group composition. This component is of a similar magnitude to the between-species component, indicating that whistles vary considerably with these factors. Significant between-location differences may be attributable to these confounding factors. For whistle duration, most of the variation occurred within location. There is less significant variation in duration across species compared with the frequency measures. This study highlights the need to collect samples across all potential strata whenever possible, and provides a framework for future, more comprehensive work.
Notes: Part 4
Link to PDF: Rendell_etal_1999_cetaceans_vocs.pdf

Reference Type: Journal Article
Record Number: 89
Author: Richardson, W. John; Davis, Rolph A.; Evans, C. R.; Ljungblad, D. K.; Norton, P.
Year: 1987
Title: Summer distribution of bowhead whales, *Balaena-mysticetus*, relative to oil industry activities in the Canadian Beaufort Sea, 1980-1984
Journal: Arctic
Volume: 40
Issue: 2
Pages: 93-104
Short Title: Summer distribution of bowhead whales, *Balaena-mysticetus*, relative to oil industry activities in the Canadian Beaufort Sea, 1980-1984
Accession Number: ISI:A1987J171700001
Keywords: BOWHEAD WHALE; *BALAENA MYSTICETUS*; OIL; BEAUFORT SEA; ALASKA
Abstract: Aerial surveys in 1980-84 showed that summer distribution of bowheads in

the Beaufort Sea varied markedly between years. Distribution varied both outside and within the “main industrial area” (MIA), the area of island construction, drilling and intensive ship and helicopter traffic. Numbers of bowheads in the MIA were high in 1980, lower in 1981, near zero in 1982 and very low in 1983-84. The few whales in the MIA in 1983-84 were mainly near its edges, contrary to 1980-8 1. These data, plus limited evidence from 1976-79, indicate that bowheads were numerous in the centre of the MIA in 3 of 5 years from 1976-80 (1976-77, 1980) vs. O of 4 years from 1981-84. One hypothesis is that progressively increasing industrial activities affected bowhead distribution after 1980. However, bowheads probably also react to variations in their zooplankton prey, which may be affected by year-to-year changes in oceanography and weather. Influences of natural factors on zooplankton and bowheads need to be better understood in order to
assess whether oil exploration caused any of the observed changes in bowhead distribution.
Link to PDF: Richardson_etal_1987_bowhead_beaufort.pdf

Reference Type: Journal Article
Record Number: 288
Author: Richardson, W. John; Finley, Kerwin J.; Miller, Gary W.; Davis, Rolph A.; Koski, William R.
Year: 1995
Title: Feeding, social and migration behavior of bowhead whales, *Balaena mysticetus*, in Baffin Bay vs. the Beaufort Sea - regions with different amounts of human activity
Journal: Marine Mammal Science
Volume: 11
Issue: 1
Pages: 1-45
Date: Jan
Type of Article: Article
Short Title: Feeding, social and migration behavior of bowhead whales, *Balaena mysticetus*, in Baffin Bay vs. the Beaufort Sea - regions with different amounts of human activity
Alternate Journal: Mar. Mamm. Sci.
ISSN: 0824-0469
Accession Number: ISI:A1995QG60800001
Keywords: BOWHEAD WHALE; *BALAENA MYSTICETUS*; BEAUFORT SEA; BAFFIN BAY; BEHAVIOR; RESPIRATION; SURFACING; DIVE; MULTIVARIATE ANALYSIS; DISTURBANCE; SHIPPING; SEISMIC EXPLORATION; DRILLING; HUNTING; VERTICAL DISTRIBUTION; *CALANUS HYPERBOREUS*; HUMPBACK WHALE; DIVE BEHAVIOR; ALASKA; SUMMER; RESPIRATION; ZOOPLANKTON; ISLAND; SOUND
Abstract: This paper compares the behavior of bowhead whales of the Davis Strait/Baffin Bay stock, as observed along the east coast of Baffin Island in 1979-1986, with behavior of the Bering/Chukchi/Beaufort Sea stock observed in the Beaufort Sea in 1980-1986. All data used here were collected during late summer and early autumn in the absence of acute human disturbance. The behavioral repertoires of the two

populations were similar. However, quantitative differences were found for whales engaged in all three activities studied: (1) Bowheads feeding in deep water off Isabella Bay, Baffin Island, had longer dives and surfacings, on average, than noted for bowheads feeding in the Beaufort Sea. (2) Among whales socializing in shallow water, we saw sexual interactions more often at Isabella Bay than in the Beaufort Sea. Calls emitted by socializing whales off Baffin Island were similar to those heard in the Chukchi and Beaufort Seas. However, pulsed tonal calls were longer off Baffin Island, and previously undescribed mechanical "crunch" sounds were recorded there near socializing bowheads. (3) During autumn migration, "fluke-out" dives were less common, and dive durations were longer, in the Beaufort Sea than off Baffin Island ($P<0.001$). Multivariate and other analyses indicated that some but not all differences can be ascribed to regional differences in the natural environment or in whale activities. However, during 1974-1986, Bering/Chukchi/Beaufort bowheads were exposed to more industrial, hunting and other human activity than Davis Strait/Baffin Bay bowheads. The "inconspicuous" behavior during autumn migration in the Beaufort may have been attributable to human activities, but causative links cannot be isolated.
Notes: ISI Document Delivery No.: QG608
Times Cited: 15
Cited Reference Count: 88
Research Notes: Bowhead whale behavior activity comparing two areas of differing human influence and noise levels.
URL: <Go to ISI>://A1995QG60800001
Link to PDF: Richardson_etal_1995_bowhead_behavior.pdf
Author Address: RICHARDSON, WJ, LGL LTD,22 FISHER ST,POB 280,KING CITY,ON L7B 1A6,CANADA.
Language: English

Reference Type: Journal Article
Record Number: 218
Author: Richardson, W. John; Fraker, M. A.; Wursig, B.; Wells, R. S.
Year: 1985
Title: Behaviour of bowhead whales *Balaena mysticetus* summering in the Beaufort Sea: reactions to industrial activities
Journal: Biological Conservation
Volume: 32
Issue: 3
Pages: 195-230
Short Title: Behaviour of bowhead whales *Balaena mysticetus* summering in the Beaufort Sea: reactions to industrial activities
Keywords: BOWHEAD WHALE; *BALAENA MYSTICETUS*
Abstract: In general, bowheads showed considerable tolerance of ongoing noise from seismic exploration, dredging or drilling, but tended to react more strongly to rapidly changing situations such as an approaching boat or aircraft or a brief playback experiment. -from Authors [Journal; In English]
URL:
http://www.sciencedirect.com/science/article/B6WPY-3V4HG0K-3K9/2/b8812b1010b0a

9012a1a3bccac5e9d70
Link to PDF: Richardson_etal_1985_RX_Bowhead_summering_industrial.pdf

Reference Type: Book
Record Number: 376
Author: Richardson, W. John; Greene, Charles R. Jr.; Malme, C.I.; Thomson, D. H.
Year: 1995
Title: *Marine Mammals and Noise*
City: San Diego, CA
Publisher: Academic Press
Number of Pages: 576
Short Title: *Marine Mammals and Noise*
ISBN: 0-12-588440-0
Link to PDF: Richardson_etal_1995_MarMam_NoiseTOC.pdf

Reference Type: Journal Article
Record Number: 290
Author: Richardson, W. J.; Wursig, B.
Year: 1997
Title: Influences of man-made noise and other human actions on cetacean behaviour
Journal: Marine and Freshwater Behaviour and Physiology
Volume: 29
Issue: 1-4
Pages: 183-209
Type of Article: Article
Short Title: Influences of man-made noise and other human actions on cetacean behaviour
Alternate Journal: Mar. Freshw. Behav. Physiol.
ISSN: 0091-181X
Accession Number: ISI:000070995900010
Keywords: UNDERWATER NOISE; IMPACT; DISTURBANCE; MASKING; WHALE; DOLPHIN; CANADA; BEAUFORT SEA; *BALAENA MYSTICETUS*; BOWHEAD WHALE; HEARING THRESHOLD; HUMPBACK WHALE; BELUGA WHALE; SPERM WHALE; UNDERWATER; RESPONSES; ATLANTIC; BEHAVIOR
Abstract: Behavioral reactions of cetaceans to man-made noises are highly variable, ranging from attraction (e.g. bow riding by dolphins) or no response through short-term changes in behaviour to short-or long-term displacement. Noise can also mask important natural sounds or (if strong enough) cause hearing impairment or perhaps stress. This review summarizes the observed behavioral reactions of cetaceans to noise and other stimuli from aircraft, boats, tourism, marine industrial activities, seismic exploration, sonars, explosions, and ocean acoustics studies. Specific response thresholds have been determined for only a few combinations of species and noise type, and they tend to be quite variable even within species. In general, response thresholds are often low for variable or increasing sounds, e.g. approaching boat;

intermediate for steady sounds, e.g. offshore drilling noise; and high for pulsed sounds, e.g. seismic survey pulses. With repeated exposure, many cetaceans habituate at least partially. However, cases of increased sensitivity following harassment are known. Long-term effects on individuals and populations are little known.
Notes: ISI Document Delivery No.: YL818
Times Cited: 17
Cited Reference Count: 100
Language: English

Reference Type: Journal Article
Record Number: 91
Author: Richardson, W. John; Wursig, Bernd; Greene, Charles R.
Year: 1986
Title: Reactions of bowhead whales, *Balaena-mysticetus*, to seismic exploration in the Canadian Beaufort Sea
Journal: Journal of the Acoustical Society of America
Volume: 79
Issue: 4
Pages: 1117-1128
Short Title: Reactions of bowhead whales, *Balaena-mysticetus*, to seismic exploration in the Canadian Beaufort Sea
Accession Number: ISI:A1986A743900029
Keywords: BOWHEAD WHALE; *BALAENA MYSTICETUS*; SEISMIC; CANADA; BEAUFORT SEA; VESSEL; AIR GUN; BEHAVIOR
Abstract: The behavioral reactions of bowhead whales to (1) distant seismic vessels not under our control, (2) a controlled approach by a seismic vessel, and (3) controlled tests with a single airgun were observed. (1) On 21 occasions in the summers of 1980-84, general activities ofbowheads exposed to pulses of underwater noise (107-158 dB re: 1 pPa) from seismic vessels 6-99 km away were observed. Activities were indistinguishable from those without seismic noise; there was no detectable avoidance. Hints of subtle changes in surfacing, respiration, and diving behavior were unconfirmed, but were consistent with reactions to stronger noise pulses from closer seismic boats. (2) In a test with a full-scale seismic boat (30 airguns totaling 471, source level 248 dB re: 1 /tPa, closest point of approach = 1« km), bowheads began to orient away when the airgun array began to fire 7« km away. However, some whales continued apparent near-bottom feeding until the vessel was 3 km away. Whales were displaced by about 2 km. Reactions were not much stronger than those to any conventional vessel. (3) Tests with one 0.66-1 airgun showed that some bowheads move away from sources of strong seismic impulses even in the absence of boat noise, and that bowheads can detect the direction from which seismic impulses arrive. In general,
bowheads exhibit avoidance reactions when they receive seismic pulsestronger than about 160 dB re: 1/zPa. Evidence of reactions to lower received levels remains inconclusive.
Link to PDF: Richardson_etal_1986_RX_Bowhead_seismic_Beaufort.pdf

Reference Type: Journal Article
Record Number: 92
Author: Richardson, W. John; Würsig, B.; Greene, Charles R.
Year: 1990
Title: Reactions of bowhead whales, *Balaena-mysticetus*, to drilling and dredging noise in the Canadian Beaufort Sea
Journal: Marine Environmental Research
Volume: 29
Issue: 2
Pages: 135-160
Short Title: Reactions of bowhead whales, *Balaena-mysticetus*, to drilling and dredging noise in the Canadian Beaufort Sea
Accession Number: ISI:A1990DA71200003
Keywords: BOWHEAD WHALE; *BALAENA MYSTICETUS*; BEAUFORT SEA; CANADA; BEHAVIOR; VESSEL;PLAYBACK EXPERIMENTS
Abstract: Behavioural reactions of bowhead whales to seven 30-40 rain underwater playbacks of recorded drillship and dredge noise were determined in 1982-84. Some (but not all) bowheads oriented away when received noise levels and spectral characteristics were comparable to those several kilometres from actual drillships and dredges. During some playback tests, call rates decreased, feeding ceased, and cycles of surfacing, respiration and diving may have changed. Sensitivity of various whales to noise differed. Roughly half responded when the received level of noise was about 115 dB re 1 uPa on a broadband basis, or about 110 dB in one 1/3-octave band (20-30 dB above ambient). Such levels occurred 3-11 km from a drillship and dredge in the Canadian Beaufort Sea. Bowhead~ occasionally were seen < 5 km /rom actual drillships and dredges, where received noise levels were at least as high as during our brief playbacks. Thus, some howheads may habituate to prolonged noise exposure. Alternatively, only the less sensitive individual whales may occur < 5 km from drillships and dredges.
Link to PDF: Richardson_etal_1990_RX_Bowhead_Drilling-Dredging_Beaufort.pdf

Reference Type: Journal Article
Record Number: 93
Author: Richter, C.; Dawson, S.; Slooten, E.
Year: 2006
Title: Impacts of commercial whale watching on male sperm whales at Kaikoura, New Zealand
Journal: Marine Mammal Science
Volume: 22
Issue: 1
Pages: 46-63
Short Title: Impacts of commercial whale watching on male sperm whales at Kaikoura, New Zealand
Accession Number: ISI:000234942300005

Keywords: SPERM WHALE; *PHYSETER MACROCEPHALUS*; WHALE-WATCHING; BEHAVIOR; DIVING BEHAVIOR; VOCAL BEHAVIOR; KAIKOURA; NEW ZEALAND; TOURISM; VESSEL
Abstract: Male sperm whales are the basis for a commercially important whale-watching industry at Kaikoura, NewZealand.We examined the influence of whale-watching boats and aircraft over three years using observations from an independent research boat and from shore. We employed an information-theoretic approach to determine which factors were necessary to explain variation in blow interval, time at surface, and time to first click. In almost all analyses, models required the inclusion of the presence of the research boat or whale-watching boats or airplanes. The only exception was the model explaining variation in blow intervals observed from shore, which required only season. We also analyzed spatial behavior at the surface. Resident whales changed direction significantly more in the presence of whale-watching boats compared to encounters with only the research boat present. No such difference was observed for encounters with aircraft. Our results thus indicate that sperm whales off Kaikoura respond to whale-watching activities, although these changes are small and most likely not of biological importance. However, resident whales responded less to these activities compared to transient whales, possibly indicating habituation and, more importantly, the need to monitor continued activities closely.
Link to PDF: Richter_etal_2006_FX_whale-watching_SpermWhale.pdf

Reference Type: Journal Article
Record Number: 507
Author: Ridgway, Sam H.; Carder, Donald A.
Year: 2001
Title: Assessing hearing and sound production in cetaceans not available for behavioral audiograms: Experiences with sperm, pygmy sperm, and gray whales
Journal: Aquatic Mammals
Volume: 27
Issue: 3
Pages: 267-276
Short Title: Assessing hearing and sound production in cetaceans not available for behavioral audiograms: Experiences with sperm, pygmy sperm, and gray whales
Link to PDF: Ridgway_Carder_2001_cetacean_hearing.pdf

Reference Type: Journal Article
Record Number: 326
Author: Ridgway, Sam H.; Carder, D. A.; Kamolnick, T.; Schlundt, C. E.; Elsberry, W.; Hastings, Mardi C.
Year: 1999
Title: Comments on "broadband spectra of seismic survey air-gun emissions, with reference to dolphin auditory thresholds" [J Acoust Soc Am 103,2177-2184(1998)]
Journal: Journal of the Acoustical Society of America
Volume: 105

Issue: 3
Pages: 2047-2048
Date: Mar
Type of Article: Letter
Short Title: Comments on "broadband spectra of seismic survey air-gun emissions, with reference to dolphin auditory thresholds" [J Acoust Soc Am 103,2177-2184(1998)]
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000079078500063
Keywords: MARINE MAMMALS; BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; COMMON DOLPHIN; *DELPHINUS DELPHIS*; HEARING; SEISMIC; VESSEL
Abstract: Responses of marine mammals to human-generated sound are of interest due to concern for protection of animals with sensitive hearing from acoustic harassment or injury. Goold and Fish [J. Acoust. Sec. Am. 103, 2177-2184 (1998)] compare their limited observations of wild common dolphins (*Delphinus delphis*) near operating seismic vessels off Wales, with studies of trained bottlenose dolphins (*Tursiops truncatus*) in San Diego Bay [Ridgway et al., Tech. Rpt. 1751, NCCOSC RDTE (1997)]. Because of the considerable difference between numerous seismic pulses and the single 1-s tones employed by Ridgway et al., the comparison is not valid. Further, Goold and Fish do not accurately represent the bottlenose dolphin responses.
Notes: ISI Document Delivery No.: 175DW
Times Cited: 0
Cited Reference Count: 7
URL: <Go to ISI>://000079078500063
Link to PDF: Ridgway_etal_1999_Comments.pdf
Author Address: SAIC Maritime Serv, San Diego, CA 92110 USA. Texas A&M Univ, Marine Acoust Lab, Galveston, TX 77551 USA. Ohio State Univ, Dept Mech Engn, Columbus, OH 43210 USA.
Ridgway, SH, SPAWARSYSCEN D3503 PLBS, San Diego, CA 92152 USA.
Language: English

Reference Type: Report
Record Number: 486
Author: Riedman, M.L.
Year: 1983
Title: Studies of the effects of experimentally produced noise assocaited with oil and gas exploration and development on sea otters in California.
City: Anchorage, AK
Institution: U.S. Minerals Management Service
Pages: 92
Short Title: Studies of the effects of experimentally produced noise assocaited with oil and gas exploration and development on sea otters in California.

Reference Type: Journal Article
Record Number: 94

Author: Romano, T. A.; Keogh, M. J.; Kelly, C.; Feng, P.; Berk, L.; Schlundt, C. E.; Carder, D. A.; Finneran, James J.
Year: 2004
Title: Anthropogenic sound and marine mammal health: measures of the nervous and immune systems before and after intense sound exposure
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 61
Issue: 7
Pages: 1124-1134
Date: Jul
Short Title: Anthropogenic sound and marine mammal health: measures of the nervous and immune systems before and after intense sound exposure
Accession Number: ISI:000224451000008
Keywords: MARINE MAMMALS; SEISMIC; WHITE WHALE; *DELPHINAPTERUS LEUCAS*; BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; NERVOUS SYSTEM
Abstract: Anthropogenic sound is a potential stressor for marine mammals that may affect health, as has been demonstrated in other mammals. Therefore, we have initiated investigations on the effects of intense underwater sounds on nervous system activation and immune function in marine mammals. Blood samples were obtained before and after sound exposures (single underwater impulsive sounds (up to 200 kPa) produced from a seismic water gun and (or) single pure tones (up to 201 dB re 1 μPa) resembling sonar “pings” from a white whale, *Delphinapterus leucas*, and a bottlenose dolphin, *Tursiops truncatus*, to measure neural–immune parameters. Norepinephrine, epinephrine, and dopamine levels increased with increasing sound levels and were significantly higher after high-level sound exposures (>100 kPa) compared with low-level sound exposures (<100 kPa) or controls ($P = 0.003$, 0.006, and 0.020) for the white whale. Alkaline phosphatase decreased over the experimental period ($P < 0.001$), while γ-glutamyltransferase increased over the experimental period ($P < 0.001$). Significant neural–immune measurements for the dolphin after exposure to impulsive sounds included an increase in aldosterone ($P = 0.003$) and a decrease in monocytes ($P = 0.006$). Neural–immune changes to tonal sound exposures were minimal, although changes were observed in multiple neural–immune measures over time.
Research Notes: Responses to noise by examining blood samples.
Link to PDF: Romano_etal_2004_Phys_measures_intense-noise.pdf

Reference Type: Journal Article
Record Number: 512
Author: Rommel, S.A.; Costidis, A.M.; Fernandez, A.; Jepson, P.D.; Pabst, D.A.; McLellan, W.A.; Houser, Dorian S.; Cranford, T.W.; van Helden, A.L.; Allen, D.M.; Barros, N.B.
Year: 2005
Title: Elements of beaked whale anatomy and diving physiology and some hypothetical causes of sonar-related stranding
Journal: Journal of Cetacean Research and Management
Volume: 7

Issue: 3
Pages: 189-209
Short Title: Elements of beaked whale anatomy and diving physiology and some hypothetical causes of sonar-related stranding
Link to PDF: Rommel_etal_1006_BeakedWhale_stranding_sonar.pdf

Reference Type: Journal Article
Record Number: 445
Author: Ross, D.
Year: 1993
Title: On ocean underwater ambient noise
Journal: Acoustic Bulletin
Volume: 18
Pages: 5-8
Date: 1993
Type of Article: Journal Article
Short Title: On ocean underwater ambient noise

Reference Type: Journal Article
Record Number: 306
Author: Ross, D.
Year: 2005
Title: Ship sources of ambient noise
Journal: IEEE Journal of Oceanic Engineering
Volume: 30
Issue: 2
Pages: 257-261
Date: Apr
Type of Article: Reprint
Short Title: Ship sources of ambient noise
ISSN: 0364-9059
Accession Number: ISI:000232942300003
Keywords: AMBIENT NOISE; SHIPPING DISTRIBUTION; VESSEL
Abstract: The rapid increase in world shipping results in an increase in low-frequency ambient noise at an average rate of about 1/2 dB per year. During the past 10 years there has been a virtual revolution in the sizes and speeds of merchant ships, resulting in significant increases in the noise radiated by the average ship. This trend is continuing. In this paper, the trends in world merchant shipping will be presented, including important changes in propulsion plants as well as in numbers and sizes of ships. The need for radiated noise measurements of these new ship types will be stressed. Ambient noise is also dependent on the geographical distribution of shipping. The LRAPP-sponsored program to establish standard shipping distributions for the Northern Hemisphere will be discussed, and the reliability of current information will be assessed.

Notes: ISI Document Delivery No.: 979LA
Times Cited: 2
Cited Reference Count: 1
Research Notes: Reprint of 1974 article. Trends in underwater shipping noise for large vessels.
URL: <Go to ISI>://000232942300003
Link to PDF: Ross_2005_Ship_Ambient_Trends.pdf
Author Address: Tetra Tech Inc, Pasadena, CA 91107 USA.
Ross, D, Tetra Tech Inc, Pasadena, CA 91107 USA.
Language: English

Reference Type: Journal Article
Record Number: 95
Author: Røstad, Anders; Kaartvedt, Stein; Klevjer, Thor A.; Melle, Webjørn
Year: 2006
Title: Fish are attracted to vessels
Journal: ICES Journal of Marine Science
Volume: 63
Issue: 8
Pages: 1431-1437
Short Title: Fish are attracted to vessels
Accession Number: ISI:000240543100006
Keywords: ACCUMULATION; ACOUSTICS; AVOIDANCE; SWIMMING BEHAVIOR; VESSEL; FISH; ACOUSTIC BACKSCATTER
Abstract: Fish rapidly accumulated below research vessels (RVs) at anchor, kept stationary by dynamic satellite positioning, or freely drifting. This happened by day and night, beneath vessels with different noise levels, in fjords and the open ocean, comprised different species assemblages of fish, and spanned depths of several hundred metres. Acoustic backscatter (fish abundance) increased by more than an order of magnitude in less than an hour. One of the study sites was characterized by much ship traffic, and intermittent, strong decreases in the local fish aggregation beneath the RV were caused by fish swimming towards passing commercial vessels, before returning to the stationary RV. The study suggests more complex relationships between fish, vessels, and noise than previously anticipated. If fish are commonly attracted to vessels, this has implications for fish abundance estimates and basic ecological research.
Research Notes: Fish congregate near and under boats (research vessel in the case). ~10 fold increase in backscatter over one hour. Decrease in acoustic backscatter occurred when commercial vessels passed 200-600 m away because fish were swimming towards passing vessel. Fish returned to original position (stationary research vessel) once passing vessel was gone. Swim speed remained constant.
Link to PDF: Rostad_etal_2006_Fish_attracted_vessels.pdf

Reference Type: Journal Article
Record Number: 96

Author: Samuel, Y.; Morreale, S. J.; Clark, Christopher W.; Greene, C. H.; Richmond, M. E.
Year: 2005
Title: Underwater, low-frequency noise in a coastal sea turtle habitat
Journal: Journal of the Acoustical Society of America
Volume: 117
Issue: 3
Pages: 1465-1472
Short Title: Underwater, low-frequency noise in a coastal sea turtle habitat
Accession Number: ISI:000227574700047
Keywords: SEA TURTLE; VESSEL; BOAT; HEARING; ANTHROPOGENIC NOISE; BEHAVIOR
Abstract: Underwater sound was recorded in one of the major coastal foraging areas for juvenile sea turtles in the Peconic Bay Estuary system in Long Island, New York. The recording season of the underwater environment coincided with the sea turtle activity season in an inshore area where there is considerable boating and recreational activity, especially during the summer between Independence Day and Labor Day. Within the range of sea turtle hearing, average noise pressure reached 110 dB during periods of high human activity and diminished proportionally, down to 80 dB, with decreasing human presence. Therefore, during much of the season when sea turtles are actively foraging in New York waters, their coastal habitats are flooded with underwater noise. During the period of highest human activity, average noise pressures within the range of frequencies heard by sea turtles were greater by over two orders of magnitude (26 dB) than during the lowest period of human activity. Sea turtles undoubtedly are exposed to high levels of noise, most of which is anthropogenic. Results suggest that continued exposure to existing high levels of pervasive anthropogenic noise in vital sea turtle habitats and any increase in noise could affect sea turtle behavior and ecology.
Research Notes: Good information on sea turtle hearing. Anthropogenic noise is from recreational boats, not tankers.
Link to PDF: Samuel_etal_2005_LowF_Noise_Turtle_Habitat.pdf

Reference Type: Journal Article
Record Number: 97
Author: Sandstrom, Alfred; Eriksson, Britas Klemens; Karàs, Peter; Isæus, Martin; Schreiber, Henrik
Year: 2005
Title: Boating and navigation activities influence the recruitment of fish in a Baltic Sea archipelago area
Journal: Ambio
Volume: 34
Issue: 2
Pages: 125-130
Short Title: Boating and navigation activities influence the recruitment of fish in a Baltic Sea archipelago area

Accession Number: ISI:000228090700010
Keywords: PIKE; *ESOX LUCIUS*; BLEAK; *ALBURUS ALBURNUS*; PERCH; *PERCA FLUVIATILIS*; PASSENGER FERRY; MARINA; FISH
Abstract: We studied the effects of boating and navigation activities on the recruitment of coastal fish in the Stockholm archipelago in the NW Baltic proper. The impacts were quantified by sampling metamorphosed young-of-the-year (Y-O-Y) fish in inlets adjacent to i) routes for medium-sized passenger ferries; ii) berths (small marinas) with small boats; and iii) references. Species with high preference for vegetation were negatively influenced by boating and navigation activities and species with low preference positively influenced. Pike (*Esox lucius*) Y-O-Y were significantly more abundant in reference areas, while bleak (*Alburnus alburnus*) were more abundant in dredged marinas. No statistically signi ficant patterns were identified for perch (*Perca fluviatilis*) although there was a trend of low abundance along ferry routes. Many species of nearshore fishes are dependent on submerged vegetation as spawning and larval substrate, structural refuge and feeding habitat. Our results suggest that the negative effects from boating and navigation activities on the coverage and height of vegetation, especially on species of Chara and Potamogeton spp., may contribute to changes in the Y-O-Y fish community.
Research Notes: Boat activitiy near fish nurseries and having a negative effect on YOY fish. Baltic Sea.
Link to PDF: Sandstrom_etal_2005_fish_recruitment_vessel.pdf

Reference Type: Journal Article
Record Number: 489
Author: Sapolsky, R.M.
Year: 1996
Title: Why stress is bad for your brain
Journal: Science
Volume: 273
Pages: 749-750
Short Title: Why stress is bad for your brain
Link to PDF: Sapolsky_1996_stress_bad_brain.pdf

Reference Type: Journal Article
Record Number: 407
Author: Saulitis, Eva; Matkin, Craig; Barrett-Lennard, Lance; Heise, Kathy; Ellis, Graeme
Year: 2000
Title: Foraging strategies of sympatric killer whale (*Orcinus orca*) populations in Prince William Sound, Alaska
Journal: Marine Mammal Science
Volume: 16
Issue: 1
Pages: 94-109

Date: January 2000
Short Title: Killer whale Foraging
Keywords: KILLER WHALE; *ORCINUS ORCA*; PRINCE WILLIAM SOUND; FORAGING; PREDATION; BEHAVIOR
Abstract: Killer whales (*Orcinus orca*) feed on a wide variety of fish, cephalopods, and marine mammals throughout their cosmopolitan range; however, the dietary breadth that characterizes the species is not reflected in all populations. Here, we present the findings of a 14-yr study of the diet and feeding habits of killer whales in Prince William Sound, Alaska. Two non-associating forms of killer whale, termed resident and transient (Bigg *et al.* 1987), were identified. All prey seen taken by transients were marine mammals, including harbor seals (*Phoca vitulina*), Dall's porpoises (*Phocoenoides dalli*), Steller sea lions (*Eurnetopias jubatus*), and harbor porpoises (*Phocoena phocoena*). Resident killer whales appeared to prey principally on salmon (*Oncorhynchus* spp.), preferring coho salmon (*O. kisutch*) over other, more abundant salmon species. Pacific herring (*Clupea pallasi*) and Pacific halibut (*Hippocampus stenolepis*) were also taken. Resident killer whales frequently were seen to interact in non-predatory ways with Steller sea lions and Dall's porpoises, while transients were not. Differences in the social organization and behavior of the resident and transient killer whales in Prince William Sound are discussed in the light of the dietary differences documented here.
Research Notes: Foragaing behaviors and food species for PWS orcas.
Link to PDF: Saulitis_etal_2000_orca_pws_foraging.pdf

Reference Type: Journal Article
Record Number: 99
Author: Schick, R. S.; Urban, D. L.
Year: 2000
Title: Spatial components of bowhead whale (*Balaena mysticetus*) distribution in the Alaskan Beaufort Sea
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 57
Issue: 11
Pages: 2193-2200
Short Title: Spatial components of bowhead whale (*Balaena mysticetus*) distribution in the Alaskan Beaufort Sea
Accession Number: ISI:000165451000003
Keywords: BOWHEAD WHALE; *BALAENA MYSTICETUS*; BEAUFORT SEA; ALASKA
Abstract: Bowhead whales (*Balaena mysticetus*) on their fall migration are exposed to oil exploration activities in the
Alaskan Beaufort Sea. While previous research into the effect of industrial noise on whale behavior and distribution
has noted significant responses, this research has often proceeded from a parametric statistical framework. To account
for the presence of spatially autocorrelated and intercorrelated data, we propose a suite of spatial analysis techniques to

assess the distribution of bowhead whales relative to oil exploration activities. Using random resampling techniques and
Mantel tests, we analyzed the distribution of bowhead whales around active drilling rigs in 1993. Results from the
resampling tests indicated that whales were distributed farther from the drilling rig than they would be under a random
scenario. Results from the Mantel tests indicated that in 1993, the spatial pattern of bowhead whale distribution was
highly correlated with distance from the drilling rig, indicating that the presence of the drilling rig resulted in a significant
temporary loss in available habitat. These techniques offer a new perspective on spatial analysis in the marine
realm.
Link to PDF: Schick_Urban_2000_bowhead_spatial.pdf

Reference Type: Journal Article
Record Number: 100
Author: Schlundt, C. E.; Finneran, J. J.; Carder, D. A.; Ridgway, S. H.
Year: 2000
Title: Temporary shift in masked hearing thresholds of bottlenose dolphins, *Tursiops truncatus*, and white whales, *Delphinapterus leucas*, after exposure to intense tones
Journal: Journal of the Acoustical Society of America
Volume: 107
Issue: 6
Pages: 3496-3508
Date: Jun
Short Title: Temporary shift in masked hearing thresholds of bottlenose dolphins, *Tursiops truncatus*, and white whales, *Delphinapterus leucas*, after exposure to intense tones
Accession Number: ISI:000087508100054
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS; DELPHINAPTERUS LEUCAS*; WHITE WHALE; BELUGA WHALE; PLAYBACK EXPERIMENTS; MASKED TEMPORARY THRESHOLD SHIFT; MASKED HEARING THRESHOLD; MTTS
Abstract: A behavioral response paradigm was used to measure masked underwater hearing thresholds in five bottlenose dolphins and two white whales before and immediately after exposure to intense 1-s tones at 0.4, 3, 10, 20, and 75 kHz. The resulting levels of fatiguing stimuli necessary to induce 6 dB or larger masked temporary threshold shifts (MTTSs) were generally between 192 and 201 dB re: 1 mu Pa. The exceptions occurred at 75 kHz, where one dolphin exhibited an MTTS after exposure at 182 dB re: 1 mu Pa and the other dolphin did not show any shift after exposure to maximum levels of 193 dB re: 1 mu Pa, and at 0.4 kHz, where no subjects exhibited shifts at levels up to 193 dB re: 1 mu Pa. The shifts occurred most often at frequencies above the fatiguing stimulus. Dolphins began to exhibit altered behavior at levels of 178-193 dB re: 1 mu Pa and above; white whales displayed altered behavior at 180-196 dB re: 1 mu Pa and above. At the conclusion of the study all thresholds were at baseline

values. These data confirm that cetaceans are susceptible to temporary threshold shifts (TTS) and that small levels of TTS may be fully recovered. [S0001-4966(00)00106-5].
Notes: J. Acoust. Soc. Am.
28
Research Notes: TTS study on bottlenose dolphin, beluga whales.
Link to PDF: Schlundt_etal_2000_bottlenose_beluga_TTS.pdf
Author Address: Sci Applicat Int Corp, Maritime Serv Div, San Diego, CA 92110 USA. Space & Naval Warfare Syst Ctr, Marine Mammal Program, San Diego, CA 92152 USA. Schlundt, CE, Sci Applicat Int Corp, Maritime Serv Div, 3990 Old Town Ave,Suite 105A, San Diego, CA 92110 USA.

Reference Type: Journal Article
Record Number: 295
Author: Scholik, Amy R.; Yan, Hong Y.
Year: 2001
Title: Effects of underwater noise on auditory sensitivity of a cyprinid fish
Journal: Hearing Research
Volume: 152
Issue: 1-2
Pages: 17-24
Date: Feb
Type of Article: Article
Short Title: Effects of underwater noise on auditory sensitivity of a cyprinid fish
Alternate Journal: Hear. Res.
ISSN: 0378-5955
Accession Number: ISI:000167302700003
Keywords: AUDITORY BRAINSTEM RESPONSE; ABR; NOISE INDUCED HEARING LOSS; TEMPORARY THRESHOLD SHIFT; FATHEAD MINNOWS; SENSORY HAIR-CELLS; EAR; SOUND; HETEROGENEITY; GASBLADDER; *PIMEPHALES PROMELAS*
Abstract: The ability of a fish to interpret acoustic information in its environment is crucial for its survival. Thus, it is important to understand how underwater noise affects fish hearing. In this study, the fathead minnow (*Pimephales promelas*) was used to examine: (1) the immediate effects of white noise exposure (0.3-4.0 kHz, 142 dB re: 1 mu Pa) on auditory thresholds and (2) recovery after exposure. Audiograms were measured using the auditory brainstem response protocol and compared to baseline audiograms of fathead minnows not exposed to noise. Immediately after exposure to 24 h of white noise, five out of the eight frequencies tested showed a significantly higher threshold compared to the baseline fish. Recovery was found to depend on both duration of noise exposure and auditory frequency. These results support the hypothesis that the auditory threshold of the fathead minnow can be altered by white noise, especially in its most sensitive hearing range (0.8-2.0 kHz), and provide evidence that these effects call be long term (>14 days).
Research Notes: Example of fish behavior response, using ABR.

Link to PDF: Scholik_Yan_2001_fatheadminnow_abr_noise.pdf
Language: English

Reference Type: Journal Article
Record Number: 294
Author: Scholik, Amy R.; Yan, Hong Y.
Year: 2002
Title: Effects of boat engine noise on the auditory sensitivity of the fathead minnow, *Pimephales promelas*
Journal: Environmental Biology of Fishes
Volume: 63
Issue: 2
Pages: 203-209
Date: Feb
Type of Article: Article
Short Title: Effects of boat engine noise on the auditory sensitivity of the fathead minnow, *Pimephales promelas*
Alternate Journal: Environ. Biol. Fishes
ISSN: 0378-1909
Accession Number: ISI:000173985800009
Keywords: ANTHROPOGENIC; AUDITORY BRAINSTEM RESPONSE; ABR; TEMPORARY THRESHOLD SHIFT; TTS; CYPRINID FISH; FISH; SOUND; BEHAVIOR; GASBLADDER; RESPONSES; FATHEAD MINNOWS; *PIMEPHALES PROMELAS*
Abstract: Fishes are constantly exposed to various sources of noise in their underwater acoustic environment. Many of these sounds are from anthropogenic sources, especially engines of boats. Noise generated from a small boat with a 55 horsepower outboard motor was played back to fathead minnows, *Pimephales promelas*, for 2 h at 142 dB (re: 1 muPa), and auditory thresholds were measured using the auditory brainstem response (ABR) technique. The results demonstrate that boat engine noise significantly elevate a fish's auditory threshold at 1 kHz (7.8 dB), 1.5 kHz (13.5 dB), and 2.0 kHz (10.5 dB), the most sensitive hearing range of this species. Such a short duration of noise exposure leads to significant changes in hearing capability, and implies that man-made noise generated from boat engines can have far reaching environmental impacts on fishes.
Link to PDF: Scholik_Yan_2002_boatnoise_minnow.pdf
Author Address: Univ Kentucky, Sch Biol Sci, Mechanosensory Physiol Lab, Lexington, KY 40506 USA.
Scholik, AR, Univ Kentucky, Sch Biol Sci, Mechanosensory Physiol Lab, Lexington, KY 40506 USA.
Language: English

Reference Type: Journal Article
Record Number: 373
Author: Scholik, Amy R.; Yan, Hong Y.
Year: 2002

Title: The effects of noise on the auditory sensitivity of the bluegill sunfish, *Lepomis macrochirus*
Journal: Comparative Biochemistry and Physiology A-Molecular and Integrative Physiology
Volume: 133
Pages: 43-52
Short Title: The effects of noise on the auditory sensitivity of the bluegill sunfish, *Lepomis macrochirus*
Keywords: AUDITORY BRAINSTEM RESPONSE; ABR; CENTRARCHIDAE; CYPRINIDAE; HEARING GENERALIST FISH; THRESHOLD SHIFT; UNDERWATER NOISE; WHITE NOISE; FISH; BLUEGILL SUNFISH; *LEPOMIS MACROCHIRUS*
Abstract: As concerns about the effects of underwater anthropogenic noises on the auditory function of organisms increases, it is imperative to assess if all organisms are equally affected by the same noise source. Consequently, auditory capabilities of an organism need to be evaluated and compared interspecifically. Teleost fishes provide excellent models to examine these issues due to their diversity of hearing capabilities. Broadly, fishes can be categorized as hearing specialists (broad hearing frequency range with low auditory thresholds) or hearing generalists (narrower frequency range with higher auditory thresholds). The goal of this study was to examine the immediate effects of white noise exposure (0.3–2.0 kHz, 142 dB re: 1 mPa) and recovery after exposure (1–6 days) on a hearing generalist fish, bluegill sunfish (Lepomis macrochirus). Noise exposure resulted in only a slight, but not statistically significant, elevation in auditory threshold compared to fish not exposed to noise. In combination with results from our previous studies examining effects of noise on a hearing specialist fish, the fathead minnow (*Pimephales promelas*), this study provides evidence supporting the hypothesis that fish's auditory thresholds can be differentially affected by noise exposure.
Link to PDF: Scholik_Yan_2002_bluegillsunfish_abr_noise.pdf

Reference Type: Journal Article
Record Number: 102
Author: Scholz, K.; Ladich, Friedrich
Year: 2006
Title: Sound production, hearing and possible interception under ambient noise conditions in the topmouth minnow *Pseudorasbora parva*
Journal: Journal of Fish Biology
Volume: 69
Issue: 3
Pages: 892-906
Short Title: Sound production, hearing and possible interception under ambient noise conditions in the topmouth minnow *Pseudorasbora parva*
Accession Number: ISI:000239796900020
Keywords: AMBIENT; AUDITORY EVOKED POTENTIAL; AEP; FEEDING SOUNDS; MASKING; SOUND INTERCEPTION; TOPMOUTH MINNOW; *PSEUDORASBORA PARVA*; CYPRINID; PLAYBACK EXPERIMENTS

Abstract: Sounds were produced by the topmouth minnow *Pseudorasbora parva*, a common Eurasian cyprinid, during feeding but not during intraspecific interactions. Feeding sounds were short broadband pulses with main energies between 100 and 800 Hz. They varied in their characteristics (number of single sounds per feeding sequence, sound duration and period, and sound pressure level) depending on the food type (chironomid larvae, Tubifex worms and flake food). The loudest sounds were emitted when food was taken up at the water surface, most probably reflecting 'suctorial' feeding. Auditory sensitivities were determined between 100 and 4000 Hz utilizing the auditory evoked potentials recording technique. Under laboratory conditions and in the presence of natural ambient noise recorded in Lake Neusiedl in eastern Austria, best hearing sensitivities were between 300 and 800 Hz (57 dB re 1 mPa v. 72 dB in the presence of ambient noise). Threshold-to-noise ratios were positively correlated to the sound frequency. The correlation between sound spectra and auditory thresholds revealed that P. parva can detect conspecific sounds up to 40 cm distance under ambient noise conditions. Thus, feeding sounds could serve as an auditory cue for the presence of food during foraging.
Research Notes: Feeding sounds playback and auditory detection in minnows.
Link to PDF: Scholz_Ladich_2006_FX_ambient_minnow.pdf

Reference Type: Journal Article
Record Number: 349
Author: Scrimger, P.; Heitmeyer, R. M.
Year: 1991
Title: Acoustic source-level measurements for a variety of merchant ships
Journal: Journal of the Acoustical Society of America
Volume: 89
Issue: 2
Pages: 691-699
Short Title: Acoustic source-level measurements for a variety of merchant ships
Keywords: VESSEL; ACOUSTICS; NOISE
Abstract: This report presents a set of 50 source spectra obtained from merchant ships of opportunity near Genova, Italy. The source spectra were calculated from radiated-noise spectra measured on a towed array together with a transmission-loss spectrum computed from a parabolic equation model. The aggregate source spectra are characterized in terms of a mean source spectrum and three source-level histograms computed for different frequency bands. It is shown that the mean spectrum is comparable in level and shape to a spectrum computed from a well-known empirical model and that the source-level histograms are approximately Gaussian with standard deviations of 5, 5.5, and 6.8 dB, respectively. Finally, a sub-sample of 36 spectra is drawn from the aggregate and separated into three identifiable ship classes, namely, passenger/ferries, cargo ships, and tankers. It is seen that the source spectra for the three different ship classes have comparable means and standard deviations. From this result it is conjectured that both the mean spectrum and the source-level histograms are not sensitive to ship class and can therefore be taken as representative of shipping in other regions with different ship class percentages.

Research Notes: Noise metrics from a variety of ship types.
Link to PDF: Scrimger_Heitmeyer_1991_vessels_noise.pdf

Reference Type: Journal Article
Record Number: 298
Author: Shaffer, Scott A.; Costa, Daniel P.
Year: 2006
Title: A database for the study of marine mammal behavior: Gap analysis, data standardization, and future directions
Journal: IEEE Journal of Oceanic Engineering
Volume: 31
Issue: 1
Pages: 82-86
Date: Jan
Type of Article: Article
Short Title: A database for the study of marine mammal behavior: Gap analysis, data standardization, and future directions
ISSN: 0364-9059
Accession Number: ISI:000238710400009
Keywords: DATABASE DEVELOPMENT; DIVING; LIVE ACCESS SERVER; MARINE MAMMALS; TRACKING; WHALE; SONAR; ESME
Abstract: A relational database that contained published information on the diving behavior and/or movement patterns of marine mammals was compiled to facilitate a modeling effort of the Effects of Sound on the Marine Environment (ESME) program. A total of 448 references from reports, books, and peer-reviewed journal articles were obtained. The metadata describing each animal studied, location of the study, and equipment used were entered into the database as well as empirical data describing the diving behavior and movement patterns of each animal. In total, the database contained 1815 entries from 51 different marine mammal species or subspecies. The majority of animals were seals and sea lions with 1560 entries from 29 individual species. More than half the number of animals studied were from high latitude regions (e.g., Arctic and Antarctic). Other problem areas identified were: 1) Data reduction in summaries, 2) inability to easily summarize qualitative and quantitative data, and 3) lack of standardization in data reporting. A solution is to create a common access data archive where researchers contribute raw published or unpublished geospatially referenced data sets. This would improve access to original data sets with large volumes of data, which, overall, enhances the power to develop robust behavioral or ecological models that could help define critical habitats of marine mammals.
URL: <Go to ISI>://000238710400009
Link to PDF: Schaffer_Costa_2006_ESME_gap-analysis.pdf
Author Address: Univ Calif Santa Cruz, Dept Ecol & Evolutionary Biol, Santa Cruz, CA 95060 USA.
Shaffer, SA, Univ Calif Santa Cruz, Dept Ecol & Evolutionary Biol, Santa Cruz, CA 95060 USA.
shaffer@biology.ucsc.edu costa@biology.ucsc.edu

Language: English

Reference Type: Journal Article
Record Number: 459
Author: Shaughnessy, P.D.; Semmelink, A.; Cooper, J.; Frost, P.G.H.
Year: 1981
Title: Attempts to develop acoustic methods of keeping Cape fur seals (*Arctocephalus pusillis*) from fishing nets
Journal: Biological Conservation
Volume: 21
Pages: 141-158
Short Title: Attempts to develop acoustic methods of keeping Cape fur seals (*Arctocephalus pusillis*) from fishing nets
Abstract: Cape fur seals *Arctocephalus pusillus* cause losses to catches of pelagic shoaling fish made by purse-seine vessels off southern Africa. The seals disturb fish shoals and fish within nets, and damage nets. Weighted firecrackers, 'Thunderflashes', 'Belugas' and
'Seal Deterrents', that exploded underwater were used to scare seals in nets. Seals responded to playback of killer whale *Orcinus orca* vocalisations and sweep frequency pulses, but did not flee. Seals moved away from 0-303 in calibre rifle bullets fired into the water in their vicinity, but were unaffected by bullets fired over their heads. An arcdischarge transducer was developed to produce the underwater compression and sound levels similar to those caused by firecrackers and by 0-303 in bullets. Most seals at the cod-end of a trawl net moved away from the arc-discharger stimulus, but seals did not leave a purse-seine net. It is concluded that deterrents developed in this study were ineffective in reducing disturbances by seals at purse-seine nets.

Link to PDF: Shaughnessy_etal_2006_furseal_fishingnet.pdf

Reference Type: Journal Article
Record Number: 336
Author: Siderius, M.; Porter, M. B.
Year: 2006
Title: Modeling techniques for marine-mammal risk assessment
Journal: IEEE Journal of Oceanic Engineering
Volume: 31
Issue: 1
Pages: 49-60
Date: Jan
Type of Article: Article
Short Title: Modeling techniques for marine-mammal risk assessment
ISSN: 0364-9059
Accession Number: ISI:000238710400006
Keywords: ACOUSTICS; MARINE MAMMALS; SONAR; ACOUSTIC PROPAGATION; DOPPLER; ENVIRONMENTS; WAVEGUIDE; FIELDS; DEPTH

Abstract: Propagation modeling in the ocean may be said to be a fairly mature subject, with a number of reliable and efficient acoustic models freely distributed. However, acoustic modeling to predict effects of sound on marine mammals presents some particular challenges. Standard sonar models predict the mean power levels for static receivers. However, marine-mammal researchers have shown a strong interest in being able to predict the actual time series that a moving mammal would experience as it swims through an ensonified ocean. The time series can then be used to directly model auditory models of the mammalian ear. To do this properly requires attention to subtle Doppler effects. The authors present a Gaussian-beam-tracing method that handles all these issues. Another key element needed for such models is the ability to rapidly predict three-dimensional (3-D) acoustic fields for lots of source/receiver combinations. This problem arises in trying to choose optimal locations for navy exercises, considering also a variety of hypothesized mammal-migration patterns. The authors discuss a precomputation approach to solve this problem. Finally, they examine a technique to reduce the computation needed for the one-third octave transmission loss (TL) averages. The one-third octave average is often used as a metric for the assessment of risk to mammals. The brute-force solution to this problem requires propagation modeling at many frequencies in the band. Here, the authors develop a general relationship to replace those frequency averages with much more easily computed range averages. The novelty of this approach relative to the previous range-averaging techniques is that it extends those methods to the range-dependent conditions.
Notes: ISI Document Delivery No.: 059CH
Times Cited: 3
Cited Reference Count: 17
URL: <Go to ISI>://000238710400006
Link to PDF: Siderius_Porter_2006_Modeling_Risk.pdf
Author Address: Heat Light & Sound Res Inc, San Diego, CA 92130 USA.
Siderius, M, Heat Light & Sound Res Inc, San Diego, CA 92130 USA.
siderius@hlsresearch.com
Language: English

Reference Type: Journal Article
Record Number: 472
Author: Sisneros, Joseph A.; Forlano, Paul M.; Deitcher, David L.; Bass, Andrew H.
Year: 2004
Title: Steroid-dependent auditory plasticity leads to adaptive coupling of sender and receiver
Journal: Science
Volume: 305
Pages: 404-407
Short Title: Steroid-dependent auditory plasticity leads to adaptive coupling of sender and receiver
Abstract: For seasonally breeding vertebrates, reproductive cycling is often coupled with
changes in vocalizations that function in courtship and territoriality. Less is
known about changes in auditory sensitivity to those vocalizations. Here, we

show that nonreproductive female midshipman fish treated with either testosterone or 17B-estradiol exhibit an increase in the degree of temporal encoding of the frequency content of male vocalizations by the inner ear that mimics the reproductive female's auditory phenotype. This sensory plasticity provides an adaptable mechanism that enhances coupling between sender and receiver in vocal communication.
Link to PDF: Sisneros_etal_2004_auditory_plasticity.pdf

Reference Type: Journal Article
Record Number: 355
Author: Skalski, J. R.; Pearson, W. H.; Malme, C.I.
Year: 1992
Title: Effects of sounds from a geophysical survey device on catch-per-unit-effort in a hook-and-line fishery for rockfish (*Sebastes* spp.)
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 49
Issue: 7
Pages: 1357-136
Short Title: Effects of sounds from a geophysical survey device on catch-per-unit-effort in a hook-and-line fishery for rockfish (*Sebastes* spp.)
Alternate Journal: Can. J. Fish. Aquat. Sci.
Keywords: HUMAN IMPACT; CATCH; REDUCTION; UNDERWATER; FISHERIES; *SEBASTES*
Abstract: We examined the concern of commercial fishermen that the sounds generated by acoustic geophysical survey devices result in decreased commercial catches. In blind experimental trials, a test of effects was performed on the rockfish (*Sebastes* spp.) hook-and-line fishery located along the central California coast. A single 1639-cm super(3) air gun with a source level of 223 dB re 1 mu Pa was used to produce peak pressures above 186 dB re 1 mu Pa at the base of rockfish aggregations. There was an average decline in catch-per-unit-effort of -52.4% (90% confidence interval -27.9%, -76.9%) under emission conditions relative to control trials. This overall decline was also reflected in the individual catches of chilipepper (*S. goodei*) (alpha = 0.046)), bocaccio (*S. paucispinis* (alpha = 0.007)), and greenspotted rockfish (*S. chlorostictus* (alpha = 0.021)). The overall reduction in catch translated to an average economic loss of 49.8% (90% confidence interval -21.7%, -77.9%) under the test conditions of this experiment.
Link to PDF: Skalski_etal_1992_Rockfish_airgun.pdf

Reference Type: Journal Article
Record Number: 104
Author: Skaret, Georg; Axelsen, Bjørn Erik; Nøttestad, Leif; Fernö, Anders; Johannessen, Arne
Year: 2005
Title: The behaviour of spawning herring in relation to a survey vessel

Journal: ICES Journal of Marine Science
Volume: 62
Issue: 6
Pages: 1061-1064
Short Title: The behaviour of spawning herring in relation to a survey vessel
Accession Number: ISI:000231917200004
Keywords: VESSEL AVOIDANCE; HERRING; SPAWNING BEHAVIOR; STATE-DEPARTMENT TRADE-OFF
Abstract: Vessel avoidance of spawning herring (Clupea harengus L.) was studied off the coast of
southwestern Norway in April 2000. In eight repeated night-time passages a demersal layer
of herring was recorded acoustically by a small stationary reference vessel (96 GRT), while
a survey vessel (710 GRT) passed at short ranges (8e40 m). No avoidance attributable to
the survey vessel was observed. We interpret vessel avoidance as a response to a perceived
threat and herring are known to exhibit strong avoidance reactions to survey vessels during
wintering and the spawning migration. At the spawning site, the high priority given to
reproductive activities seems to overrule the avoidance responses to a passing survey vessel.
Link to PDF: Skaret_etal_2005_herring_spawning_vessel.pdf

Reference Type: Journal Article
Record Number: 360
Author: Slotte, A.; Hansen, K.; Dalen, J.; Ona, E.
Year: 2004
Title: Acoustic mapping of pelagic fish distribution and abundance in relation to a seismic shooting area off the Norwegian west coast
Journal: Fisheries Research
Volume: 67
Pages: 143-150
Short Title: Acoustic mapping of pelagic fish distribution and abundance in relation to a seismic shooting area off the Norwegian west coast
Keywords: SEISMIC SHOOTING; HERRING; BLUE WHITING; MESOPELAGIC FISH; DISTRIBUTION; ABUNDANCE
Abstract: In April 1999 seismic investigations started in an area off western Norway as part of an ordinary three-dimensional survey, using a vessel with two seismic sources, each of 20 air guns and 10 hydrophone streamers. The seismic sources, towed at a depth of 8m, were alternatively fired every 25m along 51 transects, each 51 525m long, separated from adjacent transects by 500 m. The possible influence of this seismic activity on pelagic fish (herring, blue whiting and mesopelagic species) was investigated in two ways. First, the distribution and abundance within the seismic area and the

surrounding waters up to 30–50 km away were mapped acoustically three times. In all three surveys the acoustic abundance of pelagic fish was higher outside than inside the seismic shooting area, indicating a long-term effect of the seismic activity. Secondly, the acoustic abundance was recorded directly prior to and after shooting along some of the seismic transects. In these comparisons no differences were found, indicating that the shooting had insignificant short-term scaring effects. However, both blue whiting and mesopelagic species were found in deeper waters in periods with shooting compared to periods without shooting, indicating that vertical movement rather than horizontal movement could be a short-term reaction to this noise.
Research Notes: Changes in fish population due to air gun shooting.
Link to PDF: Slotte_etal_2004_fish_airgun.pdf

Reference Type: Journal Article
Record Number: 105
Author: Smith, M. E.; Kane, A. S.; Popper, A. N.
Year: 2004
Title: Acoustical stress and hearing sensitivity in fishes: does the linear threshold shift hypothesis hold water?
Journal: Journal of Experimental Biology
Volume: 207
Issue: 20
Pages: 3591-3602
Short Title: Acoustical stress and hearing sensitivity in fishes: does the linear threshold shift hypothesis hold water?
Accession Number: ISI:000224694300020
Keywords: THRESHOLD SHIFT; HEARING; FISH; NOISE; LINTS; AUDITORY BRAINSTEM RESPONSE; *CARASSIUS AURATUS*; *OREOCHROMIS NILOTICUS*; GOLDFISH; TILAPIA; TTS
Abstract: Mammals exposed to loud aerial sounds exhibit temporary threshold shifts (TTS) that are linearly related to increases of sound pressure above baseline hearing levels. It was unknown if this relationship held true for aquatic ectotherms such as fishes. To test this linear threshold shift hypothesis (LINTS) in fishes, we examined the effects of increased ambient sound on hearing of two species differing in hearing capabilities: goldfish (*Carassius auratus*; a hearing specialist) and tilapia (*Oreochromis niloticus*; a hearing generalist). Fish were exposed to 1–28 days of either quiet (110 dB re 1 uPa) or continuous white noise. First, we examined the effect of noise sound pressure level (SPL; 130, 140, 160 or 170·dB re 1·mPa) on goldfish hearing thresholds after 24·h of noise exposure. Second, in a long-term experiment using 170 dB re 1 uPa white noise, we continuously exposed goldfish and tilapia for either 7 or 21–28 days. In both experiments, we measured alterations in hearing capabilities (using auditory brainstem responses) of noise-exposed fish. While tilapia exposed to noise for 28 days showed little or no hearing loss, goldfish exhibited considerable threshold shifts that reached an asymptote of up to 25 dB after only 24 h of exposure. There was a positive linear relationship between noise-induced TTS and the sound pressure difference between the noise and the baseline hearing thresholds in goldfish but not in

tilapia. A similar relationship was found for published noise-induced threshold shifts in birds and mammals, but the slope of the linear relationship was greater in these groups than for fish. The linear threshold shift relationship provides insights into differential susceptibility of hearing specialist and generalist fishes to noise-induced hearing loss for a given SPL and provides a framework for future research on noise-induced threshold shifts in fishes and other animals.

Research Notes: Testing for LINTS (linear threshold shift) in fish, using it to compare similar data from various studies.
Link to PDF: Smith_etal_2004_fish_LINTS.pdf

Reference Type: Journal Article
Record Number: 106
Author: Smith, Michael E.; Kane, A. S.; Popper, Arthur N.
Year: 2004
Title: Noise-induced stress response and hearing loss in goldfish (*Carassius auratus*)
Journal: Journal of Experimental Biology
Volume: 207
Issue: 3
Pages: 427-435
Short Title: Noise-induced stress response and hearing loss in goldfish (*Carassius auratus*)
Accession Number: ISI:000188833700014
Keywords: TEMPORARY THRESHOLD SHIFT; TTS; HEARING; NOISE; CORTISOL; GLUCOSE; ABR; AUDITORY BRAINSTEM RESPONSE; RECOVERY; FISH; *CARASSIUS AURATUS*; SEISMIC; ANTHROPOGENIC NOISE
Abstract: Fishes are often exposed to environmental sounds such as those associated with shipping, seismic experiments, sonar and/or aquaculture pump systems. While efforts have been made to document the effects of such anthropogenic (human-generated) sounds on marine mammals, the effects of excess noise on fishes are poorly understood. We examined the short- and long-term effects of increased ambient sound on the stress and hearing of goldfish (*Carassius auratus*; a hearing specialist). We reared fish under either quiet (110–125·dB re 1·mPa) or noisy (white noise, 160–170·dB re 1·mPa) conditions and examined animals after specific durations of noise exposure. We assessed noise-induced alterations in physiological stress by measuring plasma cortisol and glucose levels and in hearing capabilities by using auditory brainstem responses. Noise exposure did not produce long-term physiological stress responses in goldfish, but a transient spike in plasma cortisol did occur within 10·min of the noise onset. Goldfish had significant threshold shifts in hearing after only 10·min of noise exposure, and these shifts increased linearly up to approximately 28·dB after 24·h of noise exposure. Further noise exposure did not increase threshold shifts, suggesting an asymptote of maximal hearing loss within 24·h. After 21·days of noise exposure, it took goldfish 14·days to fully recover to control hearing levels. This study shows that hearingspecialist fishes may be susceptible to noise-induced stress and hearing loss.

Research Notes: Experiments show immediate startle response but no long-term response to noise in goldfish.
Link to PDF: Smith_etal_2004_goldfish_abr.pdf

Reference Type: Journal Article
Record Number: 300
Author: Soldevilla, M. S.; McKenna, M. E.; Wiggins, S. M.; Shadwick, R. E.; Cranford, T. W.; Hildebrand, John A.
Year: 2005
Title: Cuvier's beaked whale (*Ziphius cavirostris*) head tissues: physical properties and CT imaging
Journal: Journal of Experimental Biology
Volume: 208
Issue: 12
Pages: 2319-2332
Date: Jun
Type of Article: Article
Short Title: Cuvier's beaked whale (*Ziphius cavirostris*) head tissues: physical properties and CT imaging
Alternate Journal: J. Exp. Biol.
ISSN: 0022-0949
Accession Number: ISI:000230360700014
Keywords: CUVIER'S BEAKED WHALE; *ZIPHIUS CAVIROSTRIS*; PHYSICAL PROPERTY; SOUND SPEED; DENSITY; HOUNSFIELD UNIT; ELASTIC MODULUS; DOLPHIN; *TURSIOPS TRUNCATUS*; *GLOBICEPHALA MELAENA MELAENA*; SOUND-VELOCITY MEASUREMENTS; ATLANTIC PILOT WHALE; SPERM WHALE; *DELPHINUS DELPHIS*; BUBBLE-GROWTH; CETACEAN; MELON; BLUBBER
Abstract: Tissue physical properties from a Cuvier's beaked whale (*Ziphius cavirostris*) neonate head are reported and compared with computed tomography (CT) X-ray imaging. Physical properties measured include longitudinal sound velocity, density, elastic modulus and hysteresis. Tissues were classified by type as follows: mandibular acoustic fat, mandibular blubber, forehead acoustic fat (melon), forehead blubber, muscle and connective tissue. Results show that each class of tissues has unique, co-varying physical properties. The mandibular acoustic fats had minimal values for sound speed (1350 +/- 10.6 m s(-1)) and mass density (890 +/- 23 kg m(-3)). These values increased through mandibular blubber (1376 +/- 13 m s(-1), 919 +/- 13 kg m(-3)), melon (1382 +/- 23m s(-1), 937 +/- 17 kg m(-3)), forehead blubber (1401 +/- 7.8 m s(-1), 935 +/- 25 kg m(-3)) and muscle (1517 +/- 46.8 m s(-1), 993 +/- 58 kg m(-3)). Connective tissue had the greatest I mean sound speed and density (1628 +/- 48.7 m s(-1)
URL: <Go to ISI>://000230360700014
Link to PDF: Soldevilla_etal_2005_beakedwhale_tissue.pdf
Author Address: Univ Calif San Diego, Scripps Inst Oceanog, La Jolla, CA 92093 USA. San Diego State Univ, San Diego, CA 92182 USA.
Soldevilla, MS, Univ Calif San Diego, Scripps Inst Oceanog, 9500 Gilman Dr, La Jolla,

CA 92093 USA.
mhock@ucsd.edu
Language: English

Reference Type: Journal Article
Record Number: 307
Author: Sorensen, Peter W.; Medved, Robert J.; Hyman, Martin A. M.; Winn, Howard E.
Year: 1984
Title: Distribution and abundance of cetaceans in the vicinity of human activites along the continental-shelf of the northwestern Atlantic
Journal: Marine Environmental Research
Volume: 12
Issue: 1
Pages: 69-81
Type of Article: Article
Short Title: Distribution and abundance of cetaceans in the vicinity of human activites along the continental-shelf of the northwestern Atlantic
Alternate Journal: Mar. Environ. Res.
ISSN: 0141-1136
Accession Number: ISI:A1984SL64000005
Keywords: CETACEAN; OIL; OIL RIG; DISTRIBUTION
Abstract: The distribution and abundance of cetaceans were investigated in the vicinity of oil rigs, surface oil and boat traffic along the continental shelf of the northwestern Atlantic. Data concerning the total number of cetacean sightings and individuals were obtained from dedicated aerial surveys conducted between January, 1979 and January, 1982. Sightings per unit effort and individuals per unit effort for areas surrounding active oil rigs were not significantly different from those found in the same areas when no oil rigs were present. Surface oil was sighted ninety-four times. Cetacean sightings were made in the vicinity of oil on eleven different occasions and in oil twice. None of these animals was noted as displaying unusual behavior and no feeding was observed. The presence of boat traffic was found to decrease the probability of sighting squid-eating cetaceans but had no apparent e[ffect on the probability of sighting fish-eating cetaceans.
Notes: ISI Document Delivery No.: SL640
Times Cited: 5
Cited Reference Count: 16
URL: <Go to ISI>://A1984SL64000005
Link to PDF: Sorenson_etal_1984_Cetaceans-human-activities_Atlantic.pdf
Author Address: SORENSEN, PW, UNIV RHODE ISL,GRAD SCH OCEANOG,NARRAGANSETT,RI 02882.
Language: English

Reference Type: Journal Article
Record Number: 361
Author: Soria, Marc; Fréon, Pierre; Gerlotto, François

Year: 1996
Title: Analysis of vessel influence on spatial behaviour of fish schools using a multi-beam sonar and consequences for biomass estimates by echo-sounder
Journal: ICES Journal of Marine Science
Volume: 53
Issue: 2
Pages: 453-458
Short Title: Analysis of vessel influence on spatial behaviour of fish schools using a multi-beam sonar and consequences for biomass estimates by echo-sounder
Keywords: ACOUSTICS; SCHOOL; FISH
Abstract: Biases in the measurements of spatial distribution of fish schools and their consequences for school biomass estimates during conventional acoustic surveys are mainly due to vertical and lateral avoidance of the vessel. In this paper, we quantify school avoidance during an acoustic survey carried out from 13 to 29 May 1994 in the Catalan Sea. From a lateral multi-beam sonar the geometric characteristics (depth, length, width, height, surface, and volume) of 1268 schools were obtained. The 60 beams (1.5#&176;x15#&176;) of the sonar scanned a vertical plane from 0#&176; to 90#&176;, perpendicular to the vessel path within a range of 100 m. Within this plane, the projected area ensonified by the echo-sounder used aboard for acoustic evaluation was evaluated to simulate a comparison between the sonar and the echo-sounder. The results have enabled us to improve our knowledge on the vertical and lateral avoidance patterns of schools in relation to their size, external structure, and their position in the water column, and to quantify the vessel influence on biomass estimated by echo-sounder.
Link to PDF: Soria_etal_1996_fish_biomass_sonar.pdf

Reference Type: Journal Article
Record Number: 194
Author: Soto, Natacha A.; Johnson, Mark P.; Madsen, Peter T.; Tyack, Peter L.; Bocconcelli, Alessandro; Borsani, J. Fabrizio
Year: 2006
Title: Does intense ship noise disrupt foraging in deep-diving Cuvier's beaked whales (*Ziphius cavirostris*)?
Journal: Marine Mammal Science
Volume: 22
Issue: 3
Pages: 690-699
Date: Jul
Short Title: Does intense ship noise disrupt foraging in deep-diving Cuvier's beaked whales (*Ziphius cavirostris*)?
Accession Number: ISI:000238186500012
Keywords: CUVIER'S BEAKED WHALE; *ZIPHIUS CAVIROSTRIS*; VESSEL
URL: <Go to ISI>://000238186500012
Link to PDF: Soto_etal_2006_ShipNoise_CuviersBeaked.pdf

Reference Type: Report
Record Number: 372
Author: Southall, Brandon L.
Year: 2004
Title: Shipping Noise and Marine Mammals: A Forum for Science, Management, and Technology
City: Arlington, Virginia, USA
Institution: National Oceanic and Atmospheric Administration
Pages: 1-40
Date: 18-19 May 2004
Short Title: Shipping Noise and Marine Mammals: A Forum for Science, Management, and Technology
Keywords: MARINE MAMMALS; SHIP NOISE; VESSEL;NOAA
Abstract: The first international symposium on “Shipping Noise and Marine Mammals” was held on 18-19 May 2004 in Arlington, Virginia, U.S.A. This meeting brought together representatives of various ocean industries, academia and other research organizations, government and military personnel, and non-governmental organizations. The main purpose of the meeting was to initiate discussion on what information is available and needed concerning sounds produced by large ships and other vessels and their potential impacts on marine mammals (and, to a lesser extent, fish and turtles). This collaborative forum begins a dialogue among various stakeholder groups on this emerging scientific question. The National Oceanic and Atmospheric Administration (NOAA) Acoustics Program was the primary sponsor of this meeting. The Acoustics Program initiated the symposium to formally address the potential effects of sound from vessels on marine mammals, with specific technical emphasis on evaluating available data and planning future research efforts. Seven partners from segments of the commercial shipping industry, U.S. government, and academia aided in the planning and advertisement of the meeting. Approximately 200 people with a wide range of affiliations, including all of those given above, attended the meeting. Introductory remarks were provided by a number of distinguished invited speakers. Technical sessions were conducted on issues ranging from sound produced by ships to the state of knowledge on possible acoustic impacts on marine animals to vessel quieting technologies and their possible commercial applications. Each of the technical presentations, as well as much more information regarding the meeting, are available at: www.shippingnoiseandmarinemammals.com Many of the presentations and discussion in the symposium focused on large vessels, principally the largest ocean-going commercial shipping vessels (container and dry bulk ships and tankers). This emphasis, based on the fact that such vessels are specifically known to emit relatively high levels of low frequency sound capable of traveling long distances, is consequently largely reflected in the report of the symposium proceedings. As was acknowledged during the symposium, however, a wide range of human vessel types are not reflected by the term “commercial ships”. The relative contribution of sounds from various vessel types to overall ambient noise and their possible impacts on marine life remain largely unknown. Symposium participants noted that emphasis should be expanded in future forums to the wide range of human vessel types: including

recreational and fishing craft, cruise vessels, ferries, certain tankers, and other transport vessels. An invited panel discussed various technical, legal, and economic issues and considered possible future actions. At the conclusion of the panel discussion, a steering committee was formed to plan aspects of a proposed follow-on symposium.
Notes: Website not live as of 26 June 2007.
Research Notes: Report on "information-sharing meeting". Panel discussion session recaps. Session I – Trends in the Shipping Industry and Shipping Noise; Session II – Effects of Noise on Marine Life; Session III – National and International Response to the Marine Noise Issue; Session IV – Developing Technologies for Monitoring Marine Noise; Session V – Vessel Quieting Technology: Applications and Benefits
URL: http://www.nmfs.noaa.gov/pr/pdfs/acoustics/shipping_noise.pdf
Link to PDF: Southall_2004_Shipping_Noise_Symposium.pdf

Reference Type: Conference Proceedings
Record Number: 476
Author: Southall, Brandon L.; Bowles, Ann E.; Ellison, W.T.; Finneran, James J.; Gentry, R.L.; Greene, C.R. Jr.; Kastak, D.; Ketten, Darlene R.; Miller, J.H.; Nachtigal, P. E.; Richardson, W. John; Thomas, J. A.; Tyack, Peter L.
Year of Conference: 2007
Title: Marine Mammal Exposure Criteria: Initial Scientific Recommendations
Conference Name: Nyborg Conference “Effects of Noise on the Aquatic Environment”
Conference Location: Nybord, Denmark
Date: 13-17 August 2007
Short Title: Marine Mammal Exposure Criteria: Initial Scientific Recommendations
Link to PDF: Southall_etal_2007_Nyborg poster_FINAL_7_30_07.ppt

Reference Type: Journal Article
Record Number: 547
Author: Sprague, Mark W.; Luczkovich, J.J.
Year: 2004
Title: Measurement of an individual silver perch *Bairdiella chrysoura* sound pressure level in a field recording
Journal: Journal of the Acoustical Society of America
Volume: 116
Issue: 5
Pages: 3186-3191
Date: November 2004
Short Title: Measurement of silver perch sound level
Abstract: Simultaneous audio and video were recorded of a silver perch Bairdiella chrysoura producing its
characteristic drumming sound in the field. The background noise contribution to the total sound
pressure level is estimated using sounds that occurred between the pulses of the silver perch sound.

This background contribution is subtracted from the total sound to give an estimate of the sound
pressure level of the individual fish. A silver perch source level in the range 128–135 dB (re: 1
mPa! is obtained using an estimate of the distance between the fish and the hydrophone. The
maximum distance at which an individual silver perch could be detected depends on the background
sound level as well as the propagation losses. Under the conditions recorded in this study, the
maximum detection distance would be 1–7 m from the hydrophone.
Link to PDF: Sprague_etal_2004_SilverPerch_SPL.pdf

Reference Type: Journal Article
Record Number: 522
Author: St. Aubin, D.J.; Ridgway, Sam H.; Wells, R. S.; Rhinehart, H.
Year: 1996
Title: Dolphin thyroid and adrenal hormones: Circulating levels in wild and semidomesticated *Tursiops truncatus*, and influence of sex, age, and season
Journal: Marine Mammal Science
Volume: 12
Issue: 1
Pages: 1-13
Short Title: Dolphin thyroid and adrenal hormones: Circulating levels in wild and semidomesticated *Tursiops truncatus*, and influence of sex, age, and season
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS;* THRYOXINE; TRIIODOTHYRONINE; CORTISOL; ALDOSTERONE; SERUM; STRESS
Abstract: Biological and environmental influences on circulating adrenal and thyroid hormones were investigated in 36 wild and 36 semidomesticated Atlantic bottlenose dolphins, Tursiops truncatus, matched by age, sex, and time of year when the samples were collected. Serum concentrations of thyroxine (free [fT41 and total [tT4]), triiodothyronine (free [fT3], total [tT3], and total reverse [rT37), cortisol, and aldosterone were determined by radio-immunoassay, Wild female dolphins had significantly higher levels of tT4, fT4 and fT3, an effect that was possibly related to reproduction and lactation. Semidomesticated females had higher tT3 than their wild counterparts. fT4 declined with age in wild dolphins, whereas rT3 was greatest in the older animals. Cortisol and aldosterone were both higher in wild animals sampled after a variable interval of up to four hours after encirclement by capture net. The pattern of adrenal hormone release suggested a mild stress response. Levels of both adrenal hormones were low in semidomesticated dolphins conditioned to present voluntarily their tails for blood sampling, an approach that appears
Link to PDF: StAubin_etal_2007_Dolphin_regulatory_hormones.pdf

Reference Type: Report
Record Number: 396
Author: Stewart, Brent S.; Evans, William E.; Awbrey, Frank T.
Year: 1982
Title: Effects of Man-made Waterborne Noise on Behavior of Belukha Whales *(Delphinapterus leucas*) in Bristol Bay, Alaska
Series Title: HSWRI Technical Report
City: Juneau, AK
Institution: National Oceanic and Atmospheric Administration
Type: Technical Report
Short Title: Effects of Man-made Waterborne Noise on Behavior of Belukha Whales *(Delphinapterus leucas*) in Bristol Bay, Alaska
Report Number: 82-145
Accession Number: NA82RAC00094
Keywords: BELUGA WHALE; *DELPHINAPTERUS LEUCAS*; BRISTOL BAY; ALASKA; ANTHROPOGENIC NOISE; VESSEL
Notes: Belukha = Russian for beluga
Research Notes: Beluga whales behavioral response to playback in wild and captive settings and vessels in wild settings.
Link to PDF: SCAN
Author Address: HSWRI

Reference Type: Journal Article
Record Number: 108
Author: Sun, Jennifer W. C.; Narins, Peter A.
Year: 2005
Title: Anthropogenic sounds differentially affect amphibian call rate
Journal: Biological Conservation
Volume: 121
Issue: 3
Pages: 419-427
Short Title: Anthropogenic sounds differentially affect amphibian call rate
Accession Number: ISI:000224662100010
Keywords: ANURAN; ACOUSTIC INTERFERENCE; VOCALIZATION; FROG; AMPHIBIAN DECLINE; *MICROHYLA BUTLERI*; *RANA NIGROVITTATA*; *KALOULA PULCHRA*; *RANA TAIPEHENSIS*; AIRCRAFT; MOTORCYCLE
Abstract: The effects of airplane flyby noise and playbacks of low-frequency motorcycle sounds on calling activity were examined in a mixed-species anuran calling assemblage in central Thailand. In response to these stimuli, three of the most acoustically active pondedge species (*Microhyla butleri, Rana nigrovittata* and *Kaloula pulchra*) significantly decreased their calling rate. Yet under the identical stimulus regime, *Rana taipehensis* consistently increased its calling rate. Moreover, during the occasional natural lulls in the chorus in which males collectively stop calling, resulting in a conspicuous reduction in chorus intensity, calls of *R. taipehensis* would appear to emerge from the background noise. These results suggest that man-made acoustic

interference may affect anuran chorus behavior either directly by modulating call rates of the chorus participants or indirectly, by suppressing calling behavior of one set of species which in turn stimulates calling in other species. The results of our playback experiment coupled with the natural calling behavior of these species support the latter hypothesis.
Link to PDF: Sun_Narins_2005_AnthroNoise_amphibian_call_rate.pdf

Reference Type: Journal Article
Record Number: 408
Author: Szymanski, Michael D.; Bain, David E.; Kiehl, Kent; Pennington, Scott; Wong, Scott; Henry, Kenneth R.
Year: 1999
Title: Killer whale (*Orcinus orca*) hearing: auditory brainstem response and behavioral audiograms
Journal: Journal of the Acoustical Society of America
Volume: 106
Issue: 2
Pages: 1134-1141
Short Title: Killer whale hearing
Abstract: Killer whale (*Orcinus orca*) audiograms were measured using behavioral responses and auditory evoked potentials (AEPs) from two trained adult females. The mean auditory brainstem response (ABR) audiogram to tones between 1 and 100 kHz was 12 dB (re 1 mPa) less sensitive than behavioral audiograms from the same individuals (±8 dB). The ABR and behavioral audiogram curves had shapes that were generally consistent and had the best threshold agreement (5 dB) in the most sensitive range 18–42 kHz, and the least (22 dB) at higher frequencies 60–100 kHz. The most sensitive frequency in the mean Orcinus audiogram was 20 kHz (36 dB), a frequency lower than many other odontocetes, but one that matches peak spectral energy reported for wild killer whale echolocation clicks. A previously reported audiogram of a male *Orcinus* had greatest sensitivity in this range (15 kHz, ~35 dB). Both whales reliably responded to 100-kHz tones (95 dB), and one whale to a 120-kHz tone, a variation from an earlier reported high-frequency limit of 32 kHz for a male *Orcinus*. Despite smaller amplitude ABRs than smaller delphinids, the results demonstrated that ABR audiometry can provide a useful suprathreshold estimate of hearing range in toothed whales.
Link to PDF: Szymanski_etal_1999_orca_abr_behavior.pdf

Reference Type: Journal Article
Record Number: 305
Author: Talpalar, A. E.; Grossman, Y.
Year: 2005
Title: Sonar versus whales: Noise may disrupt neural activity in deep-diving cetaceans
Journal: Undersea and Hyperbaric Medicine
Volume: 32

Issue: 2
Pages: 135-139
Date: Mar-Apr
Type of Article: Article
Short Title: Sonar versus whales: Noise may disrupt neural activity in deep-diving cetaceans
ISSN: 1066-2936
Accession Number: ISI:000228762100009
Keywords: HIGH PRESSURE; *GRAMPUS GRISEUS*; ECHOLOCATION; FEATURES; DOLPHIN; DEATHS; BRAIN; SOUND; POTENTIALS; RESPONSES
Notes: ISI Document Delivery No.: 921KC
Times Cited: 1
Cited Reference Count: 39
URL: <Go to ISI>://000228762100009
Author Address: Ben Gurion Univ Negev, Fac Hlth Sci, Zlotowski Ctr Neurosci, Dept Physiol, IL-84105 Beer Sheva, Israel.
Talpalar, AE, Ben Gurion Univ Negev, Fac Hlth Sci, Zlotowski Ctr Neurosci, Dept Physiol, IL-84105 Beer Sheva, Israel.
Language: English

Reference Type: Book
Record Number: 504
Author: Tavolga, William N.; Popper, Arthur N.; Fay, Richard R.
Year: 1981
Title: *Hearing and Sound Communication in Fishes*
City: New York, NY
Publisher: Springer-Verlag
Number of Pages: 608
Short Title: *Hearing and Sound Communication in Fishes*
Link to PDF: Tavolga_etal_1981_hearing_communication_fishTOC.pdf

Reference Type: Journal Article
Record Number: 484
Author: Taylor, A.R.; Knight, R.L.
Year: 2003
Title: Behavioral responses of wildlife to human activity: Terminology and methods
Journal: Wildlife Society Bulletin
Volume: 31
Issue: 4
Pages: 1263-1271
Short Title: Behavioral responses of wildlife to human activity: Terminology and methods
Keywords: ALERT DISTANCE; BEHAVIORAL RESPONSE; DISTANCE MOVED; FLIGHT DISTANCE; HUMAN ACTIVITY; METHODOLOGY; TERMINOLOGY; WILDLIFE BEHAVIOR

Link to PDF: Taylor_Knight_2003_BehavResp_Terms.pdf

Reference Type: Journal Article
Record Number: 365
Author: Teilmann, J.; Tougaard, J.; Miller, L. A.; Kirketerp, T.; Hansen, K.; Brando, S.
Year: 2006
Title: Reactions of captive harbor porpoises (*Phocoena phocoena) to pinger-like sounds*
Journal: Marine Mammal Science
Volume: 22
Issue: 2
Pages: 240-260
Short Title: Reactions of captive harbor porpoises (*Phocoena phocoena) to pinger-like sounds*
Keywords: HARBOR PORPOISE; *PHOCOENA PHOCOENA*; BEHAVIOR; HABITUATION; PINGER; HEART RATE; SWIMMING; ACOUSTIC ALARM; BYCATCH; TDR; DATALOGGER
Abstract: Pingers on gill nets can reduce bycatch of harbor porpoises. If harbor porpoises habituate to pingers, the effect may be reduced or lost. Two captive harbor porpoises were exposed to three sound types. All sounds were in the frequency band from 100 kHz to 140 kHz, 200 ms long, and presented once per 4 s. The source level was 153 dB re 1 uPa RMS at 1 m. Each session consisted of a 10-min presound, a 5-min sound, and a 10-min postsound period. Behavior was recorded on video and on dataloggers placed on the dorsal fin of one animal. The loggers recorded heart rate, swimming speed, dive duration, and depth. The animals responded most strongly to the initial presentations of a sound. Surface time decreased, the heart rate dropped below the normal bradycardia, and echolocation activity decreased. The reactions of both animals diminished rapidly in the following sessions. Should the waning of responsiveness apply to wild animals, porpoises may adapt to the sounds but still avoid nets, or the bycatch may increase after some time. The success of long-term use of pingers may then depend on the variety of sounds and rates of exposure.
Research Notes: Harbor porpoise behavioral and physical (heart-rate) responses to pinger noises. Captive animals.
Link to PDF: Teilmann_etal_2006_harborporpoise_pinger.pdf

Reference Type: Journal Article
Record Number: 110
Author: Terhune, J. M.; Hoover, C. L.; Jacobs, S. R.
Year: 2002
Title: Potential detection and deterrence ranges by harbor seals of underwater acoustic harassment devices (AHD) in the Bay of Fundy, Canada
Journal: Journal of the World Aquaculture Society
Volume: 33
Issue: 2

Pages: 176-183
Date: Jun
Short Title: Potential detection and deterrence ranges by harbor seals of underwater acoustic harassment devices (AHD) in the Bay of Fundy, Canada
Accession Number: ISI:000176741800009
Keywords: BAY OF FUNDY; HARBOR SEAL; ACOUSTICS; CANADA
Abstract: Underwater acoustic harassment devices (AHDs) are designed to deter seals from attacking finfish aquaculture cages. They may also be unintentionally disturbing non-target marine mammals. As the distance from the sound source increases, the rate at which the sound pressure level (SPL) drops per unit distance decreases. This prohibits presenting loud sounds near the cages without also creating sounds that can be detected kilometers away. In situ measurements of the sound fields of two AHDs in the Bay of Fundy, Canada, were made. The distances at which a loud AHD with short duration pulses (1.8 msec, 195 dB re 1 pPa at 1 m) and a quieter AHD with longer pulse durations (>50 msec, 166 dB re 1 pPa at 1 m) would be 80 dB or more above the detection threshold of a harbor seal Phocu vitulina were 10 and 3.5 m, respectively. On a quiet day with no nearby vessel traffic, these AHDs would be clearly detectable by harbor seals at ranges up to 2.9 and 1.3 km, respectively. By increasing the pulse length of the louder AHD to >50 msec, the sound would be more than 80 dB above the seal's detection threshold at 100 m but the sound would also be clearly detectable up to 7.2 km. It is technically possible to produce AHDs that are louder. Using very high amplitude sounds to protect finfish aquaculture cages from seal predation without encountering prohibitively large capital and operating costs may not be feasible.
Link to PDF: Terhune_etal_2002_harborseal_AHD.pdf

Reference Type: Journal Article
Record Number: 429
Author: Thode, Aaron M.; Mellinger, David K.; Stienessen, Sarah; Martinez, Anthony; Mullin, Keith
Year: 2002
Title: Depth-dependent acoustic features of diving sperm whales (*Physeter macrocephalus*) in the Gulf of Mexico
Journal: Journal of the Acoustical Society of America
Volume: 112

Issue: 1
Pages: 308-321
Date: July 2002
Type of Article: Journal Article
Short Title: Sperm whale tracking
Abstract: Three-dimensional dive trajectories of three sperm whales in the Gulf of Mexico have been obtained
by measuring the relative arrival times and bearings of the animals' acoustic multipath reflections,
using two elements of a towed hydrophone array deployed at an unknown depth and orientation.
Within the first 6–12 min of the start of a dive, the intervals between successive ''clicks'' of all three
whales corresponded closely with the two-way travel time of an acoustic pulse traveling vertically
between the animals' position and the ocean bottom. The click spectra contained multiple peaks,
including a faint band of energy originally centered near 10 kHz. As the animals descended over 500
m in depth, the center frequency of this band shifted to nearly 15 kHz, but subsequently remained
near this value during the rest of the dive. This frequency shift is consistent with that expected from
energy scattering from an ensemble of incompressible small-scale air-filled resonators, with
diameters on the order of 4 mm. One possible candidate for such an ensemble is proposed to reside
in the collapsed frontal sac of the animal. A comparison of the received levels for the bottom and
direct multipath arrivals indicates that the whales' acoustic directivity must range between 10–30
dB in the 5–20-kHz region.
Link to PDF: Thode_etal_2002_DepthDependence_Acoustics_SpermWhale.pdf

Reference Type: Journal Article
Record Number: 426
Author: Thode, Aaron M.; Straley, Jan; Folkert, Kendall; O'Connell, Victoria; Tiemann, Christopher O.
Year: 2005
Title: Foraging behavior of fish-eating sperm whales in the Gulf of Alaska in the presence and absence of fishing vessels
Journal: Journal of the Acoustical Society of America
Volume: 118
Issue: 3
Pages: 1909

Date: September 2005
Type of Article: Abstract
Short Title: Foraging behavior of fish-eating sperm whales in the Gulf of Alaska in the presence and absence of fishing vessels
Abstract: [Abstract]
Historical whaling records indicate that sperm whales off southeast Alaska incorporate fish into their diets, particularly black cod (*Anoploploma fimbria*). Since 1995 this fact has become relevant to fisheries' concerns in the form of increased depredation encounters between longline fishermen and over 40 sperm whales. Since 2002 the SE Alaska Sperm Whale Avoidance Project (SEASWAP) has been studying this phenomenon using fishermen reports, photo-ID, biopsy, and (since 2004) passive acoustics using both towed arrays and autonomous recorders placed on longline deployments. By using acoustic multipath the range and depths of foraging whales can be determined. Findings to date indicate that, under natural conditions, sperm whales are foraging at mid-depth in the water column (e.g., 250 m in 500-m-deep water), and that their dive cycle durations are similar to those reported in other oceans. This information is being compared with depth measurements of black cod at various stages of their life cycle. There is increasing evidence that distinctive acoustic cues made by longline vessels lead to changes in diving and acoustic behavior by the animals, when the animals are less than 10 nautical miles away.
Notes: Joint 150th Meeting of the Acoustical Society of America/NOISE-CON 2005
Link to PDF: JASA_2005_meeting.pdf

Reference Type: Journal Article
Record Number: 428
Author: Thode, Aaron M.; Straley, Jan; Tiemann, Christopher O.; Folkert, Kendall; O'Connell, Victoria
Year: 2007
Title: Observations of potential acoustic cues that attract sperm whales to longline fishing in the Gulf of Alaska
Journal: Journal of the Acoustical Society of America
Volume: 122
Issue: 2
Pages: 1256-1277
Date: August 2007
Type of Article: Journal Article
Short Title: Sperm whale acoustic cues
Keywords: SPERM WHALE; *PHYSETER MACROCEPHALUS*; LONGLINE; FISHING; ACOUSTIC CUE
Abstract: Sperm whales (*Physeter macrocephalus*) have learned to remove fish from demersal longline gear

deployments off the eastern Gulf of Alaska, and are often observed to arrive at a site after a haul
begins, suggesting a response to potential acoustic cues like fishing-gear strum, hydraulic winch
tones, and propeller cavitation. Passive acoustic recorders attached to anchorlines have permitted
continuous monitoring of the ambient noise environment before and during fishing hauls. Timing
and tracking analyses of sperm whale acoustic activity during three encounters indicate that
cavitation arising from changes in ship propeller speeds is associated with interruptions in nearby
sperm whale dive cycles and changes in acoustically derived positions. This conclusion has been
tested by cycling a vessel engine and noting the arrival of whales by the vessel, even when the vessel
is not next to fishing gear. No evidence of response from activation of ship hydraulics or fishing gear
strum has been found to date.
Research Notes: Most recent article from a long-term study. Sperm whales depredating sablefish longline fisherman. Originally suspected hydraulics system to be best cue. 2nd hypothesis was "strumming" of gear. Whales were observed mirroring the vessel's movement before both of these were engaged. Presence of birds did not factor in as a visual cue. Sperm whales appear to repond to the acoustic cue provided by the act of engaging and disengaging the ship's propeller.
Link to PDF: Thode_etal_2007_spermwhale_longline_acoustic_cue.pdf

Reference Type: Report
Record Number: 427
Author: Thode, Aaron M.; Straley, Jan; Tiemann, Christopher O.; Teloni, Valeria; Folkert, Kendall; O'Connell, Victoria; Behnken, Linda
Year: 2005
Title: Sperm Whale and Longline Fisheries Interactions in the Gulf of Alaska - Passive Acoustic Component 2004
Institution: North Pacific Research Board
Pages: 57
Short Title: Sperm Whale and Longline Fisheries Interactions in the Gulf of Alaska - Passive Acoustic Component 2004
Report Number: F0412
Keywords: *PHYSETER MACROCEPHALUS*; ACOUSTIC TRACKING; ACOUSTIC DETECTION; BYCATCH; CREAK; MULTIPATH; ENDANGERED; SABLEFISH; *ANOPLOPOMA FIMBRIA*; DEPREDATION; FISHERMAN; COOPERATIVE RESEARCH
Abstract: Demersal longlining is a fishing technique where one to three miles of baited fishing line is

placed on the ocean floor and left to “soak” for 8-20 hours before being retrieved to haul black cod.

Historical whaling records indicate that sperm whales (Physeter macrocephalus) off southeast Alaska incorporate fish into their diets, particularly black cod (Anoplopoma fimbria). In the 1970s sperm whales were encountered off longline gear in the Gulf of Alaska, but beginning in 1995 the frequency and intensity of depredation encounters between longline fishermen and sperm whales increased. Since 2002 the SE Alaska Sperm Whale Avoidance Project (SEASWAP) has been studying this phenomenon using fishermen reports, photo-ID, and biopsies (see related report by NPRB R0309). In 2004 and early 2005 both passive acoustic towed arrays and autonomous recorders mounted on longline deployments have provided an opportunity to both monitor and track sperm whale acoustic activity, whenever fishing vessels were present and absent. This report summarizes work on the passive acoustic component of the project (NPRB F0412) during 2004, with an emphasis on the development of passive acoustic techniques developed to track the animals in range and depth. The acoustic work has subsequently been continued under the 2005 NPRB project F0527, “Evaluation of Sperm Whale Deterrents”.

By using acoustic multipath, the range and depths of foraging whales can be determined from a single hydrophone. Findings to date indicate that whenever fishing vessels are absent, sperm whales are foraging at mid-depth in the water column (e.g. 250 m in 500 m deep water), and that their dive cycle durations are similar to those reported in other areas. Whenever animals were encountered around fishing vessels, however, the dive cycles are typically much shorter (e.g. 15 minutes or less) and position fixes on vocally active animals tend to be much shallower (e.g. 50 m). The characteristics of the acoustic sounds also change, one prominent feature being a reduction in the inter-click interval (ICI). There is increasing evidence that distinctive acoustic cues made by hauling longline vessels attract the animals to longline activity, whenever the animals are less than 10 nautical miles range from the site. These cues do not seem to be associated with sounds made by specialized longline equipment, but rather relate to how the vessel is handled during a longline haul.

Link to PDF: Thode_etal_2005_spermwhale_longline_fisheries.pdf

Reference Type: Journal Article
Record Number: 215
Author: Thomas, J. A.; Kastelein, Ronald A.; Awbrey, Frank T.
Year: 1990
Title: Behavior and blood catecholamines of captive belugas during playbacks of noise from an oil drilling program
Journal: Zoo Biology
Volume: 9
Issue: 5
Pages: 393-402
Short Title: Behavior and blood catecholamines of captive belugas during playbacks of noise from an oil drilling program
Accession Number: ISI:A1990EC09100006
Keywords: BELUGA WHALE; *DELPHINAPTERUS LEUCAS*; INDUSTRIAL NOISE; STRESS; EPINEPHRINE; NOREPINEPHRINE
Abstract: Belugas (*Delphinapterus leucas*) depend on sounds for communication and echo-location. To address the concerns that noise from oil platforms may have adverse effects, we examined behavioral responses of four captive belugas to playbacks of noise from SEDCO 708, a semi-submersible drilling platform. Swim patterns, social groups, and respirationidive rates were not statistically different before and during playbacks. We assayed levels of blood catecholamines before and after playbacks as a measure of stress. Blood epinephrine and norepinephrine levels measured immediately after playbacks were not elevated. Using the parameters we selected, we could not detect any short-term behavioral or physiological effects of drilling noise playbacks on these captive belugas. However, care should be taken in extrapolating these results to the behavior of wild belugas around oil platforms.
URL: <Go to ISI>://A1990EC09100006
Link to PDF: Thomas_etal_1990_Catechol_belugas_drilling_noise.pdf

Reference Type: Journal Article
Record Number: 111
Author: Thompson, P. M.
Year: 1992
Title: The conservation of marine mammals in Scottish waters
Journal: Proceedings of the Royal Society of Edinburgh Section B-Biological Sciences
Volume: 100
Pages: 123-140
Short Title: The conservation of marine mammals in Scottish waters
Accession Number: ISI:A1992JW06100008
Keywords: MARINE MAMMALS

Reference Type: Journal Article
Record Number: 530
Author: Thompson, Paul O.; Cummings, William C.; Ha, Samuel J.
Year: 1986
Title: Sounds, source levels, and associated behavior of humpback whales, Southeast Alaska
Journal: Journal of the Acoustical Society of America
Volume: 80
Issue: 3
Pages: 735-740
Short Title: Sounds, source levels, and associated behavior of humpback whales, Southeast Alaska
Abstract: Humpback whales in Southeast Alaskan waters produced five categories of sounds: moans,
grunts, pulse trains, blowhole-associated sounds, and surface impacts. Frequencies (Hz) of
moans and grunts were 20-1900. Major energy in low-frequency pulse trains was in a band of
25-80 Hz with pulse duration of 300-4(30 ms. Blowhole-associated sounds, recorded as transiting whales encountered one another, were of two types: shrieks, 555-2000 Hz, and
trumpetlike horn blasts with fundamental at 414 Hz (median). Pulses and spread spectrum
noise were associated with gas bubble formation and explosive bursts, respectively, in connection with spiral feeding maneuvers. Surface impacts resulted from fluke or flipper slaps
in sequences of 3-21 sounds. Source levels ranged from 162 (low-frequency pulse trains) to
192 dB '(surface impacts), re: 1 pPa, 1 m. Songs, commonly heard on winter breedingrounds,
were absent from our recordings. Feeding and perhaps certain other whale activities can be
monitored based on sound production.
Link to PDF: Thompson_etal_1986_Sounds_Hback_SE-AK.pdf

Reference Type: Journal Article
Record Number: 430
Author: Tiemann, Christopher O.; Thode, Aaron M.; Straley, Jan; O'Connell, Victoria; Folkert, Kendall
Year: 2006
Title: Three-dimensional localization of sperm whales using a single hydrophone
Journal: Journal of the Acoustical Society of America
Volume: 102
Issue: 4
Pages: 2355-2365

Date: October 2006
Type of Article: Journal Article
Short Title: Three-dimensional sperm whale localizations
Abstract: A three-dimensional localization method for tracking sperm whales with as few as one sensor is
demonstrated. Based on ray-trace acoustic propagation modeling, the technique exploits multipath
arrival information from recorded sperm whale clicks and can account for waveguide propagation
physics like interaction with range-dependent bathymetry and ray refraction. It also does not require
ray identification (i.e., direct, surface reflected) while utilizing individual ray arrival information,
simplifying automation efforts. The algorithm compares the arrival pattern from a sperm whale click
to range-, depth-, and azimuth-dependent modeled arrival patterns in order to estimate whale
location.With sufficient knowledge of azimuthally dependent bathymetry, a three-dimensional track
of whale motion can be obtained using data from a single hydrophone. Tracking is demonstrated
using data from acoustic recorders attached to fishing anchor lines off southeast Alaska as part of
efforts to study sperm whale depredation of fishing operations. Several tracks of whale activity using
real data from one or two hydrophones have been created, and three are provided to demonstrate the
method, including one simultaneous visual and acoustic localization of a sperm whale actively
clicking while surfaced. The tracks also suggest that whales' foraging is shallower in the presence
of a longline haul than without.
Link to PDF: Tiemann_etal_2006_3D_loc_sperm.pdf

Reference Type: Journal Article
Record Number: 516
Author: Turl, Charles W.
Year: 1993
Title: Low-frequency sound detection by a bottlenose dolphin
Journal: Journal of the Acoustical Society of America
Volume: 94
Issue: 5
Pages: 3006-3008
Short Title: Low-frequency sound detection by a bottlenose dolphin
Abstract: The results of an underwater hearing experiment suggest that an Atlantic

bottlenose dolphin
(*Tursiops truncatus*) may detect low-frequency sound by some mechanism other than conventional hearing. At 300 and 200 Hz the dolphin's hearing threshold was similar to previously reported data. Between 50 and 150 Hz, the dolphin's response patterns to the test
signal were similar to patterns shown for higher frequencies; however, after three to five reversals, the dolphin's sensitivity suddenly improved and resumed reporting signal-present
trials at levels near ambient noise. Since the subject was in the near field of the acoustic source,
it is suspected that the dolphin was detecting particle velocity or some combination of pressure
and velocity.
Link to PDF: Turl_1993_TuTr_LowFreq_detection.pdf

Reference Type: Book Section
Record Number: 526
Author: Tyack, Peter L.; Clark, Christopher W.
Year: 2001
Title: Communication and acoustic behavior of dolphins and whales
Editor: Au, Whitlow W. L.; Popper, Arthur N.; Fay, Richard R.
Book Title: *Hearing by Whales and Dolphins*
City: New York, NY
Publisher: Springer-Verlag
Pages: 156-224
Short Title: Communication and acoustic behavior of dolphins and whales
Link to PDF: Tyack_Clark_2001_cetaceans_communication.pdf

Reference Type: Journal Article
Record Number: 312
Author: Tyack, Peter L.; Gordon, J. C. D.
Year: 2003
Title: Controlled exposure experiments to determine the effects of noise on marine mammals
Journal: Marine Technology Society Journal
Volume: 37
Issue: 4
Pages: 41-53
Date: Win
Type of Article: Article
Short Title: Controlled exposure experiments to determine the effects of noise on marine mammals
Alternate Journal: Mar. Technol. Soc. J.
ISSN: 0025-3324

Accession Number: ISI:000220657800005
Keywords: RISK ASSESSMENT; BEAUFORT SEA; WHALE; SONAR; UNCERTAINTY; UNDERWATER; *TURSIOPS TRUNCATUS*; PLAYBACK; SHIFT; TONES
Notes: ISI Document Delivery No.: 809TA
Times Cited: 0
Cited Reference Count: 46
URL: <Go to ISI>://000220657800005
Author Address: Woods Hole Oceanog Inst, Woods Hole, MA 02543 USA. Univ St Andrews, Gatty Marine Lab, Sea Mammal Res Unit, St Andrews KY16 9AJ, Fife, Scotland.
Tyack, P, Woods Hole Oceanog Inst, Woods Hole, MA 02543 USA.
Language: English

Reference Type: Journal Article
Record Number: 313
Author: Tyack, Peter L.; Johnson, Mark P.; Soto, N. A.; Sturlese, A.; Madsen, P. T.
Year: 2006
Title: Extreme diving of beaked whales
Journal: Journal of Experimental Biology
Volume: 209
Issue: 21
Pages: 4238-4253
Date: Nov
Type of Article: Article
Short Title: Extreme diving of beaked whales
Alternate Journal: J. Exp. Biol.
ISSN: 0022-0949
Accession Number: ISI:000242132500016
Keywords: BEAKED WHALE; *ZIPHIUS CAVIROSTRIS*; *MESOPLODON DENSIROSTRIS*; DIVING; FORAGING; AEROBIC DIVE LIMIT; NORTHERN ELEPHANT SEAL; GAS BUBBLE LESION; BREATH-HOLD DIVES; WEDDELL SEAL; OPTIMAL ALLOCATION;
MIROUNGA ANGUSTIROSTRIS; *PHYSETER MACROCEPHALUS*; NITROGEN TENSIONS
Abstract: Sound-and-orientation recording tags (DTAGs) were used to study 10 beaked whales of two poorly known species, *Ziphius cavirostris* (Zc) and *Mesoplodon densirostris* (Md). Acoustic behaviour in the deep foraging dives performed by both species (Zc: 28 dives by seven individuals; Md: 16 dives by three individuals) shows that they hunt by echolocation in deep water between 222 and 1885 m, attempting to capture about 30 prey/dive. This food source is so deep that the average foraging dives were deeper (Zc: 1070 m; Md: 835 m) and longer (Zc: 58 min; Md: 47 min) than reported for any other air-breathing species. A series of shallower dives, containing no indications of foraging, followed most deep foraging dives. The average interval between deep foraging dives was 63 min for Zc and 92 min for Md. This long an interval may be required for beaked whales to recover from an oxygen debt accrued in the deep

foraging dives, which last about twice the estimated aerobic dive limit. Recent reports of gas emboli in beaked whales stranded during naval sonar exercises have led to the hypothesis that their deep-diving may make them especially vulnerable to decompression. Using current models of breath-hold diving, we infer that their natural diving behaviour is inconsistent with known problems of acute nitrogen supersaturation and embolism. If the assumptions of these models are correct for beaked whales, then possible decompression problems are more likely to result from an abnormal behavioural response to sonar.
Notes: ISI Document Delivery No.: 106WK
Times Cited: 1
Cited Reference Count: 82
URL: <Go to ISI>://000242132500016
Link to PDF: Tyack_etal_2006_Diving_Beakers.pdf
Author Address: Woods Hole Oceanog Inst, Woods Hole, MA 02543 USA. Univ La Laguna, Dept Anim Biol, Tenerife 38256, Canary Isl, Spain. BluWest, I-18100 Imperia, IM, Italy. Aarhus Univ, Inst Biol, Dept Zoophysiol, Aarhus, Denmark.
Tyack, PL, Woods Hole Oceanog Inst, Woods Hole, MA 02543 USA.
ptyack@whoi.edu
Language: English

Reference Type: Journal Article
Record Number: 487
Author: Udevitz, Mark S.; Bodkin, James L.; Costa, Daniel P.
Year: 1995
Title: Detection of sea otters in boat-based surveys of Prince William Sound, Alaska
Journal: Marine Mammal Science
Volume: 11
Issue: 1
Pages: 59-71
Short Title: Detection of sea otters in boat-based surveys of Prince William Sound, Alaska
Keywords: BOAT SURVEYS; DETECTABILITY; *ENHYDRA LUTRIS*; POPULATION ESTIMATION; SEA OTTER; STRIP TRANSECT; VISIBILITY BIAS
Abstract: Boat-based surveys have been commonly used to monitor sea otter populations,
but there has been little quantitative work to evaluate detection biases that may affect these surveys. We used ground-based observers to investigate sea otter detection probabilities in a boat-based survey of Prince William Sound, Alaska. We estimated that 30% of the otters present on surveyed transects were not detected by boat crews. Approximately half (5 3%) of the undetected otters were missed because the otters left the transects, apparently in response to the approaching boat. Unbiased estimates of detection probabilities will be required
for obtaining unbiased population estimates from boat-based surveys of sea otters. Therefore, boat-based surveys should include methods to estimate sea otter detection probabilities under the conditions specific to each survey. Unbiased estimation of detection probabilities with ground-based observers requires either

that the ground crews detect all of the otters in observed subunits, or that there are no errors in determining which crews saw each detected otter. Ground-based observer methods may be appropriate in areas where nearly all of the sea otter habitat is potentially visible from ground-based vantage points.
Link to PDF: Udevitz_etal_1995_Boat_surveys_seaotters.pdf

Reference Type: Report
Record Number: 375
Author: USDI
Year: 2002
Title: Final environmental impact statement: renewal of the federal grant for the Trans-Alaska Pipeline System right-of-way SECTION 3
City: Anchorage, AK
Institution: U.S. Department of the Interior, Bureau of Land Management, Alaska State Office
Date: November 2002
Short Title: Final environmental impact statement: renewal of the federal grant for the Trans-Alaska Pipeline System right-of-way SECTION 3
Abstract: [Table of Contents]

URL: http://tapseis.anl.gov/documents/eis/index.cfm
Link to PDF: TAPS_Sections3.10_3.19.pdf
Caption: United States Department of the Interior

Reference Type: Online Multimedia
Record Number: 415
Created By: USFWS
Year: 2007
Title: USFWS threatened and endangered species system (TESS)
Date Accessed: 20 July 2007
Abstract: [WEBPAGE] - no abstract
Research Notes: Threatened and Endangered species list for Alaska, website last updated 23 March 2007. Database is searchable for all animals, only those threatened

or endangered in Alaska are printed in PDF.
URL: http://ecos.fws.gov/tess_public/StateListing.do?status=listed&state=AK
Link to PDF: USFWS_AK_TnE_species.pdf
Author Address: U.S. Fish and Wildlife Service
Access Date: Access Date

Reference Type: Journal Article
Record Number: 314
Author: Van Parijs, S. M.; Corkeron, P.
Year: 2001
Title: Boat traffic affects the acoustic behaviour of Pacific humpback dolphins, *Sousa chinensis*
Journal: Journal of the Marine Biological Association of the United Kingdom
Volume: 81
Issue: 3
Pages: 533-538
Date: Jun
Type of Article: Article
Short Title: Boat traffic affects the acoustic behaviour of Pacific humpback dolphins, *Sousa chinensis*
Alternate Journal: J. Mar. Biol. Assoc. U.K.
ISSN: 0025-3154
Accession Number: ISI:000170746300022
Keywords: HUMPBACK DOLPHIN; *SOUSA CHINENSIS*; VESSEL; SOUTH AFRICA; ALGOA BAY; SIGNATURE WHISTLES; RESPONSES; QUEENSLAND; POPULATION; TOURISM; WATERS; CAPE
Abstract: In this study, the indirect (i.e. boats not involved in dolphin viewing activities) impacts of boat traffic oil the acoustic behaviour of Pacific humpback dolphins, Sousa chinensis, were assessed in Moreton Bay, Australia. Humpback dolphin acoustic behaviour is affected by transiting boat traffic. Boats' passage did not affect the rates at which dolphins produced click trains and burst pulse vocalizations. However, dolphins significantly increased their rate of whistling immediately after a boat moved through the area. This increase occurred only when boats were less than 1.5 kill front the groups. Groups including mother calf pairs showed all increase in whistles in response to boats' passage. Groups with no calves produced significantly fewer whistles. This evidence suggests that the noise from transiting vessels affects dolphins' group cohesion. Mother-calf pairs appear to be most disturbed by transiting vessels, and exhibit all increased need to re-establish vocal contact.
Notes: ISI Document Delivery No.: 468EZ
Times Cited: 9
Cited Reference Count: 46
URL: <Go to ISI>://000170746300022
Link to PDF: VanParijs_Corkeron_2001_humpbackdolphin_boats.pdf
Author Address: Norwegian Polar Res Inst, N-9296 Tromso, Norway. James Cook Univ N Queensland, Sch Trop Environm Studies & Geog, Townsville, Qld 4811,

Australia.
Van Parijs, SM, Norwegian Inst Fisheries & Aquaculture, N-9291 Tromso, Norway.
Language: English

Reference Type: Journal Article
Record Number: 315
Author: Van Parijs, Sofie M.; Corkeron, Peter J.
Year: 2001
Title: Vocalizations and behaviour of Pacific humpback dolphins *Sousa chinensis*
Journal: Ethology
Volume: 107
Issue: 8
Pages: 701-716
Date: Aug
Type of Article: Article
Short Title: Vocalizations and behaviour of Pacific humpback dolphins *Sousa chinensis*
Alternate Journal: Ethology
ISSN: 0179-1613
Accession Number: ISI:000171351400004
Keywords: BOTTLENOSE DOLPHIN; *TURSIOPS TRUNCATUS*; SIGNATURE WHISTLES; KILLER WHALE; *ORCINUS ORCA*; REPERTOIRES; QUEENSLAND; WATERS; FIELD; CALLS; PACIFIC HUMPBACK WHALE; *SOUSA CHINENSIS*; WHISTLES; BEHAVIOR
Abstract: Very little is known about the acoustic repertoire of the Pacific humpback dolphin *Sousa chinensis*. This study, off eastern Australia, used concurrent observations of surface behaviour and acoustic recordings to gain an insight into the behavioural significance of humpback dolphin vocalizations. Humpback dolphins exhibit five different vocalization categories: broad band clicks; barks; quacks; grunts; and whistles. Broad band clicks were high in frequency (8 kHz to > 22 kHz), were directly related to foraging behaviour and may play a role in social behaviour. Barks and quacks were burst pulse sounds (frequency: 0.6 kHz to > 22 kHz, duration: 0.1-8 s) and were associated with both foraging and social behaviour. The grunt vocalization is a low frequency narrow band sound (frequency 0.5-2.6 kHz, duration 0.06-2 s) and was only heard during socializing. There were 17 different types of whistles, ranging widely in frequency (0.9-22 kHz) and vocal structure (n = 329). The predominant whistle types used by the groups were type 1 (46%) and type 2 (17%). Most whistles were heard during both socializing and foraging. The number of whistles recorded in a group increased significantly as the number of mother-calf pairs increased, suggesting that whistles may be used as contact calls. Few vocalizations were heard during either travelling or milling behaviours. Broad band clicks, barks and whistle type 1 were the only vocalizations recorded during either travelling or milling.
Notes: ISI Document Delivery No.: 478NC
Times Cited: 4
Cited Reference Count: 40
URL: <Go to ISI>://000171351400004
Link to PDF: VanParijs_Corkeron_2001_humpbackdolphin_vocs.pdf

Author Address: Norwegian Polar Res Inst, N-9296 Tromso, Norway. James Cook Univ N Queensland, Sch Trop Environm Studies & Geog, Townsville, Qld 4811, Australia.
Van Parijs, SM, Norwegian Polar Res Inst, N-9296 Tromso, Norway.
Language: English

Reference Type: Journal Article
Record Number: 535
Author: Vanderlaan, Angelia S.M.; Taggart, Christopher T.
Year: 2007
Title: Vessel collisions with whales: The probability of lethal injury based on vessel speed
Journal: Marine Mammal Science
Volume: 23
Issue: 1
Pages: 144-156
Short Title: Vessel collisions with whales: The probability of lethal injury based on vessel speed
Keywords: VESSEL STRIKE; VESSEL SPEED; LETHAL INJURY; WHALES; RIGHT WHALE; PROBABILITY; LOGISTIC REGRESSION; BOOTSTRAP
Abstract: Historical records demonstrate that the most numerous, per capita, ocean-goingvessel
strikes recorded among large-whale species accrue to the North Atlantic right whale (Eubalaena glacialis). As vessel speed restrictions are being considered to reduce the likelihood and severity of vessel collisions with right whales, we present an analysis of the published historical records of vessels striking large whales. We examine the influence of vessel speed in contributing to either a lethal injury (defined as killed or severely injured) or a nonlethal injury (defined as minor or no apparent injury) to a large whale when struck. A logistic regression model fitted to the observations, and consistent with a bootstrap model, demonstrates that the greatest rate of change in the probability of a lethal injury (Plethal) to a large whale occurs between vessel speeds of 8.6 and 15 knots where Plethal increases from 0.21 to 0.79. The probability of a lethal injury drops below 0.5 at 11.8 knots. Above 15 knots, Plethal asymptotically approaches 1. The uncertainties in the logistic regression
estimates are relatively large at relatively low speeds (e.g., at 8 knots the probability is 0.17 with a 95% CI of 0.03–0.6). The results we provide can be used to assess the utility of vessel speed limits that are being considered to reduce the lethality of vessels striking the critically endangered North Atlantic right whale and other large whales that are frequent victims of vessel strikes.
Link to PDF: Vanderlaan_Taggart_2007_Whales_lethal_speed_vessels.pdf

Reference Type: Book Section
Record Number: 114
Author: von Holst, D.

Year: 1998
Title: The concept of stress and its relevance for animal behavior
Editor: Slater, Peter; Møller, Anders; Manfred, Milinski
Book Title: *Advances in the Study of Behavior: Stress and Behavior*
Publisher: Academic Press
Volume: 27
Pages: 1-131
Series Title: Advances In The Study Of Behavior
Short Title: The concept of stress and its relevance for animal behavior
Accession Number: ISI:000079287200002
Keywords: BEHAVIOR; STRESS

Reference Type: Book Section
Record Number: 404
Author: von Ziegesar, Olga; Miller, Elizabeth; Dahlheim, Marilyn E.
Year: 1994
Title: Impacts on humpback whales in Prince William Sound
Editor: Loughlin, Thomas R.
Book Title: *Marine Mammals and the* Exxon Valdez
City: San Diego, CA
Publisher: Academic Press
Pages: 173-191 of 395
Short Title: Impacts on humpback whales in Prince William Sound
ISBN: 0-12-456160-8
Abstract: [Back Cover]
The oil spill disaster that occurred when the *Exxon Valdez* ran aground has become part of the iconography of ecological disaster. This book synthesizes previously confidential data only recently released by the U.S. government. The data concerns the effects of this nightmarish spill on marine mammals, such as sea otters, harbor seals, killer whales, and humpback whales. Because many of the book's contributors were on site within 24 hours of this 11 million gallon catastrophe, the book is a unique longitudinal study of the demise of an ecosystem due to a single acute environmental perturbation. These certain-to-be-influential results reported here should assist marine biologists, pathologists, toxicologists, environmentalists, engineers, and coastal planners in assessing the nature of this now legendary disaster.
Notes: This is part of a book and is not included in the PDF section.
Link to PDF: von Ziegesar_etal_1994_Humpback_PWS.pdf

Reference Type: Journal Article
Record Number: 115
Author: Wahlberg, Magnus; Westerberg, Håkan
Year: 2005
Title: Hearing in fish and their reactions to sounds from offshore wind farms
Journal: Marine Ecology-Progress Series

Volume: 288
Pages: 295-309
Short Title: Fish and wind farms
Accession Number: ISI:000228394400026
Keywords: BIOACOUSTICS; DETECTION RANGE; FISH; FISH COMMUNICATION; HEARING; SEA-BASED WIND FARM;
Abstract: The current knowledge on detection of, and reaction to, sound by fish is reviewed, with special emphasis on underwater noise from offshore wind farms. The detection distance to wind farms for 3 species of fish representing various hearing capabilities varies between 0.4 and 25 km at wind speeds of 8 to 13 m s–1. The detection distance depends on the size and number of windmills, the hearing abilities of the fish, background noise level, wind speed, water depth and type of sea bottom. The noise from windmills may decrease the effective range for sound communication of fish; however, it is not known to what extent this decrease affects the behaviour and fitness of fish. Windmill noise does not have any destructive effects upon the hearing abilities of fish, even within distances of a few metres. It is estimated that fish are consistently scared away from windmills only at ranges shorter than about 4 m, and only at high wind speeds (higher than 13 m s–1). Thus, the acoustic impact of windmills on fish is restricted to masking communication and orientation signals rather than causing physiological damage or consistent avoidance reactions. These conclusions must be viewed with great caution, however, as the existing data are prone to large uncertainties. Further studies on more detailed measurements of the sound-field and of fish behaviour around windmills are needed.
Research Notes: Varied fish reactions to noise, wind farms.
Link to PDF: Wahlberg_Westerberg_2005_fish_wind_farm.pdf

Reference Type: Journal Article
Record Number: 370
Author: Wales, S. C.; Heitmeyer, R. M.
Year: 2002
Title: An ensemble source spectra model for merchant ship-radiated noise
Journal: Journal of the Acoustical Society of America
Volume: 111
Issue: 3
Pages: 1211-1231
Short Title: An ensemble source spectra model for merchant ship-radiated noise
Keywords: VESSEL; VESSEL NOISE; MODEL
Abstract: This paper presents an evaluation of the classical model for determining an ensemble of the broadband source spectra of the sound generated by individual ships and proposes an alternate model to overcome the deficiencies in the classical model. The classical model, proposed by Ross [Mechanics of Underwater Noise (Pergamon, New York, 1976)] postulates that the source spectrum for an individual ship is proportional to a baseline spectrum with the constant of proportionality determined by a power-law relationship on the ship speed and length. The model evaluation, conducted on an ensemble of 54 source spectra over a 30–1200-Hz to 1200-Hz frequency band,

shows that this assumption yields large rms errors in the broadband source level for the individual ships and significantly overestimates the variability in the source level across the ensemble of source spectra. These deficiencies are a consequence of the negligible correlation between the source level and the ship speed and the source level and the ship length. The alternate model proposed here represents the individual ship spectra by a modified rational spectrum where the poles and zeros are restricted to the real axis and the exponents of the terms are not restricted to integer values. An evaluation of this model on the source spectra ensemble indicates that the rms errors are significantly less than those obtained with any model where the frequency dependence is represented by a single baseline spectrum. Furthermore, at high frequencies (400 to 1200 Hz), a single-term rational spectrum model is sufficient to describe the frequency dependence and, at the low frequencies (30 to 400 Hz), there is only a modest reduction in the rms error for a higher order model. Finally, a joint probability density on the two parameters of the single term model based on the measured histograms of these parameters is proposed. This probability density provides a mechanism for generating an ensemble of ship spectra.
Link to PDF: Wales_Heitmeyer_2002_ship_noise_model.pdf

Reference Type: Journal Article
Record Number: 358
Author: Wardle, C. S.; Carter, T. J.; Urquhart, G. G.; Johnstone, A. D. F.; Ziolkowski, A. M.; Hampson, G.; Mackie, D.
Year: 2001
Title: Effects of seismic air guns on marine fish
Journal: Continental Shelf Research
Volume: 21
Pages: 1005-1027
Short Title: Effects of seismic air guns on marine fish
Keywords: SEISMIC EQUIPMENT; AIR GUN; REEF FISH; FISH; BEHAVIOR; SCOTLAND; ATLANTIC; SEISMIC
Abstract: Observations of marine fish andinvert ebrates on an inshore reef were made using TV andacoustic tags
one week before, during, and four days after a seismic triple G. airgun (three synchronised airguns, each
gun 2.5 l and 2000 psi) was deployed and repeatedly fired. The guns were fired once/min for eight periods on four days at different positions. The structure and intensity of the sound of each triple G. gun explosion was recorded and calibrated. Peak sound pressure levels of 210 dB (rel to 1 mPa) at 16m range and195 dB (rel to 1 mPa) at 109m range were measuredat positions where the fish were being observed. The final position of the triple G. gun, at 5.3m range, hada peak pressure level of 218dB (rel to 1 mPa). Neither the fish, nor the invertebrates, showed any signs of moving away from the reef. Firing the guns did not interrupt a diurnal rhythm of fish gathering at dusk and passing the TV camera position while the guns were firing. The longterm day-to-night movements of two tagged pollack were slightly changed by the arrival and banging of the guns particularly when positionedwithin 10m of their normal living positions. Those

reef fish, watchedby the TV camera, always showedinvolunt ary reactions in the form of a Mauthner cell reflex, C-start, at each explosion of the guns at all ranges tested(max imum range was 109 m, 195dB rel to 1 mPa). When the explosion source was not visible to the fish, the C-start reaction was cut short andthe fish continued with what they were doing before the stimulus. When the G. gun rack was sunk to the seabed (depth 14 m) visible to the fish andthe TV camera, those fish that were observed approaching the G. gun rack when the guns were firedwer e seen to turn andflee from the very visible explosion. When the gun rack was suspended midwater (5m depth) and just outside visible range at 16 metres, the fish receiving a 6 ms peak to peak, 206 dB (rel to 1 mPa) pressure swing exhibiteda C-start andthen continuedto swim towards the gun position, their intended swimming track apparently unaltered. The sound of the G. guns had little effect on the day-to-day behaviour of the resident fish and invertebrates.
Research Notes: Fish behavior response to seismic air gun. Fish did not leave area (reef). Homebodies?
Link to PDF: Wardle_etal_2001_fish_airgun.pdf

Reference Type: Journal Article
Record Number: 116
Author: Warren, P. S.; Katti, M.; Ermann, M.; Brazel, A.
Year: 2006
Title: Urban bioacoustics: it's not just noise
Journal: Animal Behaviour
Volume: 71
Pages: 491-502
Short Title: Urban bioacoustics: it's not just noise
Accession Number: ISI:000236430400002
Keywords: HUMAN DISTURBANCE; ACOUSTICS; ANIMAL COMMUNICATION; URBAN NOISE
Abstract: The acoustic environment has a major influence in shaping animal communication systems. Humans, particularly in cities, profoundly alter the acoustic structure of their environment. Recent articles have identified effects of noise on animal communication and behaviour. These studies, however, serve to highlight the surprising dearth of research on the behavioural responses of animals to altered acoustic environments. We argue that noise is not the only aspect of urban bioacoustics that researchers should explore. In addition to elevated noise levels, urban areas are characterized by a spatial heterogeneity in noise levels, predictable diurnal variation in noise levels and the existence of many vertical reflective surfaces. All of these characteristics have parallels in natural environments. We suggest that cities are a fruitful area for future research on the evolution of animal communication systems, with more general implications for conservation in human-altered environments.
Research Notes: Information on urban noise, not applicable to underwater noise.
Link to PDF: Warren_etal_2006_animals_urban_noise.pdf

Reference Type: Journal Article

Record Number: 117
Author: Wartzok, D.; Popper, Arthur N.; Gordon, J.; Merrill, J.
Year: 2003
Title: Factors affecting the responses of marine mammals to acoustic disturbance
Journal: Marine Technology Society Journal
Volume: 37
Issue: 4
Pages: 6-15
Date: Win
Short Title: Factors affecting the responses of marine mammals to acoustic disturbance
Accession Number: ISI:000220657800002
Keywords: MARINE MAMMALS; DISTURBANCE

Reference Type: Journal Article
Record Number: 228
Author: Watkins, William A.
Year: 1986
Title: Whale reactions to human activities in Cape Cod waters
Journal: Marine Mammal Science
Volume: 2
Issue: 4
Pages: 251-262
Short Title: Whale reactions to human activities
Electronic Resource Number: doi:10.1111/j.1748-7692.1986.tb00134.x
Keywords: WHALE; HUMAN DISTURBANCE; MINKE WHALE; *BALAENOPTERA ACUTOROSTRATA*; FINBACK WHALE; *BALAENOPTERA PHYSALUS*; RIGHT WHALE; *EUBALAENA GLACIALIS*; HUMPBACK WHALE; *MEGAPTERA NOVAEANGLIAE*; BEHAVIOR RESPONSE; VESSEL
Abstract: A review of our whale observations of more than 25 years indicated that each of the species commonly observed within 35 km of Cape Cod reacted differently to stimuli from human activities, and that these responses have gradually changed with time. Over the years of exposure to ships, for example, minke whales (*Balaenoptera acutorostrata*) have changed from frequent positive interest to generally uninterested reactions, finback whales (*B. physalus*) have changed from mostly negative to uninterested reactions, right whales (*Eubalaena glacialis*) have apparently continued the same variety of responses with little change, and humpbacks (*Megaptera novaeangliae*) have dramatically changed from mixed responses that were often negative to often strongly positive reactions. These reactions appeared to result mostly from three types of stimuli: primarily underwater sound, then light reflectivity, and tactile sensation. The whale reactions were related to their assessment of the stimuli as attractive, uninteresting or disturbing, their assessment of the movements of the sources of the stimuli relative to their own positions, and their assessment of the occurrence of stimuli as expected or unexpected. Whale reactions were modified by their previous experience and current activity: habituation often occurred rapidly, attention to other

stimuli or preoccupation with other activities sometimes overcame their interest or wariness of stimuli, and inactivity seemed to allow whales to notice and react to stimuli that otherwise might have been ignored. The changes over time in the reactions of whales to stimuli from human activities were gradual and constantly varying with increased exposure to these activities.
Research Notes: Various whale species behavior response to human activity including noise, touch, light.
URL: http://www.blackwell-synergy.com/doi/abs/10.1111/j.1748-7692.1986.tb00134.x
Link to PDF: Watkins_1986_whales_humans_behavior.pdf

Reference Type: Journal Article
Record Number: 437
Author: Watkins, William A.; Moore, Karen E.; Wartzok, Douglas; Johnson, James H.
Year: 1981
Title: Radio tracking of finback (*Balaenoptera physalus*) and humpback (*Megaptera noaeangliae*) whales in Prince William Sound, Alaska
Journal: Deep Sea Research
Volume: 28A
Issue: 6
Pages: 577-588
Date: 1981
Type of Article: Journal Article
Short Title: Radio tagging of finback and humpback whales
Abstract: Finback whales (*Balaenoptera physalus*) and humpback whales (*Megaptera novaeangliae*) were tracked by radio tags in Prince William Sound, Alaska during June, 1978.
Tracks of the whales show details of their movements. The tag remained implanted for over 16 days
in humpbacks and for over 17 days in a finback (24 days tracking of one whale, visually and by
radio). The whales appeared to be undisturbed by the tags. During the tracking, both species had
distinct shifts in behavior, their activities were often in unison with conspecific companions, and
they had shorter dive times during the dark. The finbacks returned periodically to the same area and
the humpbacks roamed for as much as 100 km in a day. The radio tags provided positive individual
identification needed for continuous tracking and for detailed behavioral observation.
Link to PDF: Watkins_etal_1981_whales_tagging_PWS.pdf

Reference Type: Journal Article
Record Number: 222
Author: Weilgart, Linda; Whitehead, Hal; Rendell, Luke E.; Calambokidis, John

Year: 2005
Title: Signal-to-noise: Funding structure versus ethics as a solution to conflict-of-interest - Response to "Resonance and dissonance: Science, ethics, and the sonar debate", Marine Mammal Science 20 : 898-899
Journal: Marine Mammal Science
Volume: 21
Issue: 4
Pages: 779-781
Date: Oct
Short Title: Signal-to-noise: Funding structure versus ethics as a solution to conflict-of-interest - Response to "Resonance and dissonance: Science, ethics, and the sonar debate", Marine Mammal Science 20 : 898-899
Accession Number: ISI:000232297400013
Keywords: SONAR
Abstract: no abstract
URL: <Go to ISI>://000232297400013
Link to PDF: Weilgart_etal_2005_response_SNR_sonar.pdf

Reference Type: Journal Article
Record Number: 233
Author: Wenz, G. M.
Year: 1962
Title: Acoustic ambient noise in ocean - spectra and sources
Journal: Journal of the Acoustical Society of America
Volume: 34
Issue: 12
Pages: 1936-1956
Short Title: Acoustic ambient noise in ocean - spectra and sources
Accession Number: ISI:A19622945B00213
Keywords: AMBIENT NOISE;OCEAN
Abstract: The results of recent ambient-noise investigations, after appropriate processing, are compared on the basis of pressure spectra in the frequency band 1 cps to 20 kc. Several possible sources are discussed to determine the most probable origin of the observed noise. It is concluded that, in general, the ambient noise is a composite of at least three overlapping components: turbulent-pressure fluctuations effective in the band 1 cps to 100 cps; wind-dependent noise from bubbles and spray resulting, primarily, from surface agitation, 50 cps to 20 kc; and, in many areas, oceanic traffc, 10 cps to 1000 cps. Spectrum characteristics of each component and of the composite are shown. Additional sources, including those of intermittent and local effects, are also discussed. Guidelines for the estimation of noise levels are given.
URL: <Go to ISI>://A19622945B00213
Link to PDF: Wenz_1962_Ambient_noise_ocean.pdf

Reference Type: Journal Article

Record Number: 178
Author: Wheeler, R. L.; Donno, G. F.
Year: 1966
Title: The hovercraft noise problem
Journal: Journal of Sound and Vibration
Volume: 4
Issue: 3
Pages: 415-422
Short Title: The hovercraft noise problem
Keywords: HOVERCRAFT; NOISE
Abstract: This paper deals with the hovercraft noise problem from two distinct points of view. At the outset, hovercraft noise is reviewed in relation to the noise associated with other means of transport. While hovercraft appear to be rather less noisy than aircraft of comparable installed power, they tend to be much noisier than conventional surface transport. It is concluded that, for the first generation of commercial craft, the distance between a terminal and the nearest houses in a quiet residential area should be at least 800 yd to completely avoid increase in the normal level of noise. On the other hand, in a busy urban locality, a distance of 150 to 200 yd is sufficient to bring the noise from the hovercraft down to the existing level of traffic noise. Estimates made in connection with the design of the SR.N4 show that these distances will be substantially reduced for the next generation of hovercraft. It is pointed out that the noise problem at a terminal can be alleviated by minimizing the need for manoeuvring.The sources of hovercraft noise and the means for their reduction are then discussed. The external noise from existing hovercraft is dominated by that originating from the propeller and attention is drawn to the fact that actual measurements reveal that this noise is appreciably higher than would be expected from theoretical predictions. It is considered that reduction of the tip speed is the most effective way of reducing propeller noise. Large numbers of blades and the use of devices such as shroud rings are rejected as either ineffective or actually detrimental. For turbo-shaft engined hovercraft, compressor noise usually ranks next to propeller noise in importance. However, noise from this source can be reduced by muffling the air intakes. Noise from lifting fans is relatively unimportant at present but, as developments reduce the level of propeller and engine noise, it could become significant and thus merits attention.Inside a hovercraft, transmission and engine noise are usually predominant. However, the high frequencies involved can be dealt with quite effectively by aircraft soundproofing techniques and there are few fundamental problems involved.
URL:
http://www.sciencedirect.com/science/article/B6WM3-494TCHD-R9/2/1ca28c931bacb1eafeea6cb342051e00
Link to PDF: Wheeler_Donno_1966_Hovercraft_noise.pdf

Reference Type: Journal Article
Record Number: 207
Author: Whitehead, Hal; Rendell, Luke E.; Osborne, Richard W.; Wursig, Bernd
Year: 2004

Title: Culture and conservation of non-humans with reference to whales and dolphins: review and new directions
Journal: Biological Conservation
Volume: 120
Issue: 3
Pages: 427-437
Date: Dec
Short Title: Culture and conservation of non-humans with reference to whales and dolphins: review and new directions
Accession Number: ISI:000223818700012
Keywords: CULTURE; CONSERVATION; SOCIAL LEARNING; WHALE; DOLPHIN
Abstract: There is increasing evidence that culture is an important determinant of behavior in some non-human species including great apes and cetaceans (whales and dolphins). In some cases, there may be repercussions for population biology and conservation. Rapidly evolving ‘‘horizontal’’ cultures, transmitted largely within generations, may help animals deal with anthropogenic change and even allow them to exploit it, sometimes with negative consequences for both the animals and humans. In contrast, stable ‘‘vertical’’ or ‘‘oblique’’ cultures, transmitted principally between generations, may impede adaptation to environmental change, and confound range recovery, reintroductions and translocations. Conformist stable cultures can lead to maladaptive behavior, which may be mistaken for the results of anthropogenic threats. They can also structure populations into sympatric sub-populations with distinctive cultural variants. Such structuring is common among cetaceans, among which sympatric sub-populations may face different anthropogenic threats or respond to the same threat in different ways. We suggest that non-human culture should be integrated into conservation biology when considering populations with such attributes, and also more generally by refining definitions of evolutionarily significant units and considering how cultural attributes may change our perspectives of non-humans.
URL: <Go to ISI>://000223818700012
Link to PDF: Whitehead_etal_2004_culture.pdf

Reference Type: Journal Article
Record Number: 348
Author: Wiggins, S. M.
Year: 2003
Title: Autonomous acoustic recording packages (ARPs) for long-term monitoring of whale sounds
Journal: Marine Technology Society Journal
Volume: 37
Issue: 2
Pages: 13-22
Date: Summer
Type of Article: Article
Short Title: Autonomous acoustic recording packages (ARPs) for long-term monitoring of whale sounds

Alternate Journal: Mar. Technol. Soc. j.
ISSN: 0025-3324
Keywords: AUTONOMOUS ACOUSTSIC RECORDING PACKAGES; ARP; WHALE; ACOUSTICS;
Abstract: Advancements in low-power and high-data capacity computer technology during the past decade have been adapted to autonomously record acoustic data from vocalizing whales over long time periods. Acoustic monitoring of whales has advantages over traditional visual surveys including greater detection ranges, continuous long-term monitoring in remote locations and in various weather conditions, and lower cost. An autonomous acoustic recording package (ARP) is described that uses a tethered hydrophone above a seafloor-mounted instrument frame. ARPs have been deployed to record baleen whale sounds in the Bering Sea, off the coast of southern California, near the West Antarctic Peninsula, and near Hawaii. ARP data have provided new information on the seasonal presence, abundance, call character, and patterns of vocalizing whales. Current development is underway for a broader-band, higher-data capacity system capable of recording odontocete whales, dolphins, and porpoises for long time periods.

Reference Type: Journal Article
Record Number: 316
Author: Wikelski, Martin; Cooke, Steven J.
Year: 2006
Title: Conservation physiology
Journal: Trends in Ecology and Evolution
Volume: 21
Issue: 1
Pages: 38-46
Date: Jan
Type of Article: Review
Short Title: Conservation physiology
Alternate Journal: Trends Ecol. Evol.
ISSN: 0169-5347
Accession Number: ISI:000234814000011
Keywords: AFRICAN WILD DOGS; GALAPAGOS MARINE IGUANAS; NORTHERN SPOTTED OWL; CORTICOSTERONE LEVELS; ENVIRONMENTAL CHANGE; ENERGY EXPENDITURE; STRESS HORMONES; CLIMATE CHANGE; COHO SALMON; DISTURBANCE
Abstract: Conservation biologists increasingly face the need to provide legislators, courts and conservation managers with data on causal mechanisms underlying conservation problems such as species decline. To develop and monitor solutions, conservation biologists are progressively using more techniques that are physiological. Here, we review the emerging discipline of conservation physiology and suggest that, for conservation strategies to be successful, it is important to understand the physiological responses of organisms to their changed environment. New physiological techniques can enable a rapid assessment of the causes of conservation problems and

the consequences of conservation actions.
Notes: ISI Document Delivery No.: 005HU
Times Cited: 3
Cited Reference Count: 77
URL: <Go to ISI>://000234814000011
Link to PDF: Wikelski_Cooke_2006_conservation_physiology.pdf
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Language: English

Reference Type: Journal Article
Record Number: 409
Author: Williams, Rob; Lusseau, David; Hammond, Philip S.
Year: 2006
Title: Estimating relative energetic costs of human disturbance to killer whales (*Orcinus orca*)
Journal: Biological Conservation
Volume: 133
Issue: 3
Pages: 301-311
Short Title: Estimating relative energetic costs of human disturbance to killer whales (*Orcinus orca*)
Keywords: BEHAVIORAL RESPONSE; MARINE PROTECTED AREA; CETACEAN; DISTURBANCE; BOAT TRAFFIC; BIOENERGETICS; ACTIVITY BUDGET
Abstract: This study examined the activities of ‘‘northern resident’’ killer whales (*Orcinus orca*) in Johnstone Strait, British Columbia, Canada, in July and August, from 1995 to 2002. Disturbance from boat traffic has been identified as a conservation concern for this population. The primary aims of the study were to test whether boat presence altered whales’ activities, and if so, to estimate whether behavioural responses were likely to have carried energetic costs. A land-based observation site near a vessel-exclusion marine protected area allowed us to conduct a natural experiment to monitor whale activities in the presence and absence of boats. Using Time-Discrete Markov Chain models, boat presence was linked to significant changes in the probability that focal whales would switch from one activity state to another, which led to significantly different activity budgets in the presence and absence of boats. We estimated that the energetic cost of meeting these budgets differed by only 3–4%. In the presence of boats, however, whales reduced their time spent feeding and the time spent rubbing their bodies on smooth pebble beaches. These lost feeding opportunities could have resulted in a substantial (18%) estimated decrease in energy intake. Our sensitivity analysis provides preliminary evidence that disturbance could carry higher costs to killer whales in terms of reducing energy acquisition than increasing energetic demand, and future research should address this directly. Meanwhile, our observations suggest that protected areas would confer greatest conservation benefit to endangered

killer whale populations if they were designed to protect important foraging areas.
Link to PDF: Williams_etal_2006_EnergeticCosts_Disturbance.pdf

Reference Type: Journal Article
Record Number: 350
Author: Williams, Rob; Trites, A. W.; Bain, David E.
Year: 2002
Title: Behavioural responses of killer whales (*Orcinus orca*) to whale-watching boats: opportunistic observations and experimental approaches
Journal: Journal of Zoology
Volume: 256
Pages: 255-270
Short Title: Behavioural responses of killer whales (*Orcinus orca*) to whale-watching boats: opportunistic observations and experimental approaches
Keywords: WHALE; WHALE-WATCHING; BEHAVIOR; CANONICAL CORRELATION; DISTURBANCE; *ORCINUS ORCA*
Abstract: Johnstone Strait provides important summer habitat for the northern resident killer whales *Orcinus orca* of British Columbia. The site is also an active whale-watching area. A voluntary code of conduct requests that boats do not approach whales closer than 100 m to address perceived, rather than demonstrated, effects of boat traffic on killer whales. The purpose of the study was to test the relevance of this distance guideline. Relationships between boat traffic and whale behaviour were studied in 1995 and 1996 by shorebased theodolite tracking of 25 identi®able focal animals from the population of 209 whales. Individual killer whales were repeatedly tracked in the absence of boats and during approaches by a 5.2 m motorboat that paralleled each whale at 100 m. In addition, whales were tracked opportunistically, when no effort was made to manipulate boat trafffic. Dive times, swim speeds, and surface-active behaviours such as breaching and spy-hopping were recorded. On average, male killer whales swam significantly faster than females. Whales responded to experimental approaches by adopting a less predictable path than observed during the preceding, no-boat period, although males and females used subtly different avoidance tactics. Females responded by swimming faster and increasing the angle between successive dives, whereas males maintained their speed and chose a smooth, but less direct, path. Canonical correlations between whale behaviour and vessel proximity are consistent with these conclusions, which suggest that weakening whalewatching guidelines, or not enforcing them, would result in higher levels of disturbance. High variability in whale behaviour underscores the importance of large sample size and extensive experimentation when assessing the impacts of human activity on killer whales.
Research Notes: Killer whale behavioral response to vessel approach.
Link to PDF: Williams_etal_2002_orca_vessel.pdf

Reference Type: Online Multimedia
Record Number: 425
Created By: Wolfe, Robert

Year: 2003
Title: Subsistence: what have you heard?
Date Accessed: 31 July 2007
Abstract: [WEBPAGE]
Research Notes: This article originally appeared in the November - December 1989 issue of Alaska Fish and Game.
URL: http://www.subsistence.adfg.state.ak.us/geninfo/about/subfaq.cfm
Link to PDF: [WEBPAGE]
Access Date: Access Date

Reference Type: Report
Record Number: 440
Author: Woodby, Doug; Carlile, Dave; Siddeek, Shareef; Funk, Fritz; Clark, John H.; Hulbert, Lee
Year: 2005
Title: Commercial Fisheries of Alaska
City: Juneau, AK
Institution: Alaska Department of Fish and Game
Pages: 74
Date: June 2005
Type: Report
Short Title: Commercial Fisheries of Alaska
Report Number: 05-09
Link to PDF: Woodby_etal_2005_ADFG_fisheries.pdf
Author Address: Divisions of Sport Fish and Commercial Fisheries

Reference Type: Journal Article
Record Number: 317
Author: Worcester, Peter F.; Spindel, Robert C.
Year: 2005
Title: North Pacific Acoustic Laboratory
Journal: Journal of the Acoustical Society of America
Volume: 117
Issue: 3
Pages: 1499-1510
Date: Mar
Type of Article: Article
Short Title: North Pacific Acoustic Laboratory
Alternate Journal: J. Acoust. Soc. Am.
ISSN: 0001-4966
Accession Number: ISI:000227574800002
Keywords: WHALE; *MEGAPTERA NOVAEANGLIAE*; HUMPBACK WHALE; OCEAN CLIMATE; SOUND SPEED; RANGE; ATOC; PROPAGATION; THERMOMETRY; TOMOGRAPHY; ALGORITHM; ACOUSTICS

Abstract: A series of long-range acoustic propagation experiments have been conducted in the North Pacific Ocean during the last 15 years using various combinations of low-frequency, wide-bandwidth transmitters and horizontal and vertical line array receivers, including a 2-dimensional array with a maximum vertical aperture of 1400 m and a horizontal aperture of 3600 m. These measurements were undertaken to further our understanding of the physics of low-frequency, broadband propagation and the effects of environmental variability on signal, stability and coherence. In this volume some of the results are presented. In the present paper the central issues these experiments have addressed are briefly summarized. (c) 2005 Acoustical Society ofAmerica.
Link to PDF: Worcester_Spindel_2005_NPAL-ATOC_description.pdf
Language: English

Reference Type: Journal Article
Record Number: 122
Author: Würsig, Bernd; Greene, Charles R. Jr.
Year: 2002
Title: Underwater sounds near a fuel receiving facility in western Hong Kong: relevance to dolphins
Journal: Marine Environmental Research
Volume: 54
Issue: 2
Pages: 129-145
Date: Aug
Short Title: Underwater sounds near a fuel receiving facility in western Hong Kong: relevance to dolphins
Accession Number: ISI:000177010700002
Keywords: UNDERWATER SOUNDS; NOISE; TANKERS; MAMMALS; MARINE MAMMALS; ECOSYSTEM DISTURBANCE; DISTURBANCE; ENVIRONMENTAL IMPACT; INDO-PACIFIC HUMPBACK DOLPHIN; DOLPHIN; *SOUSA CHINENSIS*; FINLESS PORPOISE; *NEOPHOCAENA PHOCAENOIDES*; AIRCRAFT; VESSEL
Abstract: Western Hong Kong is home to two species of marine mammals: Indo-Pacific humpbacked dolphins (*Sousa chinensis*) and finless porpoises (*Neophocaena phocaenoides*). Both are threatened in many parts of their range in southeast Asia [for example, International Biological Research Institute Reports 9 (1997), 41; Asian Marine Biology 14 (1997) 111]. In 1998, when the new Hong Kong International Airport opened in western Hong Kong, small tankers (about 100 m long, cargo capacity about 6300 metric tons) began delivering fuel to the Aviation Fuel Receiving Facility (AFRF) just off Sha Chau Island, north of the airport. Calibrated sound recordings were taken over a 4-day period from a quiet, anchored boat at distances 80–2000 m from aviation fuel delivery activities at the AFRF. From the recordings, 143 sections were selected for analysis. Narrowband spectral densities on the sound pressures were computed, and one-third octave band levels were derived for center frequencies from 10 to 16,000 Hz. Broadband levels, viz. 10–20,000 Hz, were also computed. The results showed that the Sha Chau area is normally noisy underwater, with the lowest broadband levels measured corresponding to those expected during a storm at sea (sea state 6). This

background noise is believed to come largely from heavy vessel traffic in the Urmston Road to the north and east of Sha Chau and from vessels in the Pearl River Estuary to the West. The sound levels from the AFRF tankers are comparable to the levels measured from similar- and smaller-sized supply vessels supporting offshore oil exploration. The strongest sounds recorded were from a tanker leaving the AFRF at distance 100 m from the hydrophone, for which the one-third octave band level at 100 Hz was 141 dB re 1 mPa (spectrum level 127 dB re 1 mPa2/Hz) and the 10–20,000 Hz broadband level was 146 dB. At distances of 100 m or more and frequencies above 300 Hz, the one-third octave band levels were less than 130 dB (spectrum level 111 dB re 1 mPa2/Hz) and decreased with increasing frequency and distance. At distances greater than about 500 m, AFRF-associated sounds were negligible, masked by the generally high noise level of the area and attenuated by poor transmission in the very shallow water (<10 m). Because it is believed that humpbacked dolphins and finless porpoises are not very sensitive to sounds below 300 Hz, the Airport Authority Hong Kong (AA) stipulated that dedicated terminal vessels not radiate underwater sounds at spectrum levels greater than 110 dB re 1 mPa2/Hz at frequencies above 300 Hz and distances greater than 300 m. The spectrum levels at 300 Hz and higher frequencies of sounds from the tankers arriving, departing, or off-loading at AFRF were less than 110 dB re 1 mPa2/Hz even at distances of 200 m or less. The AA stipulation was met. However, it is presently unknown whether the generally strong noise levels of western Hong Kong inhibit acoustically based feeding and communication, or result in increased stress or permanent shifts in hearing thresholds. # 2002 Elsevier Science Ltd. All rights reserved.
Research Notes: Measured sound levels at frequencies below about 50 Hz decreased markedly.
This phenomenon was expected as a result of the waveguide nature of the shallow water. Shallow water does not support the transmission of long wavelength (low frequency) sound (Jensen, Kuperman, Porter, & Schmidt, 1994). This phenomenon is important in a shallow harbor because sounds from ship propulsion systems (from engines and propellers) are typically strongest at low frequencies. These sounds will not propagate appreciably in shallow water harbors. For the Sha Chau area with water depths from 8 to 10 m, sound at frequencies <50 Hz did not propagate well.
Link to PDF: Wursig_Greene_2002_dolphin_tanker.pdf

Reference Type: Journal Article
Record Number: 318
Author: Würsig, Bernd; Greene, Charles R. Jr.; Jefferson, T. A.
Year: 2000
Title: Development of an air bubble curtain to reduce underwater noise of percussive piling
Journal: Marine Environmental Research
Volume: 49
Issue: 1
Pages: 79-93
Date: Feb
Type of Article: Article

Short Title: Development of an air bubble curtain to reduce underwater noise of percussive piling
Alternate Journal: Mar. Environ. Res.
ISSN: 0141-1136
Accession Number: ISI:000085935600006
Keywords: SOUNDS; ATTENUATION; BUBBLE CURTAIN; BUBBLE SCREENING; DOLPHIN; SOUSA CHINENSIS; ENVIRONMENT; MITIGATION; NOISE; PILE DRIVING; BUBBLE
Abstract: Underwater bubbles can inhibit sound transmission through water due to density mismatch and concomitant reflection and absorption of sound waves. For the present study, a perforated rubber hose was used to produce a bubble curtain, or screen, around pile-driving activity in 6-8-m depth waters of western Hong Kong. The percussive hammer blow sounds of the pile driver were measured on 2 days at distances of 250, 500, and 1000 m; broadband pulse levels were reduced by 3-5 dB by the bubble curtain. Sound intensities were measured from 100 Hz to 25.6 kHz, and greatest sound reduction by the bubble curtain was evident from 400 to 6400 Hz. Indo-Pacific hump-backed dolphins (Sousa chinensis) occurred in the immediate area of the industrial activity before and during pile driving, but with a lower abundance immediately after it. While hump-backed dolphins generally showed no overt behavioral changes with and without pile driving, their speeds of travel increased during pile driving, indicating that bubble screening did not eliminate all behavioral responses to the loud noise. Because the bubble curtain effectively lowered sound levels within 1 km of the activity, the experiment and its application during construction represented a success, and this measure should be considered for other appropriate areas with high industrial noises and resident or migrating sound-sensitive animals.
Notes: ISI Document Delivery No.: 294XJ
Times Cited: 9
Cited Reference Count: 30
URL: <Go to ISI>://000085935600006
Link to PDF: Wursig_etal_2000_Air-bubble-curtain.pdf
Author Address: Texas A&M Univ, Marine Mammal Res Program, Galveston, TX 77551 USA. Greeneridge Sci, Santa Barbara, CA 93110 USA. Ocean Pk Conservat Fdn, Aberdeen, Hong Kong, Peoples R China.
Wursig, B, Texas A&M Univ, Marine Mammal Res Program, 4700 Ave U,Bldg 303, Galveston, TX 77551 USA.
Language: English

Reference Type: Journal Article
Record Number: 137
Author: Würsig, Bernd; Koski, William R.; Richardson, W. John
Year: 1999
Title: Whale riding behavior: Assisted transport for bowhead whale calves during spring migration in the Alaskan Beaufort Sea
Journal: Marine Mammal Science
Volume: 15
Issue: 1

Pages: 204-210
Date: Jan
Short Title: Whale riding behavior: Assisted transport for bowhead whale calves during spring migration in the Alaskan Beaufort Sea
Accession Number: ISI:000077568300013
Keywords: WHALE; BOWHEAD WHALE; MIGRATION; ALASKA; BEAUFORT SEA
Abstract: no abstract
URL: <Go to ISI>://000077568300013
Link to PDF: Wursig_etal_1999_bowhead_whale_riding.pdf

Reference Type: Journal Article
Record Number: 123
Author: Wysocki, Lidia E.; Dittami, John P.; Ladich, Friedrich
Year: 2006
Title: Ship noise and cortisol secretion in European freshwater fishes
Journal: Biological Conservation
Volume: 128
Issue: 4
Pages: 501-508
Short Title: Ship noise and cortisol secretion in European freshwater fishes
Accession Number: ISI:000236100800008
Keywords: FISH; SHIP NOISE; STRESS RESPONSE; CORTISOL SECRETION; HEARING; CARP; RAINBOW TROUT; *CYPRINUS CARPIO*; HORMONE LEVELS; ANTHROPOGENIC SOUNDS; SOCIAL DOMINANCE; STOCKING DENSITY; PLASMA CORTISOL; CICHLID FISH; GUDGEON; *GOBIO GOBIO*; EUROPEAN PERCH; *PERCA FLUVIATILIS*; VESSEL; PLAYBACK EXPERIMENTS
Abstract: Underwater noise pollution is a growing problem in aquatic environments and as such may be a major source of stress for fish. in the present study, we addressed the effects of ship noise and continuous Gaussian noise on adrenal activity in three European freshwater species. Underwater ship noise recorded in the Danube River and two Austrian lakes was played back to fish at levels encountered in the field (153 dB re 1 mu Pa, 30 min). Post exposure cortisol secretion was compared with control situations. Cortisol was measured with enzyme immunoassay techniques (EIA, ng cortisol/l water/g fish) in extracted aquarium water with corrections for fish mass. in the first series, two hearing specialists, the common carp (*Cyprinus carpio*) and the gudgeon (*Gobio gobio*) and one hearing generalist, the European perch (*Perca fluviatilis*) were exposed to ship noise. The noise level was well above hearing thresholds in these species. in a second series, fish were exposed to continuous Gaussian noise at a similar level (156 dB) which is known to induce temporary hearing loss in hearing specialists. All three species responded with increased cortisol secretion when exposed to ship noise. Interestingly, no elevation was observed when fish were exposed to continuous Gaussian noise. Our results indicate that ship noise characterized by amplitude and frequency fluctuations, constitutes a potential stressor in contrast to continuous noise. Surprisingly, the data also demonstrate no apparent differences between species possessing excellent hearing abilities (hearing specialists)

and species with poor hearing abilities like perch.
Notes: Biol. Conserv.
Research Notes: Fish response to simulated ship noise.
Link to PDF: Wysocki_etal_2006_fish_cortisol_ShipNoise.pdf
Author Address: Univ Vienna, Dept Neurobiol & Behav, A-1090 Vienna, Austria. Wysocki, LE, Univ Maryland, Dept Biol, College Pk, MD 20742 USA. lwysocki@umd.edu john.dittami@univie.ac.at friedrich.ladich@univie.ac.at

Reference Type: Journal Article
Record Number: 125
Author: Wysocki, Lidia E.; Ladich, Friedrich
Year: 2005
Title: Effects of noise exposure on click detection and the temporal resolution ability of the goldfish auditory system
Journal: Hearing Research
Volume: 201
Issue: 1-2
Pages: 27-36
Short Title: Effects of noise exposure on click detection and the temporal resolution ability of the goldfish auditory system
Accession Number: ISI:000227606200004
Keywords: AUDITORY EVOKED POTENTIAL; AEP; AUDITORY TEMPORAL RESOLUTION; NOISE; TEMPORAL HEARING LOSS; GOLDFISH;
Abstract: Hearing specialist fishes investigated so far revealed excellent temporal resolution abilities, enabling them to accurately process temporal patterns of sounds. Because noise is a growing environmental problem, we investigated how it affects the temporal resolution ability of goldfish. Auditory evoked potentials (AEPs) in response to clicks and double clicks were recorded before exposing, immediately after exposing the fish to white noise of 158 dB re 1 lPa for 24 h, and after 3, 7 and 14 days of recovery. Immediately after noise exposure, hearing sensitivity to clicks was reduced on average by 21 dB and recovered within 1 week. Amplitudes of the AEPs decreased by about 71% while latencies increased by 0.63 ms. Both AEP characteristics returned to baseline values within 2 weeks. Analysis of the response to double clicks showed that the minimum click period resolvable by the auditory system increased significantly from 1.25 to 2.08 ms immediately after noise exposure. After a recovery period of 3 days, this minimum period returned to pre-exposure values. The present study revealed that noise exposure affects the detection of short transient signals and the temporal resolution ability. Because acoustic information is primarily encoded via temporal patterns of sounds in fishes, environmental noise could severely impair acoustic orientation and communication.
Research Notes: Goldfish behavior response using AEP.
Link to PDF: Wysocki_Ladich_2005_Noise_Goldfish_TempResolution.pdf

Reference Type: Journal Article
Record Number: 124
Author: Wysocki, Lidia E.; Ladich, Friedrich
Year: 2005
Title: Hearing in fishes under noise conditions
Journal: Journal of the Association for Research In Otolaryngology
Volume: 6
Issue: 1
Pages: 28-36
Short Title: Hearing in fishes under noise conditions
Accession Number: ISI:000229582900004
Keywords: AUDITORY EVOKED POTENTIAL; AEP; AUDITORY SENSITIVITY; HEARING SPECIALIZATIONS; MASKING; TELEOSTS; FISH; GOLDFISH; *CARASSIUS AURATUS*; CATFISH; *PLATYDORAS COSTATUS*; SUNFISH; *LEPOMIS GIBBOSUS*
Abstract: Our current knowledge on sound detection in fishes is mainly based on data acquired under quiet laboratory conditions. However, it is important to relate auditory thresholds to background noise in order to determine the signal-detecting abilities of animals in
the natural environment. We investigated the influence of two noise levels within the naturally occurring range on the auditory sensitivity of two hearing specialists (otophysines) and a hearing generalist. Audiograms of the goldfish *Carassius auratus*, the lined Raphael catfish *Platydoras costatus* and the pumpkinseed sunfish *Lepomis gibbosus* (hearing generalist) were determined between 200 and 4000 Hz (100Y800 Hz for *L. gibbosus*) under laboratory conditions and under continuous white noise by recording auditory evoked potentials (AEPs). Baseline thresholds showed greatest hearing sensitivity around 500 Hz in goldfish and catfish and at 100 Hz in the sunfish. Continuous white noise of 110 dB RMS elevated the thresholds by 15Y20 dB in C. auratus and by 4Y22 dB in P. costatus. White noise of 130 dB RMS elevated overall hearing thresholds significantly in the otophysines by 23Y44 dB. In the goldfish, threshold did not shift at 4 kHz. In contrast, auditory thresholds in the sunfish declined only at the higher noise level by 7Y11 dB. Our data show that the AEP recording technique is suitable for studying masking in fishes, and that the occurrence and degree of the threshold shift (masking) depend on the hearing sensitivity of fishes, the frequency, and noise levels tested. The results indicate that acoustic communication and orientation of fishes, in particular of hearing specialists, are limited by noise regimes in their environment.

Research Notes: Masking noise for a variety of fish species.
Link to PDF: Wysocki_Ladich_2005_Hearing_in_Noise_Fishes.pdf

Reference Type: Book Section
Record Number: 473
Author: Ydenberg, R.C.; Dill, L. M.
Year: 1986

Title: The economics of fleeing from predators
Editor: Rosenblatt, Jay S.; Beer, Colin; Busnel, Marie-Claire; Slater, Peter
Book Title: *Advances in the Study of Behavior*
City: San Diego
Publisher: Elsevier Academic Press
Volume: 16
Pages: 229-249
Series Title: Advances In The Study Of Behavior
Short Title: The economics of fleeing from predators
Link to PDF: Ydenberg_Dill_1986_economics_flee_predators.pdf

Reference Type: Journal Article
Record Number: 323
Author: Zimmer, W. M. X.; Johnson, Mark P.; D'Amico, A.; Tyack, Peter L.
Year: 2003
Title: Combining data from a multisensor tag and passive sonar to determine the diving behavior of a sperm whale (*Physeter macrocephalus*)
Journal: IEEE Journal of Oceanic Engineering
Volume: 28
Issue: 1
Pages: 13-28
Date: Jan
Type of Article: Article
Short Title: Combining data from a multisensor tag and passive sonar to determine the diving behavior of a sperm whale (*Physeter macrocephalus*)
ISSN: 0364-9059
Accession Number: ISI:000181871700003
Keywords: ARRAY BEAM STEERING; ECHOLOCATION; INTER-CLICK INTERVAL (ICI); MARINE MAMMALS; MULTIPATH RANGING; PASSIVE SONAR; TAGS; UNDERWATER TRACKING; CETACEAN; TRACKING; CLICK; SPERM WHALE; *PHYSETER MACROCEPHALUS*
Abstract: This paper reports on the diving behavior of a sperm whale tagged and tracked on September 6, 2000 during the Sirena 2000 cruise in the Ligurian Sea. A total of about 4.5 h of acoustic and nonacoustic sensor data were recorded when a sperm whale was tagged with a Woods Hole Oceanographic Institution developed tag with a hydrophone, motion, and pressure sensors.' The animal was simultaneously tracked with a passive sonar system deployed from the NATO research vessel NRV Alliance. By combining data from the tag and passive sonar, we were able to reconstruct a three-dimensional track of the whale, along with its orientation and vocal behavior. While it was tagged, the whale carried out three deep dives to a depth of about 900 in in an area with a bottom depth of about 2600 in. The inter-click intervals of the diving whale were not consistent with ranging on the bottom, but were consistent the hypothesis that the whale was possibly echolocating on some target(s) near the depth at which it dove to feed. This study demonstrated an ability to track subtle changes in the behavior of diving whales. This ability is important for three areas: 1) basic research,

2) studies of the responses of these animals to controlled exposures of manmade noise, and 3) studies to infer the biological significance of behavioral disruption.
Notes: ISI Document Delivery No.: 661BQ
Times Cited: 13
Cited Reference Count: 40
URL: <Go to ISI>://000181871700003
Link to PDF: Zimmer_etal_2003_spermwhael_sonar_tag.pdf
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Zimmer, WMX, NATO SACLANT, Undersea Res Ctr, I-19138 La Spezia, Italy.
Language: English

Reference Type: Journal Article
Record Number: 534
Author: Zimmer, W. M. X.; Tyack, Peter L.
Year: 2007
Title: Repetitive shallow dives pose decompression risk in deep-diving beaked whales
Journal: Marine Mammal Science
Volume: 23
Issue: 4
Pages: 888-925
Short Title: Repetitive shallow dives pose decompression risk in deep-diving beaked whales
Link to PDF: Zimmer_Tyack_2007_BeakedWhale_dives_decompression.pdf