Perspectives

Active Sonar & Shipments of Radioactive Materials

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Pacific Island and Pacific Rim communities have expressed great concern about two new threats to their ocean resources and the marine environment – low frequency active sonar used by navies to spot enemy submarines and the shipments of ultrahazardous radioactive cargos between Europe and Japan. Both introduce significant new risks and neither has been tested sufficiently to alleviate the fears of coastal and island populations.

I. LOW FREQUENCY ACTIVE SONAR[1]

On July 15, 2002, the U.S. National Marine Fisheries Service (NMFS) exempted the U.S. Navy's Low Frequency Active Sonar (LFAS) program from the requirements of the Marine Mammal Protection Act after determining that its operation would have a "negligible impact" on any species.[2] NMFS thus authorized the Navy to use two ships to transmit low frequency active sonar in about 75% of the world's oceans (exempting the polar extremes). Ten weeks later, in late September 2002, 15 Cuvier's beaked whales beached on the Canary Islands at the same time the U.S. destroyer *Mahan* was maneuvering in

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1. For a more detailed analysis of this issue, see Jon M. Van Dyke, et al., *Whales, Submarines, and Active Sonar*, 17 OCEAN YEARBOOK (forthcoming) (manuscript on file with the Colorado Journal of International Environmental Law and Policy).

2. Kenneth R. Weiss & Tony Perry, *Navy's Use of Sonar OK'd Despite Risk to Whales*, L.A. TIMES, at A1, July 16, 2002, 2002 WL 2490241; Marc Kaufman, *Navy Cleared to Use a Sonar Despite Fears of Injuring Whales*, WASHINGTON POST, at A3, July 16, 2002, 2002 WL 23853879.

the area with ships from nine other members of the North Atlantic Treaty Organization.[3] Autopsies of the whales revealed brain damage consistent with an acoustic impact.[4] This mass stranding followed similar incidents near the Bahamas in March 2000,[5] near Greece in 1996,[6] and in the Canaries between 1985 and 1989.[7]

The U.S. Navy's Surveillance Towed Array Sensor System (SURTASS) Low Frequency Active Sonar (LFAS) will employ very loud low-frequency sounds (less than 500 Hz with intensity levels as great as 230 dB re: 1μPa at 1 m),[8] posing a significant threat to the safety and welfare of marine mammals, and possibly to other forms of marine

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3. Nine Cuvier's beaked whales were found dead on September 24-25, 2002 on the Canary Islands of Fuerteventura and Lanzarote. Six beached whales were pushed back into the sea, and another two were seen floating lifeless in coastal waters. Ships from Belgium, Canada, France, Germany, Greece, Norway, Portugal, Turkey, the United Kingdom, and the United States were conducting a multinational exercise known as Neo Tapon 2002 designed to practice securing the Strait of Gibraltar. The Cuvier's beaked whale is a toothed cetacean that ranges from five to eight meters in length. Jerome Socolovsky, *Investigation Points to NATO Exercise in Mass Whale Beaching*, Associated Press, Oct. 10, 2002, *available at* http:/www.enn.com/news/wire-stories/2002/10/10102002/ap_4866.

4. *Id.* ("The only cause which we cannot rule out. . .is acoustic impact.")

5. Seventeen whales of four different species, including Cuvier's beaked whales, two minke whales, and a dolphin stranded in the Bahamas in March 2000 as a result of tactical mid-frequency sonar transmitted from U.S. Navy vessels, which were thought to have reached the whales at the 165 decibel level. Scientists found hemorrhaging around the brain and ear bones of the beached cetaceans, injuries consistent with exposure to extremely loud sounds. The U.S. Navy admitted that these strandings "were most likely caused by its [mid-range] sonar transmissions." Center for Biological Diversity v. National Science Foundation, No. C02-5065 (N.D.Cal. Oct. 30, 2002) (Temporary Restraining Order), 2002 WL 31548073.

6. Twelve Cuvier's beaked whales stranded in the Mediterranean near Greece at a time that coincided temporally and geographically with "sound detecting system trials" of LFAS by the NATO research vessel *Alliance.* The whales were exposed to sound transmitted from at least 25 kilometers away, which was determined to have reached them at the level of 150-160 decibels after 238 four-second pings of sound were released, which caused severe tissue damage to their ear cavities. U.S. Dept. Of Commerce and Secretary of the Navy, *Joint Interim Report Bahamas Marine Mammal Stranding Event of 15-16 March 2000* (Dec. 2001), *at* http://www.nmfs.noaa.gov/prot_res/overview/Interim_Bahamas_Report.pdf.

7. M.P. Simmonds & L.F. Lopez-Jurado, *Whales and the Military*, 351 NATURE 448 (June 6, 1991).

8. Although the Navy refuses to release the maximum source level of SURTASS LFA, claiming it to be classified information, reports indicate the maximum source level to be 230 dB re 1 uPa. *Quiet Please. Whales Navigating*, THE ECONOMIST, March 7, 1998, at 85, 1998 WL 8884376; Alexandros Frantis, *Does Military Testing Strand Whales?* 352 NATURE 29 (March 5, 1998).

life as well. The transmitted sound will be about 215-dB at its source, arrayed in a manner to have "an effective source level" of 230-240-dB.[9] According to the Navy's environmental impact statement (EIS), the sound would be at the 180-dB level one kilometer from the source, at 173-dB two kilometers from the source, about 165-dB 40 nautical miles from the source, at the 150-160-dB level up to 100 miles from the source, and some 140-dB 400 miles from the source vessel.[10] (Decibel levels are logarithmic in nature, so that a sound of 180-dB is ten times as intense as one of 170-dB.) The sounds are not transmitted uniformly in all directions from the source, but travel in a beam that is a few hundred feet in width,[11] which tends to expand as it leaves the source. These sounds are the loudest ever put into the world's oceans by humans, with the possible exception of underground explosions. They are designed to travel great distances and are audible by humans 1000 kilometers away without any signal processing.

In October 2002, federal Magistrate Judge Elizabeth D. LaPorte determined that the Navy's use of low frequency active sonar was likely to violate four federal statutes[12] and to cause irreparable injury to ocean creatures. She therefore issued a preliminary injunction restricting the Navy's actions, but allowing further testing and training of personnel

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9. Because of the way sound is measured and the different speed that sound travels through water, as compared to land, it is estimated that "underwater sound pressure levels numerically are about 61.5 dB greater than sound pressure levels in air for an equal intensity." Robert C. Gisiner, *Proceedings, Workshop on the Effects of Anthropogenic Noise in the Marine Environment,* February 10-12, 1998, 24 (Marine Mammal Science Program, Office of Naval Research, 1988), *at* http://www.onr.navy.mil/sci_tech/personnel/cnb_sci/proceed.pdf. In other words, sound measured at 131-dB in water would have the same pressure impact as sound measured at 70-dB on land. *Id.* 60-dB on land is the sound generated by freeway traffic. Continuous exposure above 85-dB (on land) is likely to degrade the hearing of most humans. "Deafening" noise (on land) begins at 110-dB, with 120-dB measuring a hard rock band, 130-dB being the point at which pain is registered, and 140-dB being the point adjacent to a jet engine. *See, e.g.,* Motionizer.com, *Reference Desk, at* http://www.members.aol.com/motionizer/page28.html (last visited May 5, 2003). The 180-dB (in water) figure said by the Navy to be "safe" for cetaceans would thus affect them at about the same extent as human hearing would be affected by standing next to a hard rock band at a rock concert, if we can assume that the hearing system of cetaceans is roughly comparable to ours.

10. Natural Resources Defense Council v. Evans, 232 F.Supp.2d 1003, 1021, 1033–34, (N.D.Cal. Oct. 31, 2002) (Opinion and Order Granting Plaintiffs' Motion for a Preliminary Injunction).

11. *Id.* at 1033–34.

12. The four statutes are the Marine Mammal Protection Act of 1972, 16 U.S.C. § 1361 (2003), the National Environmental Protection Act of 1969, 42 U.S.C. § 4332 (2003), the Endangered Species Act of 1973, 16 U.S.C. § 1531 (2003), and the Administrative Procedure Act of 1940, 5 U.S.C. § 551 (2003).

regarding this system.[13] The court explained: "[i]t is undisputed that marine mammals, many of whom depend on sensitive hearing for essential activities like finding food and mates and avoiding predators, and some of whom are endangered species, will at a minimum be harassed by the extremely loud and far traveling LFA sonar."[14] The subsequent agreement between the parties allows the Navy to test its sonar in an area of the Western Pacific extending from Saipan, in the Commonwealth of the Northern Mariana Islands, to Japan's Bonin Islands, south of Tokyo, pending the hearing for a preliminary injunction, scheduled for the summer of 2003.[15] About the same time, another federal judge in Northern California issued a temporary restraining order blocking geographers from the National Science Foundation, Columbia University, and the Georgia Institute of Technology from mapping the sea floor with 220-dB sound blasts which had killed at least two beaked whales.[16]

In January 2003, U.S. District Judge Samuel Conti of the Northern District of California made an additional ruling against sonar use, blocking experiments (authorized by NMFS) that were to be conducted by Woods Hole Oceanographic Institution scientist Dr. Peter Tyack to determine the effect of sound on the gray whales migrating along the West Coast of California to their winter grounds along the coast of

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13. *Natural Resources Defense Council*, 232 F.Supp.2d at 1053.

14. *Id.* Although Magistrate Judge LaPorte found that the Navy's activities violated four federal statute, she accepted the testimony of the NMFS experts regarding the impact of LFAS on marine mammals over the sharply conflicting testimony presented by the Natural Resources Defense Counsel. Judge LaPorte wrote that: "[t]he law is clear. . .that when qualified experts on both sides reach carefully reasoned but different conclusions, the Court must defer to the agency's experts. . ." *Id.* at 1017.

Other courts dealing with ocean environmental issues have taken a more skeptical view of the scientific opinions offered by federal agencies. *See, e.g., Natural Resources Defense Counsel v. Daley*, 209 F.3d 747, 755, 754 (D.C. Cir. 2000)(courts "do not hear cases merely to rubber stamp agency actions" and agency's scientific conclusions could only be correct in "Superman Comics' Bizarro world, where reality is turned upside down"); *Greenpeace v. National Marine Fisheries Service*, 106 F.Supp.2d 1066 (W.D.Wash. 2000)(where the court treated the views of the two sides' experts as having equal credibility and issued the injunction sought by plaintiffs despite the contrary testimony of the agency's experts).

15. David Kravets, *U.S. Navy Agrees to Temporarily Limit Testing of New Sonar System Amid Marine Life Concerns,* Associated Press, Nov. 15, 2002, *at* Westlaw APWIRES file.

16. *Court Order Blocks Whale Killing in Gulf of California,* Oct. 29, 2002, *at* http://www.endangeredearth.org/alerts/result.asp?index=1210 (summarizing issuance of temporary restraining order by Magistrate Judge James Larson in the case of Center for Biological Diversity v. National Science Foundation, no. C 2-5065 JL (N.D. Cal. Oct. 31, 2002) (Temporary Restraining Order)).

Mexico.[17] Judge Conti ruled that because the permits involved "major amendments" to the original project, which had generated "public controversy," it was necessary to conduct a proper environmental impact assessment under the National Environmental Protection Act before undertaking the experiments. In the process of "balancing" the "harms" to determine whether to issue an injunction, Judge Conti noted that the population of gray whales had been dropping since 1984 (from 21,942 individuals to 17,414) and that "Dr. Tyack's proposed experiments might inflict unacceptable levels of harm on the gray whales."[18]

If U.S. judges eventually allow the Navy and other researchers to proceed with this powerful new sonar, this activity is sure to be challenged at the international level. The unusually loud sounds emitted in the LFAS process would certainly be considered pollution under Article 1(1)(4) of the Law of the Sea Convention, which is defined as:

> the introduction by man, directly or indirectly, of substances or *energy* into the marine environment, including estuaries, which *results or is likely to result* in such *deleterious effects* as *harm to living resources and marine life*, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.[19]

Sound is a form of energy manifested by small pressure and/or particle velocity variations in a continuous medium.[20] "While the definition [of pollution in the Law of the Sea Convention] was . . . not drafted with acoustic pollution in mind, the inclusion of 'energy' implies that noise can be a form of pollution under the terms of the LOS Convention."[21] Although the U.S. Navy did prepare an EIS, the scientific tests it relied upon were woefully inadequate because they did not test the effects above 155-dB and, even so, these tests demonstrated that LFAS will have significant negative impacts on marine mammals.[22]

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17. *Hawaii County Green Party v. Evans*, No. C-03-0078-SC (N.D. Cal., Jan. 24, 2003) (Order Granting Permanent Injunction).

18. *Id.*, slip op. at 24.

19. United Nations Convention on the Law of the Sea (UNCLOS), Dec. 10, 1982, 1833 U.N.T.S. 3, 21 I.L.M. 1261 (entered into force Nov. 16, 1994) (emphasis added) [hereinafter Law of the Sea].

20. W.J. RICHARDSON, ET AL., MARINE MAMMALS AND NOISE 544 (1995).

21. Harm M. Dotinga & Alex G. Oude Elferink, *Acoustic Pollution in the Oceans: The Search for Legal Standards*, 31 OCEAN DEV. & INT'L LAW 151, 158 (2000).

22. *See* Christopher W. Clark, Peter Tyack, and William T. Ellison, Quicklook, Low-Frequency Sound Scientific Research Program, Phase I: Responses of Blue and Fin Whales to SURTASS LFA, Southern California Bight, Sept. 5 – Oct. 21, 1997 (Feb. 27,

II. SEA TRANSPORT OF ULTRAHAZARDOUS RADIOACTIVE MATERIALS.[23]

Another new threat to the marine environment has been presented by the shipments during the past decade of ultrahazardous cargoes of plutonium, mixed-oxide ("MOX") nuclear fuel, and high level radioactive wastes back and forth from Japan to Europe as part of the Japanese nuclear power program.[24] These shipments have caused enormous concern among the nations that could be devastated by an accident or terrorist attack involving their cargoes. A Chilean naval vessel ordered the 1994-95 shipment to exit Chile's exclusive economic zone, citing the precautionary principle as a primary reason for banning the British-flag vessel from its EEZ.[25] More recently, Chile has amended its law to require prior notification and approval (based on whether the cargo meets safety standards) before shipments of radioactive materials can pass through its exclusive economic zone.[26] New Zealand has also taken a lead in protesting these shipments, arguing that they should not be permitted through New Zealand's EEZ because of the "'precautionary

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1998) 30-31, Figure 28 (on file with author); Peter Tyack and Christopher Clark, Quicklook Phase II, Playback of Low-Frequency Sound to Gray Whales Migrating Past the Central California Coast, January 1998 (June 23, 1998) 22-25 (on file with author).

23. For a more complete analysis of this issue, see Jon M. Van Dyke, *The Legal Regime Governing Sea Transport of Ultrahazardous Radioactive Materials*, 33 OCEAN DEV. & INT'L LAW 77 (2002).

24. *See, e.g.*, Jon M. Van Dyke, *Sea Shipment of Japanese Plutonium under International Law*, 24 OCEAN DEV. & INT'L LAW 399 (1993); Jon M. Van Dyke, *Applying the Precautionary Principle to Ocean Shipments of Radioactive Materials*, 27 OCEAN DEV. & INT'L LAW 379 (1996); Duncan E.J. Currie & Jon M. Van Dyke, *The Shipment of Ultrahazardous Nuclear Materials in International Law*, 8 RECIEL 113 (1999).

25. Transcript of radiotelephone conversation of March 22 1994. See, in particular, Article 23 of the Law of the Sea, *supra* note 18, requiring "[f]oreign nuclear-powered ships and ships carrying nuclear or other inherently dangerous or noxious substances. . .when exercising the right of innocent passage through the territorial sea [to] carry documents and observe special precautionary measures established for such ships by international agreements."

Coastal States have the specific right "to adopt and enforce non-discriminatory laws and regulations for the prevention, reduction and control of marine pollution from vessels in ice-covered areas within the limits of the exclusive economic zone, where particularly severe climatic conditions and the presence of ice covering such areas for most of the year create obstructions or exceptional hazards to navigation, and pollution of the marine environment could cause major harm to or irreversible disturbance of the ecological balance." *Id.* at art. 234. This provision could strengthen Chile and Argentina's claim to ban carriers of highly radioactive nuclear cargoes from their EEZs.

26. See Chile Governing Assembly, Law for Nuclear Safety, Law-18302 (promulgated April 16, 1984), as amended by Law-19825 (Oct. 1, 2002).

principle' enshrined in the Rio Declaration," and that "there should be recognition in international law of the right of potentially affected coastal states to prior notification, and, ideally, prior informed consent for shipments of nuclear material."[27] Vanuatu and the Fiji issued particularly strong protests after the 2002 shipment.[28] The countries opposing these shipments argue that passage of such dangerous cargoes through coastal EEZs violates the standards found in the Law of the Sea Convention. Some of these nations are now thinking of bringing a claim under the Law of the Sea Convention's dispute-resolution procedures against Japan, the United Kingdom, and France. Such a claim could argue that these nations have violated:

(A) their duties under Articles 204-06 to prepare and disseminate an environmental impact statement (because "planned activities under their jurisdiction or control may cause substantial pollution of or significant and harmful changes to the marine environment"),

(B) their duty under general international law to consult affected states, including specifically their duty under Article 199 to "jointly develop and promote contingency plans for responding to pollution incidents in the marine environment,"

(C) their general duty under Articles 192 and 235 to "protect and preserve the marine environment," including the more specific duty under Article 194(5) "to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life," and

(D) their more specific duty under Article 235(3) to create an appropriate liability regime, including the "development of criteria and

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27. Letter from Don McKinnon, New Zealand Minister of Foreign Affairs and Trade, to Michael Szabo, July 7, 1999.

28. At a meeting to discuss the creation of a liability regime held in Nadi, Fiji, in February 2003, Vanuatu's delegation laid out the requirements of a proper liability regime (strict liability, no limits on liability, claims can be brought against owner of cargo as well as shipping nation, no statute of limitations, adjudication in a neutral tribunal, an expansive and inclusive definition of damages including harm that results from an incident that does not involve the release of radioactive materials, and a proper insurance program including the establishment of a compensation fund) and then stated "that it would be a violation of international law for any further sea shipments of ultrahazardous radioactive materials to take place prior the compliance by the shipping nations with all their obligations under the Law of the Sea Convention and international law, as described above." Submission by the Republic of Vanuatu for the Meeting on Liability, Nadi, Fiji, February 24-27, 2003. Fiji's Prime Minister Laisenia Qarase denounced these shipments at the summit meeting of African, Caribbean and Pacific nations held in Nadi, Fiji, in July 2002. *Nuclear Fuel Shipping Opposed*, HONOLULU ADVERTISER, at A2, col.2, July 19, 2002.

procedures for payment of adequate compensation, such as compulsory insurance or compensation funds."[29]

The duties of the shipping nations appear to be identified clearly in these provisions of the Law of the Sea Convention, and the Law of the Sea Convention's dispute-resolution mechanisms provide an opportunity for small countries to protect their resources and the marine environment against threats posed by the larger maritime and nuclear nations.

CONCLUSION

The Law of the Sea Convention anticipated conflicts among users of the oceans, and included a sophisticated dispute resolution procedure in Part XV.[30] As technology advances and risks of pollution increase, coastal and island countries will inevitably be taking steps to protect their marine resources and coastal environment. One dramatic recent example is the decree issued by Spain and France – after the disaster caused by the breaking apart of the tanker *Prestige* off their coasts – that all single-hulled oil tankers passing through their exclusive economic zones will be subject to being stopped and inspected, and that such ships will be prohibited completely from their EEZs in a few years.[31] It is logical and appropriate that countries will be taking steps to protect their resources and populations from the risks posed by active sonar and sea transport of ultrahazardous cargos. If the tribunals established by the Law of the Sea Convention operate conscientiously and effectively, disputes between shipping and coastal countries should be resolvable in a manner that protects the marine environment.

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29. Law of the Sea, *supra* note 18.

30. *See generally* Jon M. Van Dyke, *Louis B. Sohn and the Settlement of Ocean Disputes*, 33 GEO. WASH. J. INT'L L. & ECON. 31 (2000).

31. See, e.g., Emma Daly, *After Oil Spill, Spain and France Impose Strict Tanker Inspections*, N.Y. TIMES, at A5, col.3, Nov. 27, 2002. *See also* Marlise Simons, *France Clamps Down on Shipping Pollution*, N.Y. TIMES, at A8, col.1, April 7, 2003.