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May 20, 2006

Stephen L. Leathery
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NOAA Fisheries
1315 East-West Highway
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Dear Steve,

I am writing to provide comments in regards to the Navy's request for an Incidental Harassment Authorization in relation to the RIMPAC exercise in Hawai‘i. My basis for these comments comes primarily from undertaking research on odontocete cetaceans in Hawai‘i each year since 1999. This research has involved small vessel surveys around all of the main Hawaiian Islands, covering over 34,000 km of trackline, searching for all species of odontocetes (with an emphasis in the last four years on beaked whales), as well as undertaking studies of stock structure and diving behavior. During this period we have collected information from 741 sightings/encounters with 16 species of odontocetes. While some of the results of this work are available in various publications and reports (see www.cascadiaresearch.org/robin/hawaii.htm), the work is on-going and as such most is unpublished.

Based on my review of the information presented in NMFS' proposed incidental take authorization (Federal Register, I.D. 011806L), the Navy's application for an Incidental Harassment Authorization (IHA application), and the Navy's 2006 Supplement to the 2002 Rim of the Pacific (RIMPAC) Programmatic Environmental Assessment (2006 PEA), I question the efficacy of the proposed mitigation/monitoring that will be in place. In particular I outline below why:

1) estimates of cetacean densities used in modeling and estimating numbers of individuals to be exposed to high-intensity sounds are underestimated such that the estimate of takes will also be underestimated;

2) population sub-division has not been taken into account, thus the proportions of some populations predicted to be exposed/taken will be greater than that indicated;

3) aerial reconnaissance is insufficient in determining the presence of many species of deep-diving cetaceans due to long dive times and unfavorable sea states;

4) the geographic scope of land-based coverage for animals that may potentially be exposed to sounds in the Alenuiuhaha Channel is inadequate; and

5) limiting sonar use outside of 25 km from the 200 m isobath is insufficient in mitigating impacts on beaked whales and other species.

Several other issues relevant to mitigation and predicting impacts are also discussed below.

Estimated marine mammal densities used in modeling

There are a number of issues associated with the estimated densities used in modeling exposure/takes. The IHA application (page 9, also the 2006 PEA) notes that estimates of densities for modeling exposure of animals within 25 nm of the islands (Table 3-2) were based on Mobley et al. (2000). There are several reasons why use of the Mobley et al. (2000) aerial survey data results in under-estimates of density for some species (and thus under-estimates of the numbers/species of animals exposed to sounds). Densities of long-diving species (e.g., beaked whales, *Kogia* spp., see below), and species that are difficult to detect except in particularly good sea states (e.g., beaked whales, *Kogia* spp.) are negatively biased from aerial surveys. Table 3-2 in the Navy's application notes no dwarf sperm whales within 25 nm of shore, yet this species was the fifth-most frequently encountered species within that range in a recent survey off the island of Hawai'i (Baird unpublished, see also Baird 2005). Table 3-2 also notes no pygmy killer whales within the inshore (within 25 nm) strata, yet there is a small population of apparently resident pygmy killer whales found within 25 nm of shore off the island of Hawai'i (McSweeney et al. 2005). In terms of under-estimating the density of beaked whales, Mobley et al. (2000) acknowledge this (pg. 6), noting that "the abundance estimates presented here for beaked whales and sperm whales probably underestimate the true abundance by a factor of at least two to five", and Barlow and Gisiner (2006) note that an even smaller fraction of beaked whales (approximately 7% of Cuvier's and 11% of Mesoplodon) are likely detected when directly on the trackline, with even lower proportions detected to the side of the aircraft. Abundance/density estimates for two other species (melon-headed whales, rough-toothed dolphins) from Mobley et al. (2000) are substantially lower than abundance determined by mark-recapture analysis based on photo-identification. In the case of rough-toothed dolphins, Mobley et al. (2000) provide an estimate of 123 individuals (CV=0.88) around all the main Hawaiian Islands, while a mark-recapture estimate for the "marked" population off Kaua'i and Ni'ihau (only a fraction of the area covered by Mobley et al) is 1,759 (CV=0.33) (Baird et al. unpublished manuscript). Thus because aerial surveys underestimate cetacean abundance (and in the case of dwarf sperm whales and pygmy killer whales did not result in any sightings), the estimated number of takes within 25 nm of shore are underestimated.

Population sub-division not taken into account

Evidence from genetic studies of all species so far studied around the Hawaiian Islands (short-finned pilot whales, false killer whales, bottlenose dolphins, spinner dolphins) have indicated that animals around the main Hawaiian Islands are reproductively differentiated from animals elsewhere in the tropical Pacific (see Chivers et al. 2003; Martien et al. 2005; Andrews et al. 2006). In the case of spinner dolphins and bottlenose dolphins, there appears to be additional population structure within the main Hawaiian Islands (Martien et al. 2005; Andrews et al. 2006), with genetic differentiation and no evidence of movements of individuals among the four main groups of islands. Thus, utilizing abundance estimates for the entire Hawaiian EEZ may not be appropriate in determining the proportion of the total population that may be exposed to sounds (Federal Register Table 1). In these cases, the actual proportion of the population exposed to sounds should be greater than that indicated in Table 1, suggesting that any impacts may affect a much larger proportion of these populations. For example, with bottlenose dolphins the estimated abundance within the OpArea (Table 1 in Federal Register) is 3,263 individuals, and the estimated takes include 1,183 individuals (Table 1), resulting in an estimated 36% of the total population that may be taken. However, based on genetic (Martien et al. 2005) and photo-ID evidence (Baird et al. 2002, 2003, 2006), including mark-recapture analyses (Baird et al. 2001), there is likely a small reproductively isolated population around each island (e.g., off Maui/Lanaʻi the mark-recapture estimate was 134 individuals; Baird et al. 2001). Thus it is likely that the estimates of the proportion of some populations that may be taken are strongly negatively biased.

Efficacy of aerial reconnaissance in mitigation/monitoring

Several species of odontocetes in the area of interest may dive for extended periods and therefore will have a very low probability of being detected through aerial overflights. For example, Blainville's beaked whales and Cuvier's beaked whales have been documented diving for periods of up to 83 and 87 minutes, respectively, in Hawaiʻi (Baird unpublished; Baird et al. 2005), and regularly dive for periods of 50-60 minutes. Short-finned pilot whales may dive for periods of up to 27 minutes in Hawaiʻi (Baird unpublished). Dwarf and pygmy sperm whales (*Kogia* spp.) are also known to dive for extended periods. Thus the likelihood of any of these species being detected by aerial reconnaissance is extremely low, even in ideal sea conditions. Unfortunately, the area of the choke-point exercises in the Alenuihaha Channel is one of the windiest areas around the main Hawaiian Islands, with wind speeds typically in the range of 10-15 m/sec (see http://oceanwatch.pifsc.noaa.gov/ssmi/ssmi_hawaii.html), even further reducing the likelihood of detection of these species, or any species of cetacean. Barlow and Gisiner (2006) note that "the effective search width [for beaked whales] is typically only 250-500 m (on each side of the aircraft) for aerial observers searching by naked eye in good to excellent sighting conditions". Given the typically windy sea conditions in the Alenuihaha Channel and in offshore waters in Hawaiʻi, it is clear that the use of aerial reconnaissance to effectively detect animals within the range of sonar operations will be ineffective.

Geographic scope and species coverage from land-based reconnaissance in the Alenuihaha Channel

The land-based reconnaissance for activities to be undertaken in the Alenuihaha Channel (Federal Register, 2006 PEA) note that such reconnaissance will be undertaken between Mahukona and Lapakahi on the island of Hawaiʻi. The distance between the Mahukona Lighthouse and the southern boundary of the Lapakahi State Park is approximately 2 km (the exact boundaries of the land-based reconnaissance area are not given in the FR notice). Using the southern boundary of Lapakahi State Park as the SW limit, the linear length of the coastline immediately bordering the southern part of the area outlined for the choke-point exercise in the Alenuihaha Channel is approximately 28 km. The justification for monitoring only such a small proportion of the near-shore area in the Channel is not given (nor is it noted why no shore-based monitoring would be undertaken off the other two islands bordering this channel). Given the typical densities of odontocetes in Hawaiian waters, the likelihood of detecting groups along a 2-km stretch of coastline on any particular day is extremely small. In addition, the near-shore bathymetry on the south side of the Alenuihaha Channel is generally relatively gentle, i.e., there is no deep (>200 m) water within several kilometers of shore. Thus the species that typically use the area where land-based observers will be able to document groups are primarily spinner dolphins, bottlenose dolphins, and rarely false killer whales. Some of the species that are thought or known to be most susceptible to impacts from high-intensity mid-frequency sonars (e.g., beaked whales, pilot whales, melon-headed whales) do not occur close enough to shore in this area to be detected from land-based observers. Besides the limited geographic coverage of the land-based site, it is difficult to evaluate the efficacy of this monitoring as no information is presented on the elevation of the observation site, the number of observers, or the methods used to detect cetaceans (e.g., naked eye, 8x binoculars, 25x binoculars, etc).

Limiting sonar use within 25 km of the 200 m isobath is ineffective at limiting exposure

One mitigation measure proposed (Federal Register, 2006 PEA) to minimize exposure to sonar is that “with the exception of three specific choke-point exercises [ ], the Navy will not operate mid-frequency sonar within 25 km of the 200 m isobath”. Based on sighting data of Blainville’s and Cuvier’s beaked whales off the island of Hawai‘i (Baird et al. 2005; Baird unpublished), using 25 km from the 200 m isobath as a cut-off point for sonar use will not be effective at limiting exposure of these two species. A quantitative analysis of sighting and effort distances in relation to the 200 m isobath based on these survey data has not been undertaken, however, the distance of sightings from the shoreline for all odontocete sightings and the distance from the 200 m isobath for the furthest offshore beaked whale sightings have been measured. For both Cuvier’s and Blainville’s beaked whales, the farthest from shore that we have documented these two species is 48.8 km, and these two sightings were approximately 38 km from the 200 m isobath. We have also documented most other species at distances far greater than 25 km from shore (bottlenose dolphins, 30.5 km; dwarf sperm whale, 35.7 km; false killer whale, 69.8 km; melon-headed whale, 43 km; pantropical spotted dolphin, 40.5 km; pygmy sperm whale, 30.2 km; Risso’s dolphin, 33 km; rough-toothed dolphin, 49.8 km; sperm whale, 47.2 km; striped dolphin, 36.7 km), despite the fact that the majority of our survey effort is within approximately 30 km of shore. In most areas along the west coast of the island of Hawai‘i, the 200 m isobath is within 1-2 km of shore, so these sighting distances are likely all far outside of 25 km from the 200 m isobath. In addition, in the area to the west of the island of Hawai‘i there are a number of seamounts that rise to within 1,000 m of the surface. The area offshore west of the island of Hawai‘i is also characterized by regular cyclonic eddies which increase productivity (Seki et al. 2001, 2002) and likely result in greater densities of cetaceans far from shore. If the purpose of such a mitigation measure is to reduce the likelihood of exposure of species/individuals which may associate with steeply sloping areas (e.g., Blainville’s beaked whales, short-finned pilot whales), or areas of high productivity, sonar use should be excluded from the area with seamounts and cyclonic eddies west of the island of Hawai‘i, and the exclusion of sonar within 25 km of the 200 m isobath should be extended to a greater range. While the above-noted discussion focuses on sightings off the island of Hawai‘i, it is likely that most of these species also occur >25 km outside of the 200 m isobath off the other islands, though we have not had enough survey effort offshore of these islands to demonstrate this.

Power to detect effects

No information is presented on the statistical power (the probability of rejecting a false statistical null hypothesis) of the monitoring/mitigation plan. In particular, it should be possible to estimate statistical power based on the proposed level of monitoring, estimated densities of different species, and the probability of detecting different species. As well, it should be possible to estimate the probability of detecting unexpected impacts (e.g., strandings) that may adversely affect the species or stocks involved. Statistical power is directly related to sample size and effect size; as sample size or effect size increases, so does statistical power. In this case, whether the null hypothesis (for simplicity, that as a result of monitoring and mitigation there are no Level A takes of cetaceans due to RIMPAC) is true or false is unknown. If the null hypothesis is false (i.e., there are Level A takes of cetaceans due to RIMPAC), the question is whether the planned monitoring efforts have enough power to detect such effects, or, in the case of monitoring to reduce impacts, whether the monitoring has a high likelihood of detecting groups of animals that can or may be exposed to high sound levels. Based on the level of monitoring outlined, the low density of most species of odontocetes in Hawai‘i, and the low likelihood of detecting long-diving/cryptic species, the effective sample size in this monitoring plan is low, and thus the power to detect impacts and assess the presence of animals to reduce impacts are low. If there are unexpected impacts (e.g., animals which strand or move into shallow waters), the likelihood of detecting such impacts are small unless the animals move into an area under direct monitoring (e.g., between Mahukona and Lapakahi on the island of Hawai‘i), or into an area with regular access by people. In addition, given the prevailing direction of currents in Hawai‘i, and the large number of large sharks which scavenge carcasses, the likelihood of dead animals stranding (and thus having a higher chance of being detected) is very low. Certainly in the area of the Alenuihaha Choke Point Exercises there are huge areas of coastline that do not appear to be monitored under the existing monitoring plan (e.g., along Kaho‘olawe, the south coast of Maui, much of the Kohala Peninsula), and thus the power to detect unexpected impacts is extremely low.

In conclusion, for the reasons outlined above it appears that the monitoring and mitigation proposed for the incidental harassment authorization will be insufficient to detect, much less prevent, Level A takes, particularly of Cuvier’s and Blainville’s beaked whales.

If you would like any additional information on any of the analyses noted above, please do not hesitate to contact me.

Sincerely,

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Literature Cited

Andrews, K.R., L. Karczmarski, W.W.L. Au, S.H. Rickards, C.A. Vanderlip, and R.J. Toonen. In press. Patterns of genetic diversity of the Hawaiian spinner dolphin (*Stenella longirostris*). Atoll Research Bulletin.

Baird, R.W. 2005. Sightings of dwarf (*Kogia sima*) and pygmy (*K. breviceps*) sperm whales from the main Hawaiian Islands. Pacific Science 59:461-466. Available from www.cascadiaresearch.org/robin/hawaii.htm

Baird, R.W., A.M. Gorgone, A.D. Ligon and S.K. Hooker. 2001. Mark-recapture abundance estimate of bottlenose dolphins (*Tursiops truncatus*) around Maui and Lanai, Hawaii, during the winter of 2000/2001. Report prepared under Contract #40JGNF000262 to the Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, CA. Available from www.cascadiaresearch.org/robin/hawaii.htm

Baird, R.W., A.M. Gorgone, and D.L. Webster. 2002. An examination of movements of bottlenose dolphins between islands in the Hawaiian Island chain. Report prepared under contract #40JGNF110270 to the Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, CA. Available from www.cascadiaresearch.org/robin/hawaii.htm

Baird, R.W., D.J. McSweeney, D.L. Webster, A.M. Gorgone, and A.D. Ligon. 2003. Studies of odontocete population structure in Hawaiian waters: results of a survey through the main Hawaiian Islands in May and June 2003. Report prepared under Contract No. AB133F-02-CN-0106 from the National Oceanic and Atmospheric Administration, Western Administrative Support Center, 7600 Sand Point Way N.E., Seattle, WA. Available from www.cascadiaresearch.org/robin/hawaii.htm

Baird, R.W., D.L. Webster, D.J. McSweeney, A.D. Ligon and G.S. Schorr. 2005. Diving behavior and ecology of Cuvier's (*Ziphius cavirostris*) and Blainville's beaked whales (*Mesoplodon densirostris*) in Hawai'i. 2005. Report prepared under Order No. AB133F-04-RQ-0928 to Cascadia Research Collective, Olympia, WA from the Southwest Fisheries Science Center, NMFS, La Jolla, CA. Available from www.cascadiaresearch.org/robin/hawaii.htm

Baird, R.W., G.S. Schorr, D.L. Webster, S.D. Mahaffy, A.B. Douglas, A.M. Gorgone, and D.J. McSweeney. 2006. A survey for odontocete cetaceans off Kaua'i and Ni'ihau, Hawai'i, during October and November 2005: evidence for population structure and site fidelity. Report to Pacific Islands Fisheries Science Center, NOAA Fisheries under Order No. AB133F05SE5197, with additional support from Marine Mammal Commission and Dolphin Quest. Available from www.cascadiaresearch.org/robin/hawaii.htm

Baird, R.W., D.L. Webster, D.J. McSweeney, A.D. Ligon, G.S. Schorr, and S.D. Mahaffy. Unpublished manuscript. High site fidelity and evidence of population structure in a deep water dolphin: rough-toothed dolphins (*Steno bredanensis*) in the Hawaiian archipelago.

Barlow, J. 2003. Cetacean abundance in Hawaiian waters during summer/fall of 2002. National Marine Fisheries Service Southwest Fisheries Science Center Administrative Report LJ-03-13.

Barlow, J. 2006. Cetacean abundance in Hawaiian waters estimated from a summer/fall survey in 2002. Mar. Mamm. Sci. 22:446-464.

Barlow, J., and R. Gisiner. 2006. Mitigating, monitoring and assessing the effects of anthropogenic sound on beaked whales. J. Cetacean Res. Manage. 7: in press.

Chivers, S.J., R.G. LeDuc and R.W. Baird. 2003. Hawaiian island populations of false killer whales and short-finned pilot whales revealed by genetic analyses. Page 32 *in* Abstracts of the 15th Biennial Conference on the Biology of Marine Mammals, 14-19 December 2003, Greensboro, North Carolina.

Martien, K., R.W. Baird and K. Robertson. 2005. Population structure of bottlenose dolphins around the main Hawaiian Islands. Document presented to the Pacific Scientific Review Group, January 2005.

McSweeney, D.J., R.W. Baird, D.L. Webster, G.S. Schorr, and S.D. Mahaffy. 2005. Requirements for conservation action? Small population size, high site-fidelity, strong associations, and uncertainty: pygmy killer whales off the island of Hawaii. *In* Abstracts from the 16th Biennial Conference on the Biology of Marine Mammals, December 2005, San Diego, California.

Mobley, J.R., Spitz, S.S., Forney, K.A., Grotefendt, R., and Forestell, P.H. 2000. Distribution and abundance of odontocete species in Hawaiian waters: preliminary results of 1993-98 aerial surveys. SWFSC Admin. Rep. LJ-00-14C.

Seki, M.P., Polovina, J.J., Brainard, R.E., Bidigare, R.R., Leonard, C.L., and Foley, D.G. 2001. Biological enhancement at cyclonic eddies tracked with GOES thermal imagery in Hawaiian waters. Geophysical Res. Lett. 28: 1583-1586.

Seki, M.P., Lumpkin, R., and Flament, P. 2002. Hawaii cyclonic eddies and blue marlin catches: the case study of the 1995 Hawaiian International Billfish Tournament. J. Oceanog. 58: 739-745.