

**SPINNER DOLPHIN (*Stenella longirostris longirostris*):**  
**Hawaiian Islands Stock Complex- Hawaii Island, Oahu/4-islands,**  
**Kauai/Niihau, Pearl & Hermes Reef, Midway Atoll/Kure, Hawaii Pelagic**

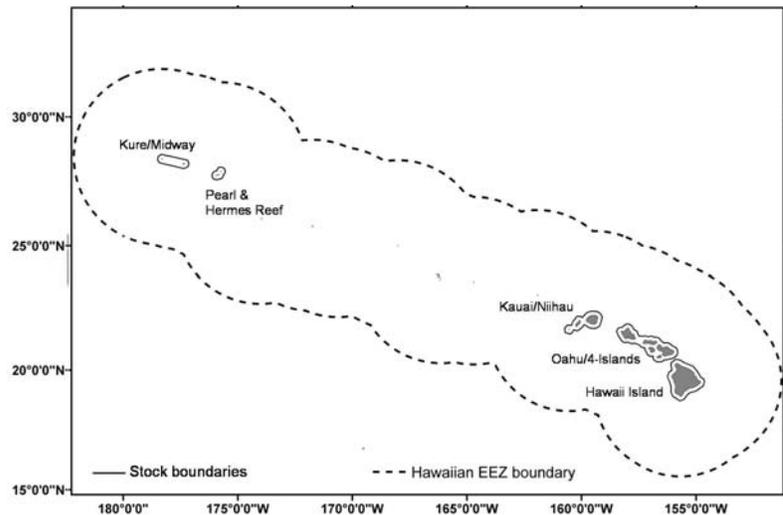
**STOCK DEFINITION AND GEOGRAPHIC RANGE**

Six morphotypes within four subspecies of spinner dolphins have been described worldwide in tropical and warm-temperate waters (Perrin et al. 2009). The Gray's (or pantropical) spinner dolphin (*Stenella longirostris longirostris*) is the most widely distributed subspecies and is found in the Atlantic, Indian, central and western Pacific Oceans (Perrin et al. 1991). Within the central and western Pacific, spinner dolphins are island-associated and use shallow protected bays to rest and socialize during the day then move offshore at night to feed (Norris and Dohl 1980; Norris et al. 1994). They are common and abundant throughout the entire Hawaiian archipelago (Shallenberger 1981; Norris and Dohl 1980; Norris et al. 1994), and 26 strandings have been reported (Maldini 2005). Recent sighting locations from a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the main Hawaiian Islands (Barlow 2006) are shown in Figure 1.

Hawaiian spinner dolphins belong to a stock that is separate from those involved in the tuna purse-seine fishery in the eastern tropical Pacific (Perrin 1975; Dizon et al. 1994). The Hawaiian form is referable to the subspecies *S. longirostris longirostris*, which occurs pantropically (Perrin 1990). Recent studies on the genetic structure of spinner dolphins in the Hawaiian archipelago found significant genetic distinctions between spinner dolphins sampled at five different islands/atolls- Hawaii, Oahu/4-islands, Kauai/Niihau, Pearl and Hermes Reef, Midway Atoll/Kure (Andrews 2009, Andrews et al. 2010) and these distinctions are supported by available photo-ID and animal movement data (Karczmarski 2005). In particular, mitochondrial and microsatellite DNA data from individuals sampled along the Kona Coast of the Island of Hawaii show marked distinctions from individuals sampled at all other Hawaiian Islands including Maui (Andrews 2009, Andrews et al. 2010). Hill et al. (2009) suggest an offshore boundary for each island-associated stock at 10nmi from shore based on anecdotal accounts of spinner dolphin distribution. This offshore boundary is likely to be revised as new information on the movements of island-associated spinner dolphins becomes available. For the Marine Mammal Protection Act (MMPA) stock assessment reports, there are six stocks found within the U.S. EEZ of the Hawaiian Islands 1) Hawaii Island, 2) Oahu/4-islands, 3) Kauai/Niihau, 4) Pearl & Hermes Reef, 5) Kure/Midway, and 6) Hawaii Pelagic, including animals found both within the Hawaiian Islands EEZ and in adjacent international waters. Because data on abundance, distribution, and human-caused impacts are largely lacking for international waters, the status of all stocks combined is evaluated based on data from U.S. EEZ waters of the Hawaiian Islands (NMFS 2005). Spinner dolphins involved in eastern tropical Pacific tuna purse-seine fisheries are managed separately under the MMPA.

**POPULATION SIZE**

No data on current population sizes for any of the Hawaiian Island stocks are available. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 3,351 (CV=0.74) spinner dolphins (Barlow 2006); however, this estimated assumed a single Hawaiian Islands stock. Over the past few decades abundance estimates have been produced from several studies along the Kona coast of the Island of Hawaii. Norris et al. (1994) photo-identified 192 individuals along the west coast of Hawaii and estimated 960 animals for this area in 1979-1980. Östman (1994) photo-identified 677 individual spinner dolphins in the same area from 1989 to 1992. Using the



**Figure 2.** Spinner dolphin stock boundaries. Animals outside of the defined island areas represent the pelagic stock range

same estimation procedures as Norris et al. (1994), Östman (1994) estimated a population size of 2,334 for his study area along the Kona coast of Hawaii. In the Northwestern Hawaiian Islands, a multi-year photo-identification study at Midway Atoll resulted in a population estimate of 260 spinner dolphins based on 139 identified individuals (Karczmarski et al 1998). As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 3,184 (CV=0.37) spinner dolphins was calculated from the combined survey data (Mobley et al. 2000). These data may be used to produce abundance estimates for each new stock area; however, the data are now more than 8 years old and abundance estimates from these data would be out of date.

### **Minimum Population Estimate**

Abundance data for each new stock is not yet available, but estimates will be incorporated into this report as estimates based on photo-identification data become available. The log-normal 20th percentile of the 2002 abundance estimate for all stocks combined (Barlow 2006) is 1,920 spinner dolphins.

### **Current Population Trend**

No data on current population trend are available.

### **CURRENT AND MAXIMUM NET PRODUCTIVITY RATES**

No information on current or maximum net productivity rate is currently available for any stock in the Hawaiian Islands stock complex.

### **POTENTIAL BIOLOGICAL REMOVAL**

The potential biological removal (PBR) level for the combined Hawaiian Islands stock complex is calculated as the minimum population size within the U.S EEZ of the Hawaiian Islands (1,920) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a species of unknown status with no estimated fishery mortality or serious injury within the U.S. EEZ of the Hawaiian Islands; Wade and Angliss 1997), resulting in a total PBR of 19 spinner dolphins from all stocks per year.

### **HUMAN-CAUSED MORTALITY AND SERIOUS INJURY**

#### **Fishery Information**

Information on fishery-related mortality of cetaceans in Hawaiian waters is limited, but the gear types used in Hawaiian fisheries are responsible for marine mammal mortality and serious injury in other fisheries throughout U.S. waters. Gillnets appear to capture marine mammals wherever they are used, and float lines from lobster traps and longlines can be expected to occasionally entangle cetaceans (Perrin et al. 1994). In Hawaii, some entanglements of spinner dolphins have been observed (Nitta and Henderson 1993; NMFS/PIR, unpublished data), but no estimate of annual human-caused mortality and serious injury is available, because the nearshore gillnet fisheries are not observed or monitored.

Interactions with cetaceans have been reported for all Hawaiian pelagic fisheries (Nitta and Henderson 1993). There are currently two distinct longline fisheries based in Hawaii: a deep-set longline (DSL) fishery that targets primarily tunas, and a shallow-set longline fishery (SSL) that targets swordfish. Both fisheries operate within U.S. waters and on the high seas. Between 2004 and 2008, no spinner dolphins were observed hooked or entangled in the SSL fishery (100% observer coverage) or the DSL fishery (20-28% observer coverage) (Forney 2009, McCracken & Forney 2010).

Interaction rates between dolphins and the NWHI bottomfish fishery have been estimated based on studies conducted in 1990-1993, indicating that an average of 2.67 dolphin interactions, most likely involving bottlenose and rough-toothed dolphins, occurred for every 1000 fish brought on board (Kobayashi and Kawamoto 1995). Fishermen claim interactions with dolphins that steal bait and catch are increasing. It is not known whether these interactions result in serious injury or mortality of dolphins, nor whether spinner dolphins are involved.

### **STATUS OF STOCK**

The status of spinner dolphins in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance for any stock. A habitat issue of increasing concern is the potential effect of swim-with-dolphin programs and other tourism activities on spinner dolphins around the main Hawaiian Islands (Danil et al. 2005, Courbis and Timmel 2009). Spinner dolphins are not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor as “depleted” under the MMPA. The Hawaiian stocks of spinner

dolphins are not considered a strategic stock under the 1994 amendments to the MMPA, because the estimated rate of mortality and serious injury within the Hawaiian Islands EEZ is zero. However, there is no systematic monitoring of nearshore fisheries that may take animals from both island-associated and pelagic regions of the stock complex. Insufficient information is available to determine whether the total fishery mortality and serious injury for any Hawaiian spinner dolphin stock is insignificant and approaching zero mortality and serious injury rate.

## REFERENCES

- Andrews, K.R. 2009. Barriers to gene flow in the spinner dolphin (*Stenella longirostris*). PhD dissertation, University of Hawaii, Manoa. 99 pp.
- Andrews, K.R., Karczmarski, L., Au, W.W.L., Rickards, S.H., Vanderlip, C.A., Bowen, B.W., Grau, E.G., and Toonen, R.J. 2010. Rolling stones and stable homes: social structure, habitat diversity and population genetics of the Hawaiian spinner dolphin (*Stenella longirostris*). *Molecular Ecology* 19:732-748.
- Barlow, J. 2006. Cetacean abundance in Hawaiian waters estimated from a summer/fall survey in 2002. *Marine Mammal Science* 22(2): 446-464.
- Courbis, S. and G. Timmel. 2009. Effects of vessels and swimmers on behavior of Hawaiian spinner dolphins (*Stenella longirostris*) in Kealake'akua, Honaunau, and Kauhako bays, Hawai'i. *Marine Mammal Science* 25(2):430-440.
- Danil, K., D. Maldini, and K. Marten. 2005. Patterns of use of Maku'a Beach, O'ahu, Hawai'i, by spinner dolphins (*Stenella longirostris*) and potential effects of swimmers on their behavior. *Aquatic Mammals* 31(4):403-412.
- Dizon, A. E., W. F. Perrin, and P. A. Akin. 1994. Stocks of dolphins (*Stenella* spp. and *Delphinus delphis*) in the eastern tropical Pacific: a phylogeographic classification. NOAA Tech. Rep. NMFS 119, 20 pp.
- Forney, K.A. 2009. Serious injury determinations for cetaceans caught in Hawaii longline fisheries during 1994-2008. Draft document PSRG-2009-09 presented to the Pacific Scientific Review Group, November 3-5, 2009, Del Mar, CA.
- Hill, M.C., E.M. Oleson, K.R. Andrews. 2009. A proposal to introduce new stock boundaries for Hawaiian spinner dolphins. PSRG-2009-12.
- Karczmarski, L., B. Würsig and B. Winning. 1998. Socio-ecology and population biology of spinner dolphins *Stenella longirostris* in Midway Atoll, Northwest Hawaiian Chain, Central Pacific. Unpublished report to U.S. Fish and Wildlife Service and National Marine Fisheries Service. 41 pp.
- Karczmarski, L., B. Würsig, G. Gailey, K.W. Larson, and C. Vanderlip. 2005. Spinner dolphins in a remote Hawaiian atoll: Social grouping and population structure. *Behavioral Ecology* 16(4):675-685.
- Kobayashi, D. R. and K. E. Kawamoto. 1995. Evaluation of shark, dolphin, and monk seal interactions with Northwestern Hawaiian Island bottomfishing activity: a comparison of two time periods and an estimate of economic impacts. *Fisheries Research* 23: 11-22.
- Maldini, D., L. Mazzuca, and S. Atkinson. 2005. Odontocete stranding patterns in the Main Hawaiian Islands (1937-2002): How do they compare with live animal surveys? *Pacific Science* 59(1):55-67.
- McCracken M., and K.A. Forney. 2010. Preliminary assessment of incidental interactions with marine mammals in the Hawaii longline deep and shallow set fisheries. NMFS, Pacific Islands Fisheries Science Center Working Paper WP-10-001. 27p.
- Mobley, J. R. , Jr, S. S. Spitz, K. A. Forney, R. A. Grotefendt, and P. H. Forestall. 2000. Distribution and abundance of odontocete species in Hawaiian waters: preliminary results of 1993-98 aerial surveys Admin. Rep. LJ-00-14C. Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA 92038. 26 pp.
- Nitta, E. and J. R. Henderson. 1993. A review of interactions between Hawaii's fisheries and protected species. *Mar. Fish. Rev.* 55(2):83-92.
- Norris, K. S., B. Würsig, R. S. Wells, and M. Würsig. 1994. *The Hawaiian Spinner Dolphin*. University of California Press, 408 pp.
- Norris, K. S. and T. P. Dohl. 1980. Behavior of the Hawaiian spinner dolphin, *Stenella longirostris*. *Fish. Bull.* 77:821-849.
- NMFS, Pacific Islands Region, Observer Program, 1602 Kapiolani Blvd, Suite 1110, Honolulu, HI 96814.
- Östman, J. S. O. 1994. Social organization and social behavior of Hawaiian spinner dolphins (*Stenella longirostris*). Ph.D. dissertation, University of California, Santa Cruz, 114 pp.
- Perrin, W. F. 1975. Variation of spotted and spinner porpoise (genus *Stenella*) in the eastern tropical Pacific and Hawaii. *Bull. Scripps Inst. Oceanogr.* 21, 206 pp.

- Perrin, W. F. 1990. Subspecies of *Stenella longirostris* (Mammalia: Cetacea: Delphinidae). Proc. Biol. Soc. Wash. 103:453-463.
- Perrin, W.F., P.A. Akin, and J.V. Kashiwada. 1991. Geographic variation in external morphology of the spinner dolphin *Stenella longirostris* in the Eastern Pacific and implications for conservation. Fishery Bulletin 89:411-428
- Perrin, W.F., G. P. Donovan and J. Barlow. 1994. Gillnets and Cetaceans. Rep. Int. Whal. Commn., Special Issue 15, 629 pp.
- Perrin, W.F., B. Würsig and J.G.M. Thewissen. 2009. Encyclopedia of Marine Mammals. Second Edition. Academic Press, Amsterdam.
- Shallenberger, E.W. 1981. The status of Hawaiian cetaceans. Final report to U.S. Marine Mammal Commission. MMC-77/23, 79pp.
- Wade, P. R. and R. P. Angliss. 1997. Guidelines for Assessing Marine Mammal Stocks: Report of the GAMMS Workshop April 3-5, 1996, Seattle, Washington. U. S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-12. 93 pp.