

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). Spinner dolphins in Hawaii belong to this sub-species. Unlike Gray's spinner dolphins in the eastern tropical Pacific (ETP), which are commonly found in pelagic waters, spinner dolphins in Hawaii 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). Spinner dolphins in Hawaii are considered separate stocks from those in the ETP (Perrin 1975; Dizon *et al.* 1994). Andrews *et al.* (2010) found that mtDNA control region haplotype and nucleotide diversities of Hawaiian spinner dolphins are low compared with those from other geographic regions and suggested the existence of strong barriers to gene flow, both geographic and ecological. These analyses also reveal significant genetic distinction, at both mtDNA and microsatellite loci, between spinner dolphins sampled in American Sāmoa and those sampled in the Hawaiian Islands (Johnston *et al.* 2008, Andrews *et al.* 2010).

Most spinner dolphin research in Hawaii occurs in nearshore waters surrounding the main Hawaiian Islands and at Midway and Kure Atoll in the northwestern Hawaiian Islands (e.g. Norris *et al.* 1994, Karczmarski *et al.* 2005, Tyne *et al.* 2017). Spinner dolphins are rare in pelagic waters in the Hawaiian Archipelago, and have been infrequently seen during large-scale line-transect surveys. Summer/fall shipboard surveys of the waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands, resulted in 8 sightings in 2002 and 2 sightings in 2010, though none of the 2010 sightings occurred during on-effort survey (Barlow 2006, Bradford *et al.* 2017; Fig. 1).

The population structure of spinner dolphins in Hawaii has been assessed using

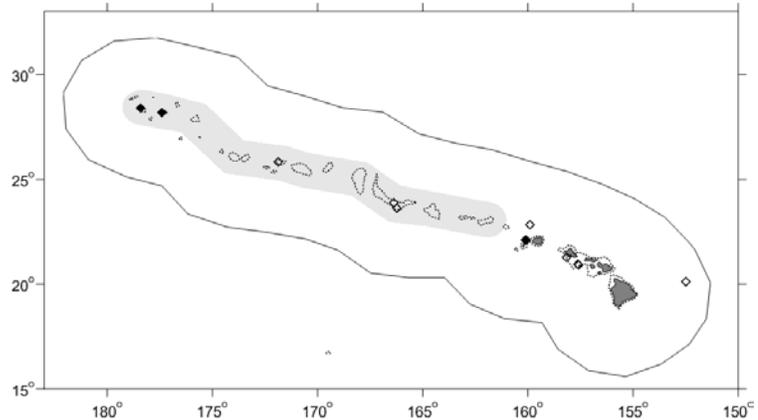


Figure 1. Spinner dolphin sighting locations during the 2002 (open diamonds) and 2010 (black diamonds) shipboard cetacean surveys of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow 2006, Bradford *et al.* 2017; see Appendix 2 for details on timing and location of survey effort). Outer line indicates approximate boundary of survey area and U.S. EEZ. Gray shading indicates area of Papahānaumokuākea Marine National Monument. Dotted line represents the 1000 m isobath. Insular stock boundaries are shown in Figure 2.

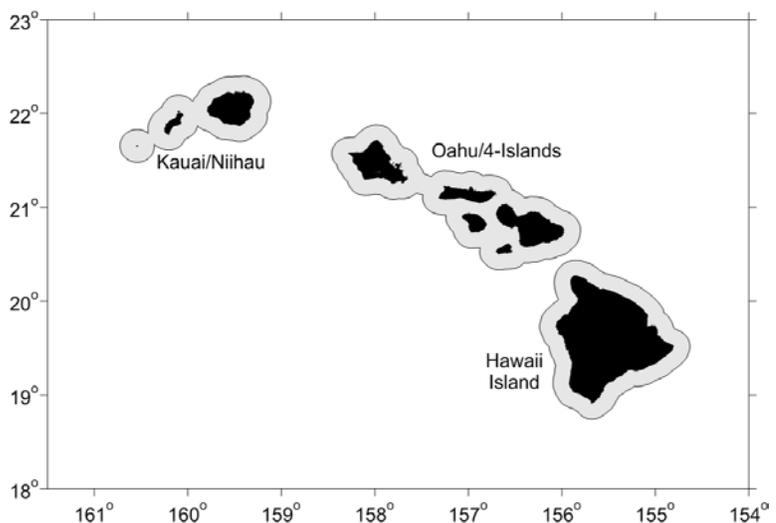


Figure 2. Spinner dolphin stock boundaries in the main Hawaiian Islands (Midway/Kure and Pearl and Hermes stock ranges not shown). Animals outside of the defined island areas are considered to be part of the Hawaii pelagic stock.

genetic and movement data. Andrews *et al.* (2010) found significant genetic distinctions between spinner dolphins sampled at different islands within the Hawaiian Archipelago. Most significant was differentiation between animals sampled off the Kona Coast of Hawaii Island and animals sampled at all other Hawaiian Islands. Similarly, in the Northwestern Hawaiian Islands, spinner dolphins sampled at Midway and Kure were shown not to be genetically distinct from each other, but are distinct from those sampled at all other islands. Andrews (2009) found that none of the pairwise comparisons between French Frigate Shoals, Niihau, Kauai, and Oahu were statistically significant and Oahu was not significantly differentiated from Maui/Lanai. Assignment tests, which may provide information about recent gene flow, show that for most islands and atolls within the Hawaiian Archipelago, more samples assigned to the island/atoll at which they were collected than to any other island. These patterns are supported by available photo-ID and animal movement data (Karczmarski *et al.* 2005). Spinner dolphin genetic data are lacking from some islands and atolls within the Hawaiian Archipelago (e.g., Molokai, Kahoolawe, Nihoa, Mokumanamana (Necker), Gardner Pinnacles, Laysan, and Lisianski). Sighting data confirms spinner dolphin presence at some locations (e.g., Molokai, Kahoolawe, Mokumanamana, and Gardner Pinnacles; PIFSC unpublished data), however, without genetic or photo-identification data it is difficult to evaluate connectivity between these dolphins and those at other islands.

Hill *et al.* (2010) proposed designation of island-associated stocks of spinner dolphins at Midway/Kure, Pearl and Hermes Reef, Kauai/Niihau, Oahu/4-Islands, and Hawaii Island based on microsatellite and mtDNA genetic data, movement patterns, and the geographic distances between the Hawaiian Islands (Karczmarski 2005, Andrews *et al.* 2010). They suggested an offshore boundary for each island-associated stock at 10 nmi from shore based on anecdotal accounts of spinner dolphin distribution. Analysis of individual spinner dolphin movements suggests that few individuals move long distances (from one main Hawaiian Island to another) and no dolphins have been seen farther than 10 nmi from shore (Hill *et al.* 2011). Based on the maximum distance from shore observed for island-associated animals, a 10 nmi stock boundary is assumed for management under the MMPA. Norris *et al.* (1994) suggested that spinner dolphins may move seasonally between leeward and windward shores of the main Hawaiian Islands.

For the Marine Mammal Protection Act (MMPA) stock assessment reports, six spinner dolphin stocks are recognized 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. This includes animals found within the Hawaiian Islands EEZ (outside of island-associated boundaries) and in adjacent high seas waters. Because data on abundance, distribution, and human-caused impacts are largely lacking for high seas waters, the status of the Hawaii pelagic stock is evaluated based on data from U.S. EEZ waters of the Hawaiian Islands (NMFS 2005). Spinner dolphins in the eastern tropical Pacific that may interact with tuna purse-seine fisheries are managed separately under the MMPA.

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 Hawaii-based fisheries cause marine mammal mortality and serious injury in other U.S. waters. Seven spinner dolphins were reported hooked or entangled by fishing gear or marine debris in the main Hawaiian Islands from 2012 through 2016, five from the Hawaii Island stock, and two from the Oahu/4-Islands stock (Bradford and Lyman 2015, 2018). All cases were reviewed following the criteria for assessing serious injury in marine mammals (NMFS 2012). In two cases off Kailua-Kona in 2012 and 2014, individual spinner dolphins were observed with line, net, or other debris entangled around the rostrum preventing the dolphin from opening its mouth, and in one case with additional trailing gear (Bradford and Lyman 2015, 2017). Both cases were considered serious injuries given the potential of the line to impact the animal's ability to feed. In April 2013, a spinner dolphin was observed off Mahaiula Beach, Hawaii entangled in fishing gear (300+ ft. of fishing line, float, glow stick and hook). A swimmer cut the line close to the body, removing much of the trailing line and associated gear, but leaving several wraps of line around the dolphin's tail. This animal was considered seriously injured despite the gear removal because it is unclear whether the mitigation improved the animal's status. In June 2016, a spinner dolphin was observed off Kailua-Kona, Hawaii with a single wrap of small gauge fishing line around and cutting into its tail stock and trailing 40-50 feet behind. A diver removed most of the trailing line, reducing the length to about 6 feet. The animal was considered seriously injured because the constricting wrap remained and was constriction was possibly worsened by the attempt to remove the gear. In March 2014, a male spinner dolphin stranded off Keahole Pt, Hawaii with twine netting wrapped around its rostrum and peduncle. Examination revealed hemorrhage at the rostrum and peduncle and suggested the animal drowned due to the entanglement. In March 2013 a spinner dolphin was observed off Waikiki, Oahu with a bag through its mouth and wrapped behind its head. This entanglement was considered a serious injury given the bag was unlikely to degrade causing an adverse health response. In January 2014 a spinner dolphin was observed at the entrance of Manele Bay, Lanai with red line/net wrapped around its rostrum and trailing down part of the body. This entanglement was considered a serious injury as the placement of the wrap could impact the animal's ability to feed. It is not possible to

attribute any of these interactions to specific fisheries given the generic nature of the gear. There are eight additional reports between 1991 and 2011 of spinner dolphins found entangled, hooked, or shot (Bradford and Lyman 2013). No estimates of annual human-caused mortality and serious injury are available for nearshore hook and line or gillnet fisheries because these fisheries are not observed or monitored for protected species interactions.

Between 2012 and 2016, no spinner dolphins were observed hooked or entangled in either the deep-set (20-22% observer coverage) or shallow-set (100% observer coverage) longline fisheries operating in pelagic waters of the Hawaii EEZ and surrounding high-seas (Bradford and Forney 2017, Bradford 2018).

HAWAII ISLAND STOCK POPULATION SIZE

Over the past few decades several abundance estimates were generated from studies along the Kona coast of Hawaii Island. Norris *et al.* (1994) photo-identified 192 individuals primarily within Kealekekua Bay along the west coast of Hawaii and estimated 960 animals for this area in 1979-1980. Östman (1994) photo-identified 677 individual spinner dolphins from a broader region, extending north to the Kohala Coast, from 1989 to 1992 and using the same estimation procedures as Norris *et al.* (1994), estimated a population size of 2,334 spinner dolphins. From 2010 to 2012, intensive year-round photo-identification surveys for spinner dolphins were carried out in Kauhako Bay, Kealakekua Bay, Honaunau Bay, and Makako Bay along the Kona Coast of Hawaii Island (Tyne *et al.* 2013). These surveys represent the most systematic and geographically extensive surveys for spinner dolphins in this region. Several mark-recapture models were evaluated with available data to examine the impact of sampling design. Models that used the most complete dataset yielded abundance estimates of 617 (CV=0.09) in 2011 and 665 (CV=0.09) in 2012 (Tyne *et al.* 2016). These are the best available and most recent abundance estimates for this stock. Considerable seasonal variation in spinner dolphin occurrence on the leeward versus south and east sides of the island may occur, with lower abundance off the leeward Kona coast in the winter, potentially due to increased wind and swell in that region (Norris *et al.* 1994). Because the most recent abundance estimate is based on year-round surveys, some of the animals seasonally present on the leeward side have likely been seen. However, because only four bays were surveyed, some portion of the population is likely not included in this abundance estimate and the new estimate is an underestimate of total population size.

Minimum Population Estimate

The minimum population size is calculated as the lower 20th percentile of the log-normal distribution of the 2012 abundance estimate for Hawaii Island, or 617 spinner dolphins (Barlow *et al.* 1995).

Current Population Trend

Quantitative trend analyses have not been conducted with available data, as estimates from the 1970s and 1980s did not include year-round surveys and occurred in a different study area than the 2010-2012 surveys. Tyne *et al.* (2016) evaluated the impact of sampling intensity and frequency on the ability to detect trends within this population and estimated that 6 annual estimates resulting from 7 years of monthly surveys at all four monitored bays would be required to detect a 5% change in population size with 80% power. Abundance estimates resulting from surveys at 3-year intervals would detect change with fewer surveys, over a longer time period (9-12 years).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate for this species in Hawaiian waters.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the Hawaii Island stock is calculated as the minimum population estimate (617) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a stock of unknown status; Wade and Angliss 1997) resulting in a PBR of 6.2 spinner dolphins per year.

STATUS OF STOCK

The Hawaii Island stock of spinner dolphins is not considered a strategic stock under the MMPA. The status of Hawaii Island spinner dolphins relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance for this stock. Spinner dolphins are not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor designated as “depleted” under the MMPA. Insufficient information is available to determine whether the total fishery mortality and serious injury for this Hawaii Island spinner dolphin stock is insignificant and approaching zero mortality and serious injury rate.

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). A two year study including collection of behavioral time-series data indicates that spinner dolphins off the leeward coast of Hawaii Island spatially and temporally partition their behavioral activities on a daily basis (Tyne *et al.* 2017), with rest most common midday and travel and socializing in early morning and late afternoon. Foraging was not observed during the daytime. This behavior pattern suggests they are less resilient to human disturbance than other cetaceans. Further, Tyne *et al.* (2015) observed that spinner dolphins do not engage in rest behavior outside of sheltered bays, such that displacement from resting bays by tourist or other activities, would reduce rest time, with potential for long-term health consequences in the population. Heenehan *et al.* (2017a) measured acoustic response of spinner dolphins to human activities and found that the dolphins increased vocal activity in two bays with predominantly dolphin-directed activities, but less so in bays with noise attributed to a broader range of human activities, suggesting greater behavioral disruption by human activities directed at the dolphins.

All Hawaiian spinner dolphin stocks are potentially exposed to high levels of Navy sonar and frequent detonations during training exercises. The sensitivity of spinner dolphins to these sound levels is unknown and therefore the impact of these exercises on spinner dolphin stocks is unknown. Naval sonar has been detected within spinner dolphin resting bays, with median sonar exposure levels between 24.7 and 45.8 dB above median sound levels on one occasion in 2011 (Heenehan *et al.* 2017b). Detection of the same sonar event at multiple spinner dolphin resting bays suggests a single sonar event may expose the entire spinner dolphin stock.

One spinner dolphin found stranded on Oahu tested positive for *Morbillivirus* (Jacob 2012). Although *morbillivirus* is known to trigger lethal disease in cetaceans (Van Bressem *et al.* 2009), its impact on the health of the stranded animal is not known (Jacob 2012). The presence of *morbillivirus* in 10 species of cetacean in Hawaiian waters (Jacob 2012), raises concerns about the history and prevalence of this disease in Hawaii and the potential population impacts on Hawaiian cetaceans. A spinner dolphin stranded off Hawaii Island was also determined to have died from infection with toxoplasmosis in 2015. A retrospective analysis of previously stranded and archived spinner dolphins from Hawaii is now underway to determine if others may have died from the disease.

OAHU/4-ISLANDS STOCK POPULATION SIZE

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 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 3,184 (CV=0.37) spinner dolphins resulted from the combined survey data (Mobley *et al.* 2000), now representing the Kauai/Niihau, Oahu/4-Islands, and Hawaii Island stocks. It is not feasible to partition this estimate into island-specific abundance estimates given the available data. New photo-ID mark-recapture estimates have resulted in seasonal abundance estimates for the Oahu/4-Islands stock. Closed capture models provide two separate estimates for the leeward coast of Oahu representing different time periods: 160 (CV = 0.14) for June to July, 2002; and 355 (CV = 0.09) for July to September 2007 (Hill *et al.* 2011). Both the 2002 and 2007 estimates likely underestimate true stock abundance as they include only dolphins found off the leeward coast of Oahu, and do not account for individuals that may spend most of their time along other parts of Oahu or somewhere in the 4-Islands area. The 2007 estimate is >8 years old and therefore is no longer used for stock assessment, based on NMFS Guidelines for Assessing Marine Mammal Stocks (NMFS 2005).

Minimum Population Estimate

No minimum population estimate is available for this stock, as the most recent estimate of abundance is >8 years old.

Current Population Trend

There are insufficient data to evaluate trends in abundance for this stock.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate for this species in Hawaiian waters. A default level of 4% is assumed for maximum net productivity rate.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the Oahu/4-Islands stock is calculated as the minimum population estimate 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; Wade and Angliss 1997). Because there is no minimum population estimate for Oahu/4-Islands spinner dolphins, the potential biological removal (PBR) is undetermined.

STATUS OF STOCK

The Oahu/4-Islands stock of spinner dolphins is not considered a strategic stock under the MMPA. The status of Oahu/4-Islands spinner dolphins relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. Spinner dolphins are not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor designated as “depleted” under the MMPA. Insufficient information is available to determine whether the total fishery mortality and serious injury for this Oahu/4-Islands spinner dolphin stock is insignificant and approaching zero mortality and serious injury rate.

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). A two year study including collection of behavioral time-series data indicates that spinner dolphins off the leeward coast of Hawaii Island spatially and temporally partition their behavioral activities on a daily basis (Tyne *et al.* 2017), with rest most common midday and travel and socializing in early morning and late afternoon. Foraging was not observed during the daytime. This behavior pattern suggests they are less resilient to human disturbance than other cetaceans. Further, Tyne *et al.* (2015) observed that spinner dolphins do not engage in rest behavior outside of sheltered bays, such displacement from resting bays by tourist or other activities, would reduce rest time, with potential for long-term health consequences for the population. Heenehan *et al.* (2017) measured acoustic response of spinner dolphins to human activities and found that the dolphins increased vocal activity in two bays with predominantly dolphin-directed activities, but less so in bays with noise attributed to a broader range of human activities, suggesting greater behavioral disruption by human activities directed at the dolphins.

All Hawaiian spinner dolphin stocks are potentially exposed to high levels of Navy sonar and frequent detonations during training exercises. The sensitivity of spinner dolphins to these sound levels is unknown and therefore the impact of these exercises on spinner dolphin stocks is unknown. Naval sonar has been detected within monitored spinner dolphin resting bays on Hawaii Island, with median sonar exposure levels between 24.7 and 45.8 dB above median sound levels on one occasion in 2011 (Heenehan *et al.* 2017b). Detection of the same sonar event at multiple spinner dolphin resting bays suggests a single sonar event may expose the entire spinner dolphin stock. Naval training also occurs near the other main Hawaiian Islands, suggesting the Hawaii Islands observations are not unique.

One spinner dolphin found stranded on Oahu has tested positive for *Morbillivirus* (Jacob 2012). Although *morbillivirus* is known to trigger lethal disease in cetaceans (Van Bresseem *et al.* 2009), its impact on the health of the stranded animal is not known (Jacob 2012). The presence of *morbillivirus* in 10 species of cetacean in Hawaiian waters (Jacob 2012), raises concerns about the history and prevalence of this disease in Hawaii and the potential population impacts on Hawaiian cetaceans. A spinner dolphin stranded off Hawaii Island was also determined to have died from infection with toxoplasmosis in 2015. A retrospective analysis of all previously stranded and archived spinner dolphins from Hawaii is now underway to determine if others may have died from the disease.

KAUAI/NIIHAU STOCK

POPULATION SIZE

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 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), now representing the Kauai/Niihau, Oahu/4-Islands, and Hawaii Island stocks. More recent mark-recapture estimates based on photo-identification studies resulted in an estimate of 601 (CV = 0.20) spinner dolphins for the leeward coast of Kauai for the period October to November 2005. This estimate is likely an underestimate as it includes only dolphins found off the leeward coast of Kauai, and does not account for individuals that may spend most of their time along other parts of Kauai, Niihau, or Kaula Rock. The 2005 estimate is now >8 years old and therefore will no longer be used based on NMFS Guidelines for Assessing Marine Mammal Stocks (NMFS 2005).

Minimum Population Estimate

No minimum population estimate is available for this stock, as the most recent estimate of abundance is >8 years old.

Current Population Trend

There is only one abundance estimate available for the stock area of Kauai/Niihau from 2005 and thus, no trend analysis is possible.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate for this species in Hawaiian waters. A default level of 4% is assumed for maximum net productivity rate.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the Kauai/Niihau stock is calculated as the minimum population estimate times one half the default maximum net growth rate for cetaceans ($\frac{1}{2}$ of 4%) times a recovery factor of 0.50 (for a stock of unknown status; Wade and Angliss 1997). Because there is no minimum population estimate for Kauai/Niihau spinner dolphins, the potential biological removal (PBR) is undetermined.

STATUS OF STOCK

The Kauai/Niihau stock of spinner dolphins is not considered a strategic stock under the MMPA. The status of Kauai/Niihau spinner dolphins relative to OSP is unknown, and there are insufficient data to evaluate abundance trends. Spinner dolphins are not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor designated as “depleted” under the MMPA. Insufficient data are available to determine whether the total fishery mortality and serious injury for this Kauai/Niihau spinner dolphin stock is insignificant and approaching zero mortality and serious injury rate.

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). A two year study including collection of behavioral time-series data indicates that spinner dolphins off the leeward coast of Hawaii Island spatially and temporally partition their behavioral activities on a daily basis (Tyne *et al.* 2017), with rest most common midday and travel and socializing in early morning and late afternoon. Foraging was not observed during the daytime. This behavior pattern suggests they are less resilient to human disturbance than other cetaceans. Further, Tyne *et al.* (2015) observed that spinner dolphins do not engage in rest behavior outside of sheltered bays, such displacement from resting bays by tourist or other activities, would reduce rest time, with potential for long-term health consequences for the population. Heenehan *et al.* (2017) measured acoustic response of spinner dolphins to human activities and found that the dolphins increased vocal activity in two bays with predominantly dolphin-directed activities, but less so in bays with noise attributed to a broader range of human activities, suggesting greater behavioral disruption by human activities directed at the dolphins.

All Hawaiian spinner dolphin stocks are potentially exposed to high levels of Navy sonar and frequent detonations during training exercises. The sensitivity of spinner dolphins to these sound levels is unknown and therefore the impact of these exercises on spinner dolphin stocks is unknown. Naval sonar has been detected within monitored spinner dolphin resting bays on Hawaii Island, with median sonar exposure levels between 24.7 and 45.8 dB above median sound levels on one occasion in 2011 (Heenehan *et al.* 2017b). Detection of the same sonar event at multiple spinner dolphin resting bays suggests a single sonar event may expose the entire spinner dolphin stock. Naval training also occurs near the other main Hawaiian Islands, suggesting the Hawaii Islands observations are not unique.

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PEARL & HERMES REEF STOCK

POPULATION SIZE

There is no information on the abundance of the Pearl & Hermes Reef stock of spinner dolphins. A photo-identification catalog of individual spinner dolphins from this stock is available, though inadequate survey effort and low re-sighting rates prevent robust estimation of abundance.

Minimum Population Estimate

There is no information on which to base a minimum population estimate for the Pearl & Hermes Reef stock of spinner dolphins.

Current Population Trend

Insufficient data exists to assess population trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate for this species in Hawaiian waters.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the Pearl & Hermes Reef stock is calculated as the minimum population estimate times one half the default maximum net growth rate for cetaceans ($\frac{1}{2}$ of 4%) times a recovery factor of 0.50 (for a species of unknown status; Wade and Angliss 1997). Because there is no minimum population estimate available for this stock the PBR for Pearl & Hermes Reef stock of spinner dolphins is undetermined.

STATUS OF STOCK

The Pearl & Hermes Reef stock of spinner dolphins is not considered a strategic stock under the MMPA. The status of Pearl & Hermes Reef spinner dolphins relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance for this stock. Spinner dolphins are not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor designated as “depleted” under the MMPA. Because the stock resides entirely within the Paphanaumokuakea Marine National Monument, where fishing is not permitted, it is assumed that the rate of mortality and serious injury within the stock area is zero. It is unlikely that habitat issues facing spinner dolphin in the main Hawaiian Islands impact those in the northwestern Hawaiian Islands to the same magnitude given their relative isolation from tourism, military sonar activities, and urban water input to the environment. Pearl and Hermes stock spinner dolphins may still be vulnerable to infection with *morbillivirus* or *Brucella* given transmission through wild populations is not well understood and not necessarily related to coastal proximity.

MIDWAY ATOLL/KURE STOCK POPULATION SIZE

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). This abundance estimate for the Midway Atoll/Kure stock of spinner dolphins is > 8 years old and therefore will no longer be used, based on NMFS Guidelines for Assessing Marine Mammal Stocks (NMFS 2005). A 2010 shipboard line-transect survey within the Hawaiian EEZ resulted in a single off-effort sighting of spinner dolphins at Kure Atoll. This sighting cannot be used within a line-transect framework; however, photographs of individuals may be used in the future to estimate the abundance of spinner dolphin at Midway Atoll/Kure using mark-recapture methods.

Minimum Population Estimate

The minimum population estimate for the Midway Atoll/Kure stock is > 8 years old and therefore will no longer be used (NMFS 2005). There is no current minimum population estimate available for this stock.

Current Population Trend

Insufficient data exists to assess population trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate for this species in Hawaiian waters.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the Midway Atoll/Kure stock is calculated as the minimum population estimate times one half the default maximum net growth rate for cetaceans ($\frac{1}{2}$ of 4%) times a recovery factor of 0.50 (for a species of unknown status; Wade and Angliss 1997). The PBR for the Midway Atoll/Kure stock of spinner dolphins is undetermined because no minimum population estimate is available for this stock.

STATUS OF STOCK

The Midway Atoll/Kure stock of spinner dolphins is not considered strategic under the MMPA. The status of Midway Atoll/Kure spinner dolphins relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. Spinner dolphins are not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor designated as “depleted” under the MMPA. Because the stock resides entirely within the Paphanaumokuakea Marine National Monument, where fishing is not permitted, it is assumed that the rate of mortality and serious injury within the stock area is zero. It is unlikely that habitat issues facing spinner dolphin in the main Hawaiian Islands impact those in the northwestern Hawaiian Islands to the same magnitude given their relative isolation from tourism, military sonar activities, and urban water input to the environment. The Midway Atoll/Kure stock of spinner dolphins may still be vulnerable to infection with *morbillivirus* or *Brucella* given transmission through wild populations is not well understood and not necessarily related to coastal proximity.

HAWAII PELAGIC STOCK POPULATION SIZE

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 estimate assumed a single Hawaiian Islands stock. Two of the 8 sightings during the 2002 survey did occur in pelagic waters far outside of the current island-associated stock boundaries, suggesting at least some spinner dolphins do occur in pelagic archipelago waters. This estimate for the Hawaiian EEZ is > 8 years old and therefore will no longer be used based on NMFS Guidelines for Assessing Marine Mammal Stocks (NMFS 2005). A 2010 shipboard line-transect survey within the Hawaiian EEZ did not result in any sightings of pelagic spinner dolphins.

Minimum Population Estimate

No minimum population estimate is available for this stock, as there were no sightings of pelagic spinner dolphins during a 2010 shipboard line-transect survey of the Hawaiian EEZ.

Current Population Trend

Insufficient data exists to assess population trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate for this species in Hawaiian waters.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the Hawaii pelagic stock is calculated as the minimum population estimate times one half the default maximum net growth rate for cetaceans ($\frac{1}{2}$ of 4%) times a recovery factor of 0.50 (for a species of unknown status; Wade and Angliss 1997). Because there is no minimum population estimate for Hawaii pelagic spinner dolphins, the potential biological removal (PBR) is undetermined.

STATUS OF STOCK

The Hawaii pelagic stock of spinner dolphins is not considered a strategic stock under the MMPA. The status of Hawaii pelagic spinner dolphins relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. Spinner dolphins are not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor as “depleted” under the MMPA. The estimated rate of fishery mortality and serious injury for this stock is zero in observed U.S. fisheries. This stock likely extends outside of U.S. EEZ waters, where international high seas fisheries may interact with and take animals from this stock. Exposure of pelagic spinner dolphins to habitat stressors common for island-associated spinner stocks in the main Hawaiian Islands is unknown. The Hawaii pelagic stock of spinner dolphins may be vulnerable to infection with *morbillivirus* or *Brucella* given transmission through wild populations is not well understood and not necessarily related to coastal proximity.

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