# Movements of satellite-tagged pantropical spotted dolphins in relation to stock boundaries in Hawaiian waters

Robin W. Baird[1] and Daniel L. Webster

Cascadia Research Collective
218 ½ W. 4th Avenue
Olympia, WA 98501

The main Hawaiian Islands are home to resident populations of 11 different species of odontocetes (Baird 2016). Up to three independent lines of evidence have been used to assess residency patterns for these species over various time scales, the application of which has varied among species: genetic studies (e.g., Martien et al. 2011, 2014); photo-identification (e.g., Baird et al. 2008, 2009; Mahaffy et al. 2015); and satellite tagging (e.g., Baird et al. 2012). For pantropical spotted dolphins (*Stenella attenuata*) in Hawaiian waters, early evidence of site fidelity came from an individual tagged off Oʻahu in 1965 with a numbered roto tag (Norris 1974). That individual was sighted in the same area three and a half years later, and several times subsequently, leading Norris (1974) to note they appear to be resident to the area. Based on a combination of distribution patterns, morphological differences and genetics, pantropical spotted dolphins in Hawaiʻi are distinct from stocks recognized in the eastern tropical Pacific (Dizon et al. 1994; Perrin et al. 1994; Courbis 2011; Carretta et al. 2018).

Until recently, research on pantropical spotted dolphins in Hawaiian waters has been limited (e.g., Shomura and Hida 1965; Scott and Wussow 1983; Baird et al. 2001; Maldini 2003; Psarakos et al. 2003; Burgess et al. 2011). Information on habitat use and calving seasonality has come from a long-term multi-species study of odontocetes in Hawaiian waters (Baird et al. 2013; Baird 2016), and a tagging study, using suction-cup attached time-depth recorders, revealed diel patterns in behavior, with most foraging occurring at night (Baird et al. 2001; Baird 2016). There is no established photo-identification catalog for pantropical spotted dolphins in Hawaiʻi, although evidence for long-term resident populations among the main Hawaiian Islands has come from genetic studies (Courbis et al. 2014). Within Hawaiian waters, four stocks were recognized in 2014, a pelagic stock and three insular stocks (Oleson et al. 2013; Carretta et al. 2018). The National Marine Fisheries Service delineates stock boundaries for each stock they recognize, to allow for abundance estimation by stock and for apportioning bycatch to stock. The boundaries of the three insular stocks, one each around Oʻahu, Maui Nui (termed the "4-islands" stock, including the islands of Molokaʻi, Lānaʻi, Maui and Kahoʻolawe), and Hawaiʻi Island, were set to the greatest distance from shore that spotted dolphins were sampled in the Courbis et al. (2014) study. Off Oʻahu and Maui Nui these boundaries were at 20 km from shore, while off Hawaiʻi Island they were set at 65 km offshore. However, it should be noted that the distribution of effort for sampling varied among the three areas, with greater effort far offshore of Hawaiʻi Island (see Baird et al. 2013). As noted by Oleson et al. (2013), the boundaries of the insular stocks likely extend farther offshore than initially set, particularly off Oʻahu and Maui Nui, given the depth distribution of sightings around the main Hawaiian Islands (Baird et al. 2013).

[1]rwbaird@cascadiaresearch.org

Off O‘ahu, Maui Nui, and Hawai‘i Island, pantropical spotted dolphins are among the most frequently encountered odontocete in small-boat surveys, while off Kaua‘i and Ni‘ihau they are rarely seen (Baird et al. 2013; Baird 2016). The stock identity of individuals seen off Kaua‘i and Ni‘ihau has been uncertain (Baird et al. 2013; Courbis et al. 2014; Oleson et al. 2013). No abundance estimates are available for any of the insular stocks, while the abundance of the pelagic stock was estimated at 55,795 (CV=0.40) based on a large-vessel survey in 2010 (Bradford et al. 2017). In this study we used satellite tags deployed on pantropical spotted dolphins among the main Hawaiian Islands to assess residency patterns over time scales of several weeks, and discuss the results as they relate to stock structure and boundaries. This research is particularly of interest given fishery interactions that occur in Hawaiian waters (Baird 2016; Baird and Webster 2019).

## Methods

The tags used were Wildlife Computers Argos-linked satellite tags in the LIMPET configuration (Andrews et al. 2008). Both location-only (SPOT5, n=2; SPOT6, n=4) and depth-transmitting (MK10A, n=3) tags were used. Tags were remotely deployed during small-boat field operations (see Baird et al. 2013) with a Dan Inject JM Special 25 pneumatic projector and attached with two 4.4 cm titanium darts with backward facing petals. Tags were programmed to transmit for 14 or 15 hours per day during times of the day with the best coverage from satellites. Individuals chosen for tagging were large, slow-moving individuals without calves in attendance, with the dorsal fin as the target area. Pantropical spotted dolphin groups in Hawai‘i often appear to have multiple sub-groups that are segregated by sex, including sub-groups of large animals presumed to be adult males, or sub-groups of females with associated calves (Baird 2016). When possible we targeted sub-groups thought to be composed of adult males.

Location data obtained were processed through the Douglas Argos-filter v. 8.5 to remove unrealistic locations. The Douglas Argos-filter retained Argos class locations 2 and 3, set the maximum rate of movement at 20 km/h, and the default rate coefficient for marine mammals of 25 was selected. Resulting filtered locations were processed with R to determine depth using package raster (Hijmans 2017) and distance from shore and location relative to stock boundaries using package rgeos (Bivand and Rundel 2017). For one pair of individuals tagged during the same encounter, the distance between the two individuals was measured for pairs of locations obtained during the same satellite overpass. Minimum horizontal distance traveled was estimated by summing distances between consecutive locations.

## Results and Discussion

Nine satellite tags were deployed on pantropical spotted dolphins during eight different field projects between April 2015 and August 2018 (Table 1). Based on the dolphins’ relative size all individuals were thought to be adults. Based on field assessments of size one was thought to be an adult male (SaTag004); others were of undetermined sex. Reactions to tagging were primarily fast dives (n=7) or fast dive and a barrel roll (n=2). Eight of the nine individuals were re-approached post-tagging from 1 to 8 minutes after tagging, and all had resumed normal behavior (e.g., travel, milling). Most tags were deployed in the dorsal fin (n=7) or base of the fin (n=1), and one tag was deployed below the base of the fin (SaTag009). Data from this individual were obtained over a 7-day span, though only two locations were obtained and are hence not considered further.

All individuals were tagged on the leeward (i.e., west) sides of the islands, and location data were obtained over periods of 3.3 to 21.4 days (median=14 days). Two tags were deployed on individuals in the same group (SaTag006 and SaTag007), and during the period of overlap the two individuals remained associated (distance apart median=1.3 km, maximum=7.4 km). Thus only information from the longer of the two deployments (SaTag006) is considered further.

Of the remaining seven tagged individuals, minimum horizontal distance traveled ranged from 495 to 1,688 km, yet individuals remained relatively close to the tag deployment locations (medians ranging from 17.9 to 116.2 km; Table 2). Five of the individuals were tagged within the boundaries of the insular stocks, with one individual tagged off Hawai‘i Island (Figure 1), two tagged off Lāna‘i (Figure 2), and two tagged off O‘ahu (Figure 3). While these individuals were tagged in five different months, four were tagged in the January-April period, with the other (SaTag004) tagged in October. It is unknown whether spatial use patterns may vary seasonally. Calving of spotted dolphins in Hawai‘i appears to be diffusely seasonal, with a peak between July and October (Baird 2016). Models of the relative abundance of pantropical spotted dolphins around the islands in relation to environmental variables have suggested higher relative abundance on the leeward sides of the islands, and some differences in spatial use between winter and summer (Pittman et al. 2016).

Movements of the individual tagged off Hawai‘i Island spanned almost the entire length of the island over a 10.6-day period, and broadly overlapped with the high relative abundance area for pantropical spotted dolphins in Pittman et al.’s (2016) model. Scott and Wussow (1983) reported on a spotted dolphin tagged with a VHF radio tag off Hawai‘i Island in May 1980, which moved over a smaller stretch of the west side of the island over a 5-day period. Of the five individuals tagged within the insular stock boundaries, four remained on the leeward sides of the islands for the duration of tag attachments, all except SaTag004, the individual tagged in October. The individuals tagged off Lāna‘i and the other individual tagged off O‘ahu (SaTag002) also overlapped with the modelled winter high relative abundance areas (Figures 2, 3; Pittman et al. 2016).

For the five individuals tagged within the insular stock boundaries, the proportion of locations inside the stock boundary ranged from 22.2% to 100% (median=65.9%; Table 1). In the case of the four individuals tagged off Lāna‘i and O‘ahu, all moved offshore of the stock boundaries. One individual (SaTag002), tagged 6.3 km off O‘ahu in water 1,010 m deep, moved offshore of the stock boundary and back inshore of the boundary12 times over the 18.4-day period (Figure 3). Two of the four individuals also moved across boundaries into the range of one or both of the other insular stocks. One of the individuals tagged off Lāna‘i (SaTag008) moved briefly into the range of the Hawai‘i Island stock, before moving back (Figure 2). The individual tagged off O‘ahu in October (SaTag004), thought to be an adult male, exhibited a more directed movement across stock boundaries (Figure 3). This individual spent the first nine days post-tagging off the southwest and northwest sides of O‘ahu, before moving to the northeast coast of O‘ahu for just over four days. The animal then moved north of Moloka‘i and Maui for about three days, and spent the last three and a half days of tag transmission off the north side of

Hawaiʻi Island (Figure 3). Three of the five individuals tagged within the insular stock boundaries tended to use relatively shallow waters, with median depths at tagged animal locations of less than 1,000 m (Table 2; Figure 5), while two individuals, the one tagged off Hawaiʻi Island and one tagged off Oʻahu, primarily used deeper waters (Figure 5).

Data were obtained from individuals tagged off Kauaʻi, which does not have a known insular population, in both 2016 and 2017. Although tagged in relatively shallow water (651 m and 822 m, respectively) and relatively near-shore (8.8 and 12.5 km), these two individuals spent time farther offshore than any of the individuals tagged off other islands (Table 2; Figure 4), primarily in deep (median depths >3,000 m) water (Figure 5). One individual remained outside the stock boundaries of the known insular stocks for the entire period of tag data, while the other only briefly crossed the existing boundary of the Oʻahu stock, with 5.5% of locations inside the Oʻahu stock boundary. Such overlap, as well as that of SaTag004 with the ranges of the Maui Nui and Hawaiʻi Island stocks (Figure 4), has implications for how abundance estimation studies of these populations are designed.

Our sample size is small, and clearly more tag deployments are needed to fully characterize the movement patterns of this species in Hawaiian waters. This is particularly the case given the potential for seasonal variability in spatial use, as well as the presence of three different insular populations, each which may exhibit habitat-related differences in spatial use. That said, our results with a limited number of deployments do have a number of implications for stock structure and stock boundaries of pantropical spotted dolphins in Hawaiian waters. The genetic study of Courbis et al. (2014) noted that population identity of spotted dolphins off Kauaʻi and Niʻihau was uncertain. The broad ranging movements in pelagic waters for individuals tagged off Kauaʻi in two different years (Figure 4), combined with the low sighting rates there in comparison to other islands (Baird et al. 2013), suggest that spotted dolphins off Kauaʻi and Niʻihau are part of the pelagic stock, rather than from an insular stock. While movements across stock boundaries were documented for four of the five individuals tagged within the ranges of the three different insular stocks, their relatively limited movements (median distance from deployment locations from 17.9 to 49.9 km) do provide support for site fidelity of individuals within these areas. When the stocks were recognized it was noted that stock boundaries, particularly for the Oʻahu and Maui Nui stocks, may need to be revisited (Oleson et al. 2013), and our tagging results confirm this. The movements of the one individual tagged off Oʻahu that traveled north of Molokaʻi and Maui to the north end of Hawaiʻi Island (Figure 3) also indicate that there may be overlap among the different stocks, or may reflect dispersal between stocks (Courbis et al. 2014). Determining which of these options is most likely could be addressed through establishment of a photo-identification catalog to assess residency and movements of distinctive individuals[2], additional genetic studies with the collection of samples in areas closer to existing stock boundaries, and a larger sample size of satellite tagged individuals within the ranges of the three populations.

[2]Over 100,000 photographs have been collected as part of ongoing research on this species from over 300 encounters among the islands (Baird unpublished), but resources to establish a photo-identification catalog have not been available.

**Acknowledgements**

Research was undertaken under NMFS Scientific Research Permits No. 15330 and 20605 and the tagging protocol was approved by the Cascadia Research Collective Institutional Animal Care and Use Committee. A number of individuals assisted in the field, but we particularly thank Kim Wood, Jordan Lerma, Brittany Guenther and Colin Cornforth, and David Anderson for providing GIS analyses of tag data. Funding for satellite tags was provided by grants from Dolphin Quest, an anonymous donor, and Commander, Pacific Fleet. Tags were deployed during field projects funded by a grant from the NOAA Fisheries Bycatch Reduction Engineering Program, a NOAA Species Recovery Grant (to the State of Hawai‘i), grants from the Pacific Island Fisheries Science Center and the Office of Naval Research, and from contracts from the U.S. Navy as part of the Marine Species Monitoring Program. We thank David Anderson, Sarah Courbis, Annie Douglas, Annette Harnish and Sabre Mahaffy for comments on a draft of this report.

**Literature Cited**

Andrews, R.D., R.L. Pitman and L.T. Balance. 2008. Satellite tracking reveals distinct movement patterns for Type B and Type C killer whales in the southern Ross Sea, Antarctica. Polar Biology 31:1461-1468.

Baird, R.W. 2016. The lives of Hawai‘i’s dolphins and whales: natural history and conservation. University of Hawai‘i Press, Honolulu.

Baird, R.W., and D.L. Webster. 2019. Using dolphins to catch tuna: assessment of interactions between pantropical spotted dolphins and hook and line fisheries in Hawai‘i. Document SPRG-2019-16 presented to the Pacific Scientific Review Group, 5-7 March 2019, Olympia, WA.

Baird, R.W., A.D. Ligon, S.K. Hooker and A.M. Gorgone. 2001. Subsurface and nighttime behaviour of pantropical spotted dolphins in Hawai‘i. Canadian Journal of Zoology 79:988-996.

Baird, R.W., D.L. Webster, S.D. Mahaffy, D.J. McSweeney, G.S. Schorr and A.D. Ligon. 2008. Site fidelity and association patterns in a deep-water dolphin: rough-toothed dolphins (*Steno bredanensis*) in the Hawaiian Archipelago. Marine Mammal Science 24:535-553.

Baird, R.W., A.M. Gorgone, D.J. McSweeney, A.D. Ligon, M.H. Deakos, D.L. Webster, G.S. Schorr, K.K. Martien, D.R. Salden, and S.D. Mahaffy. 2009. Population structure of island-associated dolphins: evidence from photo-identification of common bottlenose dolphins (*Tursiops truncatus*) in the main Hawaiian Islands. Marine Mammal Science 25:251-274.

Baird, R.W., M.B. Hanson, G.S. Schorr, D.L. Webster, D.J. McSweeney, A.M. Gorgone, S.D. Mahaffy, D. Holzer, E.M. Oleson and R.D. Andrews. 2012. Range and primary habitats of Hawaiian insular false killer whales: informing determination of critical habitat. Endangered Species Research 18:47-61.

Baird, R.W., D.L. Webster, J.M. Aschettino, G.S. Schorr and D.J. McSweeney. 2013. Odontocete cetaceans around the main Hawaiian Islands: habitat use and relative abundance from small-boat sighting surveys. Aquatic Mammals 39:253-269.

Bivand, R., and C. Rundel. 2017. Rgeos: interface to geometry engine – open source ('GEOS'). R package version 0.3-26.

Bradford, A.L., K.A. Forney, E.M. Oleson, and J. Barlow. 2017. Abundance estimates of cetaceans from a line-transect survey within the U.S Hawaiian Islands Exclusive Economic Zone. Fishery Bulletin 115:129-142.

Burgess, W.C., E.M. Oleson and R.W. Baird. 2011. A hydrodynamic acoustic recording tag for small cetaceans and first results from a pantropical spotted dolphin. Poster presented at the 19th Biennial Conference on the Biology of Marine Mammals, Tampa, Florida, November-December 2011. Available from http://www.cascadiaresearch.org/files/Projects/Hawaii/Burgess_et_al_2011SMM_poster.pdf

Carretta, J.V., K.A. Forney, E.M. Oleson, D.W. Weller, A.R. Lang, J. Baker, M.M. Muto, B. Hanson, A.J. Orr, H. Huber, M.S. Lowry, J. Barlow, J.E. Moore, D. Lynch, L. Carswell, and R.L. Brownell Jr. 2018. U.S. Pacific marine mammal stock assessments: 2017. US Department of Commerce. NOAA Technical Memorandum NMFS-SWFSC-602.

Courbis, S.S. 2011. Population structure of island-associated pantropical spotted dolphins (*Stenella attenuata*) in Hawaiian waters. Ph.D. Dissertation, Portland State University. 173 pp.

Courbis, S., R.W. Baird, F. Cipriano, and D. Duffield. 2014. Multiple populations of pantropical spotted dolphins in Hawaiian waters. Journal of Heredity 105:627-641.

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 Technical Report NMFS 119, 20 pp.

Hijmans, R.J. 2017. Raster: geographic data analysis and modeling. R package version 2.6-7.

Mahaffy, S.D., R.W. Baird, D.J. McSweeney, D.L. Webster and G.S. Schorr. 2015. High site fidelity, strong associations and long-term bonds: short finned pilot whales off the island of Hawai'i. Marine Mammal Science doi: 10.1111/mms/12234.

Maldini, D. 2003. Evidence of predation by a tiger shark (*Galeocerdo cuvier*) on a spotted dolphin (*Stenella attenuata*) off O'ahu, Hawai'i. Aquatic Mammals 29:84-87.

Martien, K.K., R.W. Baird, N.M. Hedrick, A.M. Gorgone, J.L. Thieleking, D.J. McSweeney, K.M. Robertson, and D.L. Webster. 2011. Population structure of island-associated dolphins: evidence from mitochondrial and microsatellite markers for common bottlenose dolphins (*Tursiops truncatus*) around the main Hawaiian Islands. Marine Mammal Science doi: 10.1111/j.1748-7692.2011.00506.x

Martien, K.K., S.J. Chivers, R.W. Baird, F.I. Archer, A.M. Gorgone, B.L. Hancock-Hanser, D. Mattila, D.J. McSweeney, E.M. Oleson, C. Palmer, V.L. Pease, K.M. Robertson, G.S. Schorr, M.B. Schultz, D.L. Webster and B.L. Taylor. 2014. Nuclear and mitochondrial patterns of population structure in North Pacific false killer whales (*Pseudorca crassidens*). Journal of Heredity doi: 10.1093/jhered/esu029.

Norris, K.S. 1974. The porpoise watcher. W.W. Norton & Company, Inc. New York.

Oleson, E.M., R.W. Baird, K.K. Martien, and B.L. Taylor. 2013. Island-associated stocks of odontocetes in the main Hawaiian Islands: a synthesis of available information to facilitate evaluation of stock structure. PIFSC Working Paper WP-13-003.

Perrin, W.F., G.D. Schnell, D.J. Hough, J.W. Gilpatrick, Jr., and J.V. Kashiwada. 1994. Re-examination of geographical variation in cranial morphology of the pantropical spotted dolphin, *Stenella attenuata*, in the eastern Pacific. Fish. Bull. 92:324-346.

Pittman, S.J., A.J. Winship, M. Poti, B.P. Kinlan, J.B. Leirness, R.W. Baird, J. Barlow, E.A. Becker, K.A. Forney, M.C. Hill, P.I. Miller, J. Mobley, and E.M. Oleson. 2016. Chapter 6: Marine mammals - cetaceans. pp. 227-265. In: B.M. Costa and M.S. Kendall (eds.), Marine biogeographic assessment of the main Hawaiian Islands. Bureau of Ocean Energy Management and National Oceanic and Atmospheric Administration. OCS Study BOEM 2016-035 and NOAA Technical Memorandum NOS NCCOS 214. 359 pp.

Psarakos, S., D.L. Herzing and K. Marten. 2003. Mixed-species associations between pantropical spotted dolphins (*Stenella attenuata*) and Hawaiian spinner dolphins (*Stenella longirostris*) off Oahu, Hawaii. Aquatic Mammals 29:390-395.

Scott, M.D., and P.C. Wussow. 1983. Movements of a Hawaiian spotted dolphin. Pages 353-364 *in* Proceedings of the Fourth International Conference on Wildlife Biotelemetry, August 1983. Edited by D.G. Pincock. Technical University of Nova Scotia, Halifax, Canada.

Shomura, R. S. and Hida, T. S. 1965. Stomach contents of a dolphin caught in Hawaiian waters. Journal of Mammalogy 65:500-501.

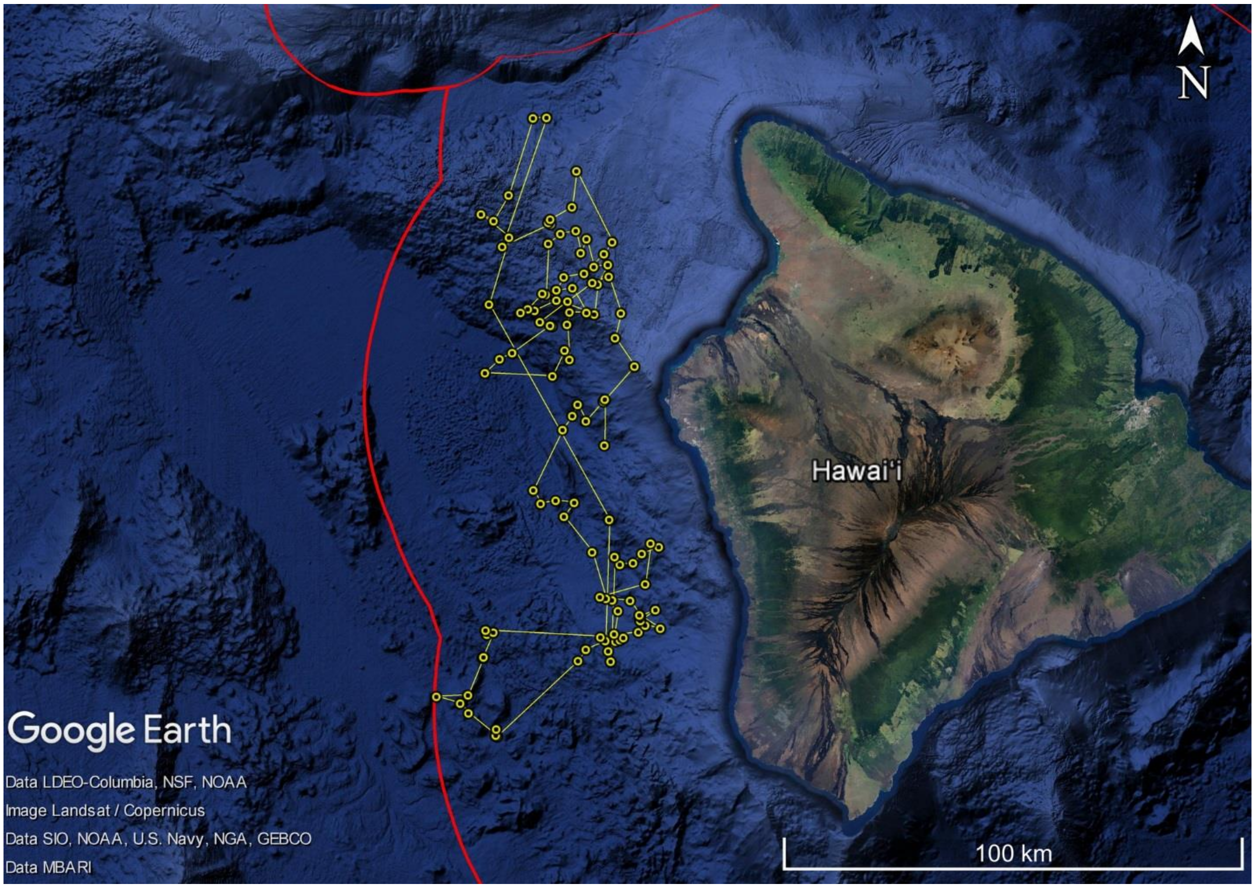



Figure 1. Location data over a 10.6-day period from a pantropical spotted dolphin (SaTag001) satellite tagged off Hawaiʻi Island in 2015. Consecutive locations are joined by a line. The stock boundaries are shown in red.

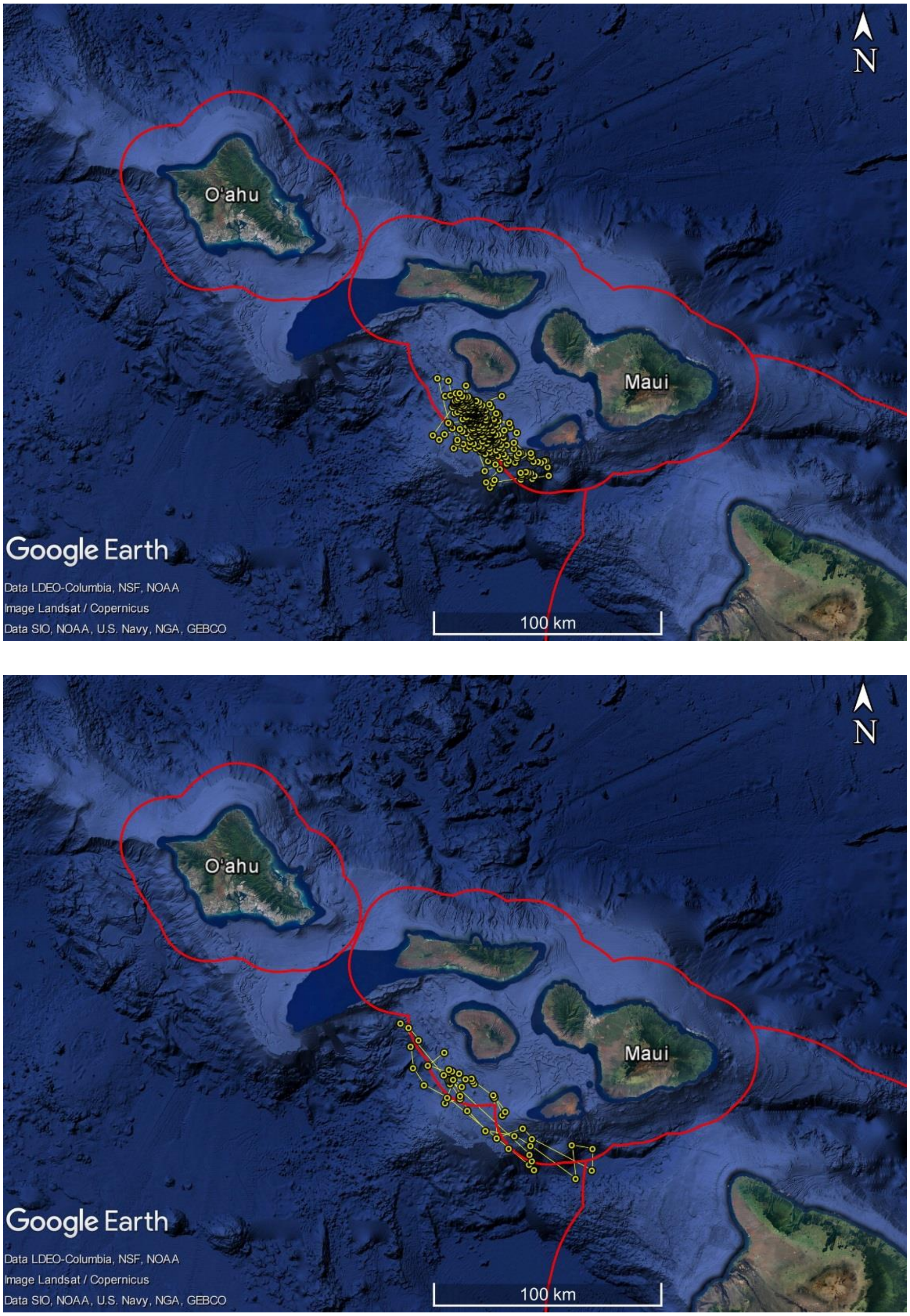



Figure 2. Location data from pantropical spotted dolphins satellite tagged off Lāna‘i. Consecutive locations are joined by a line. Top – data from SaTag005 over a 21.4-day period in March 2017; Bottom – data from SaTag008 over a 9.0-day period in February and March 2018. The stock boundaries are shown in red.

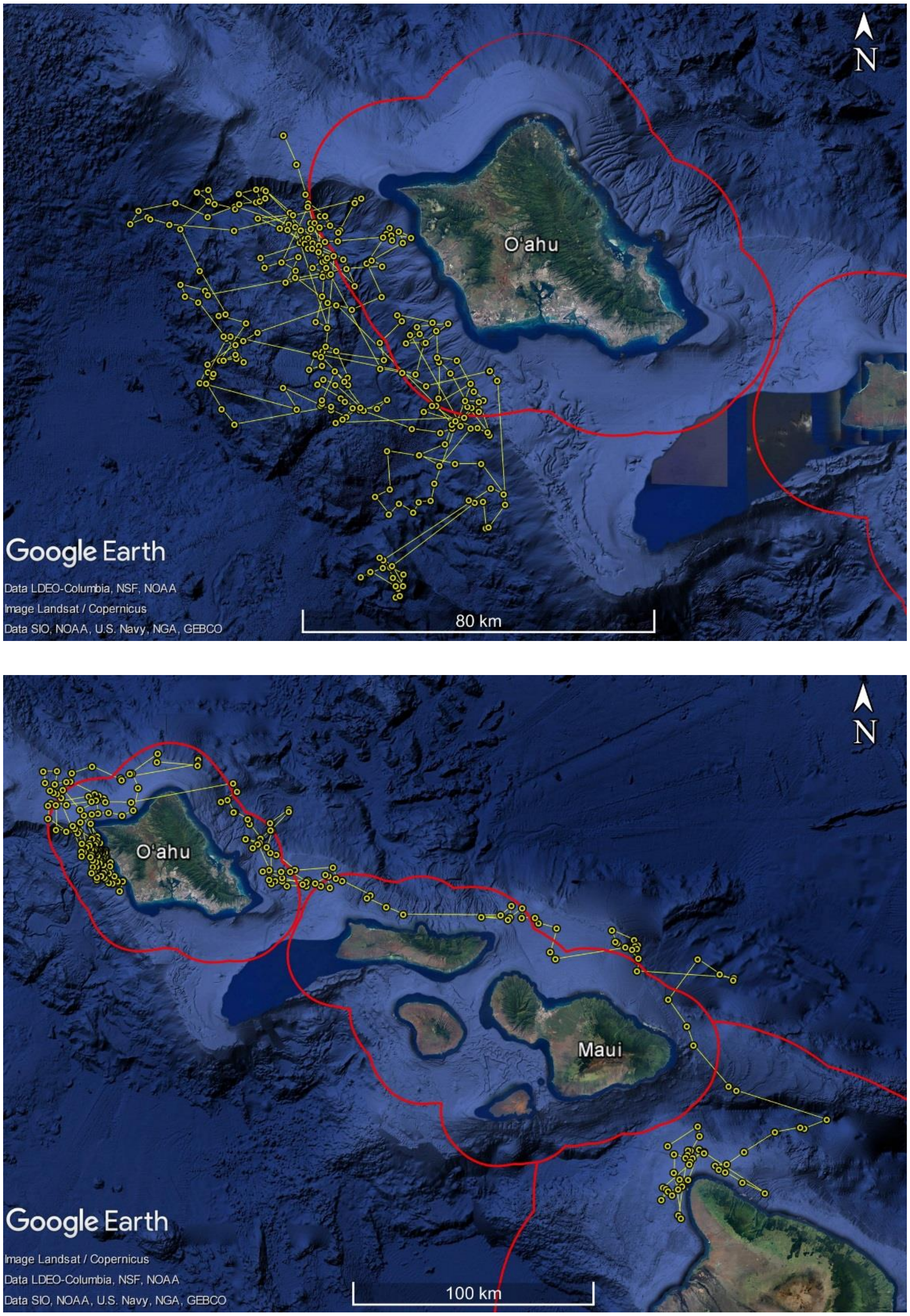
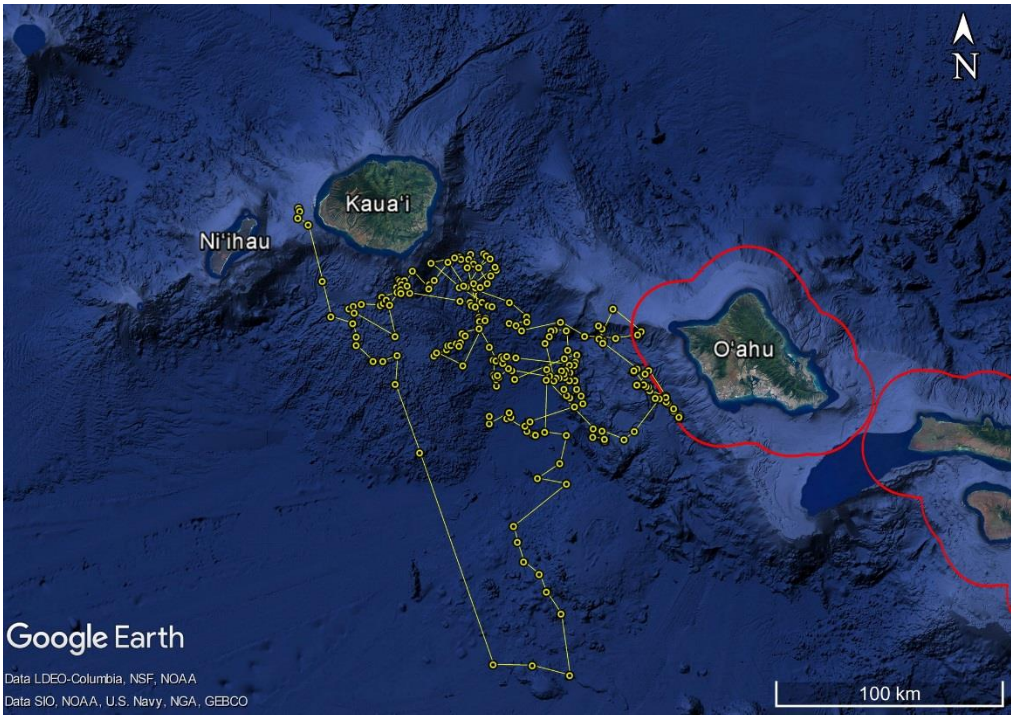



Figure 3. Location data from pantropical spotted dolphins satellite tagged off O‘ahu. Consecutive locations are joined by a line. Top – data from SaTag002 over an 18.4-day period in January 2016; Bottom – data from SaTag004 over a 19.5-day period in October 2016. The stock boundaries are shown in red.



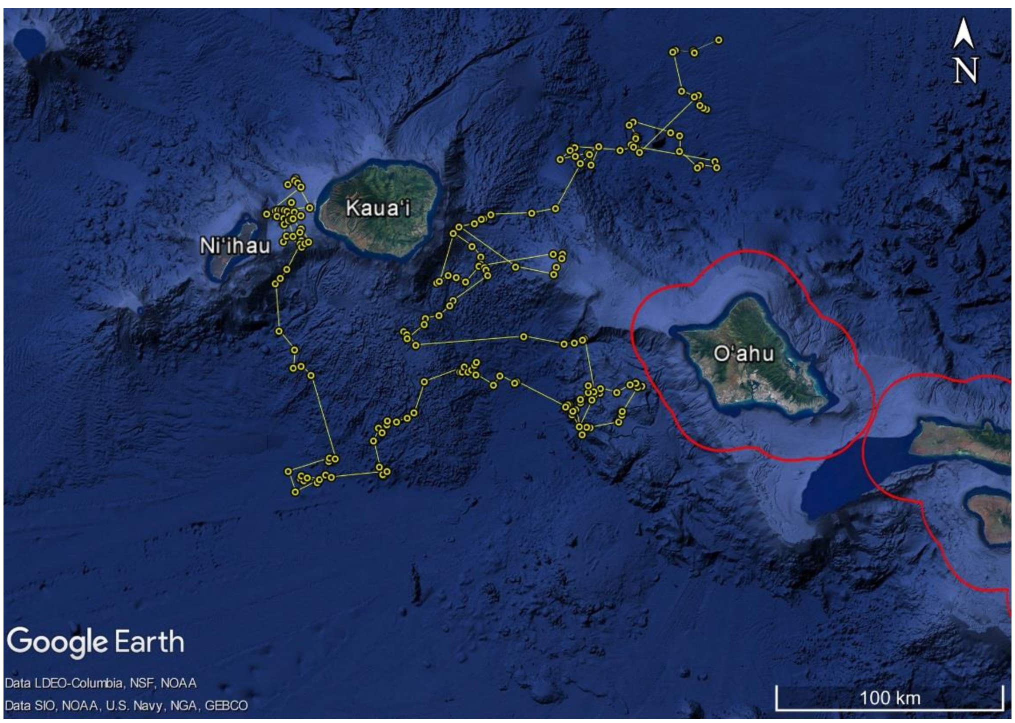




Figure 4. Location data from pantropical spotted dolphins satellite tagged off Kauaʻi. Consecutive locations are joined by a line. Top – data from SaTag003 over a 17.9-day period in February and March 2016; Bottom – data from SaTag006 over a 14.0-day period in August 2017. The stock boundaries are shown in red.

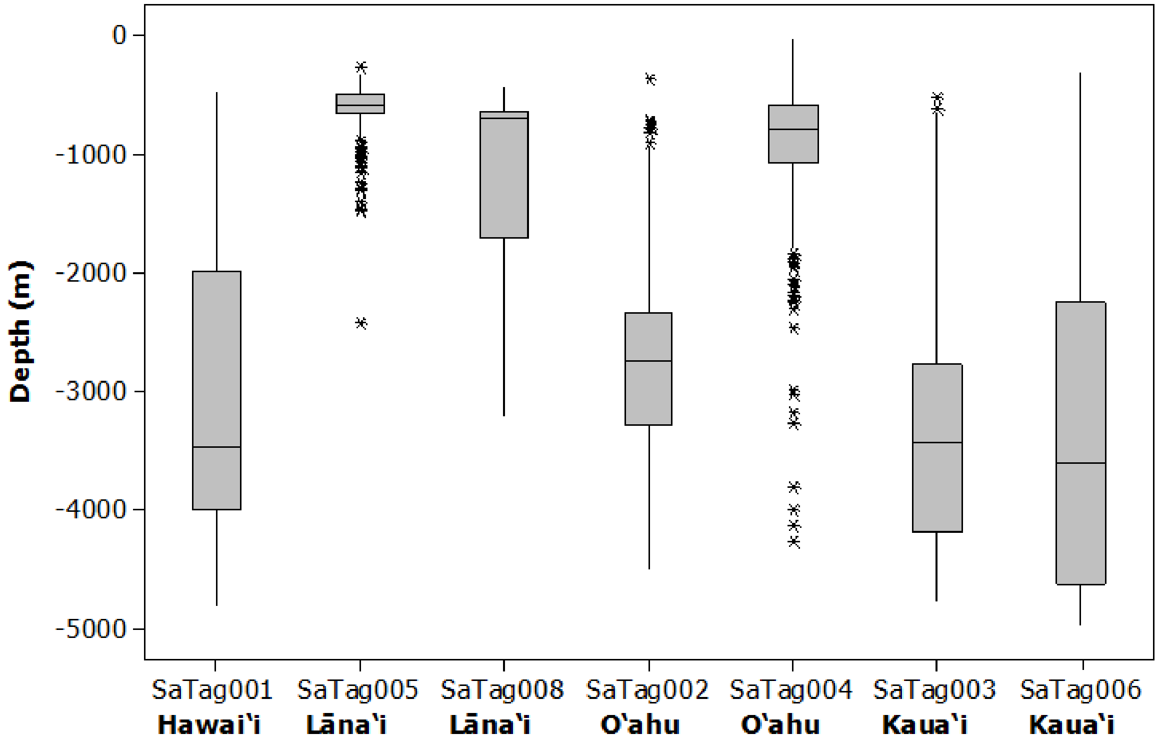



Figure 5. Box plot of water depths at Argos-derived locations of satellite-tagged pantropical spotted dolphins. Individuals are grouped based on where they were tagged. The line drawn through the middle of the box represents the median of the data, while the top and bottom of the boxes represent the first and third quartile. The lines extend to represent the lowest and highest values, excluding outliers (represented by *). Outliers are values that are more than 1.5 times the inter-quartile range.

Table 1. Details of satellite tag deployments on pantropical spotted dolphins in Hawaiian waters.

| Tag ID | Date tagged | Sighting No. | Island | Tag duration (days) | # locations after filtering | # (%) of locations inside stock boundary where tagged |
|---|---|---|---|---|---|---|
| SaTag001 | 21 Apr 2015 | 1 | Hawai‘i | 10.6 | 107 | 107 (100.0) |
| SaTag002 | 5 Jan 2016 | 3 | O‘ahu | 18.4 | 252 | 56 (22.2) |
| SaTag003 | 14 Feb 2016 | 1 | Kaua‘i | 17.9 | 217 | N/A |
| SaTag004 | 6 Oct 2016 | 3 | O‘ahu | 19.5 | 251 | 142 (56.6) |
| SaTag005 | 8 Mar 2017 | 1 | Lāna‘i | 21.4 | 307 | 245 (79.8) |
| SaTag006 | 10 Aug 2017 | 4 | Kaua‘i | 14.0 | 185 | N/A |
| SaTag007* | 10 Aug 2017 | 4 | Kaua‘i | 3.3 | 30 | N/A |
| SaTag008 | 22 Feb 2018 | 2 | Lāna‘i | 9.0 | 47 | 31 (65.9) |
| SaTag009^ | 16 Aug 2018 | 2 | Kaua‘i | 7.1 | 2 | N/A |

*Tagged in the same group as SaTag006 and remained associated during the period of tag overlap, thus not included in further analyses. ^This tag was deployed below the base of the dorsal fin. Although data were obtained over a 7-day period only two locations were obtained, thus information from this individual is not included in additional analyses.

Table 2. Information on spatial use of pantropical spotted dolphins satellite-tagged in Hawaiian waters.

| Tag ID | Minimum horizontal distance moved (km) | Distance to deployment location (km) median (max) | Depth at tagging location (m) | Depth (m) median (max) | Distance to shore at tagging location (km) | Distance to shore (km) median (max) |
|---|---|---|---|---|---|---|
| SaTag001 | 709 | 34.3 (75.5) | 2,699 | 3,468 (4,806) | 13.0 | 28.7 (64.3) |
| SaTag002 | 1,587 | 36.1 (80.4) | 1,010 | 2,740 (4,487) | 6.3 | 29.5 (63.6) |
| SaTag003 | 1,557 | 113.4 (233.9) | 651 | 3,424 (4,769) | 8.8 | 43.8 (150.7) |
| SaTag004 | 1,688 | 49.9 (326.9) | 573 | 767 (4,261) | 3.8 | 10.8 (43.9) |
| SaTag005 | 1,495 | 17.9 (54.1) | 575 | 566 (2,410) | 8.6 | 13.9 (29.6) |
| SaTag006 | 1,307 | 116.2 (199.1) | 822 | 3,603 (4,970) | 12.5 | 52.8 (112.4) |
| SaTag008 | 495 | 18.4 (76.3) | 649 | 686 (3,203) | 12.4 | 15.8 (27.1) |