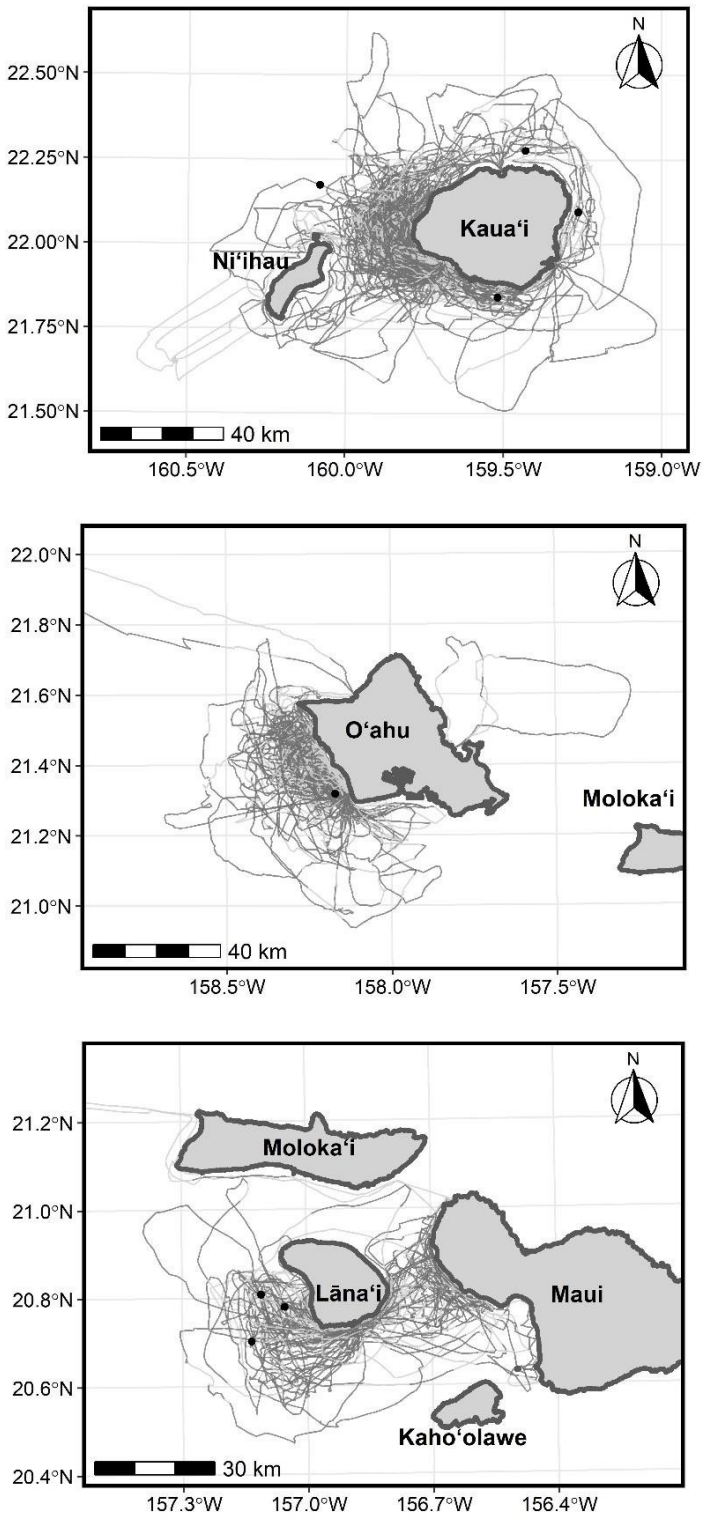

FIGURE S1 Maps showing survey effort (lines) and dwarf sperm whale sightings (dots) off Kauaʻi and Niʻihau (top), Oʻahu (middle) and Maui Nui (bottom). Tracks in Beaufort 0, 1 and 2 are shaded dark, those in Beaufort 3 or greater are shaded light.

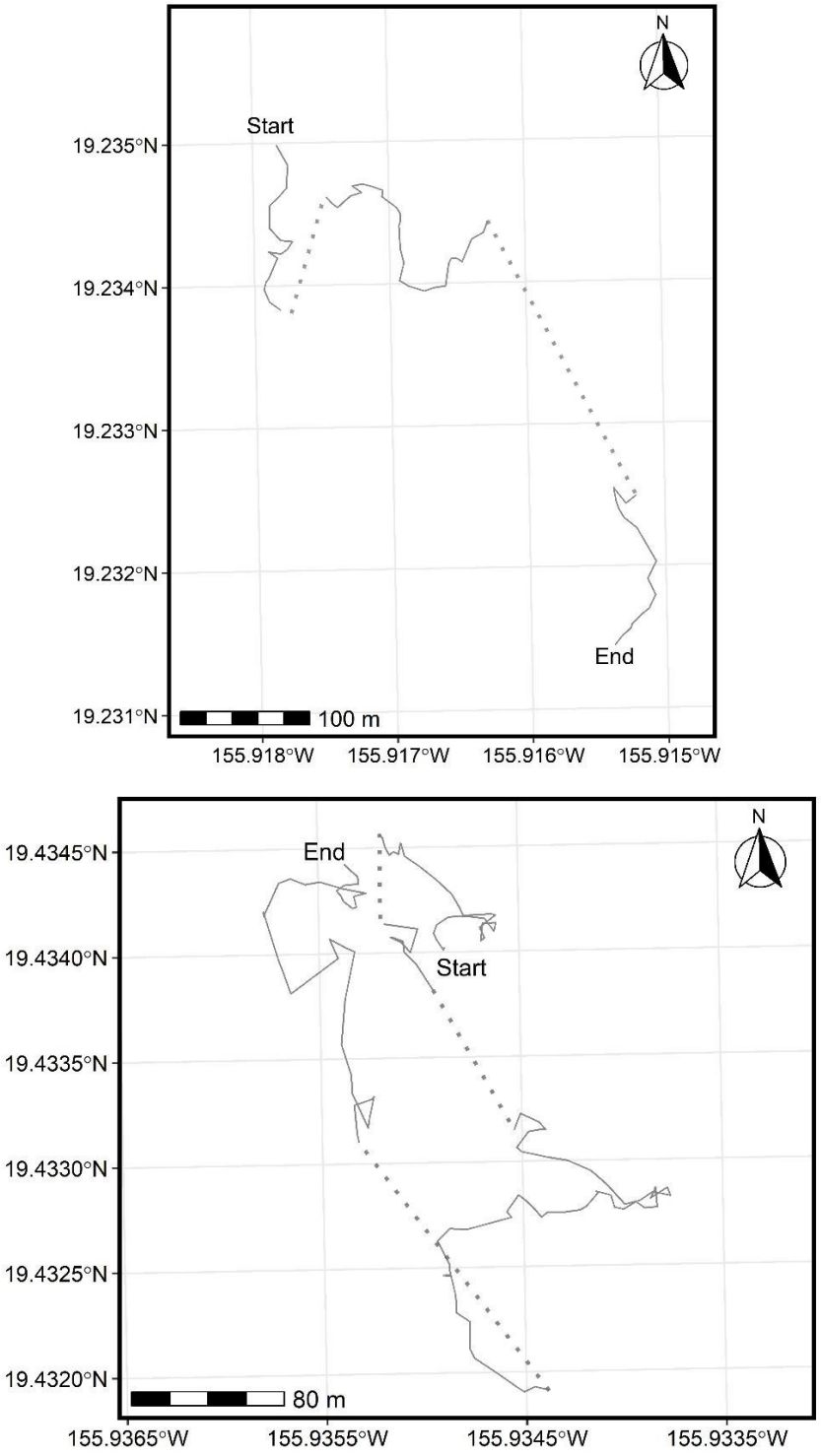

FIGURE S2 Maps showing travel path of dwarf sperm whale groups based on position of drone during October 28, 2019 (top) and November 6, 2019 (bottom) encounters. Start and end locations are indicated, and segments when animals were visible are joined by a dashed line in consecutive order.

TABLE S1 Information on individual dwarf sperm whales with betweenness centralities (i.e., the extent to which a node acts as a bridge between two nodes) greater than zero (values calculated from a network restricted to individuals slightly distinctive or greater with fair or better photo qualities. Individuals that are cutpoints in the network are in bold.

Individual ID	Span of years seen	Number of times seen	Betweenness centrality	Age/sex if known or inferred
HIKs011	2.45	2	108.0	Adult female
HIKs020	14.90	14	264.7	Adult female
HIKs035	6.16	7	487.7	Adult male
HIKs037	1.67	2	74.0	
HIKs042	4.21	3	37.3	Adult male
HIKs044	1.96	4	263.0	Adult male
HIKs050	5.22	7	112.8	Adult male
HIKs053	1.13	2	140.0	Adult female
HIKs055	3.45	2	74.0	Adult
HIKs061	5.02	3	38.0	Adult
HIKs078	1.25	4	207.5	Adult
HIKs086	1.56	4	178.0	Adult female
HIKs098	4.03	2	108.0	Subadult
HIKs103	6.59	3	170.0	Adult
HIKs107	1.46	3	38.0	Adult female

Sources of injuries and markings

Three of the four wounds from large sharks were only partially healed, with white or reddish tissue visible. The fourth case (one of the two on the dorsal fin) appeared to be completely healed, had re-pigmented, and was visible only because of excellent quality photos and lighting conditions (Figure 8e). Two of the individuals (one with the healed dorsal fin wound, and the other with a bite wound on the mid-back) were re-sighted after the wounds were first documented, at periods of 0.12 and 5.22 years, respectively. The other individual with the bite wound on the dorsal fin was documented off Lānaʻi, and thus had a low likelihood of being resighted given the small number of identifications available. Three other individuals were missing part of their dorsal fin, which could possibly have been due to bites from large sharks, but the wounds were completely healed (e.g., Figure 8g,h), and photo quality precluded assessment of subtle scarring that might have been informative for determining the cause of the injuries. Nine individuals were documented with holes through the dorsal fin (e.g., Figure 9b), including one individual with two holes through the fin. Holes varied in size from small holes (e.g., <1 cm diameter) to the size of a bite wound from an adult cookiecutter shark (e.g., 6–88 cm; Muñoz- Chápuli et al., 1988).

UAS operations

Drone operations were undertaken with two groups encountered in 2019. In both cases, groups were sighted in Beaufort 1 sea conditions and relatively early in the morning (08:50 HST on October 28 and 08:55 HST on November 6), and thus there was minimal glare on the water surface when the drone was directly over the animals. Horizontal travel speeds were calculated from each video segment when animals were visible beneath the drone, using the summed distance between consecutive locations of the drone recorded every five seconds, and the summed time for each segment of drone footage. Means and standard deviations (*SD*s) are presented for horizontal travel speeds for each encounter.

October 28, 2019 encounter

On October 28, the drone was launched within a minute of the group being sighted, and the first individual was in view on the drone's camera within 21 s of launch. This group was sighted about 110 m from the research vessel and followed for 20 min. The flight lasted 18 min and 51 s, with 11 min and 45 s of video being recorded. Video recording was stopped when animals dove and resumed when they became visible again. The estimated group size from the boat-based observers was 4/4/5, and four individuals were documented from the video and were photo-identified from the boat-based photographers. Two of the four were considered not distinctive based on dorsal fin markings, but it was possible to match individual IDs to those identified in the video, based on relative size and markings. Based on relative size the distinctive individual (HIKs165) was considered an adult, and one nondistinctive individual (HIKs166) was considered a juvenile. HIKs165 had a large injury to the peduncle, consistent with a line wrap (Figure 9g,h). The remaining two individuals (HIKs167 and HIKs168) were considered likely adults, based on relative size and the number of scars visible. HIKs168 had scarring on the dorsal fin and back immediately behind the dorsal fin consistent with a fishery interaction (Figure 9f). One or more individuals were visible in theframe for periods ranging from 1 sec to 3 min 25 sec, although there was often overlap of individuals that moved into or out of the frame of view. Note that on some occasions individuals left the frame by diving out of sight, rather than traveling laterally away from the individual the drone was focused on. All four individuals were documented engaging in slow rolling at the surface and logging behavior (Video S1), with the duration of logging events ranging from 18 s to 1 min 16 s (median = 24 s). During logging, sculling motions of both the flippers and flukes were observed, and a wake was visible behind the individuals, indicating movement even while logging at the surface. On occasion one or more individuals were observed logging while another was subsurface. There were periods where the altitude of the drone was too high to confirm whether an animal exhaled, however, a total of 53 breaths were documented, 40 while the individuals were logging (including the first breath occurring when logging was initiated), and 13 while the

individuals were slow rolling.

November 6, 2019 encounter

On November 6 a group was sighted at a distance of approximately 450 m, and the drone was launched within a minute of the group being sighted. The animals had dove but were resighted 7 min later, and the group was followed for 47 min. Three flights were undertaken lasting a total of 40 min and 32 s, with 28 min and 21 s of video being recorded. One or more individuals were visible to the drone for 24 min and 44 s. Estimated group size was 3/3/3, and three individuals were identified both from boat-based photos and video. The three individuals identified on November 6, 2019 included HIKs167 and HIKs168, and a new nondistinctive individual (HIKs169) that was also likely an adult based on relative size. Eleven logging events were recorded that ranged from 7 to 46 s (median = 28 s), and 64 breaths were documented with 33 occurring while logging. Two social interactions were recorded (Video S2). While one individual (HIKs168) was logging, a second (HIKs167) changed course to intercept, at which point HIKs168 stopped logging and veered perpendicularly towards HIKs167. When within three body lengths, HIKs168 turned and swam subsurface at an increased rate of speed in the opposite direction of HIKs167. The drone continued following HIKs168 until the animal was no longer visible and then was maneuvered to resight HIKs167, who was still visible at the surface. Three minutes later HIKs167 was again on an intercept course with HIKs168 until about 5–6 body lengths apart, when HIKs167 abruptly stalled and turned 90°, at which point HIKs168 also stopped and slow rolled at the surface. Both animals then turned so they were parallel to each other and slowly moved apart.

Prior to the first flight, a petri dish was mounted on the drone for an attempt to collect a breath sample. One breath sampling attempt was undertaken, with the drone descending to ~3 m as the animal surfaced and began logging. While no blow was visible during the initial exhalation, when reviewing the video recorded during the encounter, one larger droplet of liquid or mucus was visible exiting the blowhole during the second breath of the logging event. However the breath sampling attempt was aborted due to the lack of visible blow and inability of the drone pilot to predict when the animal would exhale. No reactions were documented during the low altitude descent.

Video S1 Drone video footage from dwarf sperm whale encounters in October and November 2019 showing sinusoidal swimming patterns and head turning prior to surfacing, likely related to vigilance for predator detection. Compass rosette shows degrees true. Date/time shown is in HST. Available at https://youtu.be/HborwUZicXY

Video S2 Drone footage from dwarf sperm whale encounters in October and November 2019 showing social interactions. Date/time shown is in HST. 28 October 2019. Footage from 08:56:16 to 08:56:27 shows juvenile HIKs166 approaching adult HIKs167 from behind and HIKs167 turning away. Footage from 08:56:48 to 08:57:12 shows these same two individuals logging. Footage from 08:57:24 to 08:58:03 shows HIKs166 first approaching adult HIKs168, which appears to react negatively to the approach, and then adult HIKs165, which does not appear to react to the close approach. November 6, 2019. Footage from 09:33:39 to 9:34:06 shows HIKs167 (left) and HIKs168 (right) slowly getting closer to each other on an intercepting course, and then HIKs168 turning and swimming rapidly away. Footage from 09:38:14 to 09:38:53 shows HIKs167 (left) and HIKs168 (right) on an intersecting course coming to within 5–6 body lengths before they turn parallel to each other. Available at https://youtu.be/3U0lLjIqaO4

REFERENCES

Muñoz-Chápuli, R., Rey Salgado, J. C., & De La Serna, J. M. (1988). Biogeography of *Isistius brasiliensis* in the north-eastern Atlantic, inferred from crater wounds on swordfish (*Xiphias gladius*). *Journal of the Marine Biological Association of the United Kingdom*, *68*(2), 315–321. https://doi.org/10.1017/S0025315400052218