

HAWAIIAN GREEN TURTLES DIVE TO RECORD DEPTHS DURING OCEANIC MIGRATIONS

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Baskers of French Frigate Shoals.



Baskers of Laniakea.



Fig. 1. Female (F1) and male (M2) seen basking at Laniakea, Oahu shortly after their return from FFS. The TDR cameras can be seen on the left side of the carapace.

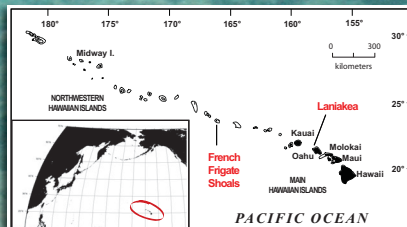


Fig. 2. Map of the Hawaiian Archipelago with lines indicating the location of Laniakea and French Frigate Shoals.

Turtle #	Laniakea Departure Date	FFS Arrival Date	Travel Time To FFS	FFS Departure Date	Laniakea Arrival Date	Travel Time to Laniakea
M1 to FFS	4/13/04	4/23/04	10 days	4/23/04	4/27/04	4 days
F1 from FFS	4/27/04	5/01/04	4 days	5/01/04	5/11/04	10 days
M2 from FFS	5/28/04	6/24/04	26 days	6/30/04	6/24/04	21 days

Table 1. Travel times and dates of travel for three adult green turtles between their forage grounds at Laniakea and their breeding grounds at French Frigate Shoals.

Turtle	Max Dive Depth (m)	Mean Max Dive Depth (m)	Mean Dive Duration (min)	% night dives
M1 to FFS	103	45.3	25.3	85
M1 from FFS	4	1.9	35	95
F1 from FFS	137	55.1	26.6	84
M2 to FFS	86	39.5	28.1	44
M2 from FFS	48	15.4	28.1	17.7

Table 2. Summary of Type 3 diving carried out by males 1 and 2 (M1, M2), and female 1 (F1) during their migration to and from French Frigate Shoals in 2004.

Summary

The diving behavior of an adult female (Fig. 1) and two adult male green turtles was recorded during their roundtrip breeding migration from Laniakea, Oahu, to French Frigate Shoals (FFS) in the Hawaiian Islands (Fig. 2). All three turtles exhibited a biphasic diving behavior (Figs. 3 & 4). During the daylight hours, diving depth was shallow (1-4 meters) and duration was short (1-18 minutes). It is assumed that the turtles were moving deliberately toward their destination during this time. Between 1900-1930 hours daily, the turtles began a diving pattern consisting of deep dives with a mean maximum dive depth of 35-55 meters and a mean duration between 35 and 44 minutes. The nocturnal deep diving pattern ended and the shallow diurnal diving began between 0600 and 0700 each day. The adult female made two dives in excess of 135 meters and one of the males made several dives in excess of 100 meters. These are the deepest dives ever recorded for a naturally diving green turtle. It took an average of 36 days for the turtles to make the trip to French Frigate Shoals and an average of 30 days to make the return trip (Tables 1 & 2). Turtle M1 made several unusually long resting dives during his trip to FFS (Fig. 5). The deep nocturnal diving was unexpected and this behavior is in need of further investigation.

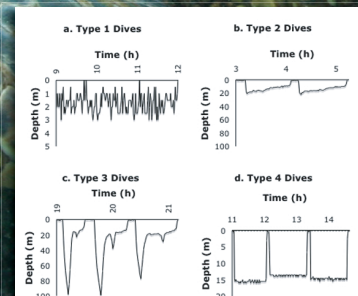


Fig. 3. Four dive types identified in migrating turtle dive profile data: a) Type 1 dive is a shallow surface dive from 1.5 to 4 m; b) Type 2 dive has a steep descent to depth with a slow gradual ascent; c) Type 3 dive shows a steep descent to depth and a rapid ascent followed by a gradual ascent to the surface; d) Type 4 dive is a 'U-shaped' resting dive where 90% of the bottom time is spent at the maximum dive depth.

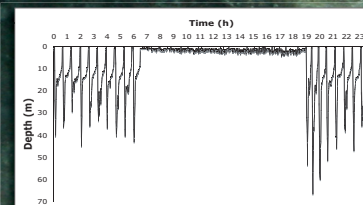


Fig. 4. Dive profiles for female turtle (F1) on March 16, 2004 showing a typical day of nocturnal Type 3 dives and diurnal Type 1 dives.

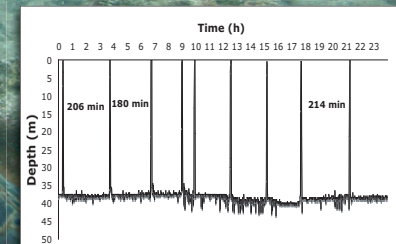


Fig. 5. Dive profiles for Male 1 on April 5, 2004 showing unusually long Type 4 resting dives.



Nesting turtle.