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ANDERS G. J. RHODIN, *Orthopaedic Associates, P.C., Nichols Rd., Fitchburg, Massachusetts 01420, and Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138;* ROBERTO DA ROCHA E SILVA, *Rio de Janeiro Primate Center, Department of Environmental Conservation—FEEMA, Rio de Janeiro, Brazil; and* RUSSELL A. MITTERMEIER, *World Wildlife Fund—US, 1601 Connecticut Ave., NW, Washington, D.C. 20009, and Department of Anatomical Sciences, HSC, State University of New York, Stony Brook, New York 11794.* Accepted 25 Oct. 1983.

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RECORDS OF THE YELLOW-BELLIED SEA SNAKE, *PELAMIS PLATURUS*, FROM THE GALÁPAGOS ISLANDS.—Based on the field notes of J. R. Slevin, Van Denburgh (1912) provided the first account of the yellow-bellied sea snake, *Pelamis platurus*, from Galápagos waters. This account resulted from a single snake sighted at sea between the islands of Santa María and Española. Unfortunately Slevin was unable to capture the snake. Subsequently several authors (Krefft, 1953; Halstead, 1970; Dunson and Ehlert, 1971; Kropach, 1975; Pickwell and Culotta, 1980) included the Galápagos within the range of *Pelamis*, but no additional specimens have been reported. Dunson and Ehlert (1971) found no evidence of *Pelamis* during a persistent search in the Galápagos area for eight weeks in 1968 and 1969. They suggested that the *Pelamis* occurring in the vicinity of Galápagos were not residents, but rather individuals passively wafted from their breeding range on ocean currents.

Between 1970 and 1980, eight specimens of *Pelamis* (Table 1) were collected in the Galápagos region, representing the only known voucher specimens from Galápagos. Seven are deposited in the vertebrate collection of the Charles Darwin Research Station (CDRS), Santa Cruz, Galápagos, and one is housed in the Museum of the San Diego Society of Natural History (SDSNH), San Diego, California. Duffy (1982) first mentioned the existence of *Pelamis* in the Darwin Station collection and provided locality information for six specimens, but gave no description of these animals.

By comparing the combined snout–vent lengths and tail lengths for individuals in Table 1 with the size class designations of Kropach (1975), three results are apparent: 1) no first year juveniles are present in the sample; 2) specimens CDRS 359 and 362 fall into the ambiguous intermediate age class; and 3) the remaining six are adults. The single female, CDRS 558, was dissected and found to be non-gravid. Values for mid-body scale rows and ventrals (Table 1) are within the normal range of variation for *Pelamis* (Pickwell and Culotta, 1980). The color pattern is highly variable between individual specimens in this series. However, CDRS 362 and 363 are distinctly bicolored with no tendency toward a brownish suffusion along the ventral surface, while the remainder are of the tricolor variety described by Pickwell (1972), having dark pigmentation along the venter varying from light tan to dark brown.

The eight specimens in this series were collected in seven different months (Table 1), and there is no obvious relation between collection dates and seasonal sea surface temperatures or current patterns. Five specimens were collected alive; three (CDRS 359, 363, 558) were stranded on beaches, and CDRS 361 was captured while it was swimming in shallow water along the coast. Interestingly, the other live specimen (CDRS 362) was brought aboard the former Darwin Station research vessel, Beagle III, by a lava gull (*Larus fuliginosus*). The gull landed on the boat's railing with the snake in its beak, and then dropped it onto the deck after being approached by the captain (B. Schreyer pers. comm.). Lava gulls feed mainly by scavenging along the tideline (Harris, 1974), therefore, it appears likely that the gull captured this specimen while it was stranded on the beach, approximately 300 m from where the boat was anchored. CDRS 359 had a 1 × 1 cm open wound on the dorsal surface at mid-body when captured; however, no information was supplied with this specimen indicating how this wound may have occurred. The two other CDRS specimens were dead when collected; one (CDRS

TABLE 1. PERTINENT DATA FROM YELLOW-BELLIED SEA SNAKES, *Pelamis platurus*, COLLECTED IN THE GALÁPAGOS, 1970–1980.

Specimen no.	Date	Locality	Sex	Snout–vent length (mm)	Tail length (mm)	Mid-body scale rows	Ventral scales
CDRS 359	14 Nov 1971	Academy Bay, Santa Cruz I.	M	415	53	51	312
CDRS 360	10 Feb 1975	South Channel, Santa Cruz I.	M	630	50	63	373
CDRS 361	27 Mar 1976	Academy Bay, Santa Cruz I.	M	499	68	51	294
CDRS 362	17 Mar 1973	James Bay, San Salvador I.	M	315	41	59	279
CDRS 363	10 Aug 1970	Academy Bay, Santa Cruz I.	M	550	69	53	279
CDRS 557	20 Apr 1980	Genovesa I.	ND*	580	51	51	ND
CDRS 558	8 May 1980	South Plaza I.	F	689	76	53	339
SDSNH 63126	Jun 1977	Caamaño I.	ND	407**	78 (approx.)	ND	ND

* Not determined.
** Total length of the three body sections equaled approximately 485 mm. The length of the tail suggests the snout–vent length should be greater than indicated, so additional mid-body portions may have been lost. For details see text.

360) was washed up on a rocky shoreline and the other (CDRS 557) was found mummified, but intact, 400 m inland. An additional mummified *Pelamis* was reported to one of us (GVP) by the late herpetologist, Timothy W. Brown, who noted the specimen beneath a bush about 50 m from shore on Seymour Island on 14 June 1977. The specimen was not collected.

The SDSNH specimen (Table 1) is possibly unique in that it was reported by its collector, Krisztina Trillmich, to have been picked up in an area where an immature sea lion (*Zalophus californianus wollebaeki*, estimated age 1–2 years) was observed to vomit an ophichthyid (?) eel. The snake, however, was not observed directly in the vomitus and was not actually seen being regurgitated. The sea lion appeared in normal condition and it cannot be stated with certainty that it had ingested the snake.

The specimen is in three sections with head and tail intact, but all internal organs missing or no longer recognizable and the skin sufficiently disfigured so that accurate scale counts are not possible. Nevertheless, general body dimensions indicate an adult snake. Thus, this cannot unequivocally be said to constitute a legitimate record of predation as was the case recently in Australia where a leopard seal (*Hydrunga leptonyx*) was reported to have regurgitated a partly digested *Pelamis* (Heatwole and Finnie, 1980). It is of interest that Krisztina Trillmich recalled seeing one or two additional dried *Pelamis* at sea lion resting sites on Caamaño Island. These were not collected.

CDRS 361 had a cluster of six recently settled barnacle cypris larvae attached to the anal scales. These were removed and identified as *Lepas* sp. *Lepas* is one of the relatively few genera of stalked barnacles known to be associated with *Pelamis* (Zann et al., 1975).

The results of interviews with a number of long term Galápagos residents, including boat captains and fishermen, indicated that *Pelamis* is never captured in local fishermen's nets, and only one person interviewed recalled seeing sea snakes at sea, on two separate occasions between 1973 and 1976. Both times, single individuals were seen floating on ocean currents in the vicinity of Bahía Sardinas on the north coast of San Cristóbal (B. Schreyer pers. comm.).

Based on the few specimens presently available, the lack of first year juveniles in this series, and the results of these interviews, it appears that the occurrence of *Pelamis* in the Galápagos area is most likely the result of passive wafting from breeding areas as suggested by Dunson and Ehlert (1971).

The logical sources for *Pelamis* in the Galápagos are the Gulf of Guayaquil, Ecuador, and the Gulf of Panama where they are known to breed (Dunson and Ehlert, 1971; Kropach, 1975). Ocean currents originating in the Gulf

of Panama move south to the west coast of Ecuador, then westward with the South Equatorial Current, passing directly through the Galápagos Archipelago (Schaeffer, 1962; Wyrtki, 1965, 1966). The South Equatorial Current is strongest from July to November, but is supported in all seasons by prevailing easterly winds (Wyrtki, 1965; Thornton, 1971).

An alternative, though perhaps less likely, means by which *Pelamis* might reach the Galápagos is the South Equatorial Countercurrent first described by Reid (1959). This eastward flowing current evidently advances along 5°S latitude to 120°W longitude and moves further south to the east of this location (Reid, 1959; Tsuchiya, 1968). Wyrtki (1965, 1966) disputed the existence of a discrete South Equatorial Countercurrent except perhaps during periods leading to El Niño conditions in the eastern Pacific (Wyrtki et al., 1976), believing instead that portions of water flowing eastward with the main (North) Equatorial Countercurrent turn south and join the westward flowing South Equatorial Current. In either case, these warm eastward flowing surface waters could occasionally carry individuals of *Pelamis* to the Galápagos from a source to the west. However, we know of no reported locations in the central or western Pacific with population densities approaching those seen in Panama or elsewhere along the tropical Pacific coast of the Americas that could function as a source of *Pelamis*. Thus, while stray specimens of *Pelamis* may arrive in the Galápagos from multiple sources, present information suggests the most likely source is in the tropical eastern Pacific.

Studies of the thermal ecology of *Pelamis* indicated that a major factor limiting the range of this sea snake may be cold surface waters. Dunson and Ehlert (1971) concluded that the 20 C isotherm described the breeding range of *Pelamis*, while Graham et al. (1971) determined that the 18 C isotherm was the limiting factor in distribution. Recently, a dying adult *Pelamis* was reported from a beach in southern California where water temperature had dropped to 16 C (Pickwell et al., 1983).

Sea surface temperatures for Academy Bay, Santa Cruz Island, between 1971 and 1981 showed an annual range of about 7 C, with lowest values (20–21 C) occurring during Aug.–Nov., and highest values (26–27 C) in Feb.–April (from data on file at CDRS). Thus, surface water temperatures in the Galápagos lie within the 20 C isotherm. Body temperatures of *Pelamis* caught in surface waters along the Pacific coast of Mexico and Central America ranged from 26.9–31.0 C (Dunson and Ehlert, 1971), and in the Gulf of Panama from 28–29 C (Hecht et al., 1974). The latter authors determined from their studies of captive *Pelamis* from the Gulf of Panama that the snakes usually reduce feeding at 26 C and effectively cease to feed at 23 C. Therefore, except for the period from February through April, water temperatures in the Galápagos may be too low for long term survival. In addition, other factors such as prevailing surface currents may operate to prevent the occurrence of a continuously resident population in this area.

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ROBERT P. REYNOLDS, *Charles Darwin Research Station, Isla Santa Cruz, Galápagos, Ecuador and* GEORGE V. PICKWELL, *Marine Sciences Division, Naval Ocean Systems Center, San Diego, California 92152. Present address (RPR): US Fish and Wildlife Service, National Museum of Natural History, Washington, DC 20560.* Accepted 13 Sept. 1983.

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