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#### APPENDIX A Specimens Examined

*Chelodina oblonga* (Perth population): BMNH 1946.1.22.5, 1947.3.5.90-91, 1899.5.4.1, 64.12.22.9 QM 59272, 59273, 59274, 59283, UC 161-163, 2103; *C. oblonga* (holotype): BMNH 1947.3.5.89; *C. expansa*: AM 1242, 18860-64, 18883, 33209, 40176, 123066, AMNH 103699, 108948-49, BMNH 1947.3.4.21, 1947.3.5.88, QM 12387, 18360, 21742, 21936, 35344, 48015, 48020, 48032, UU 14324, 14328, 14333, 14335, 14369, 14554, 16821, 16825, 17778-79, 17801, 17818, 18800-01; *C. longicollis*: AM 3223, 3226, 8633, 12754, 132778, 142846, 142877-78, 146186, AMNH 2323, 76569, MCZ 8369, 8377, 86783, MNHN 9403, 9405, BMNH 1947.3.5.86, QM 3560, 18359, 21372, 24024, 24134, 35679, 35768, 45021-22, 45022, 48043, 48049, 50583-84, 59266-68, 59281-82, UC 134, 164, 166, 169, 174, 199, 252, 253, 255, 257-58, 263, 265, 268, 270, 285, 288-89, 462, 465-67, UU 14451, 14453, 14458, 16802, 17835, 17837, 17838-42; *C. novaeguineae*: AM 129346, 132784-85, 135351, AMNH 86543-47, MV 4-6, BMNH 1908.2.25.1, NTM 16324-25, 17074, 31790, QM 4486, 4488, 4491, 5269, 10265, 13326, 15560, 15900, 20627-28, 20630-31, 20633, 20635, 26344, 31505-08, 35136, 36751, 37566, 37819, 45005, 47923, 48940, 49917, 50730-32, 50736-37, 50997-98, 53064, 53635, 56408-12, 56447-57, 58412, UC 324-25, UU 14715-18; *C. rugosa*: QM 3852, 17514, 17633-34, 20629, 20632, 20634, 20636-39, 33368, 35146, 37622, 40078-79, 45850, 47912, 47913-14, 50738, 50995-96, 53063, 53065-67, 53324, 57649, 58426, 59264, UC 256, 2102; *C. steindachneri*: AM 33117, 100425-33, 104219, 110940-41, 102689-90, AMNH 118763-64, 101977-79, MCZ 33501, 134469, 134871-72, BMNH 1958.1.7.24, 1958.1.7.25, NWC 521, UC 248, 266, 271, 281, 284, 290, UU 14719-21, 16781; *C. siebenrocki*: UC 0212.

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## Observations of Male Green Turtles (*Chelonia mydas*) on the Nesting Beach at Tortuguero National Park, Costa Rica

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Most descriptions of male green turtle (*Chelonia mydas*) behavior have been of turtles at sea (Booth and Peters, 1972; Ehrhart, 1982; Limpus, 1993; Hirth, 1997). Exceptions are observations of green turtles in the Indo-Pacific region where males occasionally emerge on land to bask (Whittow and Balazs, 1982). In addition, in Cyprus male green turtles have been seen twice on land while still attached in mating positions to females coming to nest (Broderick and Godley, 1997). Both times, the male dismounted and returned to the sea after the female had ascended 5–10 m up the beach. Broderick and Godley (1997) speculated that the male may have been sneaking copulation at a time when no other males had access to the female or mate guarding the female to ensure that other males could not seek copulation. At the Bermuda Aquarium, a captive male green turtle has emerged on land on at least three separate occasions to make a false "nest" — each time the male dug a false egg chamber, then filled it in with sand and disguised the site before returning to the water (J. Gray, *pers. comm.*). At the Cayman Turtle Farm, male turtles have been observed on land digging body pits but there are no reports of male turtles constructing false egg chambers (J. Parsons, *pers. comm.*).

Tortuguero National Park on the Caribbean coast of Costa Rica is the site of the largest green turtle rookery in the Atlantic (Carr et al., 1978; Bjorndal et al., 1999). Green turtle monitoring was initiated there in 1955 and has been conducted every nesting season since (Carr et al., 1978; Bjorndal et al., 1999). Male green turtles are rarely encountered as all monitoring activities are land-based. However, males from this population are caught and tagged during their reproductive migration through Bocas del Toro Province, Panama (A. and P. Meylan, *pers. comm.*).

In 1998, several interesting observations of male green turtles were made in conjunction with the regular monitoring activities in Tortuguero. During the early part of the nesting season, in June and July, green turtles mating in the surf zone close to the beach were seen almost daily during morning nest surveys. On at least three separate occasions mating couples were washed up on the beach by the powerful swell. In these cases, the pairs remained mated for 1–2 minutes before they sepa-

rated and both turtles returned to the sea. Observations of mating green turtles in the surf zone or washed up on the beach were rare in Tortuguero in the late 1970s (A. and P. Meylan, *pers. comm.*). The observations during the 1998 nesting season may have been due to the very high level of nesting activity. During peak nesting 8 August 1998, more than 2300 green turtle nests were recorded in a single night along 30 km of nesting beach (Caribbean Conservation Corporation, unpubl. data).

A dead male green turtle (identified by the large claws on the front flippers and the large tail) was encountered on the beach on 26 June 1998. The curved carapace length (CCL) along the midline measured 93.9 cm. Its neck had been lacerated on one side and the neck muscles had been devoured. The turtle was encountered on a stretch of beach where five female green turtles were found, also with lacerated necks and missing neck muscles. The author found and identified jaguar (*Panthera onca*) tracks in the sand around the dead turtles. It is likely that the male green turtle was attacked by a jaguar while on land, possibly after being washed up on the beach while mating in the surf zone.

During a nightly tagging patrol on 17 July 1998, a male green turtle was observed digging a false egg chamber. The male was positioned on the mid-beach platform. At the time of the encounter it was estimated that two-thirds of the "egg chamber" had been excavated. The male continued digging with the same alternating flipper movements characteristic of nesting female green turtles. The digging motions were interspersed by longer and longer periods of rest. Approximately 45 min after the first encounter, the turtle covered the egg chamber for 3 min and then camouflaged the nest site for 28 min. As the male turtle was returning to the sea, it was turned and measured. The turtle displayed all secondary sexual characteristics typical of male green turtles: large front claws and a tail that measured 45 cm from the end of the plastron to the tail tip (ventral), 35 cm from the plastron to the cloaca (ventral), and 35 cm from the edge of the carapace to the tail tip (dorsal). The CCL measured 97.4 cm. This was smaller than the mean size of female green turtles (CCL = 103.6 cm) during the 1998 nesting season but larger than the smallest female green turtle (CCL = 89.2 cm) encountered at Tortuguero in 1998.

A local tour guide has also reported seeing a male green turtle on the beach displaying nesting behavior typical of a female turtle (A. Rankin, *pers. comm.*). Similar observations have also been made on nesting beaches in the Galapagos (P. Pritchard, *pers. comm.*) and in Suriname (J. Schulz, *pers. comm.* to P. Pritchard).

Although male green turtles have sporadically been observed on land, there do not appear to be any published reports of male green turtles in the wild displaying nesting behavior typical of female turtles. Considering the behavior of the male turtle at Tortuguero, it is unlikely that it was following a female onto the beach or was on the beach for the purpose of basking.

For other reptiles, such as the American alligator (*Alligator mississippiensis*), it has been shown that ecoestrogens

(e.g., PCB and DDT) can cause activational and organizational changes in the reproductive system through endocrine disruption (Guillette et al., 1996; Crain and Guillette, 1998). The nesting behavior of the male turtle at Tortuguero may suggest endocrine disruption with resulting behavioral change. The episode may also have been an isolated case, it is certainly rare as Tortuguero is a well-patrolled beach. Similar events encountered at Tortuguero, or at other nesting beaches in the future, should be reported so that an explanation for the phenomenon can be identified. Collection of serum samples for hormone analyses from such male sea turtles would be useful.

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