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Short Note
Observation of Mating Behavior of *Hydrophis brookii* in Captivity

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In 2000 the Queen Saovabha Memorial Institute (QSMI) entered into an agreement with the School of Conservation (funded by DANIDA) in order to conduct research on the biology of sea snakes with primary reference to serum production. From February 2001 to January 2002, 23 specimens of *Enhydrina schistosa* (16 females, 7 males) and 23 *Hydrophis brookii* (13 females and 10 males) were collected from Songkhla Lake near Ban Khu Khut and Ban Klongnang, Amphur Sathing Phra, Songkhla Province in Thailand. Specimens were housed in three aquariums at the Snake Farm of QSMI in Bangkok. The largest aquarium measured 100 x 200 x 80 cm and had a capacity of 1,200 liters of water. The two smaller aquariums measured 100 x 100 x 80 cm and had capacities of 600 liters of water each. The largest and one of the smaller aquariums were housed out of doors in a shaded area and one of the smaller tank was housed in doors. A fan was installed over the outdoor aquariums. Each aquarium contained water treated with artificial sea salt (Q-SEA®) to adjust its salinity to approximately 1.0-1.7 % which approximated that of the site where the snakes were trapped in Songkhla Lake. Ten percent of the artificial brackish water was changed every two weeks**.** The large and small outdoor aquariums were placed close to each other and connected to a third compartment that was divided. One half of the third compartment contained a pump, the other a filtering system. Water passed into the filtering compartment then overflowed into the pump and then circulated through the two aquariums. The aquariums were furnished with sand as a ground floor covering and stones and plastic plants were included as hiding places. Care was also taken to ensure that the temperature of the water was close to that of Songkhla Lake at 26.8-29.0 ºC. Unfortunately, none of the sea snakes collected for this study lived long in captivity. None ate any of the following fish offered *Anabas testudineus, Clarias macrocephalus, Clarias garipinus,* or shrimp *Macrobrachium lanchesteri*. Many developed skin lesions and none survived more than two months in captivity.

OBERRVED MATING BEHAVIOR

On 22 September 2001, one female and two males of *H. brookii* were caught by trap net from Ban Klongnang. They were transported and kept in aquariums at QSMI snake farm on 24 September 2001. They were measured and weighed; the female had

FIGURE 1. (**A**) The first copulation of *Hydrophis brookii* was observed on 4 October 2001 at 10:30 hrs. (**B**) The second copulation of *Hydrophis brookii* was observed on 9 October 2001 at 11:30 hrs; female (lower front), male (upper back). (**C**) After union, the pair sank to the bottom of the aquarium. (**D**) The second, introduced male finally succeeded in copulation with the female on 24 October 2001 at 15:00 hrs. (**E**) Copulation of female (uppermost) and the second, introduced male seen coiled around the female. The first resident male can be seen swimming around the pair. (**F**) Autopsy of the mated female that died on 28 October 2001 revealed developing follicles, (10.0-15.0) x 5 mm each, in both ovaries; left ovary (upper right), right ovary (lower left). All photos by Lawan Chanhome.

a snout to vent length of 70.0 cm, her total length was 75.3 cm and she weighed 68.2 gm. The first male had a snout to vent length of 70.0 cm and a total length of 79.3 cm. He weighed 65.6 gm. The second male had a snout to vent length of 69.5 cm with a total length of 79.5 cm. He weighed 68.2 gm.

The first male and the female were housed in the same outdoor small aquarium from September 28 to October 28, 2001. Copulations were first observed on October 4, 2001 at 10:30 hrs (Fig. 1A) and again on October 9, 2001 at 11:30 hrs (Fig. 1B). The male swam around the female, and entwined his body around her. After union, the pair sank to the bottom of the aquarium (Fig. 1C). Each copulation lasted roughly three hours. After the first copulation the female was restless and swam to the surface every 3-4 minutes. Her cloacae remained red, swollen and a bit everted for a few days.

A second male that had been housed separately in the indoor aquarium was introduced into the outdoor small aquarium with the male and female on October 24, 2001 at 14:30 hrs. He showed immediate interest in the female, but also drew the attention of the male. The second male began swimming around the female and the resident male did the same and the bodies of the two males often became entwined. Both males were competing to copulate with the female and both succeeded in coiling and wrapping their bodies around the female tightly as a ball, of which the first male was outer most. However it was the second, introduced male that finally succeeded at 15:00 hrs (Fig. 1D). At this point the first male loosened itself from the entanglement and swam around the copulating couple (Fig. 1E). The copulation lasted two and one half hours.

DISCUSSION

The competition between the two males mentioned above cannot be described as the "combat dance" attributed to the males of some terrestrial snake species, e.g. *Pseudechis porphyriacus*[1]. These are described as wrestling matches and tests of strength in which one male attempts to overpower another[2]. What was observed between the two male *H. brookii* at QSMI could best be described as a shoving match in which one male tried to get in a better position to copulate with the female. We are not aware of any other observations of breeding activity among *H. brookii.* Male Banded Sea Kraits (*Laticauda colubrina*) do not fight with each other[3].

The first male and female observed in copulation survived a total of 35 days. The second male survived a total of 43 days. Physical examination found pus-like epidermal vesicles widely distributed over their skins. An autopsy of the female revealed two developing follicles and three small follicles on the left ovary, and three developing follicles on the right ovary (Fig. 1F). The size of the developing follicles was (10.0-15.0) x 5 mm each. No lesions were present on any internal organs. Unfortunately none of the skin lesions were examined in the laboratory. Nevertheless *Aeromonas hydrophila* was identified from heart blood and liver samples of *Enhydrina schistosa* which had the same skin lesions and had been kept in the same aquarium after the death of the three *H. brookii*. *Aeromonas hydrophila* is reported as a frequent causative pathogen of infectious ulcerative stomatitis or mouth rot in land snakes[4]. This pathogenic gram-negative bacteria is also associated with pneumonia, lesions of the oral cavity, cutaneous lesions, septicemia, organ failure and death. In the case of vesicular dermatitis or Blister disease in land snakes caused by *A. hydrophila,* the carrier may be the mite *Ophionyssus natricis*[5]. On the day the first pair of *H. brookii* died, water in the aquarium was examined and numerous *Escherichia coli* were found. *E. coli is* commonly present in the intestinal tracts of

many reptiles[4], and only some strains are reported as pathogenic. Therefore the numerous *E. coli* found in the water could be fecal contamination and not the cause of death.

Thirteen females of *H. brookii* were collected from February 2001 to January 2002; two of them were found to be gravid. The gravid female collected in February carried fully developed fetuses. They were three males and one female in the right oviduct, and one male and female each in the left oviduct. These fetuses had yolks attached to their umbilical cords. The upper part of their skulls was unclosed. Everted hemipenes were revealed in male fetuses. The six fetuses had snout to vent lengths averaging 19.90 (19.00-20.60) cm and a total lengths averaging of 22.73 (21.90-23.40) cm. The female caught in March carried three fully developed fetuses in both the right and the left oviducts. These fetuses had snout to vent lengths averaging 25.22 (24.30-26.50) cm and total lengths averaging 28.15 (27.30-29.70) cm. The encircling bands on their bodies from neck through mid-body were distinct. This information might be useful to postulate the breeding season of *H. brookii* in Thailand.

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