

## PARTURITION IN THE HAWAIIAN MONK SEAL (*MONACHUS SCHAUINSLANDI*)

Parturition in the Hawaiian monk seal (*Monachus schauinslandi*) has never been described in detail and has rarely been witnessed. Only four complete births (Johnson and Johnson 1978, C. J. Deutsch, personal communication, A. K. H. Kam, personal communication, J. Ruehle and A. M. Johnson, unpublished data) and two partially observed births (Alcorn 1984, Johanos and Kam 1986) have been reported. Herein we recount two births observed in 1985 in the Northwestern Hawaiian Islands, and we include the first sonograms of postpartum vocalizations between a mother-pup pair. Parturition behaviors of Hawaiian monk seals are summarized from all reported births to date.

The birth of a female pup was witnessed by two observers, 10-15 m away from the parturient female, at East Island in the French Frigate Shoals (23°47'N, 166°13'W) on 24 April 1985. When first observed at 1429, the parturient female was at the water's edge, 3-4 m from two basking Hawaiian green turtles (*Chelonia mydas*). She appeared to be experiencing occasional, mild labor contractions that spread posteriorly from the midbody region.

Observations resumed at 1502. From then until the birth, 22 contractions were observed, with intervals of 15-328 sec. During labor, the female frequently changed her position by alternately lying on her ventrum and side. When lying on her ventrum, she slightly arched her lower back during contractions, elevating her pelvic area and hind flippers 8-10 cm from the ground while slightly spreading her hind flippers. When lying on her side, she raised the upper hind flipper 6-8 cm from the lower hind flipper. As the contractions intensified during the later stages of labor, the seal also stretched her body forward with the contractions. She occasionally moved along the beach for short distances and emitted low-pitched "moaning" vocalizations or low guttural growls, which were similar to vocalizations often emitted by mothers to attract their pups. The seal vocalized at a Laysan albatross (*Diomedea immutabilis*) flying overhead. She also thrust her head towards one of the basking turtles and vocalized at both turtles several times, after which one entered the water.

Dilation of the vaginal aperture was first observed 15 min before parturition. The seal lay on her side, with the amniotic sac protruding approximately 5 cm. Six minutes later, amniotic fluid was expelled, and 10-12 cm of the amniotic

sac was visible. The sac was withdrawn briefly 6 min before parturition; 25% and then 30–50% of the sac protruded from the vaginal aperture 1 and 2 min later, respectively. The seal repositioned to lie on her ventrum with her hind flippers draped over a small berm and angled slightly downward at the water's edge. The pup, enclosed in the amniotic sac, was expelled at 1527.

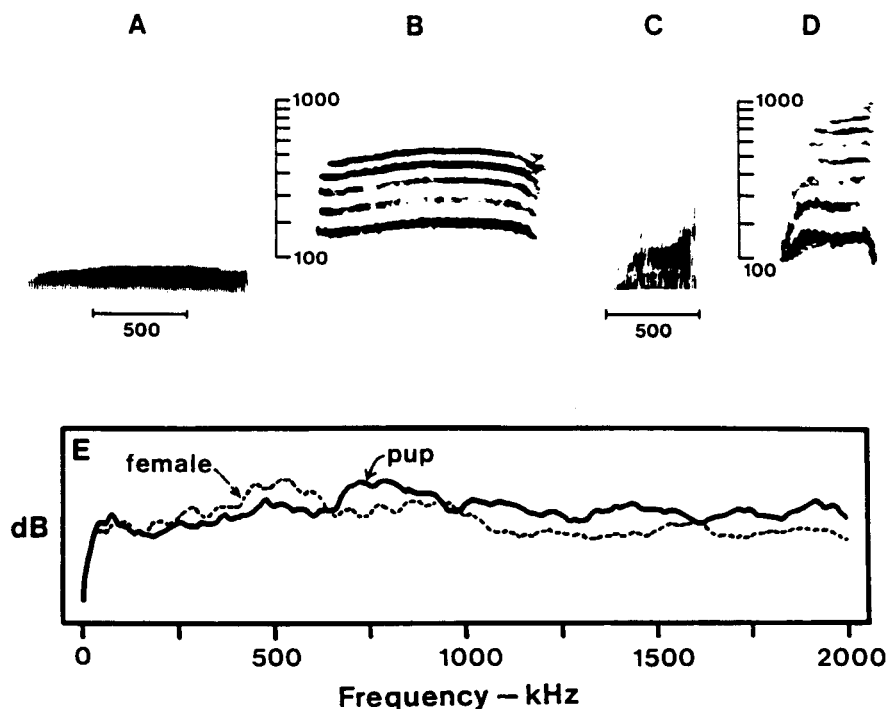
Presentation was caudal. The umbilicus separated and amniotic sac broke away from the pup as the pup was expelled into the breaking waves. The mother immediately turned, aggressively bit her pup, and vocalized. We saw no evidence of injury to the pup during this interaction. When a wave washed the pup against its mother, she nosed her pup for the first time. The pup then emitted its first vocalization, an abrupt bleat.

After a brief interruption from 1530 to 1533, observations continued until 1818. During this period, waves repeatedly separated the mother-pup pair and rolled the pup back and forth at the shoreline. The mother rolled onto her side and the placenta partially emerged 22 min postpartum; however, it remained attached for an additional 14 min. She presented her ventrum toward the pup 29 min postpartum, presumably to solicit nursing. She presented an additional seven times; however, no suckling occurred. Vocalization by the mother was associated with presentation five out of eight times, and nosing by either the mother or pup was associated with presentation four out of eight times. The mother lunged toward her pup 14 more times, 5 of which involved aggressive biting. She also hit the pup with her foreflipper on five different occasions while presenting to the pup and purposely or inadvertently "restrained" the pup nine times by resting her foreflipper, head, or body over the pup. The pup struggled unsuccessfully to free itself from under its mother and bit her on the muzzle during one period of restraint. The mother nosed her pup 93 times, and the pup nosed its mother 39 times. The total number of nose contacts by either the mother or pup for each 15-min period after birth ranged from 5 to 24 and showed no relationship with time; however, the pup was repeatedly washed away from its mother by breaking waves.

The mother-pup pair was approached by swimming seals seven times during the observation period. The mother usually vocalized and nosed her pup when the seals approached; however, once she lunged at the pup and vocalized. The approaching seal fled in each case.

Sound spectrograms of the mother and pup vocalizations are presented in Figure 1. Tape recordings were made with a Nagra IS<sup>1</sup> tape recorder and a Sennheiser MKH816 "shotgun" microphone with Scotch audio tape 208, at a speed of 19 cm/sec. Signals were digitized at a rate of 10,000 Hz, and a Hamming window was used, pre-emphasis (factor, 0.98), low smoothing (*i.e.*, incorporating four bins on either side of the current bin) and 1,024 points for each analysis. The duration of each sample was 102.4 milliseconds (1,024/10,000 Hz). The mother's calls were loud low-frequency "bawls," each about 1 sec long. Pup calls were weaker, higher pitched, and spanned a broader frequency range.

<sup>1</sup> Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.



**Figure 1.** Analysis of vocalizations of a female monk seal and her newborn pup. (A) Sound spectrogram of a female call analyzed over the range 40–4,000 Hz, with analyzing filter bandwidth of 150 Hz and linear frequency scale. Time marker, 500 milliseconds. (B) Sound spectrogram of same call, analyzed over the same range, with analyzing filter bandwidth of 22.5 Hz and logarithmic frequency scale (in Hz). (C) Sound spectrogram of pup call, analyzed as in A. (D) Sound spectrogram of pup call, analyzed as in B. (E) Power spectra of 102 millisecond segments from central parts of preceding calls. The two calls were recorded under different conditions; therefore, their sound levels are not comparable.

Both mother and pup continued to vocalize throughout the observation period. The pup vocalized several times when “restrained” by its mother, and intermittently as it struggled against the breaking waves. Pup calls often followed the mother’s calls and vice versa. Nosing by either the mother or pup also occurred frequently before or after the calls.

The birth of a male pup was witnessed by four observers located 25 m away from the parturient female, at Laysan Island (25°42’N, 171°44’W) on 28 April 1985. Two days earlier, the female had hauled out and then remained in the vicinity of her parturition site. She was checked intermittently for signs of labor. The interval between the 1984 and 1985 parturition dates for this female was 376 days. At 0800 labor was not evident. When the female was checked at 0930 contractions were observed. The seal lay on her right side, approximately 8 m from the water. An adult male seal was near the water approximately 10 m away.

Table 1. Summary of observed *Monachus schauinslandi* births (FFS = French Frigate Shoals).

Observations	Ruehle and Johnson (unpublished data)	Johnson and Johnson (1978)	Kam (personal communication)	Deutsch (personal communication)	Alcorn (1984)	Johanos and Kam (1986)	FFS 1985 (this study)	Laysan Island 1985 (this study)
Date	2 Mar. 1977	1977	5 May 1982	12 May 1982	1982	13 May 1983	24 Apr. 1985	28 Apr. 1985
Island	Kure	Laysan	Laysan	East, FFS	Laysan	Lisianski	East, FFS	Laysan
Observation time	1012-1245	—	2325-0021	0742-0805	—	—	1502-1818	1001-1050
Birth time	1013	1830	2325	0747	—	1440-1503	1527	1007
Entire birth observed?	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Position	Lateral	—	Lateral	Lateral	—	—	Ventral	Lateral
Vaginal dilation <sup>a</sup>	—	—	—	—	—	—	15	3
Pup presentation	Cephalic	Caudal	Cephalic	Cephalic	—	—	Caudal	Cephalic
Labor duration <sup>b</sup>	—	30	55 <sup>c</sup>	—	—	—	58 <sup>d</sup>	37 <sup>d</sup>
Delivery duration <sup>e</sup>	—	—	—	3-5	—	—	15	1
Amniotic sac broke	At birth	—	Before birth	At birth	—	—	9 <sup>a</sup>	At birth
Placenta expelled <sup>f</sup>	At birth	—	—	—	—	—	22	8
Umbilicus broke <sup>f</sup>	5	—	45	1-6	43	0-23	At birth	At birth
Female vocalize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pup vocalize	—	Yes	Yes	Yes, once	—	Yes	Yes	Yes
Nursing presentation <sup>f</sup>	19	—	—	—	—	—	29	21
Nurse <sup>f</sup>	47	90 <sup>d</sup>	56 <sup>d</sup>	18-51	210 <sup>d</sup>	180 <sup>d</sup>	171 <sup>d</sup>	43 <sup>d</sup>

<sup>a</sup> Minutes before birth.

<sup>b</sup> Labor duration (in minutes) is the interval between the onset of observed labor contractions and birth.

<sup>c</sup> Maximum time.

<sup>d</sup> Minimum time.

<sup>e</sup> Delivery duration (in minutes) is the interval between first appearance of the amniotic sac and final expulsion of the pup.

<sup>f</sup> Minutes after birth.

Observations resumed at 1001. From then until the birth, the mean interval between contractions was estimated at 30 sec. During contractions, the seal flexed and elevated her pelvic area 10–20 cm from the ground, spreading her hind flippers. No other movements were observed, and no vocalizations were heard. Dilation of the vaginal aperture was first observed 3 min before parturition. The seal then became very restless; she looked around several times and emitted low-pitched guttural growls. Birth occurred at 1007: the pup's head emerged, covered by the amniotic sac. A few seconds later, the female lifted and twisted her hindquarters approximately 30 cm off the ground, expelling the pup. Labor lasted a minimum of 37 min. The interval between first emergence of the amniotic sac and birth was approximately 1 min.

Presentation was cephalic. As the pup was expelled, the amniotic sac tore immediately, exposing the pup's head. The mother vocalized repeatedly, using low-pitched guttural growls, and nosed the pup's muzzle. Two minutes postpartum, the pup crawled completely out of the amniotic sac and approached the mother's head. The umbilical cord was no longer attached to the pup.

The mother and pup nosed each other frequently. The female vocalized repeatedly at the pup and also at the adult male seal nearby. She had periodic contractions during this time, and the placenta partially emerged 8 min postpartum; however, it remained attached throughout the observation period. The pup emitted its first vocalization 12 min postpartum, after the mother and pup nosed each other. The mother rolled onto her side 21 min postpartum and presented her ventrum to the pup for the first time. She presented three more times, but the pup did not suckle, although it nosed her ventral area. Once, immediately preceding her presentation, the mother used a single motion of her foreflipper to flip the pup from her head region to her nipple area. At no time did the mother lunge at or bite her pup. Observations ended at 1050.

Although these two births were observed during daylight hours, many monk seal births apparently occur at night. Approximate times of parturition were determined in 29 births at French Frigate Shoals from 1983 to 1985 by searching for newborn pups during morning and evening island patrols, periodic censuses, and miscellaneous observations. Twenty-one of these births (72%) most likely occurred at night or early in the morning (J. Eliason, J. Henderson, and M. Webber, unpublished data). Five out of nine births probably occurred at night on Lisianski Island in 1983 (Johanos and Kam 1986).

A summary of all completely and partially observed births reported for the Hawaiian monk seal is presented in Table 1. Based on a limited number of observations, a typical monk seal birth can be described as follows: Labor begins sometime during the night or early morning, the pup is expelled head first while the female lies on her side, and the amniotic sac and umbilicus break at birth or shortly thereafter. The mother and pup exchange frequent vocalizations, and the pup does not nurse immediately after birth.

#### ACKNOWLEDGMENTS

We gratefully acknowledge the following: the staff of the U.S. Fish and Wildlife Service, Hawaiian Island National Wildlife Refuge, E. H. Miller for taping and analyzing

---

the sonograms, and D. J. Alcorn, C. J. Deutsch, A. M. Johnson, A. K. H. Kam, and J. Ruehle for providing information on previous births.

#### LITERATURE CITED

- ALCORN, D. J. 1984. The Hawaiian monk seal on Laysan Island: 1982. U.S. Department of Commerce, NOAA Technical Memorandum, National Marine Fisheries Service, NOAA-TM-NMFS-SWFC-42. 32 pp.
- JOHANOS, T. C., AND A. K. H. KAM. 1986. The Hawaiian monk seal on Lisianski Island: 1983. U.S. Department of Commerce, NOAA Technical Memorandum, National Marine Fisheries Service, NOAA-TM-NMFS-SWFC-58. 37 pp.
- JOHNSON, B. W., AND P. A. JOHNSON. 1978. The Hawaiian monk seal on Laysan Island: 1977. U.S. Department of Commerce, National Technical Information Service, Springfield, Va., PB-285-428. 38 pp.
- JULIE J. ELIASON, THEA C. JOHANOS AND MARC A. WEBBER, Southwest Fisheries Center Honolulu Laboratory, National Marine Fisheries Service, NOAA, Honolulu, Hawaii 96822-2396. Present address of JJE: U.S. Fish and Wildlife Service, P.O. Box 70, San Simeon, California 93452. Present address of MAW: Department of Ornithology and Mammalogy, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118. Received May 22, 1989. Accepted November 14, 1989.
-