

Hydrodamalis gigas. By Ann Forsten and Phillip M. Youngman

Published 25 May 1982 by The American Society of Mammalogists

Hydrodamalis Retzius, 1794

Hydrodamalis Retzius, 1794:292. Type species *Manati gigas* Zimmermann.

Rytina Illiger, 1811:64. Type species as above.

Nepus Fischer von Waldheim, 1814:641. Type species as above.

Stellerus Desmarest, 1822:510.

CONTEXT AND CONTENT. Order Sirenia, Family Dugongidae, Subfamily Hydrodamalinae. There is one late Pliocene species and one extinct Pleistocene-Recent species in the genus.

Hydrodamalis gigas (Zimmermann, 1780)

Steller's Sea Cow

Manati gigas Zimmermann, 1780:416. Type locality Bering Island, Commander Islands, Bering Sea.

Trichechus manatus var. *borealis* Gmelin, 1788:61. Type locality as above.

Manati balaenurus Boddaert, 1785:173, see above.

Hydrodamalis Stelleri Retzius, 1794:292, see above.

Stellerus borealis Desmarest, 1822:510, see above.

Hydrodamalis gigas Palmer, 1895:449, see above.

(For other synonyms see Domning, 1978.)

CONTEXT AND CONTENT. As given above. All diagnoses of above authors are based on the reports of Steller (1751, 1899) as is the following account, unless otherwise stated.

DIAGNOSIS. Largest of the Recent sirenians (double the length of any living species); head small relative to body; functional teeth absent; phalanges absent; anterior margin of ascending ramus of mandible forming angle of 90° with body of bone (Fig. 1); fluke horizontal with notch. Skin extremely thick.

GENERAL CHARACTERS. Total length of an adult female was 7.52 m. The mounted skeleton of a young male in the Zoological Museum, University of Helsinki, measures 5.3 m. Color was brownish-black; some individuals had white patches or streaks. Skin with thick, uneven epidermis. Hair was sparse on body (Brandt, 1871). Stiff, white, hollow bristles were abundant on lips and inner side of flippers. The single pair of mammae was axillary. Nostrils were round, open, and 38 mm apart. Eyes were small, black, round, and situated midway between tip of nose and ear opening. Eyelashes were absent; a functional nictitating membrane was present. Ear opening was minute, and there was no external pinna. Forelimbs were about 67 cm long, and lacked claws or nails. Bones were compact (pachyostotic). Anatomical descriptions were given by Brandt (1833, 1846, 1862a, 1868, 1974), Kaiser (1974), and Steller (1751, 1899). Illustrations appeared in Büchner (1891):Fig. 2), and a reconstruction was made (considered inaccurate by Domning, 1978) by Kleinschmidt (1951).

DISTRIBUTION. Steller's sea cow was limited to shallow waters off the Bering and Copper islands in the Commander Island Group, Bering Sea. A rib was found on Attu, 350 km E of Bering Island (Brandt, 1861). For a detailed discussion see Domning (1978).

FOSSIL RECORD. Late Pleistocene fossils of *Hydrodamalis gigas* are known from Monterey Bay, California (Jones, 1967) and from Amchitka Island (Whitmore and Gard, 1977). The following account is from Domning (1976). Fossil Hydrodamalinae are known from the middle Miocene to the upper Pleistocene. The earliest recognized hydrodamaline was derived from the halitheriines. The hydrodamaline lineage, comprising a single evolving panmictic population, was characterized by size increase, loss of teeth, and loss of phalanges. Changing food resources and habitat, resulting from late Tertiary climatic-cooling

and marine transgression on the west coast of North America were probably the principal selective forces in the evolution of new morphological adaptations. See Domning (1978) for a more detailed discussion of hydrodamaline evolution.

FORM. Steller's sea cow has been called the bark animal because of the rough appearance of its skin. According to Steller (1751, 1899) the epidermis and dermis were 25.4 mm and 4.32 mm thick, respectively. They were underlain by up to almost 229 mm of fat. Long (10 to 12.7 cm), stiff, unpigmented bristles were located on the muzzle and short (3.8 cm) interlacing bristles grew between the lips. Skin on the back was almost smooth, whereas that on the sides was very rough, with crater-like borings of ectoparasites in vertical ridges along the body. Haffner (1957) described and figured a sample of skin in the Hamburg Zoological Museum. Domning (1978), however, believed that this description referred to misidentified whale skin. A large sample of skin is on exhibition in the Zoological Institute in Leningrad.

Selected measurements (in mm) are: condylobasal length of skull, 638 to 722 (n = 12); zygomatic width, 324 to 373 (n = 17); length of jaw, 432 to 491 (n = 14) (Heptner, 1974). The premaxilla was large and downturned; nasal basin on top of skull extended past the eye opening; zygomatic arches were heavy, and braincase was small (volume 1,757 cm³) (Kleinschmidt, 1951). Mastication was by keratinized pads, one each in the rostral areas of upper and lower jaws. Masticatory pads were white, 186 mm long, 82 mm broad anteriorly, and boat-shaped. Upper and lower pads had corresponding V-shaped crests and valleys, between which the food was ground. The structure of the pads resembled that of the skin; pads consisted of vertical tightly packed, keratinized, tube-like cylinders 8 to 14 cm tall (Brandt, 1833, 1846, 1974).

Axial skeleton probably consisted of 7 cervical, 17 thoracic, 3 lumbar, 1 sacral and 34 caudal vertebrae (Brandt, 1846, 1974; Domning, in litt.). There were 17 pairs of ribs, 5 of which connected to the sternum. Ribs were large and clavicles were absent.

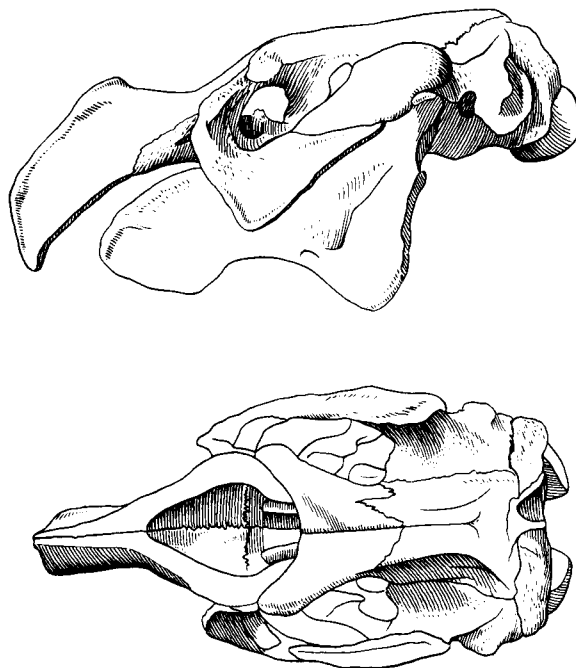


FIGURE 1. Dorsal and lateral views of cranium of Steller's sea cow. After Heptner (1974).

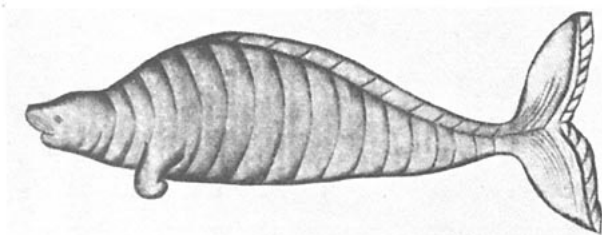


FIGURE 2. Drawing of Steller's sea cow (from Büchner, 1891).

The large scapula had a short acromion process. Pelvic bones were rod-shaped.

Muscle tissue was dark red and with thick fibers. The heart was large, broader than long, and weighed 15.8 kg; ventricles were deeply cleft. Coronary veins contained valves.

The glottis was tightly covered by the epiglottis. The trachea and bronchi were supported by a single spirally twisted cartilage. Lungs were long and broad. The short tongue did not reach the masticatory pads. The esophagus had longitudinal folds. The stomach was large; the inner wall was white and smooth, without folds. Cardiac and pyloric areas were evident. The cardiac portion had a large gastric gland that emptied into the stomach through several ducts. The pylorus was large and swollen. The intestine was 20.5 times longer than the body. The small intestine had a single, large caecum. A colic valve was absent. The large intestine was much longer than the small intestine. The anus was 10 cm wide. Feces were similar in appearance to those of horses. The liver consisted of two large lobes and one smaller anvil-shaped lobe. A gall bladder was absent; the bile duct was wide. The pancreas was small, with two lobes. Kidneys measured 81 cm long and were compound, with a renal pyramid in each part. Testes were abdominal. The penis was 81 cm long. The triangular-shaped vulva was located about 20 cm anterior to the anus. The clitoris was cartilaginous. The uterus was of the bicornuate type.

FUNCTION. Apparently Steller's sea cow was unable to submerge because of its extreme buoyancy (Domning, 1976, 1978; Stejneger, 1887). The sea cow lived in coastal waters where it was in danger of injury from rocks and ice. The thick, elastic skin may have prevented damage by abrasion.

ONTOGENY AND REPRODUCTION. Young animals were seen throughout the year, but probably most were born in the autumn. Copulation took place mainly in early spring. The gestation period was longer than 1 year. A single young was born. The milk was thick and sweet.

ECOLOGY. The defenseless sea cow probably had few enemies other than man. Steller (1751, 1899) reported a mass of white worms in the pylorus and in the duodenum. Amphipods lived in the epidermis, especially on the head around the eyes and ears, on the forelimbs, mammae, sexual organs, and anus, and in borings in the skin. Gulls sat on the exposed backs of the sea cows and ate the ectoparasites.

Sea cows occurred in shallow waters where they often congregated in herds. With their backs above water, they pulled themselves through rocky shallows with their hook-like forelimbs. They probably fed principally on algae such as *Nereocystis*, *Agarum*, *Alaria*, *Laminaria*, *Thalassiophyllum*, *Halosaccion*, and *Constantinea* (Domning, 1978; Voshinski in Heptner, 1974). After feeding, some sea cows slept on their backs.

When discovered in the 1700's, sea cows were already confined to only a few refugia (Brandt, 1862b). Steller (1751, 1899) erroneously thought that the population was considerably larger. In fact, sea cows were fairly numerous only at a few places off the coasts of Copper and Bering islands. Stejneger (1887) estimated the population at 1,500 to 2,000 individuals in 1741.

The sea cow became extinct only 27 years after Steller (1751) described the animal and compared its meat to beef and its fat to butter. A year after Steller returned from Bering Island, fur hunting parties setting out from Kamchatka for the Aleutian Islands and Alaska began dropping in on the Commander Islands to stock up on meat and fat. Soon more ships followed. Unlimited hunting pressure quickly led to the disappearance of the slow, peaceful sea cow. Off Copper Island, where the population was initially low, there were no animals left by 1754. Off Bering Is-

land, the last individual was killed in 1768 (Baer, 1840; Stejneger, 1884, 1887). Reports on later sightings have been refuted (Heptner, 1974; Stejneger, 1885). The sea cow was hunted with harpoons from boats. Often more individuals than needed for food were wounded or killed. In addition to the food value of the sea cow, the fat was used in lamps and the skin was used as soles in shoes and for building boats (Brandt, 1871).

BEHAVIOR. Sea cows spent most of their time feeding. Feeding animals lifted their heads to breathe every 4 to 5 minutes. The front limbs were used for picking algae, which were then grasped and cut by the interlacing bristles on the lips. The front limbs were also used for walking in shallow water, for swimming, for fending off from rocks, for defense against attackers, and for clasping the partner during copulation. By moving the fluke from side to side, the sea cow slowly advanced while grazing; strong vertical beating of the fluke advanced the animal more rapidly.

Sea cows lived in family groups consisting of a bull and cow with calf. Adults were monogamous. Feeding sea cows kept the young at the front of the herd, well surrounded on the flanks and rear. Steller (1751, 1899) observed indications of altruistic behavior; when one animal in a grazing herd was wounded by a harpoon the others gathered around and gave assistance. When one cow was caught her bull followed and lay 3 days near the beach where she had been killed.

The sea cow was almost mute, making only deep breathing sounds when coming up for air and loud moaning sounds when wounded.

Copulation occurred mostly in the evening, in still weather.

REMARKS. We wish to express appreciation to Dr. Daryl P. Domning who commented on an earlier draft of this report.

LITERATURE CITED

- Baer, K. E. von 1840. Untersuchungen über die ehemalige Verbreitung und die gänzliche Vertilgung der von Steller beobachteten nordischen Seekuh (*Rytina*, Ill.). Mém. Acad. Sci. St.-Petersbourg, 5(2):53-80.
- Boddaert, P. 1785. *Elenchus animalium*. Rotterdam, 1:1-174.
- Brandt, A. T. 1871. Ueber die haut der nordischen Seekuh (*Rhytina borealis* Ill.). Mém. Acad. Sci. St.-Petersbourg, 17(7):1-28.
- Brandt, J. F. 1833. Ueber den Zahnbau der Steller'schen Seekuh (*Rhytina stelleri*), nebst Bemerkungen zur Charakteristik der in zwey Unterfamilien zu zerfallenden Familie der pflanzenfressenden Cetaceen. Mém. Acad. Sci. St.-Petersbourg, 2(6):103-118.
- 1846. *Symbolae sirenologicae, quibus praecipue Rhytinae historia naturalis illustratur*. Mém. Acad. Sci. St.-Petersbourg, 7(2):1-160.
- 1861. Rapport sur un memoire qui, en traitant l'osteologie Comparée de la Rhytine, constitue la second partie de mes *Symbolae Sirenologicae*. Mélanges Biol. Bull. Acad. Sci. St.-Petersbourg, 4:75-77.
- 1862a. Bemerkungen über die Zahl der Halswirbel bei der Sirenien. Mélanges Biol. Bull. Acad. St.-Petersbourg, 4:125-128.
- 1862b. Bemerkungen über die Verbreitung und Vertilgung der *Rhytina*. Mélanges Biol. Bull. Acad. Sci. St.-Petersbourg, 4:259-268.
- 1868. *Symbolae sirenologicae*. Fasc. II et III. Typis Acad. Imperialis Scientiarum Petropolitanae, Petropoli 1861-1868, 384 pp.
- 1974. Contributions to sirenology, being principally an illustrated natural history of *Rhytina*. Nolit, Belgrade, for Smithsonian Inst. and National Science Foundation, U.S. Dept. Commerce Natl. Tech. Inform. Serv. Publ. No. TT 72-56004:1-122. (Transl. of Brandt, 1846, by Allison Barlow)
- Büchner, E. 1891. Die Abbildungen der Nordischen Seekuh [*Rhytina gigas* Zimm.]. Mém. Acad. Sci. St.-Petersbourg, 38(7):1-24.
- Desmarest, A. G. 1822. *Mammalogie ou description des espèces de mammifères*. Encyclopédie Methodique, Paris, 556 pp.
- Domning, D. P. 1976. An ecological model for late Tertiary sirenian evolution in the North Pacific Ocean. *Syst. Zool.*, 25:352-362.
- 1978. Sirenian evolution in the North Pacific Ocean. *Univ. Calif. Publ. Geol. Sci.*, 118:1-176.
- Fischer von Waldheim, G. 1814. *Zoognosia, tabulis synopticis illustrata*. Nicolai S. Vsevolozsky, Moskva, 3:1-694.

- Gmelin, J. F. (ed.) 1788. Caroli Linné . . . systema naturae . . . decima tertia, aucta, reformata, Impensis Georg. Emanuel Beer, Lipsiae, 1:1-232.
- Haffner, K. von 1957. Konstruktion und Eigenschaft der Haut der vor Jahren ausgerotteten Steller'schen Seekuh (*Rhytina stelleri* Retz). Verh. Deutschland Zool. Ges./Zool. Anzeiger, Suppl. Band 20, 1956:312-316.
- Heptner, V. G. 1974. Unterordnung Tricheciformes Hay 1923, eigentliche Sirenen . . . Pp. 30-51, in Die Säugetier der Sowjetunion (V. G. Heptner and N. P. Naumov, eds.). Gustav Fischer Verlag, Jena, 2:1-1006.
- Illiger, C. 1811. Prodromus systematis mammalium . . . Berolini (=Berlin), 302 pp.
- Jones, R. E. 1967. A *Hydrodamalis* skull fragment from Monterey Bay, California. J. Mamm., 48:143-144.
- Kaiser, H. E. 1974. Morphology of the Sirenia. S. Karger, Basel, 76 pp.
- Kleinschmidt, A. 1951. Über ein Skelet und eine Rekonstruktion des äusseren Habitus der Riesenseekuh, *Rhytina gigas* Zimmermann 1780. Zool. Anzeiger, 146:292-314.
- Palmer, T. S. 1895. The earliest name for Steller's sea-cow and dugong. Science, 2(1895):449-450.
- Retzius, A. J. 1794. Anmärkning vid genus Trichechi. Kungl. Sve. Vetenskapsakad. Nya Handl., 15:286-300.
- Stejneger, L. 1884. Contributions to the history of the Commander Islands. No. 1. Notes on the natural history, including descriptions of new cetaceans. Proc. U.S. Natl. Mus., 6:58-89.
- 1885. Contributions to the history of the Commander Islands. No. 2. Investigations relating to the date of the extermination of Steller's sea-cow. Proc. U.S. Natl. Mus., 7:181-189.
- 1887. How the great northern sea-cow (*Rhytina*) became exterminated. Amer. Nat., 21:1047-1054.
- Steller, G. W. 1751. De Bestiis Marinis. Novi Commentarii Acad. Sci. Imp. Petropoli, 2:289-398.
- 1899. The beasts of the sea. Pp. 179-201, in The fur seals and fur-seal islands of the North Pacific Ocean (D. S. Jordan, ed.). Gov. Printing Office, 629 pp. (Abridged transl. of Steller, 1751, by W. and J. E. Miller)
- Whitmore, F. C., Jr., and L. M. Gard, Jr. 1977. Steller's sea cow (*Hydrodamalis gigas*) of late Pleistocene age from Amchitka, Aleutian Islands, Alaska. U.S. Geol. Surv. Prof. Paper, 1036:1-19.
- Zimmermann, E. A. 1780. Geographische Geschichte des Menschen und der Allgemein verbreiteten vierfüssigen Thiere, II. Weygandschen Buchhandlung, Leipzig, 432 pp.

Principal editors for this account were DANIEL F. WILLIAMS and SYDNEY ANDERSON. Managing editor was TIMOTHY E. LAWLOR.

A. FORSTEN AND P. M. YOUNGMAN, ZOOLOGICAL MUSEUM, UNIVERSITY OF HELSINKI, P. RAUTATIEKATU 13, SF-00100 HELSINKI 10, FINLAND AND NATIONAL MUSEUM OF NATURAL SCIENCES, NATIONAL MUSEUMS OF CANADA, OTTAWA, ONTARIO, CANADA K1A 0M8.