MAMMALS OF THE SEA

BIOLOGY AND MEDICINE

Edited by

SAM H. RIDGWAY

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MAMMALS OF THE SEA
Biology and Medicine

This book is dedicated to

TUFFY

the singularly unique *Tursiops truncatus*
from whom we learned so much—truly
the most purposeful porpoise.

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SAM H. RIDGWAY

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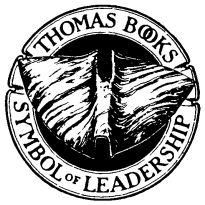

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These men are scientists and managers who in the late 1950's and early 1960's stimulated the United States Navy to undertake research with dolphins and other marine mammals. This research directly or indirectly made most of this book possible.

PREFACE

The first International Symposium on Cetacean Research was held in Washington, D.C., in 1963. During the session on practical problems, both Dr. Kenneth S. Norris, who chaired the meeting, and F. G. Wood, who chaired that particular session, suggested that I try to establish an information exchange regarding medical care and husbandry among persons working with marine mammals. An effort was made to start such a data clearinghouse, but it failed quite miserably.

In the years since the first symposium, biomedical information has developed fairly rapidly; thus, when Mr. Payne Thomas contacted me about the need for a monograph in this field, I was eager to see if a useful text could be developed to fill the practical need for information and at the same time serve as a valuable reference for scientists, teachers, and students.

Therefore, we set out to cover the basic biological and medical sciences as they relate to marine mammals rather than to develop an advanced treatise on current research in the field. The contributors were chosen because of their capability and willingness to cover a specific area.

I felt that the text should contain a brief introduction to each species of marine mammal, giving certain basic information about that species. I asked Dr. Masaharu Nishiwaki to cover the cetaceans, pinnipeds, and sirenians, and his introduction to these three orders appears as Chapter 1. At Dr. Nishiwaki's insistence, I asked Dr. Karl Kenyon, the world's foremost authority on the sea otter, to introduce that species in Chapter 2. In those chapters, we have included illustrations of all those species for which specimens or photographs have been available. We hope that these illustrations will be helpful in species identification, though age, sex, and individual variation must be taken into account when comparing them with the actual animal. We also hope that our scientific colleagues around the world will apprise us of any variations that they find between these illustrations and the animals that they observe in the field. The taxonomy of some groups of marine mammals continues to be a matter of controversy, and we have not tried to still that controversy in this work. Dr. Nishiwaki has classified the Pinnipedia, Cetacea, and Sirenia accord-

ing to the best evidence available today, but he is careful to point out that certain groups may have to be reclassified and others combined when more studies have been conducted with larger numbers of specimens.

Chapters 3, 4, and 5 deal primarily with anatomy and are designed to convey basic information about the structure of marine mammals, with special emphasis on structural detail required for identification of pathology. Chapters 6 and 7 deal with behavior, senses, and communication, with emphasis on those factors important in maintaining a colony of marine mammals. In Chapter 8, some new techniques for the evolutionary comparison of marine mammals are discussed, and current theories as to the origin of modern-day cetaceans and pinnipeds are reviewed.

Parasites appear to be the most important disease problem in wild populations of marine mammals and are therefore one of the first problems that must be dealt with in a captive group. Chapter 9 represents the first complete check list available on these parasites as well as a tabulation on host locality and a discussion of some of the more important genera. Chapter 10 is a discussion of the marine mammal and his aquatic environment. Here we provide information on our current state of knowledge concerning physiology, medicine, and husbandry and indulge in some speculation about the future.

Throughout this text we have been purposefully reckless in our use of the common terms porpoise and dolphin and we have employed them interchangeably in most cases. Following W. E. Schevill, we recognize no clear distinction between modern day Herringhoggidae and the dolphins of early Greek literature!

I am greatly indebted to many people who were helpful in this effort. Mr. Steve Leatherwood assisted in virtually every phase of the manuscript preparation. My wife, Jeanette, assisted with all the correspondence and manuscript preparation. Maria Ridge, Pam Hayslett, and Victoria Vargas typed the final manuscript, and Margaretta Fuller and Ruth Jackson helped with earlier drafts. I also want to thank many others for their assistance and valuable support. These include Mr. Bill Gilmartin, Mr. B. L. Scronce, Mr. M. F. Wintermantel, Mr. B. A. Powell, Mr. M. E. Conboy, Mr. F. G. Wood, Dr. C. Scott Johnson, Mr. George Anderson, Dr. Don Wilson, Capt. Charles B. Bishop, Mr. John Ropek, Mr. Stanley Marcus, Dr. Sam Rothman, Dr. Jack Collins, and Mr. H. B. Stone.

S.H.R.

CONTENTS

MAMMALS OF THE SEA
Biology and Medicine

Chapter 1

GENERAL BIOLOGY

MASAHARU NISHIWAKI

This chapter is intended to serve as an introduction and guide to the various species comprising the group of aquatic animals known collectively as the marine mammals. The following are the three basic taxonomic categories (orders) of marine mammals: Cetacea, which includes the porpoises (or dolphins), and whales; Pinnipedia, which includes seals, sea lions, and walruses; and Sirenia or sea cows. Another marine mammal, the sea otter, *Enhydra lutris,* a member of the order Carnivora, will be discussed separately (Chapter 2).

The morphological descriptions are included primarily to distinguish each species from others in the same genus. The more fundamental characteristics, those common to the genus, are included in the description of genus, family, or suborder. Illustrations are provided for all the species for which a specimen has been available. The scientific names are printed in italics, and when they appear for the first time are followed by the christener and the year of naming.

Relative body measurements are important for species identification, but since specific, detailed data is required only by specialists, little is included in this text. Mentions of body size usually refer to the size of the average adult, though there is occasional reference to maximum length. Where only a limited number of animals of a species have been accurately measured, the reported sizes represent an estimate based on the specimens available.

MEASUREMENTS

The measurements used by the author are as follows:

TOTAL LENGTH: Measurement in a line parallel to the body axis from the front tip of the rostrum to the notch at the posterior edge of the tail flukes.

HEAD AND BODY: Total length minus length of posterior appendages (not used for cetaceans).

MAXIMUM WIDTH OF SKULL: Generally, zygomatic breadth of pinnipeds, mastoid breadth of other species.

MAXIMUM WIDTH OF BRAINCASE: Cranial measurement above the zyomatic region.

UPPER CHEEK TEETH: Distance between anterior edge of upper cuspidate tooth and posterior end of last molar, measured either at the crown or alveolus of the tooth (method of measurement must be mentioned).

UPPER TOOTH ROW: Total length of the upper tooth row is generally measured from the anterior end of the first incisor to the posterior end of the last molar tooth. Cetacea are always measured at the alveolus. Because some species lack teeth on the upper jaw, the lower tooth row should also be measured and recorded.

LENGTH OF SKULL: Although the length of the skull is measured at three positions, the condylobasal length is most commonly used.

1. *Maximum condylobasal length.* The linear distance from the posterior surface of the occipital condyles to the anterior end of the maxillary (not including teeth). The condylobasal length in Cetacea is equivalent to the total length of the skull.
2. *Total length of the skull.* A linear measurement from the anterior to the posterior end of the skull, parallel to the body axis (teeth excluded).
3. *Basilar length.* A linear measurement from the front end of the foramen magnum to the posterior end of the central incisor tooth socket, parallel to the body axis (not applicable to cetaceans).

BODY MEASUREMENTS: These are all linear measurements and are taken parallel to the body axis.

1. Total length, from the tip of snout (upper jaw) to the notch in the tail flukes.
2. From tip of snout to center of blowhole.
3. From tip of snout to center of eye.
4. From tip of snout to gape (corner of mouth).
5. From tip of snout to anterior insertion of flipper.
6. From tip of snout to tip of flipper.
7. From ear opening to center of eye.
8. From notch of flukes to tip of dorsal fin.
9. From notch of flukes to center of anus.
10. From notch of flukes to center of the genital opening.
11. From notch of flukes to center of navel.
12. From notch of flukes to posterior end of ventral grooves.

FLIPPER:

1. From anterior insertion to tip of flipper.

2. From axilla to tip.
3. Maximum width.
4. From anterior insertion to tip around the curve.

DORSAL FIN:

1. Length of base (not necessarily parallel to the body axis).
2. Height.
3. From anterior insertion to tip around the curve.
4. Posterior insertion to tip around the curve.

TAIL FLUKE:

1. Total width (or spread) of flukes (straight line measurement).
2. From notch to tip of fluke (both sides).
3. From notch to nearest point on anterior border.
4. From notch to anterior insertion.

CLASSIFICATION OF VETEBRAL BONES: Derivation of the vertebral formula is based upon this classification.

1. *Cervical vertebrae* (C). The first seven vertebrae posterior to the skull. These are lacking rib attachment. The cervical vertebrae are fused in some species, completely free in others. When they are fused, the vertebra can be detected and counted by observing the number of nerve bundles arising from the spinal cord. Occasionally, the cervical vertebrae are found to have attached, but incomplete, bones. These are termed cervical ribs and are not considered to be true ribs.
2. *Thoracic vertebrae* (T). The vertebrae to which true ribs are attached. The first one to several ribs are generally joined to the sternum. The last rib is often a "floating rib" with no direct attachment to a vertebrae. For this reason it is easily overlooked. The number of thoracic vertebrae is equivalent to the number of rib pairs.
3. *Lumbar vertebrae* (L). The vertebrae to which neither ribs nor chevron bones attach. They are easily identified by their transverse processes.
4. *Caudal vertebrae* (Ca). The vertebrae to which the chevron bones attach. The chevrons serve as attachments for caudal muscles. Although the anterior chevrons are distinct and easily recognized, those associated with the most posterior vetebrae are difficult to distinguish. Further, many of those vertebrae lack attachment to ossified chevrons. For this reason, the number of caudal vertebrae is not equivalent to the number of chevron bones.

PHALANGEAL FORMULA: I and II refer to the first and second fingers respectively. Because it is difficult to separate the metacarpals, (generally one per finger) and phalanges, the number of bones indicated includes both type.

DENTAL FORMULA: There are a variety of ways to indicate dental formula. For example, odontocetes usually have a large number of uniform teeth and the author indicates the number of teeth by a formula such as, $\frac{22\text{-}27}{23\text{-}28}$. The numbers above the line refer to the teeth of the upper jaw, those below the line the teeth of the lower jaw. The range of individual variation is indicated for both upper and lower jaws.

CETACEA

There are three suborders of Cetacea: Archaeoceti, Mystacoceti, and Odontoceti. The first, represented from the Eocene (a specimen known as Zeuglodontia), Oligocene, and Miocene epochs, includes only extinct species and is not discussed in this chapter. The remaining two are distinguishable from each other primarily by their types of dentition and the structure of their skulls.

All species of Cetacea have teeth, at least in the gums, during the fetal period. In the Mystacoceti, however, those teeth never emerge from the gums, even after birth, but are replaced instead by baleen plates which emerge from the palatine ridges and serve as food collectors. Odontoceti, on the other hand, have no baleen and retain their teeth after birth. There are some species in which those teeth remain inside the gums throughout life and others in which the tooth shape and position differ between the sexes, the females having smaller teeth which sometimes do not emerge at all. Though some fossil Odontoceti have polyform teeth, most living species have uniform teeth. Unlike most other mammals, Odontoceti have permanent dentition and no milk teeth.

The living animals included in the order Cetacea range in size from 1 to 30 m and have the basic mammalian characteristics but unlike other mammals, including members of the order Pinnipedia and Sirenia, spend their entire lives in the water. In adapting to that completely aquatic life, their bodies have become generally spindle shaped and streamlined. Some have a dorsal fin, others do not. The forelimbs are transformed into fin-shaped flippers, and though a trace of rear limbs appears as a projection on the early developing fetus, the rear limbs have degenerated and cannot be observed externally after birth. The skin at the end of the tail has developed into a horizontally positioned swimming organ known as a fluke. Just under the epidermis there is a relatively thick blubber layer, formed of fat and dermis, which aids in maintaining body temperature and in reducing specific gravity. The nostrils have migrated to the top of the head, permitting the animals to breathe while swimming at full speed (examination of the skeleton shows that the nares actually open about the middle of the

face and that the forward elongation of the jaws causes the "overhead" appearance of the blowhole).

Fetuses of all cetacean species have hair on their snouts, like the rough or tactile hairs around the mouth of a dog or cat. Though most Odontoceti loose their external hairs soon after birth, Mystacoceti retain them as sensory organs throughout their lives.

Cetaceans have an extraordinarily well-developed skull, flexible backbones, and ten to twenty ribs. Odontoceti have a well-developed sternum, but Mystacoceti have a small sternum which is joined to only one or two pairs of ribs. (Considering this rather weak thoracic structure, it is not surprising that stranded baleen whales may suffocate under their own weight.) Whales lack clavicles. Except for the joint with the scapula, there is no moveable joint in the forelegs. There are always traces of pelvic bones, but those bones are not joined to vertebrae. Traces of femur and fibula are attached to the pelvic bone of some species of Balaenidae. At the anterior portion of the coccyx, the V-shaped chevrons are very distinctive. The vertebrae lie along the midline, but neither they nor any other bones extend into the tail flukes.

The gestation period of Mystacoceti is most frequently eleven months or slightly more; that of Odontoceti is generally a year or slightly more (sperm whales remain pregnant sixteen months). One pair of nipples is located at either side of the genital slit. There is one calf per pregnancy, and lactation continues for six to eighteen months.

Suborder Mystacoceti

The distinguishing characteristics of the suborder Mystacoceti are as follows:

1a.

1. Outer opening of nostril bipartite.
2. Teeth absent throughout life after birth.
3. Baleen plates present.
4. Convex profile of upper surface of skull (mainly maxillae and premaxillae).
5. Comparatively small sternum and poor skeletal construction of thorax.

Members of even the smallest species of this suborder reach a length of 6 m as adults. Although the fetus has teeth on both the upper and lower jaws, they are degenerated and absorbed by the time of birth and are replaced by from 150 to 400 baleen plates on the palatine ridges of an adult. The shape, color, and number of baleen plates vary according to species.

The skull is extraordinarily large, comprising one-third of the total body length in some species. The cervical vetebrae are fused in some species but separated in others. Only one or two pairs of ribs join the sternum. Although the bones of the rear legs are usually absent, some species of Balaenidae retain traces of femur and fibula. Even in those species, however, such bones never form any external legs except during fetal life. Generally, a cecum exists in members of this suborder. Baleen whales feed mainly on krill (small crustaceans), but some species also eat small pelagic fishes.

The three living families are Balaenidae, Eschrichtiidae, and Balaenopteridae.

Family Balaenidae

Some characteristics of Balaenidae are the following:

2a.

1. No ventral grooves or creases in skin of throat.
2. Head length more than one-fourth of total body length.
3. Maxillae, premaxillae, and vomer construct a long narrow arch.
4. Long and narrow baleen plates; more than two hundred plates on a side.
5. Seven cervicals all fused.

This family is characterized by very narrow, curved maxillary and premaxillary bones. There are baleens along the lower side of the maxillary. The condylobasal length of the skull relative to the total length increases as individuals grow, sometimes attaining over one-fourth of the total length. There are neither grooves on the abdomen nor throat creases. The three living genera are Balaena, Eubalaena, and Caperea, each represented by a single species. Some scientists unite genus *Balaena* and genus *Eubalaena* and form a separate independent family with genus *Caperea*.

Balaena

Some characteristics of *Balaena* are the following:

3a.

1. Size large, more than 15 m in body length.
2. No dorsal fin, flippers fairly large.
3. Baleen plates long and narrow (2.5 m and 30 cm respectively); more than three hundred plates on each side.
4. Five fingers in flippers.
5. Body color blueish gray with pale spots.
6. No bonnets (wart-like projections on skin).

Balaena mysticetus

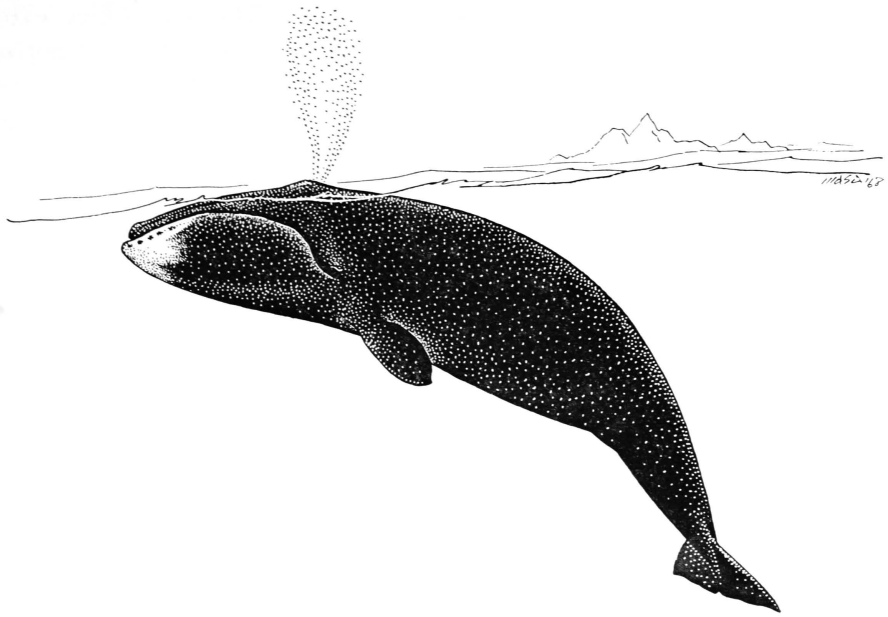

Figure 1–1. *Balaena mysticetus*, known as the Greenland right whale, named by Linnaeus in 1758.

OTHER COMMON NAMES: Bowhead, great polar whale, arctic right whale.

MORPHOLOGY: Greenland right whales are believed to reach a maximum body length of 20 m. Measurements of 30.3 to 30.6 m were once recorded, but later measurement of condylobasal length (which is approximately one-third of total length) of these two specimens confirmed that the reports were in error. These errors were probably caused by exaggeration or by measurement along the curve of the body. The valid measure of body length is the straight line from the tip of the maxillary to the notch in the tail flukes.

The body of these whales is generally blueish gray. Scoresby (1874) reported seeing a specimen in which the white portion (light coloring on underside) extended to the anterior part of the upper jaw. He also reported that some specimens are covered with white spots, that white or gray coloring predominates with old individuals, that the newborn are blue-black in color, and that the nursing young are pale blue to grayish blue. Many individuals have pale spots all over the body.

The flukes are about 6 to 8 m in width (total spread). The blowholes are located about 5 m behind the tip of upper jaw, near the highest point on the body. There are approximately 360 yellowish-white baleen plates, 35 cm wide and 3 m long, on each side.

The skull is very large (see Chapter 4). The maxillary and mandible are long and narrow but widen near the eyes. The mandibles extend forward along the lower edge of the lower jaw and are rather flat horizontally. The vertebral formula is C7 + T13 + L10–13 + Ca22–24 = 53–55. The phalangeal formula is I: 1, II: 3–4, III: 4–5, IV: 3–4, and V: 2–3. There is a trace of hind-leg bones.

DISTRIBUTION AND MIGRATION: This species is limited to the northern hemisphere. During the summer it is found in the Arctic Sea, but when the sea begins to ice over it moves southward in what is presumably not an extensive migration.

ABUNDANCE: This was the most important species in sixteenth and seventeenth century whaling and was abundant at that time. However, overwhaling has severely reduced the population, and at present, it is believed that only a few small groups exist near Greenland.

FOOD: The primary food is small plankton, mostly of the genus *Calanus* or *Copepoda*. The primary feeding ground appears to be near the icefields of the Arctic.

REPRODUCTION: Copulations occur in late summer, and adults accompanying young are frequently observed in spring. There is generally one fetus per pregnancy, but Scoresby (1874) reported seeing what appeared to be twins nursing and illustrated his observation.

Eubalaena

Some characteristics of *Eubalaena* are the following:

3b.

1. Size large, more than 15 m in body length.
2. No dorsal fin, flippers fairly large.
3. Baleen plates long and narrow (2.0 m and 30 cm respectively); less than 250 plates on each side.
4. Five fingers in flippers.
5. Body color blueish black with no pale spots.
6. Bonnets present.

Eubalaena glacialis

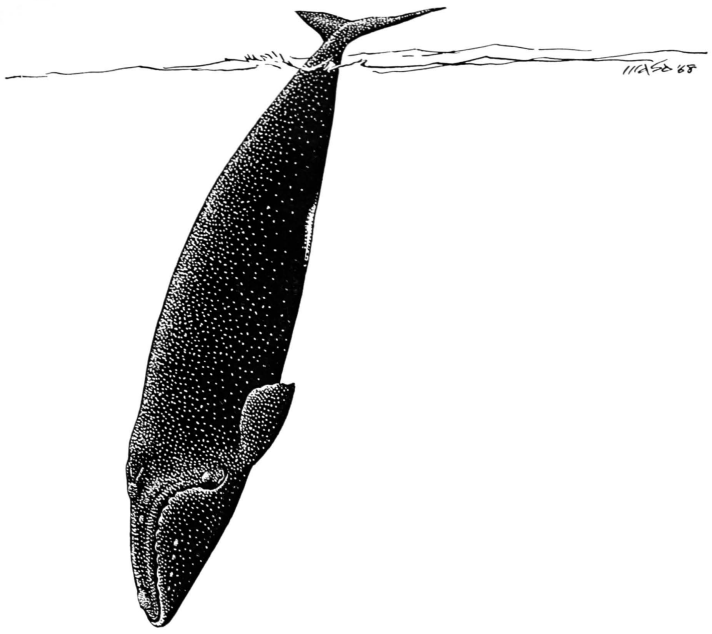

Figure 1–2. *Eubalaena glacialis,* known as the right whale, named by Borowski in 1781.

OTHER COMMON NAME: Black right whale.

MORPHOLOGY: This species is easily identifiable by its round and fat body and by the bonnets (large wart-like areas formed on the external skin) which are its most characteristic feature. The largest bonnet is located at the anterior of the upper jaw, and the next largest are found on both sides of the anterior portion of the lower jaw behind the blowhole. On the outside of the lower jaw, there is a series of several small, raised areas, each one of which is the base of an apparently tactile hair. The upper ridge of the lower lip is quite bumpy. The head comprises about one-fourth of the total length and the total spread of the tail flukes equals about 35 percent of the body length. Both maxillary and premaxillary are projected forward with a curve, forming an arch. The bristles of the olive black baleen plates are much rougher than those of *Balaena mysticetus.*

The maximum body lengths recorded to date are 16.5 m in the Atlantic and 17.8 m in the Pacific. The newborn are about 5 to 6 m long. The grayish blue body color of the young darkens with growth to the blueish black to black color of adults. White spots of irregular shape are often found on the abdomen near the navel. The tongue is thick, blueish gray in color and relatively smaller than that of other species of Mystacoceti. The mammillae are located at the inguinal region, and the mammary glands are very thick (as much as 10 cm even in immature females).

The testis, which may be only 1 to 2 kg in juveniles, may grow as large as 1,000 kg in weight in a fully matured breeding male. The blubber is very thick (as thick as 40 cm at the breast and heavy portion of back) and contains fat of good quality. The vertebral formula is C7 + T14–15 + L11–10 + Ca25 = 56–57. There are fourteen to fifteen pairs of ribs. The phalangeal formula is I: 3, II: 5, III: 6, IV: 4 (+1), and V: 4. The number of finger bones is subject to some individual variation.

DISTRIBUTION: In the southern hemisphere, *Eubalaena* are found south of 20°S and north of 50°S and in the northern hemisphere they are found between 20°N and 70°N in both the Pacific and Atlantic Oceans. Some inhabit the Arctic Sea. Since the distribution and migrations of this species in the Atlantic Ocean are often confused with those of the Greenland right whale, the northern limit of its distribution has not yet been determined.

ABUNDANCE: The abundance of *Eubalaena* in the southern hemisphere is unknown, but since reports of sightings of this species are very rare, they are considered very scarce. At present, slaughter of black right whales is prohibited by the International Whaling Convention. Sightings in the Pacific are more frequent than in the Atlantic. In the North Pacific, some animals are found north of the Bering Strait, in the Arctic Sea. The total world population is estimated to be from a few hundred to one thousand animals.

FOOD: This species is rather selective, feeding mostly on small copepods (*Calanus, Microcalanus, Pseudocalanus, Oithona,* and *Metridia*).

REPRODUCTION: Copulations have been observed from February to April, but the breeding season probably lasts about half a year. The gestation period is twelve months, and there is one fetus per pregnancy.

BEHAVIOR: Black right whales are slow swimmers. During their migrations they generally swim 2 or 3 knots (3.7 to 5.6 km/hr) and even when startled they swim no faster than 5 knots (9.3 km/hr). While swimming, they will blow two or three times per minute for several minutes and then make a longer and probably deeper dive for ten to twenty minutes. With each breath, two blows, one from each nostril, are visible to a height of 4 to 8 m above the animal. Although they may make deep dives, *Eubalaena* are not believed to dive as deeply as other species of Mystacoceti.

PARASITES: It was formerly believed that this species had a variety of external parasites. In recent studies, however, though two species of a parasitic whale lice were found all over the body, there were no acorn barnacles or ship barnacles. Black right whales simply do not migrate into warm water where the larvae of these barnacles are abundant.

MISCELLANEOUS: The length-weight relationship is as follows:*

* Based on data collected by the Japan Whale Research Institute since 1956.

Sex	Length	Body Weight (Excluding Blood and Feces)
F	11.7M	22,866kg
M	12.4	22,247
F	14.1	46,866
M	14.7	51,826
M	15.1	55,254
M	16.1	65,690
M	17.0	65,756
M	17.1	67,197

Caperea

Some characteristics of *Caperea* are the following:

3c.

1. Size small, less than 6 m in body length (smallest of the Mystacoceti).
2. Dorsal fin present, flippers small.
3. Four fingers in flippers.
4. Body color entirely black.
5. No bonnets.

Caperea marginata

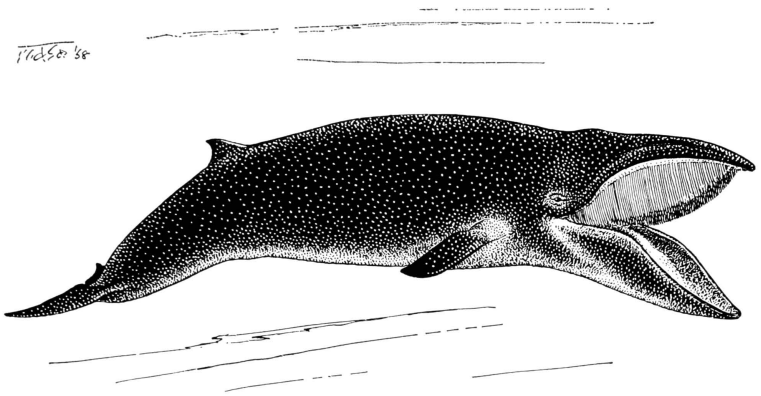

Figure 1–3. *Caperea marginata,* known as the pygmy right whale, named by Gray in 1846.

MORPHOLOGY: This species is placed in the family Balaenidae because of the following characteristics: the seven cervical vertebrae are all fused together, there are no throat grooves, the maxillary and premaxillary are projected in an arch shape, and the baleen is long in relation to its width.

This is the smallest of the Mystacoceti, reaching a maximum length of 6 m. In those specimens of which the body color has been described, the body is black with a pale abdomen. The baleen plates, numbering 230 on a side, are pale yellowish white with a brown fringe along the exterior edge. Therefore, when the row is observed outside, the baleen plates appear brown in color. The eyes appear black. The condylobasal length is about one-fourth of the total body length (123 to 496 cm in one speci-

men). Although a sternum is believed to exist, none has yet been described. The dorsal fin is about 15 cm high. The vertebrae are presumably C7 + T17 + L2 + Ca14–15 = 40–41. Seventeen pairs of ribs are attached to seventeen dorsal (or thoracic) vertebrae.

Although the internal organs of this species have not yet been studied extensively, the skelton indicates a relatively large mass of internal organs. In a 3.3 m specimen, the small intestine was 40 m long, twelve times the body length. The same specimen had a 1.7 m large intestine and unlike most cetaceans, a 20 cm cecum.

DISTRIBUTION: This species is limited to the southern hemisphere. Specimens have been reported washed onto beaches in Australia, New Zealand, South Africa, and South America.

FAMILY ESCHRICHTIIDAE

Some characteristics of Eschrichtiidae are the following:

2b.

1. No ventral grooves, but 2 to 4 furrows of skin are visible on the throat.
2. Head length comprises one-fourth to one-fifth of total body length.
3. Maxillae, premaxillae, and vomer slightly curved forward.
4. Baleen plates, yellowish white, thick and short; 140 to 180 plates on a side.
5. No dorsal fin, but several humps situated on dorsal surface of the tail stock.
6. Four fingers in flipper.
7. Seven cervical vertebrae all separated.

This family has only one genus, and that genus consists of but one species, *Eschrichtius gibbosus*, found at present only in the North Pacific.

Eschrichtius

Eschrichtius gibbosus

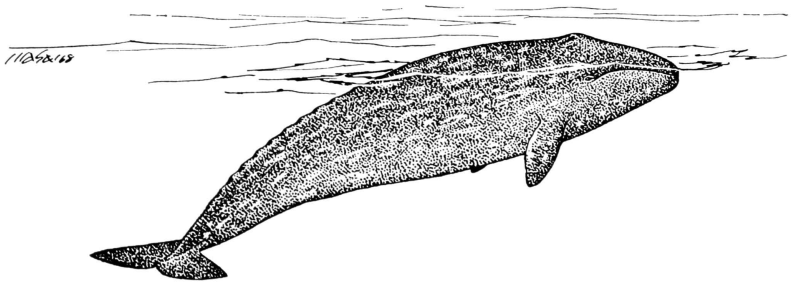

Figure 1–4. *Eschrichtius gibbosus*, known as the California gray whale, named by Erxleben in 1777.

MORPHOLOGY: In appearance, the genus Eschrichtius is midway between the Balaenidae and Balaenopteridae. The largest female ever recorded was 15.0 m, but the average is 12.7 m. The largest male recorded was 15.3 m, but the average is 12.2 m. In both male and female, the girth is largest around the base of the flippers and decreases towards the tail. The body is gray, dark gray or blueish gray.

The proportion of head to body length is relatively small. The skull of this species is wider than Balaenidae but narrower than Balaenopteridae. The maxillary projects forward with less of a downward curve than that of Balaenidae. Although there is no dorsal fin, there is a chain of seven to fifteen small bumps on the dorsum of the last one-third of the body. This chain of bumps starts around the intersection of the anus and continues to the base of the tail flukes. The tail flukes are of intermediate size, the tip-to-tip distance reaching one-fourth of the body length.

Most commonly two but sometimes four, grooves about 1.5 m long run along the throat parallel to the body axis. The half of the body posterior to the flippers is quite rough and is usually covered with injuries and scars from the animal's rubbing against sand, rock, and other objects. Those scars and the baleen plates are often covered with barnacles. Whale lice are also abundant.

The upper jaw has 140 to 180 baleen plates on each side. The baleen is light yellowish white, 40 to 50 cm long and has very rough, thick bristles. This species has many tactile hairs (more than any other species of whale) located at the upper and lower jaws and on the forehead near the blowhole. There are no bumps at the base of these hairs. The eyes are located just posterior to the angle of gape and are oval in shape. The upper eyelids are only slightly longer than the lower lids. Wrinkles above each eyelid form a circle around the eye. This may be due to the shape of the skull. The auditory openings are located about midway between the eyes and the anterior insertion of the flippers. The opening is large enough that one can put a pencil into it. The blowholes are located slightly behind the highest portion of the rostrum. The two holes form somewhat of a V shape with the apex in the anterior and the open portion at the posterior end. The tongue is narrow, thick, and salmon-pink with a gray tip. The blubber is generally 15 to 20 cm thick but may reach 35 cm in thickness over certain areas of the body. It is usually very light yellow but sometimes appears light pink.

The flipper has four fingers, often identifiable from outside by a difference in color between the skin over the finger bones and the skin between. That difference in skin color is natural in some individuals, but is often caused by abrasion of the finger parts. The first finger does not exist. The phalangeal formula is II: 3, III: 3, IV: 4 and V: 1. The vertebral formula