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Phocoena sinus.

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Phocoena sinus Norris and McFarland, 1958

Cochito

Phocoena sinus Norris and McFarland, 1958:24. Type locality "northeast shore of Punto San Felipe, Baja California Norte, Gulf of California, Mexico."

CONTEXT AND CONTENT. Order Cetacea, Suborder Odontoceti, Superfamily Delphinoidea, Family Phocoenidae. Four species are included in the genus. No subspecies are recognized in *P. sinus*.

DIAGNOSIS. Norris and McFarland (1958) reported that *P. sinus* is distinct from *P. phocoena* as follows: "In [*P.*] *sinus*, 1) cranium smaller in adult, with a relatively much broader and shorter rostrum; 2) basicranial axis deflected downward at a greater angle, in relation to the horizontal axis of the rostrum; 3) foramen magnum relatively larger; 4) maxillary bone not entering the orbit but excluded from it by the lateral margin of the frontal bone, instead of completely covering lateral margin of frontal and entering the orbit; 5) maxillary leaving a relatively larger exposure of dorsal aspect of frontal bones, where the latter contact the supraoccipital; 6) antero-ventral extension of nasals bones covered by mesethmoid; 7) posterior edge of the palate with medial U-shaped indentation, formed of the medial edges of the rounded, roughly triangular pterygoid bones and the ventral extension of the vomer, which enters the palate just posterior to the palatine bones. In [*P.*] *phocoena* the posterior edge of the palate has a W-shaped indention, formed by the pointed, usually acutely triangular pterygoid bones and a central, pointed extension of the palatines, which sometimes cover the ventral extension of the vomer completely, but more often leave it as a small point of bone at their apex; 8) lower maxillary and mandibular tooth count." The general external morphology of *P. sinus* is similar to *P. phocoena*, but *P. sinus* differs as follows: 1) total length smaller; 2) proportionately larger flippers, with posterior border more concave; and 3) proportionately higher dorsal fin, with a more concave posterior border.

GENERAL CHARACTERS. Descriptions of skulls of *P. sinus* may be found in Noble and Fraser (1971) and Orr (1969). The only description of the postcranial elements is that of Noble and Fraser (1971). Photographs and drawings of skulls are found in Noble and Fraser (1971) and Norris and McFarland (1958). The skull is illustrated in Fig. 1 and the left and right tympanic bullae and periotics are shown in Fig. 2.

External measurements (in mm) from two specimens (SDNHM 20688 and LACM 28259) are given below (Brownell, in press). The measurements of the specimen in the San Diego Natural History Museum are presented first, followed by the specimen in the Los Angeles County Museum of Natural History. All measurements of more than 100 mm were rounded to the nearest 5 mm. Total length (tip of upper jaw to fluke notch) 1,390, 1,500; tip of upper jaw to gape, 80, 65; to center of eye, 135, 105; to blowhole, 140, 105; anterior insertion of flipper, 260, 265; to tip of dorsal fin, 805, 840; and to center of anus, 960, 1,050; length of right flipper, anterior insertion to tip, 270, 280; axilla to tip, 190, 215; and maximum flipper width, 85, 100; height of dorsal fin, tip to base, 115, 155; length of dorsal fin base, 160, 180; flukes, width tip to tip, 370, 370; nearest point of anterior border to fluke notch, 100, 105; and depth of fluke notch, 20, 20. Body proportions of *P. sinus* are closer to those of *P. spinipinnis* than of *P. phocoena*. An external view of *P. sinus* is shown in Fig. 3.

Little is known about the color pattern of *P. sinus*, but a flipper stripe is present. It is widest at the anterior insertion of the flipper, and is thinner anteriorly. A narrow component of the flipper stripe extends from the flipper insertion dorsally to the axilla (see Fig. 3).

DISTRIBUTION. Norris and McFarland (1958) gave the range of *P. sinus* as "certainly occurring in the upper Gulf of California and probably extending south along the Mexican coast" but they questioned the reliability of *P. sinus* occurring outside the Gulf of California. There are two reports of *Phocoena* outside of

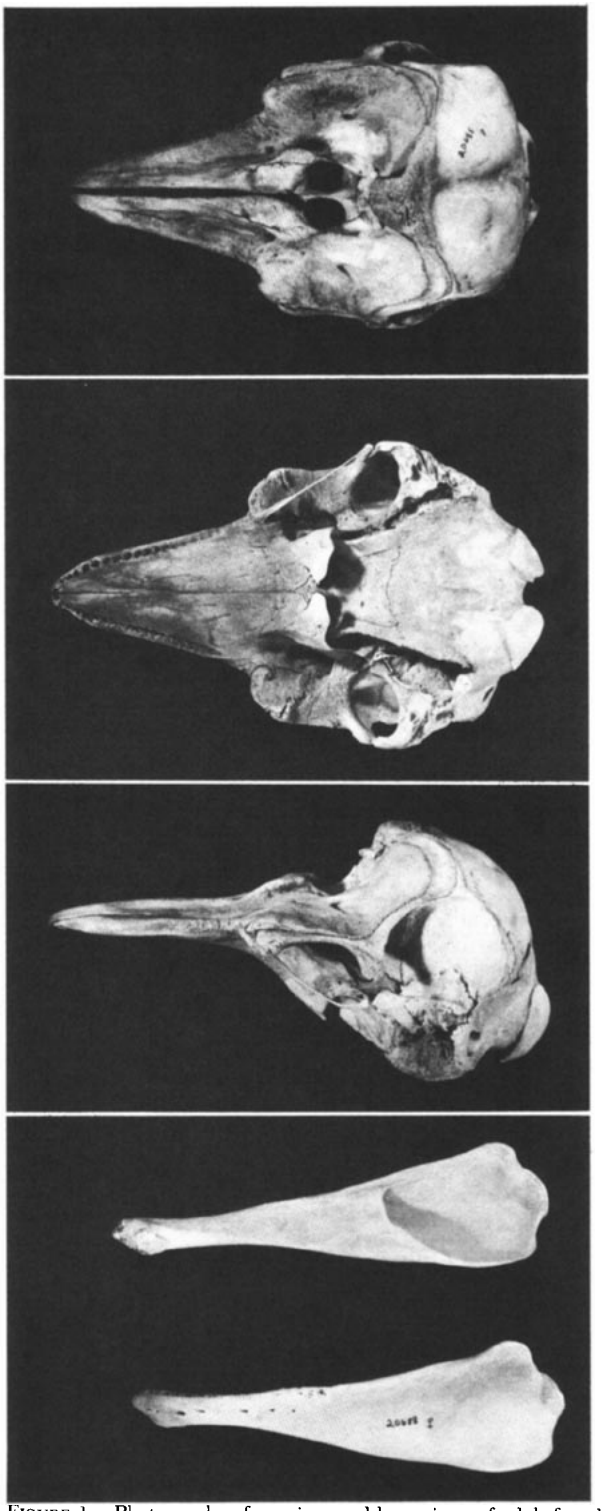

FIGURE 1. Photographs of cranium and lower jaws of adult female *Phocoena sinus*, SDNHM 20688, found on 24 April 1966 approximately 24 km N San Felipe, Baja California Norte, Mexico. From top to bottom, dorsal, ventral, and lateral views of cranium, and medial and lateral views of lower jaws. Condylobasal length is 232 mm; mandible length is 171 mm.

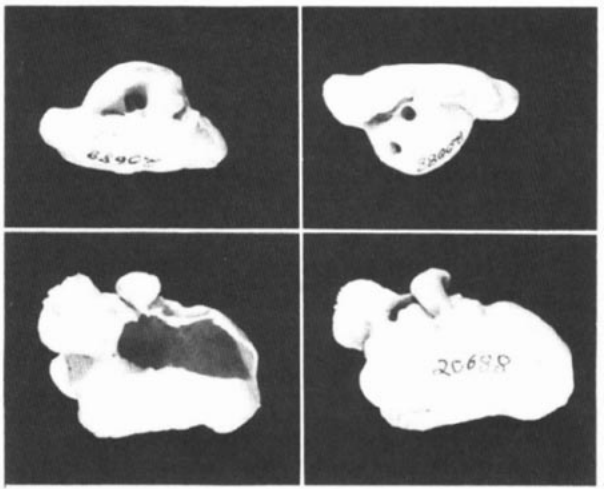

FIGURE 2. Tympanic bullae and periotics of *Phocoena sinus* (SDNHM 20688): dorsal view of left periotic (upper left); ventral view of right periotic (upper right); dorsal view of left bulla (lower left); ventral view of right bulla (lower right).

the Gulf: Scammon (1874) reported seeing this genus in Banderas Bay, Jalisco, and in the estuary of the Piginto River, Jalisco, Mexico; Nelson (1899) stated that "porpoises supposed to belong to this species [*Phocoena phocoena*] were common around the shores of the Tres Marias Islands and also in bays and mouths of streams and lagoons along the mainland." I have not seen any porpoise referable to *Phocoena* around the Islas Tres Marias or Bahia Banderas nor has Rice (pers. comm.) sighted any *Phocoena* from the waters around the Islas Tres Marias or the adjacent coast. A total of 26 confirmed records of *P. sinus* have been reported from the northern part of the Gulf of California and it is probably limited to the upper part of the Gulf. The confirmed records of the species are shown in Fig. 4. A few recent sightings in the upper part of the Gulf of California have been reported (Villa-R., 1976; Wells et al., 1981).

FOSSIL RECORD. The geologically earliest provable member of the family Phocoenidae is *Loxolithax stocktoni* (Wilson, 1973), which is known by skulls from the late Miocene Valmonte Diatomite Member of the Monterey Formation in southern California (Barnes, 1976). *Loxolithax sinuosa,* which is known only by isolated periotics from the Sharktooth Hill Bonebed of the Middle Miocene in California (Kellogg, 1931), may be involved in the ancestry of the Phocoenidae as well (Barnes, 1976), if only by virtue of Wilson's (1973) referral of his new species to the same genus. The European genera *Protophocaena* and *Paleophocaena* are probably not phocoenids (Barnes, pers. comm.), and *Microphocaena* has since been reassigned to the extinct delphinoid family Kentriodontidae (Barnes, 1978). Three unnamed species of fossil phocoenids occur between latest Miocene and early Pliocene time (Purisima, Capistrano, and Almejas Formations) from the deposits along the western border of North America (Barnes, 1976), but none of these shed light on the ancestry of *P. sinus.* Also see accounts of *P. phocoena* and *P. dioptrica* by Gaskin et al. (1974) and Brownell (1975), respectively.

FIGURE 3. External view of a stranded male *Phocoena sinus* found on 25 March 1967 near El Golfo de Santa Clara, Sonora, Mexico.

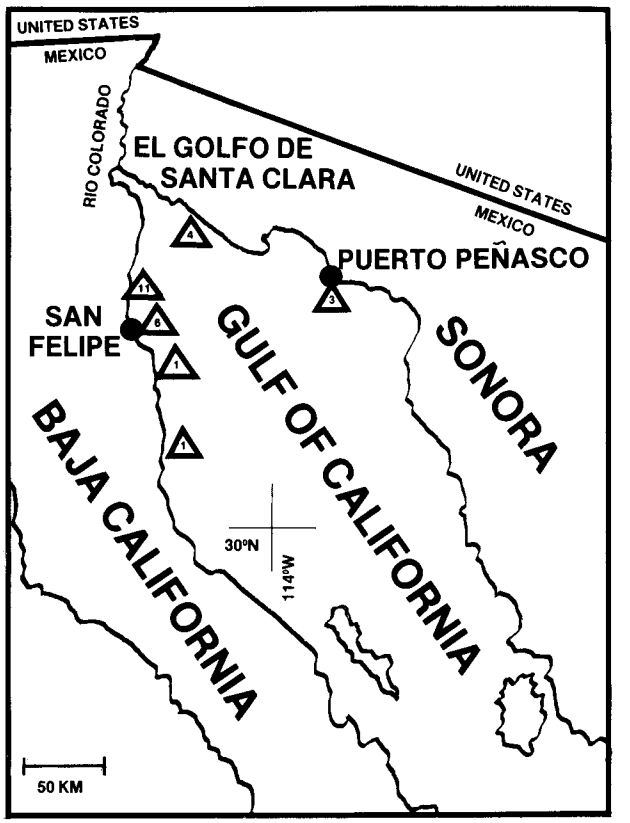

FIGURE 4. Distribution of *Phocoena sinus* in the upper Gulf of California, Mexico, based on confirmed records or specimens.

FORM. Selected measurements (in mm) are: condylobasal length of skull, 210 to 243 (n = 11); zygomatic width, 135 to 157 (n = 4); mandible length, 165 to 184 (n = 4). Dentition ranges from 18 to 22 (n = 5) upper teeth on each side and 17 to 20 (n = 5) lower teeth on each side. The teeth have spade-shaped crowns and are essentially uniform throughout as in other species of the genus. The vertebral count is lower than other species of *Phocoena*: 7 cervical, 12–13 thoracic, 13–15 lumbar, and 29–30 caudal vertebrae with 19 to 20 chevron bones (Brownell, in press; Noble and Fraser, 1971). The anterior three cervicals are fused. The anterior six ribs have capitular and tubercular attachments. Six or seven pairs of sternal ribs are present; the anterior three are attached directly to the sternum. The phalangeal formula of SDNHM 20688 is: I-1, II-9, III-8, IV-4, and V-0 (left side). No organ systems have been studied.

ECOLOGY AND BEHAVIOR. Fitch and Brownell (1968) reported one *P. sinus* with otoliths of bronze striped grunts (*Orthopristis reddingi*) and gulf croakers (*Bairdiella icistius*) in its stomach. Both of these fish are abundant throughout the northern Gulf of California. Remains of squid were also found in the stomach of the same specimen (Brownell, in press). No endoparasites are recorded (Dailey and Brownell, 1972).

Little is known about reproduction. A probable female/calf pair was taken in a gill net used for catching totoaba (*Cynoscion macdonaldi*) on 9 April 1972 (Fig. 5). The total length of the calf was 74 cm. The calf's length is estimated to be approximately 61% of the adult as measured from the photograph. Note the fetal folds on the side of the calf (Fig. 5). Two female specimens 139 and 150 cm in total length were both physically mature (Brownell, in press).

Few details are available on the incidental capture of *P. sinus.* They are occasionally taken in small numbers (Mitchell, 1975) by fishermen using gill nets for shark or totoaba. The commercial fishery for totoaba, using gill nets, started at least by the late 1940's and unidentified small cetaceans were taken at that time (Brownell, in press). However, exact data are lacking on the species and numbers of small cetaceans taken. Norris and Prescott (1961) reported several accounts of *P. sinus* taken during gill net fishing for totoaba off San Felipe. The main totoaba fishing fleets were from Puerto Peñasco, El Golfo de Santa Clara, and San Felipe (Fig. 4), and the main fishing grounds are near these towns in the northern Gulf of

FIGURE 5. External views of recently taken specimens of *Phocoena sinus* (probably female and calf) from gill nets used in totoaba (*Cynoscion macdonaldi*) fishery on 9 April 1972 offshore from El Golfo de Santa Clara, Sonora, Mexico.

California (Flanagan and Hendrickson, 1976). One day's catch from around San Felipe was reported as ten porpoises in the early 1970's (Brownell, in press). Therefore, available data suggest that the annual incidental catch of *P. sinus* by the three main commercial fishing fleets in the upper gulf during the early 1970's was in the range of tens to hundreds of porpoises (Brownell, in press).

In 1975, the Mexican Government announced a total indefinite closure on both sport and commercial fishing for totoaba because the species had declined drastically in recent years (Flanagan and Hendrickson, 1976). This ban, with good enforcement, will help decrease the number of porpoises killed in the totoaba fishery. However, gill net fishing for other sciaenids and sharks in the upper gulf will probably continue and these fishing operations will probably continue to catch some porpoises. In addition, *P. sinus* is occasionally captured in shrimp trawls (Norris and Prescott, 1961). Recent catches are unknown but even a small catch may represent a substantial impact on a localized and relatively small population.

Only Norris and McFarland (1958) and Norris and Prescott (1961) have reported observations of live *P. sinus*. Details were meager but usually two porpoises were sighted together (Norris and Prescott, 1961).

REMARKS. Nothing is known about the genetics or physiology of *P. sinus*.

The specific name *sinus* was suggested to Norris and McFarland by Carl L. Hubbs and is Latin, meaning bay, referring to the occurrence of the species in the Gulf of California.

Norris and McFarland (1958) discussed the possible origin of *P. sinus* from *P. phocoena* from the northeastern Pacific or *P. spinipinnis* from the southeastern Pacific. Although *P. sinus* is intermediate in some aspects, they favored the latter because the cranium of *P. sinus* resembles that of *P. spinipinnis* more than that of *P. phocoena*. Noble and Fraser (1971) described an incomplete skeleton of *P. sinus* and compared it with specimens of *P. phocoena* and *P. spinipinnis*. They stated that the axial skeleton of *P. sinus* suggested a closer affinity to *P. spinipinnis* than to *P. phocoena*. The two complete axial skeletons that I have collected agree with the specimen described by Noble and Fraser (1971). Externally *P. sinus* lacks the peculiarly-shaped and tuberculated dorsal fin of *P. spinipinnis*, but the size of the flippers and other external measurements of *P. sinus* are more similar to those of *P. spinipinnis* than of *P. phocoena*. Thus, *P. sinus* and *P. spinipinnis* appear to be closely related. I believe, as Norris and McFarland (1958) noted, that *P. sinus* probably evolved as a result of a northward movement of an ancestral *P. spinipinnis* stock into the Gulf of California during one of the Pleistocene glacial ages (Norris and McFarland, 1958).

The cochito is also known in the vernacular as the vaquita or Gulf of California harbor porpoise (Norris and Prescott, 1961; Villa-R., 1976).

Phocoena sinus was listed as vulnerable in 1978 by the International Union for Conservation of Nature and Natural Resources in their Red Data Book. This species was also listed in appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora on 28 June 1979.

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