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Stenella clymene.

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Stenella clymene (Gray, 1850)

Clymene Dolphin

Delphinus metis Gray, 1846 (no. 2):39. Type specimen (skull in the British Museum) collected from an unknown locality, presumably in the Atlantic Ocean. The illustration in Gray's Plate 18 of *Delphinus metis* (no. 1):38 is not the type specimen nor is it of *S. clymene*.

Delphinus clymene Gray, 1850:115. Renaming of *Delphinus metis* Gray (no. 2). See Remarks.

Clymene normalis Gray, 1866:214. Renaming of *Delphinus clymene* Gray.

Clymenia normalis Gray, 1868:6. Renaming of *Clymene normalis* Gray.

Prodelphinus clymene Lütken, 1889:41. Renaming of *Clymenia normalis* Gray.

Stenella clymene: Hershkovitz, 1966:26. First use of present name combination.

CONTEXT AND CONTENT. Order Cetacea, suborder Odontoceti, superfamily Delphinoidea, family Delphinidae, subfamily Delphininae, genus *Stenella* (LeDuc et al. 1999; Rice 1998). This species is monotypic.

DIAGNOSIS. Externally, the Clymene dolphin (Fig. 1) can be easily confused with the spinner dolphin (*Stenella longirostris*), but is somewhat shorter and more robust (Perrin et al. 1981). Greatest known total length for a male Clymene dolphin is 197 cm (n = 32) and for a female is 190 cm (n = 16—Jefferson 1996a; Perrin and Mead 1994), whereas *S. longirostris* can grow to 235 cm (Perrin 1998). The beak is relatively shorter (<12 cm) than in *S. longirostris* (11–20 cm), and flippers are generally smaller (Jefferson 1996a; Perrin et al. 1981). The subtriangular dorsal fin is also smaller than that of *S. longirostris* (Perrin et al. 1981).

The most distinctive color pattern feature of this species is the double dip in the dorsal cape, once above the eye and again below the dorsal fin (as opposed to the straighter margin of the cape below the dorsal fin in *S. longirostris*). In addition, a dark border often occurs between the light-gray, lateral field and the white belly, generally not found in related species (Jefferson 1996a). An eye stripe "zigzags" until it meets the black dorsal mesial mark of the beak tip and forms a diagnostic "moustache" marking of variable extent on the dorsal surface of the rostrum (Jefferson 1996a; Perrin and Mead 1994; Perrin et al. 1981). Upper and lower margins of the flipper stripe converge as they approach the eye, whereas in *S. longirostris* they are nearly parallel (Perrin et al. 1981).

The skull of *S. clymene* (Fig. 2) is similar to that of *S. coeruleoalba* (striped dolphin) and *S. longirostris* but can be distinguished from the former by its smaller size (condylobasal length < 415 mm). From the latter, it can be distinguished by its greater preorbital width (>150 mm) combined with its shorter upper toothrow (<215 mm—Jefferson 1996a; Perrin et al. 1981). Although the other 2 species may have shallow, palatal grooves, those of *S. clymene* are always moderately deep (up to 2.9 mm—Jefferson 1996a).

GENERAL CHARACTERS. Clymene dolphins are relatively small, reaching a known maximum body mass of 80 kg (Jefferson et al. 1995). The shape of the body and extremities is similar to that of other dolphins of the genus. *S. clymene* has a tripartite color pattern (dark gray cape, light gray sides, and a white belly), eye-to-flipper stripe, and black lip patch and beak tip (Perrin and Mead 1994; Perrin et al. 1981).

The skull (Fig. 2) has a moderately long rostrum (204–247 mm), high tooth counts, sigmoid toothrows, small temporal fossae, and short mandibular symphysis (Jefferson 1996a; Perrin and Mead 1994; Perrin et al. 1981). Tooth counts of *S. clymene* range from 39 to 52 (upper) and 39 to 48 (lower—Jefferson 1996a).

DISTRIBUTION. The Clymene dolphin is distributed in deep, oceanic waters throughout the tropical to warm temperate Atlantic Ocean, including the adjacent Gulf of Mexico and Caribbean Sea (Fig. 3). The known range limits are New Jersey and southern Brazil in the west and Mauritania and near the equator in the east (Perrin and Mead 1994).

Records of *S. clymene* have been reported for the following countries: Belize (B. Bilgre, pers. comm.), Brazil (Alves-Junior et al. 1996; Simões-Lopes et al. 1994; Soto et al. 2000), Gambia (Van Waerebeek et al. 2000), Ghana (Van Waerebeek et al. 2000), Grenada (Perrin et al. 1981; W. F. Perrin, pers. comm.), Mauritania (Jefferson et al. 1997; Robineau et al. 1994), Mexico (Venegas 1998), Senegal (Cadenat and Doutre 1958; Dupuy and Maigret 1979, 1980; Robineau et al. 1994), St. Lucia (Watkins and Wartzok 1985), St. Vincent (Perrin et al. 1981; Watkins and Moore 1982), the southeastern United States (Jefferson et al. 1995; Perrin and Mead 1994; Perrin et al. 1981), and Venezuela (Romero et al. 2001). An unconfirmed record exists for Jamaica (Caldwell 1961). Additional records are for the area offshore of the southeastern United States (Perrin and Mead 1994), offshore Gulf of Mexico (Jefferson and Schiro 1997; Mullin et al. 1994), equatorial Atlantic Ocean (Lütken 1889), and Gulf of Guinea (Perrin et al. 1981). Presumably, the species is distributed continuously across the Atlantic Ocean, but specific records in offshore regions are extremely sparse. No fossils of *S. clymene* are known.

FORM AND FUNCTION. Details of the internal anatomy or physiology of *S. clymene* are not known. Vertebral counts are 7 C, 13–15 T, 17–21 L, 31–35 Ca, total 70–76 (Jefferson 1996a; Perrin and Mead 1994), and phalangeal counts are I0–2, II7–9, III5–7, IV2–3, V0–2 (Perrin and Mead 1994). A specimen stranded in Senegal had a liver mercury level of 36 ppm (Dupuy and Maigret 1979).

ONTOGENY AND REPRODUCTION. Information on reproductive status is available for 7 females and 12 males, all from the southeastern United States and Gulf of Mexico (Jefferson et al. 1995; Perrin et al. 1981; Schmidly and Shane 1978). The smallest sexually mature female was 171 cm in length, and the smallest adult male was 175 cm; a female measuring 168 cm was considered

FIG. 1. A Clymene dolphin in the northern Gulf of Mexico (photo by R. L. Pitman).

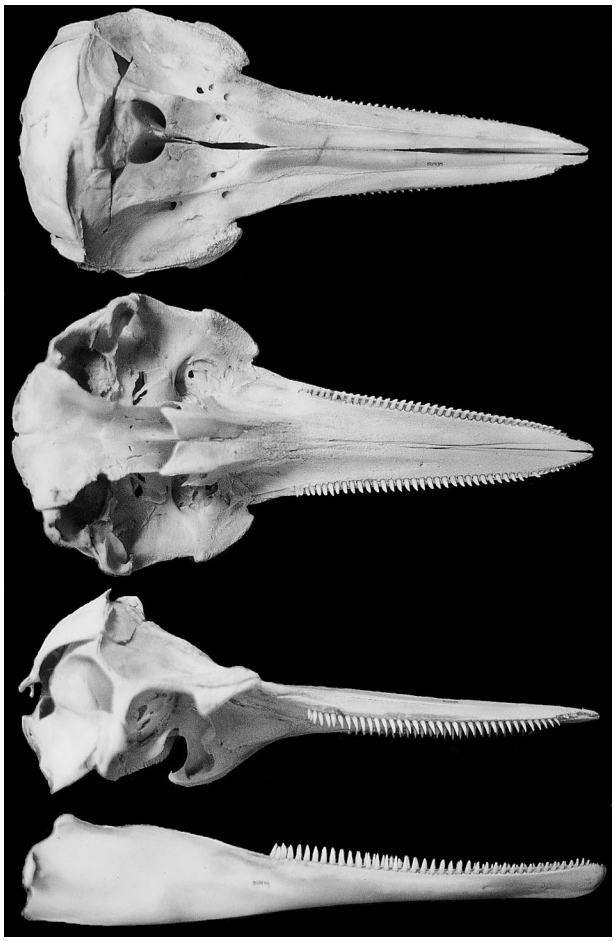

FIG. 2. Skull of *Stenella clymene*: dorsal, ventral, and lateral views of cranium and lateral view of mandible of a specimen from the Gulf of Mexico (Texas Cooperative Wildlife Collection, Texas A&M University 50934). Condylobasal length (greatest length of skull) = 388 mm.

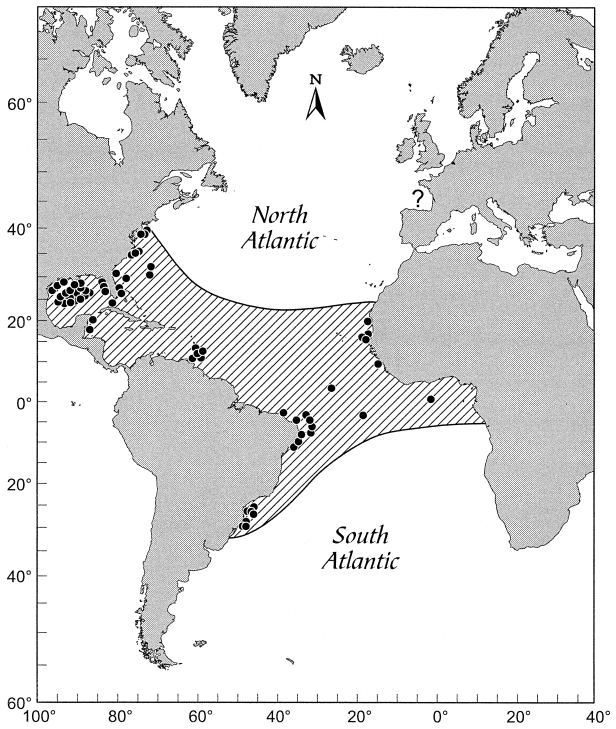

FIG. 3. Presumed distribution of *Stenella clymene* in the Atlantic Ocean and adjacent waters, showing approximate locations of stranding, sighting, and capture records (modified from Perrin and Mead 1994). The question mark represents several skulls of unknown locality in the British Museum, London.

immature (Perrin et al. 1981). Three fetuses measured 46.5, 58, and 5.7 cm (Jefferson et al. 1995).

ECOLOGY. *Stenella clymene* is a tropical species that occasionally moves into warm temperate waters but prefers deep, oceanic waters (Davis et al. 2002). In the Gulf of Mexico, sightings have mostly been well past the 100-m isobath (Davis et al. 2002; Hansen et al. 1996; Mullin and Hoggard 2000; Mullin et al. 1994). Clymene dolphins are present year-round in the Gulf and are probably not migratory, but seasonal shifts in abundance occur (Jefferson et al. 1995; Mullin and Hoggard 2000).

Based on the stomach contents of a single animal stranded in New Jersey, which contained several squid beaks and fish otoliths from the families Myctophidae, Argentinidae, and Bregmacerotidae, Clymene dolphins feed mostly at night or in mesopelagic waters (Perrin and Mead 1994; Perrin et al. 1981). Clymene dolphins also feed on small (10–15 cm) schooling fish near the surface off the Texas coast (Fertl et al. 1997).

Although uncommon, associations with other species of dolphins occur. Mixed schools with spinner dolphins are known from Florida and the Caribbean (Jefferson et al. 1995; Watkins and Moore 1982). Small groups of 1–10 Clymene dolphins reportedly swam in close association with schools of spinner dolphins around St. Vincent in the Caribbean (Watkins and Moore 1982). In this sighting, the Clymene dolphins clustered together and did not spin in the air. Associations with tuna (*Neothunnus albacora*) occur off West Africa (Cadenat and Doutre 1958).

Sharks may attack Clymene dolphins, as evidenced by a probable shark bite on a dolphin stranded in Texas (Jefferson et al. 1995). An aggressive interaction was observed between sharks and possible Clymene dolphins in the Gulf of Mexico, involving apparent cooperative behavior by the dolphins, including defense of the young (Springer 1967). Cookie-cutter shark (*Isistius*) bites, and bite scars are common on stranded Clymene dolphins and are also frequently observed on live animals at sea (Jefferson et al. 1995; Mullin et al. 1994; Perrin et al. 1981).

External parasites of *S. clymene* include barnacles (probably *Xenobalanus*) on the flippers and flukes and whale lice (*Syncyamus pseudorcae*) in lesions and body grooves (Jefferson et al. 1995). In the Caribbean, a remora (probably *Remilegia australis*) occurred on a dolphin, which based on the description, was probably *S. clymene* (Caldwell 1961).

Internal parasites include *Phyllobothrium* in the blubber of the urogenital region; *Halocercus* in the bronchioles and lungs; *Monorygma* in the peritoneum and abdominal muscle; *Nasitrema* in the cranial sinuses and brainstem; *Pharurus* in the respiratory system; and various unidentified worms in the feces, stomach, respiratory system, and mammaries (Jefferson et al. 1995; Schmidly and Shane 1978). Parasites (*Pharurus* and *Nasitrema*) have been implicated in the deaths of stranded dolphins. Bronchopneumonia, emphysema, stomach ulcers, terminal pulmonary edema, and verminous pneumonia have been documented in this species (Jefferson et al. 1995).

Only 2 specimens have been aged. Both were adult females stranded in Texas and were 15 and 16 years old (Jefferson et al. 1995). Clymene dolphins have not been live-captured for captive display, although several dolphins that were stranded alive have been taken to holding tanks for short periods before being released or dying (Caldwell and Caldwell 1975; Jefferson et al. 1995).

In the northwestern Gulf of Mexico, abundance has been estimated at 1,695 (CV = 0.37) and 2,285 (CV = 0.61—Hansen et al. 1996; Jefferson 1996b). Abundance estimated for the entire northern Gulf of Mexico (U.S. portion), based on ship and aerial surveys conducted in 1996 and 1997, suggested that there were about 2,300 Clymene dolphins over the continental slope and an additional 10,100 in oceanic waters (Mullin and Hoggard 2000).

BEHAVIOR. Clymene dolphins are active bowriders, often approaching ships from many kilometers away (Mullin et al. 1994;

Würsig et al. 1998). They display aerial behaviors, sometimes spinning on the long axis, with up to 3–4 revolutions in the air (Mullin et al. 1994). Clymene dolphins have also been observed playing with pieces of seaweed (*Sargassum*), catching it on their flippers and flukes while bowriding (Mullin et al. 1994). Both resting and traveling groups of Clymene dolphins are sensitive to disturbance by aircraft and appear to alter their behavior in response to the disturbance (Würsig et al. 1998). Cooperative feeding techniques are used to herd fish schools in the Gulf of Mexico (Fertl et al. 1997). Epimeletic behavior has been observed in dolphins, probably of this species (Springer 1967).

Most sightings of Clymene dolphins have been of groups of small to moderate size, generally <200 individuals (Fertl et al. 1997; Mullin et al. 1994; Perrin et al. 1981; Watkins et al. 1985). In the Gulf of Mexico, a mean school size of 41.6 dolphins ± 5.14 *SE* was calculated, based on 29 sightings (Mullin et al. 1994). Groups observed during surveys in the same general area were composed of 4–150 dolphins (Mullin and Hoggard 2000). Group size averaged 97.4 ± 0.22 (*CV*) and 90.1 ± 0.18 (*CV*) individuals, estimated from aircraft and vessels, respectively (Mullin and Hoggard 2000). Calves were observed in 45% of herds sighted in the offshore Gulf of Mexico (Mullin et al. 1994).

Based on information from mass strandings, this species may travel in schools that are segregated by age and sex (Perrin and Mead 1994). A school of Clymene dolphins that stranded in Louisiana consisted predominately of males (43 males, 2 females, and 1 unidentified). Similarly, in a Key West stranding, all 6 individuals were male. In the Gulf of Mexico, a school of 12 adult-size females, 4 males, and 4 juveniles or calves that stranded in the Florida Keys in 1992 may have been a "nursery school" (Jefferson et al. 1995).

Underwater vocalizations of the Clymene dolphin were 1st recorded in the early 1980s (Watkins and Wartzok 1985), but acoustic analyses were not published until recently. Sound energy of whistles recorded in the Gulf of Mexico was between 6.33 and 19.22 kHz, and the mean whistle duration was 0.61 s (Wang 1993). During acoustic surveys in the offshore Gulf of Mexico, Clymene dolphins were very vocal, and whistles ranged in frequency from 9.25 to 13.62 kHz, with a mean whistle duration of 0.41 s (Mullin et al. 1994; Norris et al. 2000).

GENETICS. The karyotype of *S. clymene* (2n = 44) has C- and G-banded patterns morphologically similar to those of the Atlantic spotted dolphin (*S. frontalis*—Árnason 1980). A portion of the cytochrome-*b* gene was sequenced for a study of phylogenetic relationships of members of the family Delphinidae, and among species of the genus *Stenella*, *S. clymene* was most closely related to *S. coeruleoalba* (LeDuc et al. 1999).

CONSERVATION STATUS. Virtually, nothing is known of the status of any Clymene dolphin population. Even the best-studied stock in the Gulf of Mexico is of uncertain status, although there is currently no evidence of any significant fishery interactions there (Waring et al. 2000). An abundance estimate of over 12,000 Clymene dolphins in the northern Gulf makes it unlikely that this population is threatened (Mullin and Hoggard 2000).

Incidental takes have been recorded in gillnets in Venezuela, where the meat is used for shark bait and human consumption (Romero et al. 1997), and in pelagic driftnets in Brazil (Zerbini and Kotas 1998). Clymene dolphins are probably killed in the tuna purse seine fishery in the eastern tropical Atlantic, which operates mostly in the Gulf of Guinea (Maigret 1981). The catch in this fishery is potentially quite large. The only known directed kills are in Senegal, where specimens are probably taken by harpoon (Cadenat and Doutre 1958), and in St. Vincent, where some Clymene dolphins are harpooned in a multispecies fishery for small cetaceans (R. V. Walker in Perrin et al. 1981).

REMARKS. Before *S. clymene* was redescribed by Perrin et al. (1981), many observers (e.g., Caldwell 1955; Caldwell and Caldwell 1975; Dupuy and Maigret 1979; Schmidly et al. 1972) apparently misidentified *S. clymene* as other species of long-beaked dolphins. Strandings of this species in the Gulf of Mexico have commonly been misidentified as *S. longirostris* and even as *S. frontalis* (Atlantic spotted dolphin—Schmidly et al. 1972). A group of several small dolphins sighted in Jamaican waters (Caldwell 1961) were probably *S. clymene*. Likewise, the "Senegal dolphin" of Mörzer Bruyns (1971) and Dupuy (1983) is probably this species (Perrin and Mead 1994).

In the early part of the 20th century, this species was generally relegated to the synonymies of other species (True 1889). The 1st indication that it might be a distinct species was made in a study on *S. attenuata* (Fraser 1950). He noticed that skulls of this species were smaller than those of *S. coeruleoalba* and that the temporal fossae were also smaller. Fraser quantified this, based on a small sample, in an unpublished, undated manuscript; however, *S. clymene* remained unrecognized as a separate species until its formal redescription by Perrin et al. (1981).

Confusion exists as to which date to cite for the name *S. clymene*. Gray (1846) has been cited by most recent authors (Jefferson 1996a; Perrin and Mead 1994; Simões-Lopes et al. 1994; Soto et al. 2000). Rice (1998), however, cited Gray (1850), although he did not explain why he did so. The confusion arises from an unusual situation in which the species was described in 1 year, but the name 1st appeared later. Gray (1846) originally described the species as *Delphinus metis*, but on the previous page he described another species also under the name *D. metis*, an obvious error. *D. metis* (no. 1) is now considered to be in the synonymy of *Tursiops truncatus* (Hershkovitz 1966). The 1st appearance of the name *D. clymene* was actually in Gray (1847) for "the Clymene dolphin," but because no description was attached nor specimen designated, this name [*Delphinus clymene* (Gray, 1847)] is a nomen nudum. Gray (1850) later used *D. clymene* with an explanation that this was *D. metis* (no. 2) and not *D. metis* (no. 1) nor the figure cited for *D. metis* (no. 2) in Gray (1846). *D. clymene* as a nomen nudum was still available for use, but under the International Code of Zoological Nomenclature rules (1999), the species must be cited as *Stenella clymene* (Gray, 1850), although actually Gray described the species in 1846 and named it in 1847. An added and unresolved complication is that Gray (1846) and Gray (1847) each cites the other, so one or the other of the publication dates must be in question. The name and description of *D. clymene* may have actually been published in the same year, but this is moot, considering that they appeared in different documents. The operative publication is Gray (1850).

The origin of the name Clymene is controversial but may be derived from the Greek word *klymenos* meaning famous or notorious (Perrin and Mead 1994). However, Gray (1846) originally named the species the "Metis" (*D. metis*) and later changed the name to *D. clymene* (Gray 1847, 1850). Although he did not provide an explanation for either name, both Metis and Clymene were goddesses of Greek mythology, daughters of Oceanus and Tethys, and Gray (1846) often named dolphin species after mythical personalities (e.g., Asia, Electra, Doris, and Styx). Thus, Clymene is a proper noun and should be capitalized in the common name. Other common names used for the species include: short-snouted spinner dolphin, helmet dolphin, Senegal dolphin, delfín de yelmo (Spanish), delfín de Clymene (Spanish), dauphin Clyméné (French), golfinho de capacete (Portuguese), and golfinho de Clymene (Portuguese).

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