

NOTES ON THE BIOLOGY OF THE CLYMENE  
DOLPHIN (*STENELLA CLYMENE*) IN THE  
NORTHERN GULF OF MEXICO

Although it was first described nearly 150 yr ago (Gray 1846), there was almost no information available on the natural history of the Clymene dolphin (*Stenella clymene*) prior to 1981 (Perrin *et al.* 1981), and dolphins of this species observed before that time were often incorrectly identified as other species of long-beaked dolphins. The Clymene dolphin has been confused with the other four species of *Stenella*, as well as with common dolphins (*Delphinus* spp.) (*e.g.*, Schmidly *et al.* 1972; Caldwell and Caldwell 1975). As a result, it is one of the most poorly known of all the delphinids. There is an immediate need to obtain information on the biology of this species as human interactions are rapidly encroaching upon its oceanic tropical habitat in the Atlantic Ocean.

Data were available to us from 96 Clymene dolphin specimens stranded in the Gulf of Mexico; however, many of these were museum specimens with little or no associated biological data. From 1981 to 1992 at least 11 Clymene dolphins were collected by the Texas Marine Mammal Stranding Network (TMMSN). Five of the 11 individually stranded Clymene dolphins were live stranded, and four of these were taken to holding tanks where they subsequently died (the remaining animal was released at sea). The other six were dead when recovered by TMMSN personnel, but all were fresh, with some remnants of the color pattern still visible.

Necropsies were performed on most specimens by veterinarians at the Texas Veterinary Medical Diagnostic Laboratory System (Texas A&M University, College Station, TX). In addition to collection of samples for toxicology, reproductive biology, and other studies, tissues were examined for parasitic infestations and other pathologic conditions. External measurements were taken by various observers, following Norris (1961). Skulls and postcranial skeletons of stranded dolphins were prepared and deposited in the Texas Cooperative Wildlife Collection (TCWC, College Station, TX).

Teeth of three specimens with reproductive data were aged at the Southwest Fisheries Science Center (SWFSC, NOAA, NMFS, La Jolla, CA), by TAJ, following the techniques of Myrick *et al.* (1983). The only departure from their protocol was that decalcification times were cut down to 7.0–7.5 h, from the 11–15 h recommended in Myrick *et al.* (1983).

On 6–8 July 1983, a mixed herd of Clymene and spinner dolphins (*S. longirostris*), totalling about 18 animals, stranded at Key West, Florida. Six Clymene dolphins and one spinner dolphin were recovered and necropsied. A pathological work-up was performed at the Department of Pathology, University of Miami, Florida, only on the freshest of the Clymene dolphins. Skeletal material was deposited in the Florida Museum of Natural History, University of Florida (UF, Gainesville, FL).

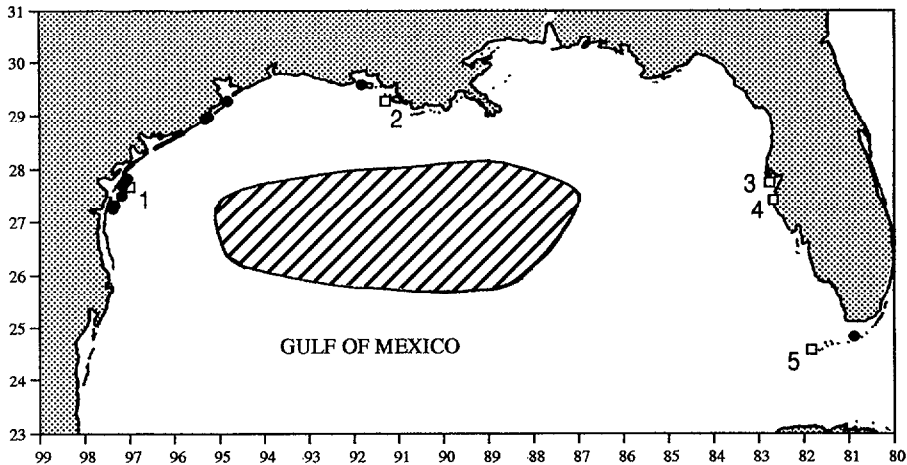


Figure 1. Distribution of the Clymene dolphin in the Gulf of Mexico, based on available records. Closed circles are previously unpublished records reported in this paper. Open squares with numbers are previously published specimen records: stranding of 3 animals at Yarbrough Pass, Texas, 12 September 1971 (Schmidly *et al.* 1972, as *S. frontalis*) (1); mass stranding of 46 at Point au Fer, Louisiana, October 1985 (the skull found at Marsh Island, 30 January 1986, may have been a remnant from this stranding) (Harris 1986; Perrin and Mead 1994) (2); 2 animals live-captured at Bunces Pass, Florida, spring 1965 (Caldwell and Caldwell 1975) (3); stranding of 3 specimens at Jewfish Key, Florida, 14 August 1975 (Perrin *et al.* 1981) (4); mass stranding of 6 at Key West, Florida, 6–8 July 1983 (brief mention in Perrin and Mead 1994) (5). Shaded area denotes region of sightings reported by Mullin *et al.* (1994).

Over a five-day period, 6–10 December 1992, 23 Clymene dolphins (presumably from a single herd) were recovered from the central and western Florida Keys. Two were alive when discovered, and the rest were either freshly dead or moderately decomposed. Most of the specimens have been necropsied, but only preliminary information is available at this writing. Detailed findings will be published in a later report.

In addition to skulls of Gulf of Mexico dolphins that had been identified as *S. clymene* from external characteristics, attempts were made to examine skulls of any unidentified dolphins of the genus *Stenella* to identify them to species. Additional external morphometric data (generally only total length) were available for some museum specimens. Those skulls determined to be *S. clymene* were measured by TAJ with a caliper rule and dial calipers, following Perrin (1975). Criteria for including specimens in adult series were the presence of distal rostral fusion of the maxillae and premaxillae (but see Perrin and Heyning 1993) and complete fusion of epiphyses to all thoracic vertebrae (Dailey and Perrin 1973).

There are verified records of Clymene dolphins from both sides of the northern Gulf of Mexico but none from the southern Gulf (Fig. 1; Mullin *et al.* 1994). The absence of records from Mexican and Cuban waters, as well as the pre-

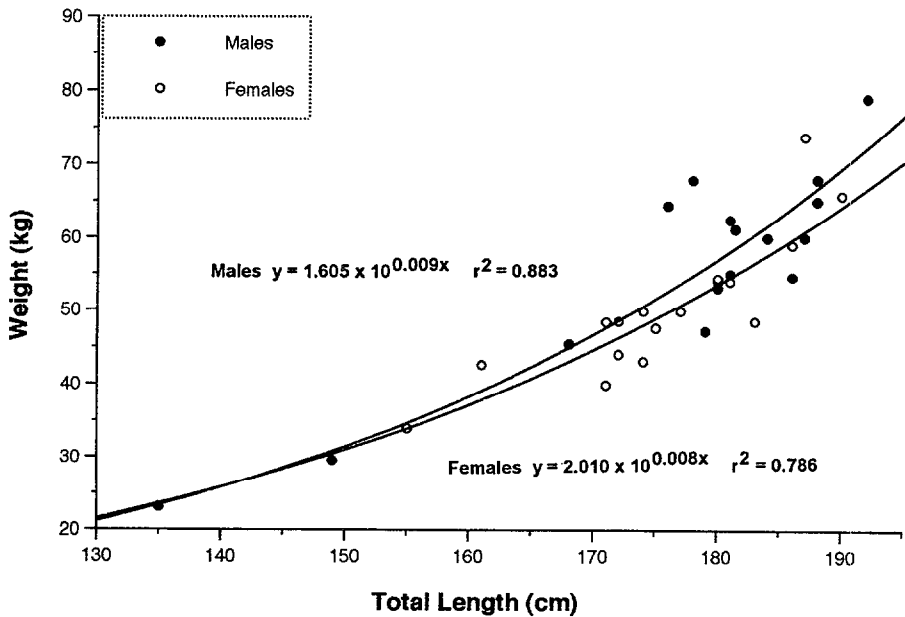


Figure 2. Length vs. weight for Clymene dolphin specimens from the Gulf of Mexico.

ponderance of records from Texas and Florida (as opposed to the other Gulf coast states), probably represent more the distribution of marine mammal researchers than the true distribution of dolphins.

It appears that this species can be found in the Gulf of Mexico at any time of year, although it is too early to tell if there are seasonal shifts in abundance. There are from one to three stranding records from the Gulf of Mexico for each month of the year, except June and November (although there have been sightings in June; Mullin *et al.* 1994).

All postnatal specimens examined had the basic color pattern and morphology described for the Clymene dolphin by Perrin *et al.* (1981). However, an additional feature was noted here. On very fresh specimens and live animals, a dark stripe could be seen that separated the light gray flank from the white of the belly (see Mullin *et al.* 1994; Fig. 2A). It was evident in photographs of all seven postnatal specimens in which its presence or absence could be reliably discerned. This stripe was only slightly darker than the color of the gray flank and had indistinct margins blending into the lighter areas above and below. This color pattern component is similar to the "stripe" (caused by an increase in intensity of the dorsal overlay at its lower margin) on southern whitebelly spinner dolphins (Perrin *et al.* 1979).

Males appear to reach somewhat greater total lengths than females. The largest male measured was 197 cm in length ( $n = 32$ ), and the largest female was only 190 cm ( $n = 16$ ). Total length vs. weight is shown in Fig. 2. Mean

*Table 1.* Internal parasites of Clymene dolphins stranded in the Gulf of Mexico. Host locations are indicated below.

Parasite	Specimen no.											
	Texas specimens							Florida specimens (C-83-)				
	C-154	C-166	C-167	C-206	C-259	C-362	C-516	11	13	14	15	16
<i>Phyllobothrium</i> sp.*	BU	BU	BU	BU				BU	BU	BU	BU	
<i>Monorygma</i> sp.*	PA	PA	PA	PA			AM	PA		PA		PA
	LT	TC										
<i>Nasitrema</i> sp.*					PS		TS					
					BS							
<i>Pharurus</i> sp. (?)			LT									
Unidentified nematode			FS		ST	LT	ST					
Unidentified lungworm		LT			LT		LT	LT				LT

\* New parasite record for the species.

Host locations: AM, Abdominal muscle; BS, Brainstem; BU, Blubber of urogenital area; FS, Fecal smear; LT, Lungs/trachea/bronchi/bronchioles; PA, Peritoneum of abdominal cavity; PS, Peribullary sinus; ST, Stomach; TC, Thoracic cavity; TS, Pterygoid sinus.

weight of males (61.38 kg, SD = 8.064,  $n = 13$ ) is greater than for females (52.05 kg, SD = 8.798,  $n = 15$ ), and this difference is significant ( $t = 2.927$ ,  $df = 26$ ,  $P < 0.01$ ).

Condylbasal lengths of 61 adult skulls ranged from 345–415 mm, an extension of the range of 354–409 mm presented in Perrin and Mead (1994). Clymene dolphins generally have less than 50 teeth per row. Upper tooththrow counts of 51 and 52 were recorded for one specimen (USNM 550509), but there were 2–3 teeth near the posterior ends of the tooththrows that were not in line with the rest of the teeth in the rows. These “accessory” teeth accounted for the high tooth counts ( $> 50$ ) for this specimen.

External parasites were only observed on two individuals. There were several barnacles (probably *Xenobalanus* sp.) on the dorsal fin, flippers, and flukes of C259. Ten whale lice and one barnacle (on the dorsal fin) were present on C217. The whale lice were tentatively identified by TAJ as *Syncyamus pseudorcae*, using the key and guide in Leung (1967).

The most commonly observed internal parasites were *Phyllobothrium* sp. in the urogenital blubber and *Monorygma* sp. in the peritoneum and/or muscles of the abdominal cavity (Table 1). Worms of one of these two genera were previously found around the mammarys of a female Clymene dolphin that stranded along the Texas coast in 1971 (Schmidly and Shane 1978). The lungworm, *Halocercus* sp., has previously been found infesting the bronchioles and lungs of Clymene dolphins from the Texas coast (Schmidly and Shane

*Table 2.* Reproductive data for Clymene dolphins stranded in the Gulf of Mexico. CL refers to corpus luteum and CA to corpus albicans.

Specimen no.	Sex	Length (cm)	Age (GLGs)	Maturity	Comments
C18	F	180	—	Mature	Pregnant, with 46.5-cm male fetus; no milk in mammae
C166	M	176	—	Mature	Spermatozoa in epididymis (late October)
C167	F	171	—	Mature	CL (3 mm <sup>3</sup> ) on left ovary
C206	F	187	15	Mature	Pregnant, with 58-cm fetus in left horn; 2 CA and 1 CL (2.3 cm in diameter) on left ovary; 1 CA on right ovary
C362	M	186	ND*	Mature	Testes very enlarged (early September)
C516	F	176	16	Mature	Uterus appeared gravid, with fetus in right uterine horn
C-83-11	M	192	—	Mature	Inactive spermatogenesis (early July); testis weights: 550 g (R) and 520 g (L)
DRC-92-28	F	175	—	Mature	Pregnant, with approx. 5.7 cm male fetus

\* Tooth sections from this specimen were not adequate for accurate age determination.

1978), and it is likely that some of the unidentified lungworms from animals in this study were *Halocercus*.

The heavy infestation of pseudaliids (probably *Pharurus* sp.) in the bronchi and bronchioles of specimen C167 was implicated as a possible cause of that stranding. *Nasitrema* eggs in the brainstem of C259 caused encephalomalacia, and this was diagnosed as the probable cause of death and stranding of this individual. Ridgway and Dailey (1972), Dailey and Walker (1978), and Cowan *et al.* (1986) discussed trematode (including *Nasitrema*) damage to the brain of small cetaceans and its involvement in strandings.

Pulmonary inflammation (bronchopneumonia) was implicated as a possible factor in the death of C-83-11. Several specimens had terminal pulmonary edema (C259, C362, C516) and, in addition, C362 had emphysema and verminous pneumonia of the lungs and ulceration of the stomach. The spleen of C154 had a fibrous, "knobby" appearance, thought to be associated with "Gamma-Gandy bodies."

All Clymene dolphin specimens from Texas had evidence of cookie-cutter shark (*Isistius brasiliensis* or *I. plutodus*) bites (see Jones 1971), ranging in number from 2 to 31 (mean = 10.6, *n* = 6). The bites were generally located on the thorax and abdomen; only one bite was located on an extremity (the tail flukes), and it was an incomplete (semicircular) bite. Most bites were healed or partially healed; no animal had more than one fresh, open wound on its body. Many of the partially healed bites were infected, some still exuding pus. Presence

or absence of cookie-cutter shark bites was not noted for the Florida specimens. Probable cookie-cutter shark bites have been observed on a Clymene dolphin specimen from Curaçao, and on animals observed at sea off West Africa and in the Gulf of Mexico (Perrin *et al.* 1981; Mullin *et al.* 1994; C. W. Oliver, personal communication).

One specimen (C362) had a fresh injury (measuring about 10 cm in length) that appeared to be a shark bite or possibly a propeller wound on the left side of its tail stock. There are no records of large sharks preying on Clymene dolphins, but it is assumed that they do attack this species at times.

Stomachs of seven of the 12 Texas specimens were examined for contents. Of these, five had empty stomachs (C18, C166, C206, C362, and C516). Two other specimens, which had been live-stranded and held briefly in captivity, contained only remains of menhaden (*Brevoortia tyrannus*), herring (*Clupea harengus*), and squid that had been force-fed to them (C167 and C259). All six 1983 Florida specimens had empty stomachs, and all four of those from the 1992 stranding that were checked were also empty. The only published information on feeding habits of Clymene dolphins comes from an animal stranded in New Jersey in 1976, which contained squid beaks and small otoliths, mostly from myctophids (Perrin *et al.* 1981).

The reproductive tracts of five females and three males were examined in detail (Table 2). The other five male Clymene dolphins from the 1983 Florida mass stranding (all > 180-cm TL) had enlarged testes (> 25 × 7 cm) and were all probably sexually mature. The shortest sexually mature male was 176 cm long and the shortest mature female was 171 cm. The only previous data available on length at sexual maturity in the Gulf of Mexico are from an adult male and adult female from Yarbrough Pass, Texas, both of which were about 175 cm in length (Schmidly and Shane 1978), and three adult males from Sarasota Bay, Florida, which ranged in length from 184–196 cm (Perrin *et al.* 1981). A 168-cm female from the central Atlantic was considered immature by Perrin *et al.* (1981).

Three fetuses were examined. The fetus of C18 was 46.5 cm in length and weighed 1.319 kg. It had several hairs on the dorsal surface of the rostrum and an indistinct margin to the cape. The fetus of C206 was 58 cm in length. In addition to the cape visible on postnatal animals, the lateral stripe described above was visible on both fetal specimens. It was possible to discern the eye stripe on both fetuses, but the presence or absence of the moustache marking could not be confirmed. A pregnant female (DRC-92-28) from the 1992 Florida mass stranding had a fetus that was estimated from photographs to be 5.7 cm in length. These are the first fetuses of this species to be described in the literature.

Most of the strandings in this study were not of entire herds. Even the group of six Clymene dolphins from Florida in 1983 was part of a larger group of about 18, which included some spinner dolphins. The only Gulf of Mexico strandings that may have been of entire herds were the herd of 46 Clymene dolphins stranded in Louisiana after Hurricane Juan in October 1985 (Harris 1986), and the mass stranding of 23 in the Florida Keys in December 1992

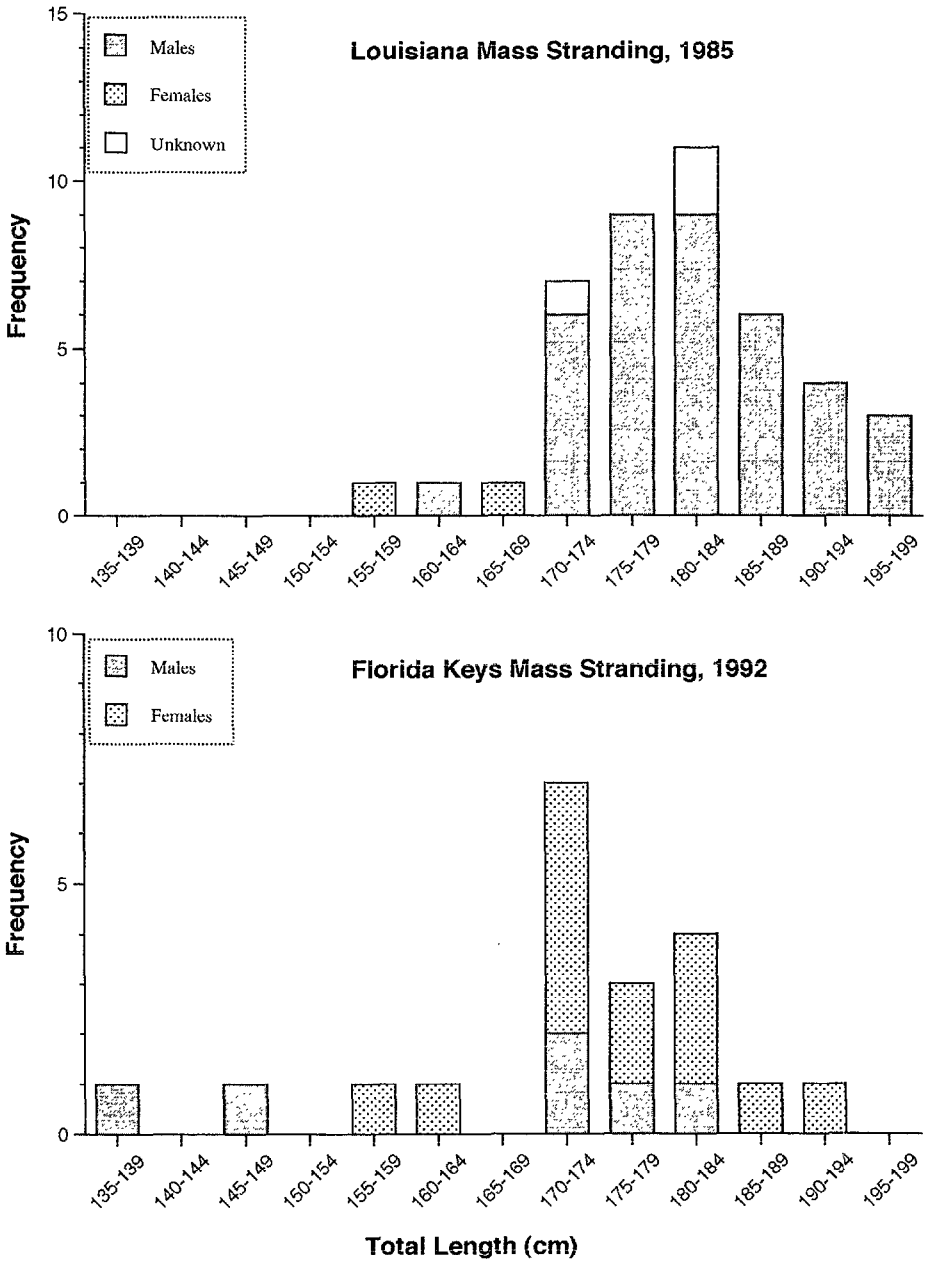


Figure 3. Length and sex composition of Clymene dolphin herds involved in two mass strandings in the Gulf of Mexico (data from Louisiana mass stranding courtesy of J. G. Mead and C. W. Potter).

(Fig. 3). Mean herd size in the Gulf of Mexico, based on 29 sightings, was  $41.6 \pm 5.14$  (SD) dolphins (Mullin *et al.* 1994).

Perrin and Mead (1994) noted that composition of Clymene dolphin herds, based on mass strandings, has shown evidence of sexual segregation, tending to consist largely of one sex or the other. The herd of 46 stranded in Louisiana in 1985 consisted almost exclusively of males of adult size (Fig. 3; Perrin and Mead 1994). All six of the Clymene dolphins examined from the Key West mass stranding were probably adult males. The herd stranded in the Florida Keys in December 1992 consisted largely of females of adult size, at least one of which was pregnant. It also contained several calves and a small number of adult-sized males (Fig. 3). It appears that herds of Clymene dolphins in the Gulf of Mexico may be of different types, and this latter herd may have been a "nursery school." It is also possible that school structure may change throughout the year, as was found to be true for striped dolphin herds off the coast of Japan (Miyazaki and Nishiwaki 1978).

What little is known about the natural history of the Clymene dolphin comes largely from the northern Gulf of Mexico. There are more records from the Gulf than from the rest of the species' tropical and subtropical Atlantic range combined. For example, there are only seven records from the West African coast (Robineau *et al.* 1994), and only a single record for the southwestern Atlantic Ocean (Simões-Lopes *et al.* 1994). This is most likely due to the much greater effort devoted to documenting strandings along the U.S. Gulf coast, and to surveying for marine mammals in the northern Gulf of Mexico. Whatever the reasons, the Gulf of Mexico has been the source of much of what we know about the natural history of the Clymene dolphin.

#### ACKNOWLEDGMENTS

The following assisted in collection of specimens and data: A. F. Amos, G. Barron, N. B. Barros, R. A. Blaylock, T. Christopher, J. Cole, C. DeNeve, S. Fernandez, R. Harris, E. Haubold, M. McHugh, S. C. Jones III, K. Ramirez, A. Schiro, R. J. Tarpley, G. A. J. Worthy, various TMMSN volunteers, and personnel of the Dolphin Research Center, Sea-Arama Marineworld, and UTMSI. Thanks also to the staff of TVMDLS and the College of Veterinary Medicine (Texas A&M University) and the Department of Pathology, School of Medicine (University of Miami) for analysis of specimens. The following allowed TAJ to examine specimens under their care: G. D. Baumgardner (TCWC), M. S. Hafner (LSUMZ), L. Wilkins (UF), and J. G. Mead and C. W. Potter (USNM). R. S. Wells, M. D. Scott, B. Mase, and C. W. Oliver provided unpublished data. J. McEachran generously loaned TAJ calipers, and S. J. Chivers allowed him to use the age determination lab at SWFSC. We are grateful to F. I. Archer, A. C. Myrick, Jr., and K. M. Peltier for assistance with age determination and tooth reading. W. F. Perrin was extremely generous with his time, knowledge, records, and expertise in many aspects of this research. Financial support for this project was received from the Lerner-Gray Fund for Marine Research, Cetacean Society International, and the Office of Graduate Studies at Texas A&M. We thank N. B. Barros, R. A. Blaylock, W. F. Perrin, and two anonymous reviewers for their helpful reviews of the manuscript. This represents contribution No. 37 of the Marine Mammal Research Program, Texas A&M University, and Sea World of Florida Technical Contribution No. 9305-F.



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