



Research note

New records of the lollipop catshark *Cephalurus cephalus* (Scyliorhinidae) from the Gulf of California, Mexico

Nuevos registros del tiburón renacuajo *Cephalurus cephalus* (Scyliorhinidae) en el golfo de California, México

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Abstract. On February 11th 2007, 13 neonates and 4 adults of *Cephalurus cephalus* were collected using a benthic sledge, during one oceanographic cruise (Talud X, St. 12) in the mid Gulf of California, Mexico (28°01'36" N, 111°51'50" W). The lollipop catsharks were caught at a depth of 464 to 486 m and at a temperature of 9.4°C, and where hypoxic (0.14 ml/l) conditions prevail. The total length (TL) of one female (221 mm) and one male (184 mm) was shorter than the known estimated sexual maturation size (240 mm and 190 mm, respectively). The TL of 10 neonates (70-96 mm) was shorter than the known estimated size at birth (100 mm), the new record was documented on a female (70 mm). Until now, the presence of neonates of *C. cephalus* during the winter season has not been reported in the literature; this suggests that the hatching season extends at least from winter to summer.

Key words: *Cephalurus cephalus*, Gulf of California, neonates, size at birth, winter.

Resumen. El 11 de febrero de 2007, se recolectaron 13 neonatos y 4 adultos de *Cephalurus cephalus*, utilizando un trineo bentónico, durante una campaña oceanográfica (Talud X, St. 12) en la porción central del golfo de California, México (28°01'36" N, 111°51'50" O). Los tiburones renacuajo se capturaron en un intervalo de profundidad de 464 a 486 m, a una temperatura de 9.4°C, y donde prevalecen condiciones hipóxicas (0.14 ml/l). La longitud total (LT) de una hembra (221 mm) y un macho (184 mm) fueron menores que la LT estimada de madurez conocida (240 mm y 190 mm, respectivamente). La LT de 10 neonatos (70-96 mm) fue menor que la LT estimada de nacimiento conocida (100 mm), el nuevo record 70 mm LT se registró en una hembra. Hasta ahora, la presencia de neonatos de *C. cephalus* durante el invierno no había sido reportada, esto sugiere que al menos la estación de alumbramiento va desde el invierno hasta el verano.

Palabras clave: *Cephalurus cephalus*, golfo de California, neonatos, talla de nacimiento, invierno.

The lollipop catshark, *Cephalurus cephalus* (Gilbert, 1892) is a little-known species of deep sea catshark, family Scyliorhinidae, and the only described member of its genus. This benthic species occurs around the outer continental shelf and upper continental slope at depths of 155-937 m; it is a bathydemersal species found in the tropical eastern Pacific from Baja California to northern Chile. Studies on its biology are scarce, and information available is mostly restricted to its taxonomy and distribution (Compagno, 1984; Sáez and Pequeño, 2010) and some notes

on its biology (Castro-Aguirre, 1981; Balart et al., 2000). During the winter season, the presence of neonates larger than the estimated size at birth (total length: 100 mm) has not been reported in the literature. Balart et al. (2000) suggested that hatching occurs in early summer. Reproduction is aplacental viviparous, with females retaining egg cases internally 2 at a time until they hatch (Compagno, 1984).

On February 11th 2007, during the launch of the Talud project, 13 neonates and 4 adults of *C. cephalus* were caught from the oceanography vessel "B/O El Puma" of the Universidad Nacional Autónoma de México. The epibenthic sledge was operated at depths of 464 to 486 m in the Gulf of California (TALUD X, St. 12, 28°01'36" N,

111°51'50" W). The fishing operation lasted 30 min, at a ship speed of 2 knots. Sampling depth was estimated with an analogical Edo Western echo sounder. Temperature and oxygen concentrations were measured approximately 10 m above the bottom level with a CTD. Specimens were fixed with a 4% formaldehyde sea water solution for at least 1 week, washed with tap water, preserved in 70% ethanol, and identified in the laboratory. *Cephalurus cephalus* can be readily identified by its tadpole-like shape with a greatly expanded, rounded head and narrow body (Fig. 1). The

guides of Springer (1979) and Compagno (1984) were used for identification. Total length (TL, mm) was recorded.

The lollipop catsharks were caught at a depth range of 464 to 486 m and at a temperature of 9.4°C, and where hypoxic (0.14 ml/l) conditions prevailed. In the south-eastern Gulf of California, epibenthic dissolved oxygen concentration is always $<0.5\text{ ml/l}$ and occasionally $<0.1\text{ ml/l}$, limiting the occurrence of macroinvertebrate species that cannot tolerate severe hypoxic conditions (Hendrickx 2001, 2003). However, for *C. cephalus* this does not repre-



Figure 1. Specimens of the lollipop catshark *Cephalurus cephalus* caught in the Gulf of California (Talud X, St. 12). a), dorsal view of a female 221 mm TL. b), ventral view of a female neonate 107 mm TL. Bar= 100 mm.

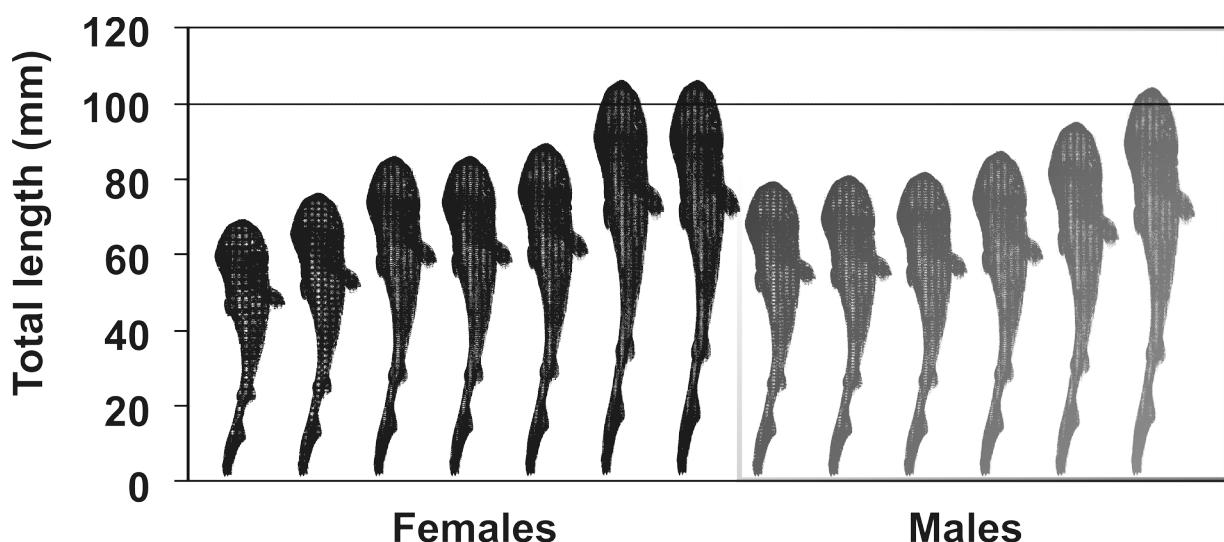


Figure 2. Total length (mm) of *Cephalurus cephalus* neonates separated by sex. The estimated size at birth (100 mm TL) proposed by Compagno (1984) was indicated.

sent a barrier for dispersion from the mid-shelf into deeper waters (depth range 155 to 937 m), because the large head houses expanded gills that are thought to be an adaptation for hypoxic conditions (Compagno, 1984).

Of the 17 specimens, 2 were adult females, 2 were adult males, 7 were neonate females, and 6 were neonate males. The overall female-to-male sex ratio was 1:1; for adults it was 1:1 and for neonates it was 1:0.9. Balart et al. (2000) also found a sex ratio close to 1:1 for 19 embryos collected in the Pacific coast of Baja California Sur, Mexico.

Adult females were 221 and 243 mm TL, both females had mature oocytes in their ovaries; however, there were no egg cases retained in the oviducts, the first female was shorter (240 mm) than the total length at first maturity (TLM) reported by Compagno (1984). Adult males were 184 and 257 mm, and the first was shorter than 190 mm (TLM) (Compagno, 1984). Neonates ranged from 70 to 107 mm TL, the 7 females measured 70, 77, 87, 88, 90, 107, and 107 mm TL and the 6 males measured 75, 82, 83, 88, 96, and 106 mm TL (Fig. 2). The TL of 10 neonates (70 to 96 mm) were shorter than the known estimated size at birth (100 mm TL).

None of 13 neonates had an egg yolk (Fig. 1b), which is an indication that they were captured after parturition. On February 1972, one pregnant female from the Gulf of California was recorded; it had 2 embryos (32 mm TL) in its uterus with a large egg yolk (Castro-Aguirre, 1981). Balart et al. (2000), based on diameter of the oocytes, suggested that hatching occurs in early summer. However, the occurrence of neonates ranging from 70 to 107 mm TL in the winter suggests that *C. cephalus* does not have a defined breeding season, and hatching occurs at least from winter to summer.

Three new size records were reported here: newborns measure about 70 mm TL, sexual maturation is reached at a length of 184 mm for males, and 221 mm for females. The new records are associated with search artifacts such as infrequent capture, low or non-existent commercial value, and the existence of local reports with limited dissemination, as occurs in other deep sea chondrichthyan fishes (Aguirre et al., 2002; Ruiz-Campos et al., 2010).

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