

FIRST RECORD OF MONOCLASPER IN THE BANDED GUITARFISH, *Zapteryx exasperata* IN THE GULF OF CALIFORNIA, MEXICO

Primer registro de monoclasper en la raya guitarra pinta, *Zapteryx exasperata* en el Golfo de California, México

Resumen. Se reporta por primera vez un macho maduro de *Zapteryx exasperata* con ausencia de clasper derecho, recolectado en el Golfo de California. Las observaciones en el sistema reproductivo no mostraron anomalías ni evidencia de cicatrización reciente de la aleta pélvica derecha. Se sugiere que esta condición podría generarse por dos posibles causas: malformación congénita o pérdida accidental en una etapa temprana de madurez (por ejemplo, la mordedura de un depredador).

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The Banded guitarfish *Zapteryx exasperata* Jordan & Gilbert 1880 is distributed from California (United States) to the Gulf of California, in coastal habitats and rocky reefs (De La Cruz Agüero et al., 1997; Last et al., 2016). It is one of the batomorphs species most frequently captured in northwestern Mexico and is usually taken in the artisanal fisheries of the Gulf of California, mainly in shrimp trawlers, with largest catches during the reproductive aggregations of spring and summer (Bizzarro & Kyne, 2015). The maximum recorded size for this species is 97 cm total length (Villavicencio-Garayzar, 1995) and the species is viviparous with yolk sac (Ebert, 2003).

Worldwide, several malformations have been reported in elasmobranchs (e.g., Delpiani et al., 2011; Mejía-Falla et al., 2011; Muñoz-Orsorio et al., 2013; Wakida-Kusunoki, 2015; Anislado-Tolentino et al., 2016; Ehemann et al., 2016). In the Mexican Pacific bicephalic embryos (Galván-Magaña et al., 2011), albinism and morphological abnormalities (Escobar-Sánchez et al., 2009; Escobar-Sánchez et al., 2014; Ochoa-Díaz et al., 2016) have been reported. However, pelvic fin abnormalities are uncommon compared to those of pectoral fins (Orlov, 2011), and five cases of a single clasper are known for batomorphs. Two are highlighted: Torres-Huerta et al. (2011) reported it for *Urotrygon chilensis* (Günther 1872) in the Gulf of Tehuantepec and Ehemann and González-González (2018) for *Pseudobatos percellens* (Walbaum, 1792) in the Caribbean Sea. This study is the second case known for the order Rhinopristiformes and the first for the family Trygonorrhinidae.

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The specimen of *Z. exasperata* was captured in the artisanal fishery in the southern zone of Espiritu Santo Island (24.486°N-110.302°W) during May 2014, with a gillnet 200 m long and with a 10-inch mesh. Disc width (DW, cm), total length (TL, cm), inner clasper length (IC, cm) and total mass (TM, g) were recorded. Maturity was defined following the criteria proposed by Blanco-Parra et al. (2009) and ICES (2010), based mainly on the length and calcification of the clasper, the development of the testes and the presence/absence of testicular lobes, as well as the presence/absence of seminal fluid. Each reproductive structure (testes, ductus deferens, and seminal vesicles) was measured in length and width (± 0.001 cm) and each testicle was weighted (± 0.001 g). The testes and seminal vesicles were histologically processed and stained using the Hematoxylin-Eosin technique. Histological analyzes were performed to observe abnormal conditions in reproductive structures at the cellular level through microphotographs, with an Axiocam ERc 5s camera and processed with the ZEN 2 software (Blue Edition). The histological description was made based on the proposed by Maruska et al. (1996) and ICES (2010).

The Batomorph was a mature male of 73 cm LT, 35 cm DW and 2000 g TM. The left clasper (dorsal view) was 19.3 cm IC, wholly calcified and contained semen; the gland of the clasper was widened and well developed and contained seminal fluid. The right pelvic fin showed no sign of a clasper and or clasper gland (Fig. 1A). The reproductive system had a wet mass of 70 g and showed no evidence of damage or malformation. It was composed of paired testes with well-defined testicular lobes and little epigonal tissue, seminal vesicles well rolled and containing seminal fluid and a well-developed vas deferens (Fig. 1B). Those characteristics defined the specimen as mature and in a reproductive stage (maturity stage 4).

Both sides (right and left; dorsal view) of the extratesticular ducts (ductus deferens + Leydig's gland) and seminal vesicles were similar in size; the left testicle was slightly longer but narrower than the right testicle but (Table 1, Fig. 1B). Gametogenic development was similar in both testes, with seminiferous tubules composed of mature spermatozoa (Fig. 2A, B). Both seminal vesicles (right and left) showed evidence of sperm and seminal fluid packets (Fig. 2C, D).

This is the first report of a specimen missing a clasper for the species *Z. exasperata*. Based on the observations of the right pelvic fin, it is suggested that the absence of the clasper gland could be due to two potential causes, both related to the early stages of development of the individual: 1) Accidental loss of the clasper in an early stage (neonate or juvenile) probably by the bite of a predator). This could prevent the development of the clasper gland in the adult stage since according to Lacy (2005), this gland is closely related to maturity. 2) Malformation was originated in its embryonic stage, indicating that this phenomenon could be of congenital type, as has been reported for *P. percellens* by Ehemann and González-González (2019), which does not

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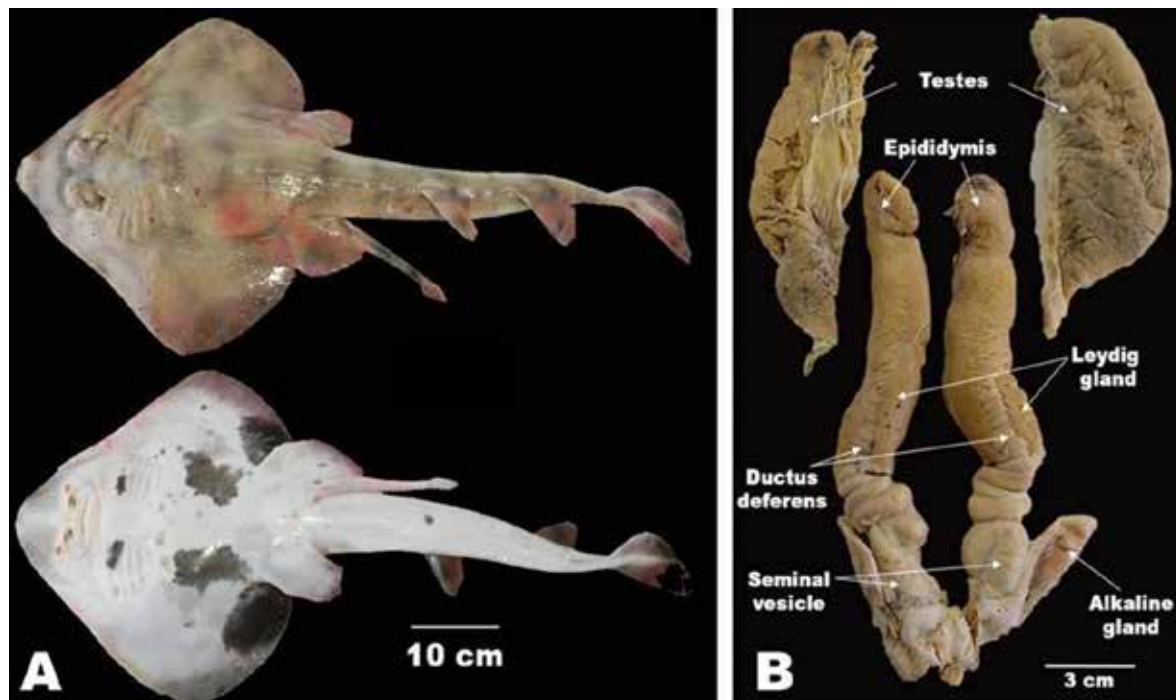


Figure 1. Images of the mature male specimen of *Zapteryx exasperata* with the absence of right clasper. (A) Dorsal and ventral view; (B) Reproductive system.

have a direct repercussion on gonadal development.

Other possible causes of these abnormalities in pelvic fins are related to disease, parasitism or some kind of genetic condition (Moore, 2015), or those related to anthropogenic factors such as pollution (Sheppard *et al.*, 2010).

Finally, considering that the male studied had the ability to produce and store spermatozoa in both testes and seminal vesicles, as well as secrete mature spermatozoa, and to have semen in its right clasper, it is suggested that this individual could have mated in its natural environment. However, it is unknown if this condition caused an intraspecific disadvantage (e.g., less reproductive events or successful copulations compared to other males), which could affect its reproductive success (Chapman *et al.*, 2003; Torres-Huerta *et al.*, 2015).

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Table 1. Measurements and maturity description of each reproductive organ (left and right, dorsal view) of the mature male with the presence of a single clasper of *Zapteryx exasperata*.

Measurements	Testes		Extratesticular ducts		Seminal vesicle	
	Right	Left	Right	Left	Right	Left
Length	5.8	7.2	10.9	10.4	4	4
Width	2.9	2.1	1.7	1.5	1.5	1.5
Weight	6.6	5.8	-	-	-	-
Maturity description	Well defined testicular lobes, with little epigonal tissue		Well-differentiated and developed		Well coiled and with the seminal fluid presence	

Extratesticular ducts: ductus deferens + Leydig gland.

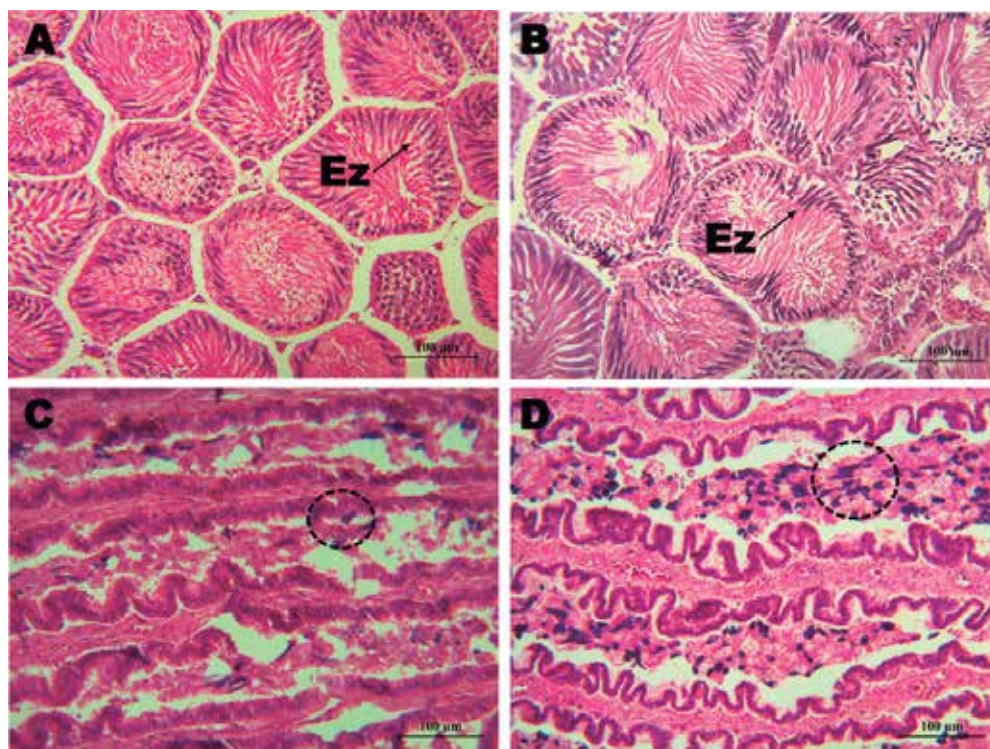


Figure 2. Cross-sectional microphotograph of (A) right testicle and (B) left testicle with spermatozoa (Ez); (C) right seminal vesicle and (D) left seminal vesicle containing packages of sperm () of the mature male of *Zapteryx exasperata*.

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