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).

María I. Burgos-Vázquez 1*, Lorem del V. González-González 1, Paola A. Mejía-Falla 2 and Víctor H. Cruz-Escalona 1.
1 Instituto Politécnico Nacional, Centro Interdisciplinario de Ciencias Marinas, Departamento de Pesquerías y Biología Marina, 23096, La Paz, BCS, México. 2 Fundación Colombiana para la investigación y conservación de tiburones y rayas, SQUALUS, Calle 10A No. 72-35 Apt. 310E, Cali, Colombia. *Corresponding author: itzigueri@gmail.com

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, Mexico. CICIMAR Oceánides, 34(1): 41-44.

The specimen of Z. exasperata was captured in the artisanal fishery in the southern zone of Espiritu Santo Island (24.486ºN-110.302ºW) 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
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).

ACKNOWLEDGMENTS

The authors thank the fisherman Juan Higuera and his wife for support during the field work. To CONACyT and CICIMAR-IPN for the logistic support. The specimen was collected through the project SEP-CONACyT 180894. VHCE is fellowship recipient of the SNI, COFAA-IPN and EDI-IPN Programs.

REFERENCES

Anislado-Tolentino, V., M. G. Medina-Lerma & L. F. Del Moral-Flores, (2016). Primer registro de albinismo en la raya redonda enana, Urotrygon nana (Urotrygonidae: Elasmobranchii), en el Pacifico oriental. REVMAR 8, 93–100. http://dx.doi.org/10.15359/revmar.8-2.6

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    |
| Length                | 5.8    | 7.2                    | 10.9            | 10.4    |
| Width                 | 2.9    | 2.1                    | 1.7             | 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.
Burgos- Vázquez et al.

International Council for the Exploration of the Sea (ICES). (2010). Report of the Workshop on Sexual Maturity Staging of Elasmobranches (WKMSEL), 11–15 October 2010, Valetta, Malta. ICES CM 2010/ACOM: 48. 32.

Lacy, E. R. (2005). Alkaline glands and clasper glands of batoids. 336-360, In: Hamlett, W.C. (Ed.), Reproductive Biology and Phylogeny of Chondrichthyes: Sharks, Batoids and Chimaeras. Science Publishers: Infield, NH.

Maruska, K., E. Cowie & T. Tricas. (1996). Periodic gonadal activity and protracted mating in elasmobranch fishes. J. Exp. Zool. 276, 219-232. https://doi.org/10.1002/(SICI)1097-010X(19961015)276:3<219::AID-JEZ6>3.0.CO;2-Q

Mejía-Falla, P. A., A. F. Navia & L. A. Muñoz. (2011). First record of morphological abnormality in embryos of Urotrygon rogersi (Jordan & Starks, 1895) (Myliobatoidei: Urotrygonidae) in the Tropical Eastern Pacific. J. Fish Biol. 82, 1753-1757. http://dx.doi.org/10.1111/j.1095-8641.2008.02177.x

Moore, A. B. M. (2015). Morphological abnormalities in elasmobranchs. J. Fish Biol. 87, 465-471. http://doi.org/10.4067/S0718-560X2011000100019

Muñoz-Osorio, L. A., P. A. Mejía-Falla & A. F. Navia. (2013). First record of a bicephalic embryo of Small-tail Shark Carcharhinus porosus (Elasmobranchii, Carcharhinidae). J. Fish Biol. 82, 1753-1757. http://doi.org/10.1111/jfb.12102

Ochoa-Díaz, M. R., J. Rodriguez-Romero, J. López-Martínez & M. C. Maldonado-García. (2016). First record of spine malformation of the round stingray Urolophus hallieri off the Western Coast of Baja California Sur, México. Mar. Biodivers. Rec. 9, 70.https://doi.org/10.1186/s41200-016-0074-x

Orlov, A. (2011). Record of a tailless Richardson’s ray Bathyrana richardsoni (Garrick, 1961) (Rajiformes: Arhynchobatidae) caught off the Mid-Atlantic Ridge. Pan-Am. J. Aquat. Sci. 6, 232-236.

Sheppard, C., M. Al-Husaini, F. Al-Jamali, F. Al-Yamani, R. Baldwin, J. Bishop, F. Benzoni Dutrieux, E., Dulvy, N. K., Durvusula, S. R. V., Jones, D. A., Loughland, R., Medio, D., Nithyanandan, M., Pilling, G. M., Polikarpov, I., Price, A. R. G., Purkis, S., Rieg, B., Saburova, M., Namin, K. S., Taylor, O., S. Wilson & K. Zainal. (2010). The Gulf: a young sea in decline. Mar. Pollut. Bull. 60, 13–38. https://doi.org/10.1016/j.marpolbul.2009.10.017.

Torres-Huerta, A. M., J. Meraz, P.E. Carrasco-Bautista & P. L. Diaz-Carballedo. (2015). Morphological abnormalities of round rays of the genus Urotrygon in the Gulf of Tehuantepec. Mar. Biodivers. https://doi.org/10.1007/s12526-015-0347-3.

Villavicencio-Garayzar, C. J. (1995). Reproductive Biology of the Banded Guitarfish, Zapteryx exasperata (Pisces: Rhinobatidae), In Bahía Almejas, Baja California Sur, Mexico. Ciencias Marinas 21, 141-153.

Wakida-Kusunoki, A. T. (2015). First record of total albinism in southern stingray Dasyatis americana. Rev. Biol. Mar. Ocean. 50, 135-139. http://dx.doi.org/10.4067/S0718-19572015000100011