


# First record of the scoophead shark (*Sphyrna media*) and new records of great hammerhead sharks (*Sphyrna mokarran*) in the Guatemalan Pacific

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## ARTICLE INFO

### Keywords:

Sphyrnidae  
Critically Endangered  
Uncommon sharks  
Tropical Eastern Pacific  
Artisanal fisheries

## ABSTRACT

A juvenile scoophead shark (*Sphyrna media*) and four juvenile great hammerhead sharks (*Sphyrna mokarran*) captured with longlines (< 30 m depth) by small-scale fisheries off the coast of Buena Vista and Sipacate in the Guatemalan Pacific are reported. These species are categorized as Critically Endangered by the IUCN Red List, primarily due to overfishing. All the specimens were juveniles: a male *S. media* (71 cm TL) and four *S. mokarran*, including a female (114 cm TL) and three males (79.5, 122, and 149.5 cm TL). *Sphyrna mokarran* specimens recorded in our study are the smallest ever reported for the Eastern Pacific region. *Sphyrna media* specimen is the first recorded in the Guatemalan Pacific, increasing the number of hammerhead species to four and the total number of shark species recorded off the Guatemalan Pacific to sixteen.

## 1. Introduction

The hammerhead sharks (family Sphyrnidae), so named because of the lateral expansion of the head, comprise sharks occurring in tropical and temperate waters worldwide (Gilbert, 1967); however, the small species, with the exception of *Eusphyrna blochii*, are restricted to waters off the American continent (Ebert et al., 2021). The scalloped hammerhead (*Sphyrna lewini* Griffith and Smith, 1834) and the smooth hammerhead (*Sphyrna zygaena* Linnaeus, 1758) are common in the Eastern Pacific (Martínez-Ortiz et al., 2007; Galeana-Villaseñor et al., 2009; Pérez-Jiménez, 2014). The great hammerhead (*Sphyrna mokarran* Rüppell, 1837) has been recorded in the Central Mexican Pacific (Castillo-Geniz et al., 2016), Panama, and Guatemala (Guzman et al., 2019; Avalos-Castillo and Santana-Morales, 2021), and the bonnethead (*Sphyrna tiburo* Linnaeus, 1758), the scalloped bonnethead (*Sphyrna corona* Springer, 1940) and the scoophead shark (*Sphyrna media* Springer, 1940) have been recorded off Colombia, Panama, and Mexico (Castillo-Geniz, 2001; Torres-Huerta, 2008; Rico-Mejia and Rueda, 2007; Guzman et al., 2019).

Along the Guatemalan Pacific coast, the most frequently caught shark is *S. lewini* (Ixquiac-Cabrera et al., 2009; Avalos-Castillo and Santana-Morales, 2021). *Sphyrna mokarran* and *S. zygaena* have also been reported in landings (Ixquiac-Cabrera et al., 2009). Notably, there

is only one previously documented record of *S. mokarran* (Avalos-Castillo and Santana-Morales, 2021); however, no data on sex and size have been recorded. Our study is aimed to provide the first verified record of *S. media* and new records of *S. mokarran* in the waters of the Guatemalan Pacific.

*Sphyrna media* is a small-sized (<150 cm total length, TL) hammerhead shark distributed in the Eastern Pacific from the Gulf of California, Mexico, to northern Peru and in the Western Atlantic from Panama to southern Brazil. It inhabits waters in continental shelves from inshore to 100 m depth (Compagno, 1984; Castro, 2011). In comparison, *S. mokarran* is a large (610 cm TL) coastal and semi-oceanic pelagic shark, wide-ranging in tropical and warm temperate waters (Compagno, 1984; Castro, 2011).

*Sphyrna media* is captured in fisheries using bottom longlines, gill-nets, and hook and line (Compagno, 1984; Kyne et al., 2012), which are typically unmanaged and operate throughout its range. The declining numbers of records over the past several decades and range contraction in some areas indicate that this shark has undergone population reduction in both the Pacific and the Atlantic (Pollom et al., 2020). Records are sparse from elsewhere in the Eastern Pacific (Pérez-Jiménez, 2014; Guzman et al., 2019). Therefore, it is inferred that *S. media* has experienced a population decline of 80 % due to high levels of fishing, leading to its category of Critically Endangered by the IUCN Red List

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<https://doi.org/10.1016/j.rsma.2025.104122>

Received 28 October 2024; Received in revised form 6 March 2025; Accepted 7 March 2025

Available online 8 March 2025

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(Pollom et al., 2020).

*Sphyrna mokarran* is caught globally as a target and bycatch in coastal and pelagic large- and small-scale longline, purse seine, and gillnet fisheries and is often retained for the fins (Castro, 2011; Kyne et al., 2012; Ebert et al., 2021). *Sphyrna mokarran* has shown significant declines in several regions throughout its range, and its population has declined by 80 % over three generations; consequently, it has been categorized as Critically Endangered by the IUCN Red List (Rigby et al., 2019).

The historical presence of *S. media* and *S. mokarran* in the Eastern Pacific is well documented in ichthyological collections in Mexico (mainly in the Gulf of California), Costa Rica, and Panama (Table 1). It is important to highlight the lack of recent records in the Gulf of California, Mexico, despite intense landing monitoring surveys in recent decades (Pérez-Jiménez, 2014). Before our study, the most recent records of *S. media* were in 2009–2010 off Panama (Vega et al., 2023), and the

**Table 1**

Specimens of *Sphyrna media* (n = 40) and *Sphyrna mokarran* (n = 30) from the Eastern Pacific preserved in ichthyological collections. NA: not available.

Collection	Catalog numbers	Year	Region	No.
<i>Sphyrna media</i>				
USNM	28160 (paratype)	1880–1881	Gulf of California, Mexico	1
CAS	SU 11583 (holotype)	1894–1895	Gulf of California, Mexico	1
USNM	196140	1947	Gulf of Nicoya, Costa Rica	6
LACM	48414–2, 31902–12	1951	Gulf of California, Mexico	2
SIO	15–78	1953	Panama Bay, Panama	1
FMNH	63093	1954	Southern Pacific coast, Mexico	2
LACM	6853–39	1955	Gulf of California, Mexico	1
USNM	190593	1958	Panama Bay, Panama	4
SIO	15–180	1958	Gulf of California, Mexico	2
SIO	15–245	1958	Panama Bay, Panama	3
SIO	15–392	1958	Panama Bay, Panama	7
SIO	60–88	1960	Gulf of California, Mexico	3
LACM	39381–2, 39381–3	1964	Gulf of California, Mexico	2
SIO	71–204	1970	Panama Bay, Panama	1
LACM	9407–25, 39388–1	NA	Gulf of California, Mexico	3
LACM	6779–21	NA	Panama Bay, Panama	1
<i>Sphyrna mokarran</i>				
YPM	ICH.001001, ICH.001124	1926	Gulf of California, Mexico	6
AMNH	I–15691	1936	Western Baja California, Mexico	1
SIO	47–67	1947	Gulf of California, Mexico	1
SIO	15–2661	1952	Gulf of California, Mexico	1
SIO	15–179	1958	Gulf of California, Mexico	1
CMN	CMNFI 1968–1375.1	1961	Southern Pacific coast, Mexico	1
IBUNAM	PE964	1982	Central Pacific coast, Mexico	1
USNM	37162, 8091, 29645	NA	Gulf of California, Mexico	3
YPM	ICH.001008, ICH.001123	NA	Pacific coast, Mexico	15

SIO = Scripps Institution of Oceanography; LACM = Natural History Museum of Los Angeles County; USNM = Smithsonian Institution National Museum of Natural History; FMNH = Field Museum of Natural History; IBUNAM = Colección Nacional de Peces, UNAM; CAS = California Academy of Sciences; YPM = Peabody Museum of Natural History; AMNH = American Museum of Natural History; CMN = Canadian Museum of Nature.

most recent records of *S. mokarran* were in 2006–2014 in the Central Mexican Pacific (Castillo-Geniz et al., 2016) (Table 2).

In our study, we conducted landing monitoring in the fishery communities on the Central Guatemalan Pacific coast. *Sphyrna media* specimen was landed in the fishing community of Buena Vista, and the four *S. mokarran* specimens (including the one reported by Avalos-Castillo and Santana-Morales, 2021) were landed in Sipacate by artisanal boats (fiberglass outboard motored, 7.5–9 m in length), which target teleosts and rays using bottom longlines (J or Eagle Claw half circle hooks of 3–6 cm height) in the continental shelf at less than 30 m depth. *Sphyrna media* specimen was taxonomically identified following the descriptions by Compagno (1984), Castro (2011), and Ebert et al. (2021), such as a moderately broad, anteriorly arched, mallet-shaped head, with weak medial and lateral indentations on its anterior edge (Fig. 1). We used molecular methods to confirm visual identification due to the close morphological similarity with *S. corona*.

We collected a muscle sample from *S. media* for genetic analysis to confirm species identity. Tissue samples were stored in 95 % ethanol, and total DNA extraction was performed using the Qiagen DNeasy Blood and Tissue Kit following the manufacturer's protocol (Qiagen, Valencia, CA, U.S.A.). A 772-base pair (bp) fragment of the mitochondrial COI region was amplified, and three independent replicates were run using the primers FishCoxI F1 (5 TCWACCAACCACAAAGAYATYGGCAG) and FishCoxI R1 (TARACTTCWGGGTGRCRAAGAATCA), modified from Ward et al. (2005). Polymerase chain reaction (PCR) was performed as follows: 94C for 2 min., 35 cycles of 30 s at 94C, 55C for 45 s, and 72C for 40 s, followed by a final extension step of 72C for 10 min. Successfully amplified PCR products were purified using Exo-SAP (Thermo Scientific) and sequenced on an ABI 3500. All sequences were edited, checked manually, and aligned using GeneiousPrime (<http://www.geneious.com>). A BLAST search was performed in GenBank to compare the sequences against all available specimens, including potential matches with *S. corona*. Since no *S. media* sequences were available in GenBank, species identification was validated using genetically confirmed *S. media* samples from Colombia and Panama.

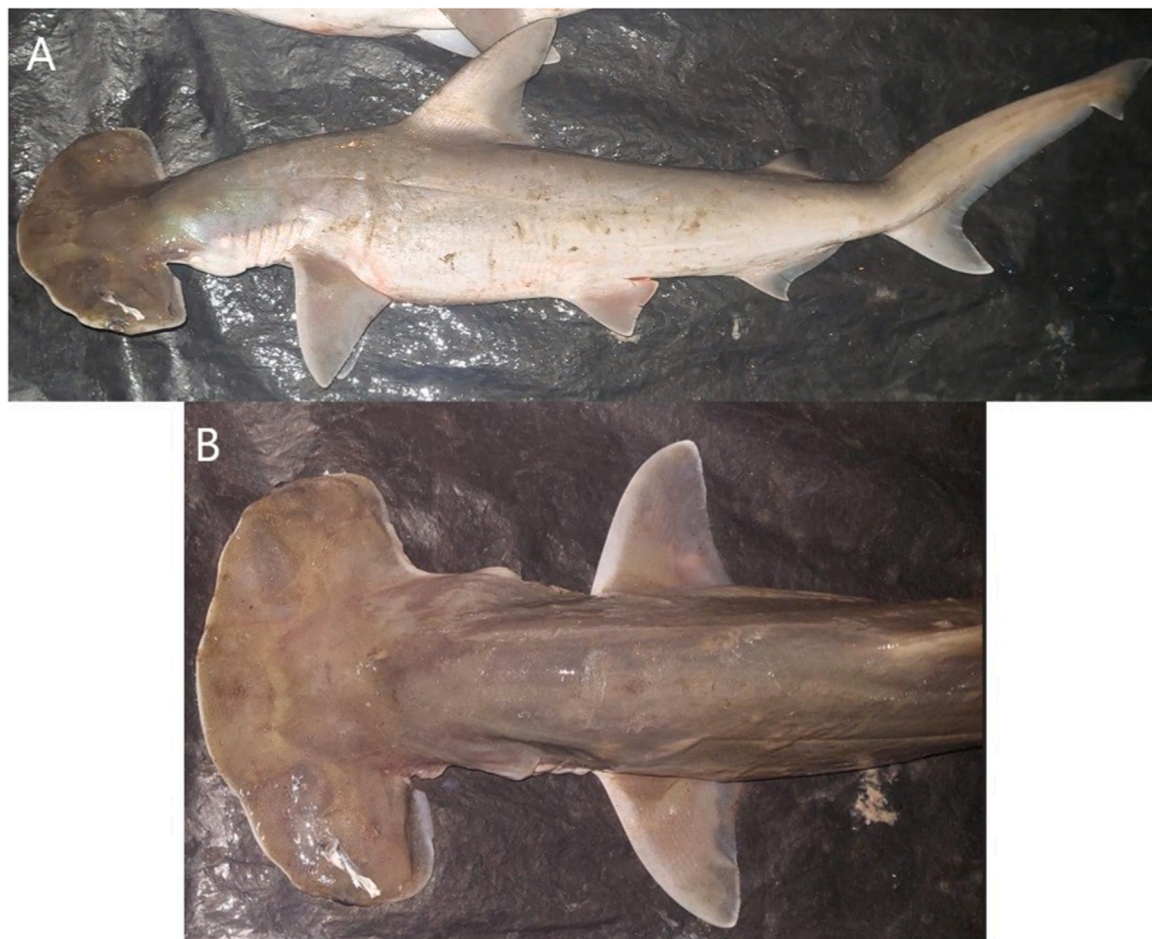
*Sphyrna mokarran* specimens were taxonomically identified following the descriptions by Compagno (1984), Castro (2011), and Ebert et al. (2021), such as the anterior margin of the head nearly straight and with a median indentation and first dorsal fin very high and falcate (Fig. 2).

We measured the total length (TL) in centimeters of all specimens using a metric tape. The male *S. media* measured 71 cm (TL) and landed on March 15, 2024 (Fig. 1). The first recorded *S. mokarran* was a male (122 cm TL) landed on February 12, 2020 (this is the one documented by Avalos-Castillo and Santana-Morales, 2021); the second record was a female (114 cm TL) landed on January 5, 2024 (Fig. 2A, B); the third record was a male (149.5 cm TL) landed on March 5, 2024 (Fig. 2C), and the fourth record was a male (79.5 cm TL) landed on June 5, 2024. The smallest *S. mokarran* (79.5 cm TL) was either a neonate or young of the year; the other *S. mokarran* and *S. media* specimens were juveniles. The size at maturity for *S. media* males has been estimated to be anywhere from 83 cm TL (Castro, 2011) to 100 cm TL (Ebert et al., 2021). *Sphyrna mokarran* males mature at 234–269 cm TL, and the females at 250–300 cm TL (Compagno, 1984). Additionally, the size at birth of *S. mokarran* is 50–70 cm TL (Compagno, 1984; Ebert et al., 2021).

With the inclusion of our record of *S. media*, the number of hammerhead species recorded in the Guatemalan Pacific now is four, including *S. lewini*, *S. zygaena*, and *S. mokarran* (Ixquiac-Cabrera et al., 2009; Avalos-Castillo and Santana-Morales, 2021), and increased to 16 the total number of shark species off Guatemalan Pacific coast. The relevance of the *S. media* record relies on the recent scarcity of records for this species in the Eastern Pacific (Table 2). Moreover, the sizes of *S. mokarran* reported in our study are the smallest recorded for the Eastern Pacific region, underscoring the importance of continuous monitoring of landings along the Guatemalan Pacific coast.

**Table 2**Biological data of *Sphyrna media* (n = 26) and *Sphyrna mokarran* (n = 263) from the Eastern Pacific, recorded in fisheries landings since 1999. NA: not available.

Country	Year of the records	Number of records	Size (cm, TL)	Sex	Reference
<i>Sphyrna media</i>					
Guatemala	2024	1	71	Male	Present study
Panama	2009–2010	18	29.3–77.5	Both	Vega et al. (2023)
Panama	2007–2009	1	NA	NA	Guzman et al. (2019)
Mexico	2006–2007	1	156	Male	Torres-Huerta (2008)
Mexico	1999–2001	2	NA	NA	Castillo-Geniz (2001)
Colombia	2001	3	NA	NA	Navia and Mejía-Falla (2016)
<i>Sphyrna mokarran</i>					
Guatemala	2020–2024	4	79.5–149.5	3 males, 1 female	Present study
Mexico	2006–2014	253	140–342	Both	Castillo-Geniz et al. (2016)
Mexico	2010	1	424	Female	Tovar-Ávila and Gallegos-Camacho (2014)
Panama	2007–2009	2	NA	NA	Guzman et al. (2019)
Mexico	2005–2006	3	NA	NA	Galeana-Villasenor et al. (2009)

**Fig. 1.** Scoophead shark *Sphyrna media* (male of 71 cm TL), A) Lateral view, B) Dorsal view of the head.**Ethics approval**

All research activities were conducted under permit Bno.1604, issued by Consejo Nacional de Áreas Protegidas (CONAP), and the collect B-01605 and research permits B-00923.

**Funding**

Luis von Ahn Foundation, the Shark Conservation Fund, and U.S. Fish and Wildlife Service provided funding for the elasmobranch monitoring project.

**Author statement**

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**Fig. 2.** Great hammerhead shark *Sphyrna mokarran*, A) Lateral view of a male (114 cm TL), B) Dorsal view of a male (114 cm TL), C) Dorsal view of a male (149.5 cm TL).

#### CRediT authorship contribution statement

**Pérez-Jiménez Juan Carlos:** Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **de los**

**Angeles Rosales-Melgar María:** Writing – review & editing, Supervision, Project administration, Funding acquisition. **Areano-Barillas Elisa M.:** Writing – review & editing, Supervision, Funding acquisition. **Hernández Ana Cristina:** Writing – review & editing, Writing – original



draft, Methodology, Conceptualization. **Sánchez-Jiménez Julio:** Writing – review & editing, Supervision, Methodology.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgments

Fundación Mundo Azul thanks Buena Vista and Sipacaté fishers for their support while conducting fishery-dependent surveys. Special thanks to our communitarian landing monitors Edwin Segovia, Manuel Zepeda, Franklin León, and Hugo Martínez. Cindy Gonzalez and Demian Chapman conducted the molecular analysis to confirm the scoophead shark identification. Thanks to Consejo Nacional de Áreas Protegidas (CONAP) for authorizing this research.

## Data Availability

Data will be made available on request.

## References

- Avalos-Castillo, C.G., Santana-Morales, O., 2021. Characterization of the artisanal elasmobranch fisheries off the Pacific coast of Guatemala. *Fish. Bull.* 119 (9), 3. <https://doi.org/10.7755/FB.119.1.2>.
- Castillo-Geniz, J.L., 2001. Elasmobranchios del Golfo de Tehuantepec, litoral Chiapaneco. Informe Final del Proyecto CONABIO S123. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, México, DF.
- Castro, J.I., 2011. *The Sharks of North America*. Oxford University Press, New York.
- Compagno, L.J.V., 1984. *Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 2. FAO Fish. Synop.* 125, 251–655.
- Ebert, D.A., Dando, M., Fowler, S., 2021. *New Jersey. Sharks of the World. A Complete Guide*. Princeton University Press.
- Galeana-Villaseñor, I., Galván-Magaña, F., Santana-Hernández, H., 2009. Pesca con anzuelos en barcos palangreros del Océano Pacífico mexicano: efectos en la captura y peso de tiburones y otras especies. *Rev. De. Biol. ía Mar. Y. Oceanogr.* ía 44 (1), 163–172.
- Gilbert, C.R., 1967. A revision of the hammerhead sharks (Family Sphyrnidae). *Proc. U. S. Natl. Mus.* 199, 1–88.
- Guzman, H.M., Cipriani, R., Vega, A.J., Morales-Saldaña, J.M., 2019. Fisheries and conservation assessment of sharks in Pacific Panama. *Aquat. Conserv. Mar. Freshw. Ecosyt.* 1–16. <https://doi.org/10.1002/aqc.3245>.
- Castillo-Geniz, J.L., Godínez-Padilla, C.J., Ortega-Salgado, I., Ajás-Terriquez, H.A., 2016. Programa de Observadores de Tiburón (POT). In: Castillo-Geniz, J.L., Tovar-Ávila, J. (Eds.), *Tiburones Mexicanos de importancia pesquera en la CITES*. Instituto Nacional de Pesca, Ciudad de México, pp. 56–67..
- Ixquiac-Cabrera, M.J., Franco-Arenales, I., Tejeda-Velásquez, C.A., Sánchez-Rodas, M.R., Sikahall-Prado, J.A., 2009. Áreas de crianza del Pacífico de Guatemala: Herramienta para el manejo y aprovechamiento sostenido del recurso tiburón. Proyecto Fodecyt 13-2006. Centro de Estudios del Mar y Acuicultura, Universidad de San Carlos de Guatemala, Guatemala City, Guatemala.
- Kyne, P.M., Carlson, J.K., Ebert, D.A., Fordham, S.V., Bizzarro, J.J., Graham, R.T., Kulka, D.W., Tewes, E.E., Harrison, L.R., Dulvy, N.K., 2012. The Conservation Status of North American, Central American, and Caribbean Chondrichyans. IUCN Species Survival Commission Shark Specialist Group, Vancouver, Canada.
- Martínez-Ortiz, J., Galván-Magaña, F., Carrera-Fernández, M., Mendoza-Intriago, D., Estupiñán-Montaño, C., Cedeño-Figueroa, L., 2007. Abundancia estacional de tiburones desembarcados en Manta-Ecuador. In: Martínez-Ortiz, J., Galván-Magaña, F. (Eds.), *Tiburones en el Ecuador: Casos de estudio*. EPESPOPMRC, Manta, Ecuador, pp. 9–27.
- Navia, N.F., Mejía-Falla, P.A., 2016. Fishing effects on elasmobranchs from the Pacific Coast of Colombia. *Universitas Scientiarum* 31 (1), 9–22. <https://doi.org/10.11144/Javeriana.SC21-1.feoe>.
- Pérez-Jiménez, J.C., 2014. Historical records reveal potential extirpation of four hammerhead sharks (*Sphyrna* spp.) in Mexican Pacific waters. *Rev. Fish. Biol. Fish.* 24, 671–683. <https://doi.org/10.1007/s11160-014-9353-y>.
- Pollom, R., Avalos, C., Bizzarro, J., Burgos-Vázquez, M.I., Cevallos, A., Charvet, P., Espinoza, M., Faria, V., Herman, K., Mejía-Falla, P.A., Navia, A.F., Pérez-Jiménez, J. C., Rincon, G., Sosa-Nishizaki, O., 2020. *Sphyrna media*. The IUCN Red List of Threatened Species. e. T60201A3091753 2020. <https://doi.org/10.2305/IUCN.UK.2020-3.RLTS.T60201A3091753.en>. Accessed on 14 June 2024.
- Rico-Mejía, F., Rueda, M., 2007. Evaluación experimental bioeconómica de cambios en la tecnología de captura de camarón con redes de arrastre en aguas someras del Pacífico Colombiano. *Boletín. Invest. Mar. Coste.* 36 (1), 79–109.
- Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureau, N., Romanov, E., Sherley, R.B., Winker, H., *Sphyrna mokarran*. The IUCN Red List of Threatened Species 2019: e. T39386A2920499. <https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T39386A2920499.en>, 2019, (Accessed on 14 June 2024)..
- Torres-Huerta, A.M., Elasmobranchios del sistema laguna Chantuto-Panzacola y Carretas-Pereyra de la Reserva de la Biósfera La Encrucijada, Chiapas. Informe final SNIBCONABIO Proyecto DJ030. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, México, DF, 2008.
- Tovar-Ávila, J., Gallegos-Camacho, R., 2014. Oldest estimated age for *Sphyrna mokarran* (Carcharhiniformes: Sphyrnidae) in the Mexican Pacific. *Hidrobiológica* 24 (2), 163–165 <https://hidrobiologica.izt.uam.mx/index.php/revHidro/article/view/574>.
- Vega, A.J., Robles, P.Y.A., Quezada, F., Montes, L., del Cid, A., Quintero, O., 2023. Incidencia de elasmobranchios en la pesca artesanal en los golfos de Chiriquí y Montijo, Pacífico Panameño. *Scientia* 33 (1), 144–172 (<https://revistas.up.ac.pa/index.php/scientia/>).