

Investigating the status of Ecuador's lost shark, the Sharpfin Houndshark *Triakis acutipinna*

Investigando el estado del tiburón perdido de Ecuador, el tollo del Ecuador *Triakis acutipinna*

Adriana Cevallos-Garcias^{1*}, Sebastián Hernández^{2,3}, Sandra J. Raredon⁴, David A. Ebert^{5,6,7}
and Peter M. Kyne⁸

¹Facultad de Ciencias del Mar, Universidad Laica Eloy Alfaro de Manabí (ULEAM), Vía San Mateo S/N. 130802, Manta, Ecuador

²Laboratorio de Biología Molecular (BIOMOL), Centro de Programas Internacionales y Estudios de Sostenibilidad (CPIES), 1 Km al Oeste de Casa Presidencial, 10105, San José, Costa Rica

³Sala de Colecciones Biológicas, Facultad de Ciencias del Mar, Larrondo 1281, Casilla 117, Universidad Católica del Norte, Coquimbo, Chile

⁴Division of Fishes, Department of Vertebrate Zoology, The National Museum of Natural History, Smithsonian Institution, Washington, D.C., United States of America

⁵Pacific Shark Research Center, Moss Landing Marine Laboratories, Moss Landing, California, United States of America

⁶South African Institute for Aquatic Biodiversity, Grahamstown, South Africa

⁷Department of Ichthyology, California Academy of Sciences, 55 Music Concourse Drive, San Francisco, California, United States of America

⁸Research Institute for the Environment and Livelihoods, Charles Darwin University, Darwin 0909, Northern Territory, Australia

*Corresponding author: adricevallos@gmail.com

Abstract. The Sharpfin Houndshark, *Triakis acutipinna*, was described in 1968 from a specimen captured from Isla de la Plata, Ecuador. Since then, there have been no confirmed records of the species. To investigate the contemporary occurrence of this 'lost shark', a multi-pronged approach was undertaken. This included a literature review, development of an educational poster, and conducting a small number of informal interviews with fishers in five coastal communities of Manabí province, Ecuador. Half of the fishers interviewed recognized *T. acutipinna* and reported its capture as recently as 2010-2015. Despite the preliminary nature of the present study, it suggests that the lost shark of Ecuador persists.

Key words: Conservation, historical ecology, threatened species, Triakidae

INTRODUCTION

The chondrichthyans (sharks, rays, and chimaeras; hereafter collectively referred to as 'sharks') are a diverse group of primarily marine fishes comprising ~1,280 species (D.A. Ebert, unpubl. database, May 2022). Much of the research attention on the group is focused on charismatic and commercially important species (Huvneers *et al.* 2015). Consequently, knowledge is not evenly spread across the fauna and there are wide varieties of species with high levels of data deficiency. Basic information on life history, distribution, and depth ranges are poorly understood for many species. This impedes conservation and management where risk to populations from threatening processes is unknown, particularly where distribution and habitat are undefined. This situation is exacerbated for species known only from a limited number of records and, in some cases, only a single specimen.

There are numerous sharks known only from historical records (often solely the type series) with no contemporary records. These 'lost sharks' may be of dire conservation concern if they occur/potentially occur in areas of intense anthropogenic pressure (*e.g.*, White *et al.* 2019). A lack of recent records may simply reflect a lack of dedicated surveys, particularly in remote areas or unexplored parts of the deep-sea, or identification issues may mask records of cryptic species given the morphological conservatism of many shark families (Ebert *et al.* 2021). Alternatively, it is possible that species have been driven to extinction unnoticed.

The houndsharks (family Triakidae) are a diverse group of sharks with 45-47 species worldwide (D.A. Ebert, unpubl. database, May 2022). This family is easily distinguished from other shark families by the combination of: two medium- to large-sized dorsal fins without spines, first dorsal fin base well ahead of the pelvic fin base, the presence of an anal fin, and moderate to very long labial furrows (Ebert *et al.* 2021). There are at least 11 species of triakid known from the Eastern Pacific (Ebert *et al.* 2021) with seven recorded from Ecuador (Bearez 1996).



The Sharpfin Houndshark *Triakis acutipinna* Kato, 1968, known locally as ‘tollo del Ecuador’, is a lost shark of high conservation concern. This species is known to science from only a single specimen caught around the Isla de la Plata (01°16’S, 81°04’W), Ecuador, in the Eastern Pacific in October 1961 (Kato 1968). *Triakis acutipinna* has not been the focus of any dedicated surveys or searches and therefore its status is unknown. Official species-specific landing records are lacking for houndsharks in Ecuador making it difficult to determine if it occurs in mixed fisheries landings. The species is reportedly very rarely landed from coastal gillnet fisheries around Puerto López and El Matal (Martínez-Ortiz & García-Domínguez 2013). The fact that there are so few records of the species raises severe concern regarding its conservation status.

This article aims to provide a contemporary overview of the status of Ecuador’s lost shark, *Triakis acutipinna*, specifically: (1) provide the first photographs of the holotype and only known specimen; (2) present the results of a literature review and online search; and, (3) provide an overview of local ecological knowledge from preliminary informal conversational interviews with fishers from coastal communities near Isla de la Plata and El Matal in the Manabí province, Ecuador. This article will help to inform future formal interviews and directed searches for the species to understand distribution, habitat, population size, and conservation status of this lost shark.

MATERIALS AND METHODS

The holotype and only known specimen of *Triakis acutipinna* [USNM 201409; 102 cm total length (TL) female] was photographed at the Smithsonian National Museum of Natural History (Washington, D.C., U.S.A.).

A literature review and search for records of the species was undertaken by searching Google and Google Scholar using the search terms ‘*Triakis acutipinna*’, ‘tollo del Ecuador’, and ‘sharpfin houndshark’.

Local ecological knowledge was recorded in January 2020 through visiting five small-scale fishing communities in Manabí province: El Matal, Liguiqui, Las Piñas, Santa Rosa, and Puerto Cayo (Fig. 1). Awareness posters (Fig. 2) were placed in strategic places around landing sites to request information on catches of *T. acutipinna*. Posters incorporated photos of the holotype, pointing out diagnostic morphological features (outlined in Results and Discussion). The poster was prepared in Spanish and requested that any information (specifically: photos, date of capture, location of capture, fishery in which it was caught, size) be sent to the lead author (A.C.-G.) (Fig. 2).

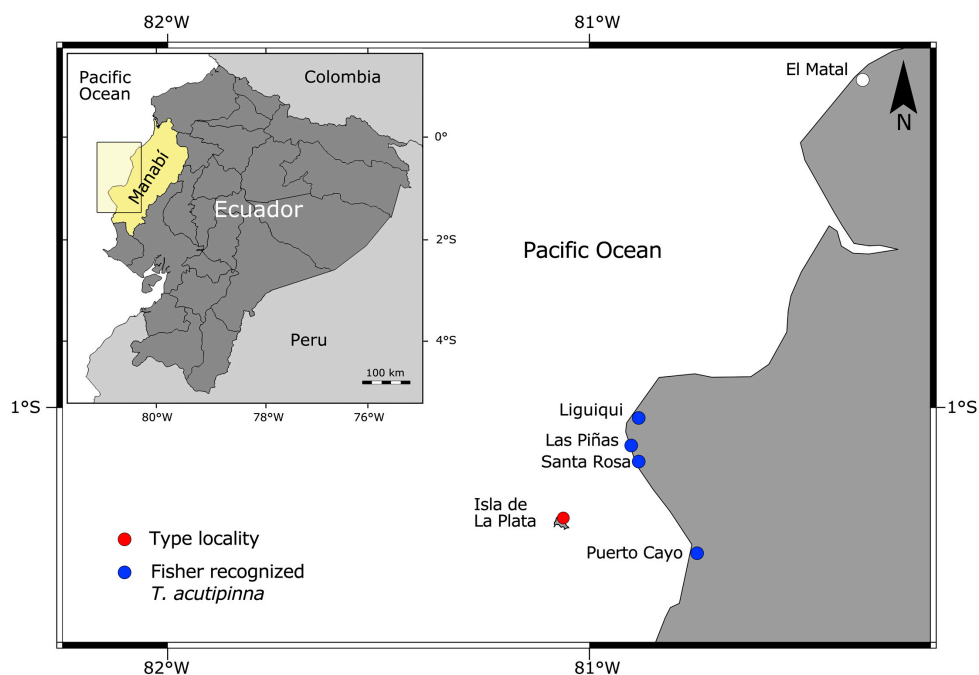


Figure 1. Map of the Manabí province coastline, Ecuador, showing the type locality (red circle) of *Triakis acutipinna* (Isla de la Plata; Kato 1968) and five sites where fisher interviews were conducted. Fishers at Liguiqui, Las Piñas, Santa Rosa, and Puerto Cayo recognized *T. acutipinna* when they saw the photos (blue circles) / Mapa de la costa de la provincia de Manabí, Ecuador, que muestra la localidad tipo (círculo rojo) de *Triakis acutipinna* (Isla de la Plata; Kato 1968) y cinco sitios donde se realizaron entrevistas a pescadores. Los pescadores de Liguiqui, Las Piñas, Santa Rosa y Puerto Cayo (círculos azules) reconocieron a *T. acutipinna* cuando vieron las fotos

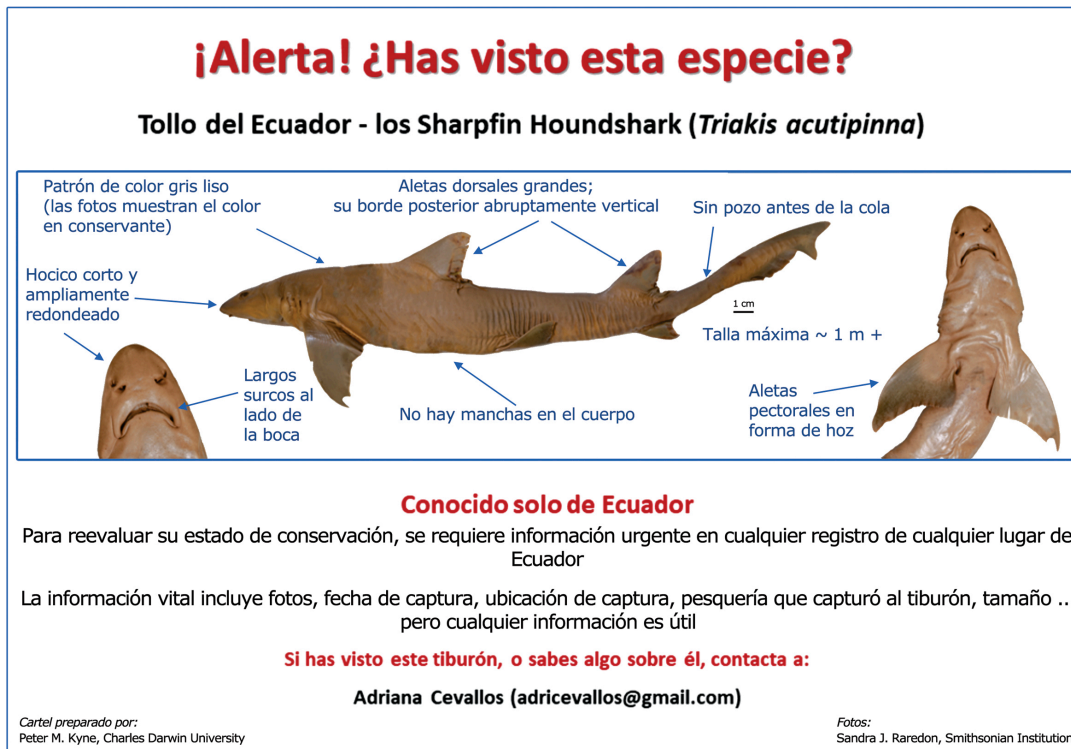


Figure 2. Descriptive poster of *Triakis acutipinna* used to request information from fishers in local communities of Manabí province, Ecuador. Photographs are of the holotype (USNM 201409; photographs by S. J. Raredon) / Cartel descriptivo de *Triakis acutipinna* utilizado para solicitar información a los pescadores de las comunidades locales de la provincia de Manabí (Ecuador). Las fotografías corresponden al holotipo (USNM 201409; fotografías de S. J. Raredon)

To assist in the search for information on *T. acutipinna*, a workshop was convened in Puerto Cayo (4 January 2020). The workshop was attended by 44 local fishers. A total of 70 posters were distributed in Manabí province, Ecuador including at the workshop.

During the community visits, informal conversational interviews were conducted with 12 adult fishers (between 50 and 90 years old), to assess their recognition of *T. acutipinna* (including with reference to other local triakids e.g., *Mustelus* spp.). Fishers were asked questions relating to: (1) if they recognize and have seen *T. acutipinna*; if yes: (2) when was the last time they caught this species; (3) the geographic area and depth of the capture; (4) the fishing gear associated with the capture; and, (5) the use of the species. Formal structured interviews were not undertaken; rather these questions were raised during casual conversations with fishers. Note that three interviews were undertaken in Puerto Cayo prior to the workshop; two fishers subsequently attended the workshop while the third did not.

RESULTS AND DISCUSSION

Based on the holotype (USNM 201409; Kato 1968), *T. acutipinna* is distinguished from other triakids by the combination of these features: both dorsal fins large with an abruptly vertical rear edge; sickle-shaped pectoral fins; short, broadly rounded snout; no precaudal pit; long labial furrows; and, plain grey colouration with an absence of spots on the body (Fig. 2).

Triakis acutipinna is sympatric with *Triakis maculata* Kner & Steindachner, 1867. These two species differ in internal features (cranium and vertebral count) but are also easily separable externally by pectoral fin shape (sickle-shaped in *T. acutipinna*; broadly triangular in *T. maculata*) and colouration (plain in *T. acutipinna*; spotted in *T. maculata*) (Kato 1968, Compagno 1984).

At present *T. acutipinna* is known with certainty from the holotype only (Kato 1968). Compagno *et al.* (1995) refers to a 90 cm TL adult male but the location of this specimen could not be determined in the present study. Additional landing records exist from around Puerto López and El Matal (Martínez-Ortiz & García-Domínguez 2013), although there appears to be no specimens to verify these records. Literature and internet searches revealed no other specimens or records and the species does not occur in the literature beyond checklists (*e.g.*, Bearez 1996) and guide books (*e.g.*, Compagno 1984, Compagno *et al.* 1995, Ebert *et al.* 2021). Chirichigno (1974) suggested that *T. acutipinna* potentially occurs in the north of Peru and the species has subsequently appeared in Peruvian checklists (Chirichigno & Cornejo 2001, Cornejo *et al.* 2015). However, its presence in Peru has not been confirmed. An online species account of *T. acutipinna* (Robertson & Allen 2015) includes a lateral body photo and a ventral head photo, however these images belong to *T. maculata* because of the specimen's spotted body and broadly triangular pectoral fin. Cruises to determine the diversity of demersal fishes on the continental shelf in Ecuador, carried out between 2003 and 2007 by the National Institute of Fisheries, describe the occurrence of sharks from the family Triakidae as *Mustelus* spp.; *Triakis acutipinna* was not recorded (Coello & Herrera 2010).

According to the 12 interviews, six fishers (50%) could recognize *T. acutipinna* (Table 1). Fishers from three communities provided an estimate of the date of last capture: 1990s for Las Piñas, 2000-2005 for Liguíqui, and 2010-2015

for Santa Rosa (Table 1; Fig. 1). Some fishers had local names specific to this species: 'Chara' in Puerto Cayo and 'Chucha seca' in Santa Rosa. The name 'Chucha seca' is attributed to the fact that the area of the cloaca next to the pelvic fins is rough, giving the appearance of being dry. Two fishers mentioned that the body is flaccid, the skin is hard, making it difficult to gut, and therefore it has no local commercial use. Three fishers reported that it is mostly discarded alive when caught (Table 1).

Ecuadorian fisheries usually land several species of sharks, including triakids. Landings data are usually categorized as species groups such as 'Triakidae' or 'Carcharhinidae', or simply 'dogfish' (ESPOL *et al.* 1987, Prieto *et al.* 1989, CPPS 1997, Flachier *et al.* 1997). In more recent documents, species-specific data on landings can be found, including demersal shark species such as *Mustelus lunulatus* Jordan & Gilbert, 1882 and *M. henlei* (Gill, 1863) (Domínguez & Cobeña 2019). However, there is no reliable basis for statistical information on species-specific shark catches in Ecuador (Martínez-Ortiz *et al.* 2007). *Triakis acutipinna* is apparently very rarely caught in artisanal demersal gillnet fisheries (Martínez-Ortiz & García-Domínguez 2013). Indeed, interviewees from three communities (Liguíqui, Santa Rosa, and Puerto Cayo) reported that the species is caught by gillnet, while a fisher from Las Piñas reported the species as bycatch in hake fishing which uses demersal longlines at 200 m depth, using the frigate tuna *Auxis thazard* (Lacépède, 1800) as bait (Table 1).

Table 1. Summary of informal interviews carried out with fishers in order to collect information on the catches of *Triakis acutipinna* in five coastal communities (see Fig. 1) of Manabí Province, Ecuador / Resumen de las entrevistas informales realizadas a los pescadores con el fin de recopilar información sobre las capturas de *Triakis acutipinna* en cinco comunidades costeras (véase Fig. 1) de la provincia de Manabí, Ecuador

Fishing port	Number of interviewees	Number of interviewees who recognize <i>T. acutipinna</i>	Years since last capture of <i>T. acutipinna</i>	Geographic area & depth of capture	Fishing gear used	Use of <i>T. acutipinna</i> if caught
El Matal	1	0	--	--	--	--
Liguíqui	2	2	2000-2005	In front of Liguíqui	Red de enmalle (gillnet)	Released alive; occasional local consumption
Las Piñas	4	1	1990s	10 miles from Las Piñas; 200 m depth	Palangre de fondo (bottom longline)	Released alive
Santa Rosa	2	1	2010-2015	3 miles from Isla de la Plata	Red de enmalle (gillnet)	No information
Puerto Cayo	3	2	No information	No information	Red de enmalle (gillnet)	No information

None of the 42 fishers attending the workshop who had not previously been interviewed revealed they had seen the species. They were however willing to contribute photographs and information in the event that they caught the species in the future. Additionally, some fishers offered their boats for an expedition to search for the species. That offer was considered to be a successful outcome of the workshop's capacity building aims.

As a result of the workshop in Puerto Cayo, a few weeks later a fisher sent a picture from a putative *T. acutipinna* they found. Unfortunately, the specimen was misidentified and was of the genus *Mustelus*. A fishing inspector from El Matal (Mr. Miguel Falcones), did not recognize the species but mentioned that the species may possibly be caught incidentally when fishers direct their efforts to catch triakids 'tollos' usually between March and April. Unfortunately, the sharks arrive processed at port (approximately 200-300 pounds of triakid carcasses per trip). Because the sharks are gutted, finned, and headless, they lose most of the diagnostic features to identify them, complicating identification to the species-specific level. Fishery inspectors usually register all triakids as *Mustelus* spp.

Triakis acutipinna has been assessed as Endangered on the IUCN Red List of Threatened Species (Kyne *et al.* 2021). The very limited number of known specimens was used to infer a population size of <2,500 mature individuals and an extent of occurrence of <5,000 km² (Kyne *et al.* 2021). A continuing decline was suspected based on ongoing artisanal fishing pressure on coastal sharks (including houndsharks). The results of our contemporary review and informal conversations with fishers indicate that the population size is likely to be very small since it appears not to be regularly encountered.

In conclusion, this study suggests that *T. acutipinna* persists in Ecuador but is rarely encountered. Half of the fishers interviewed recognize the species and have caught it as recently as 2010-2015. The results obtained are preliminary and based on a limited number of informal interviews with fishers in one province of Ecuador. As such, the interviews need to be expanded to include the other four coastal provinces of continental Ecuador. Additionally, permanent sampling of catches and landing sites underpinned by the training of fishers and inspectors in species identification would help to broaden the search for the species. Community support for local research initiatives was found, which is a positive step towards a dedicated survey for the species. Despite the preliminary nature of this study, it has been shown that the lost 'tollo' of Ecuador may not in fact be lost.

ACKNOWLEDGMENTS

We thank Carlos Baque Baque from the Parish Government of Puerto Cayo for organizing the workshop, all fishers who participated in the interviews and the workshop, and Leonardo Alonzo Zambrano and Shirley Parrales Pachay from the Liguiki community for their constant support of this project. P.M.K. was supported by the Marine Biodiversity Hub, a collaborative partnership supported through funding from the Australian Government's National Environmental Science Program. D.A.E. was supported by Moss Landing Marine Laboratories, South African Institute for Aquatic Biodiversity, Andrew Sabin Family Foundation, California Academy of Sciences, and the Save Our Seas Foundation (grant 594).

LITERATURE CITED

- Bearez F. 1996.** Lista de los peces marinos del Ecuador continental. *Revista de Biología Tropical* 44(2): 731-741.
- Chirichigno NF. 1974.** Clave para identificar los peces marinos del Perú, 387 pp. Instituto del Mar del Perú, Callao.
- Chirichigno N & RM Cornejo. 2001.** Catálogo comentado de los peces marinos del Perú, 314 pp. Instituto del Mar del Perú, Callao.
- Coello D & M Herrera. 2010.** Diversidad de peces demersales en la plataforma continental del Ecuador. *Revista Ciencias del Mar y Limnología* 4(1): 54-64.
- Compagno LJV. 1984.** FAO Species Catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 2 - Carcharhiniformes. FAO Fisheries Synopsis 125(4/2): 251-655.
- Compagno LJV, F Krupp & W Schneider. 1995.** Tiburones. En: Fischer W, F Krupp, W Schneider, C Sommer, KE Carpenter & VH Niem (eds). Guía FAO para la identificación de especies para los fines de la pesca. Pacífico centro-oriental. Volumen II. Vertebrados - Parte 1: 647-743. FAO, Roma.
- Cornejo R, X Vélez-Zuazo, A González-Pestana, JC Kouri & G Mucientes. 2015.** An updated checklist of Chondrichthyes from the southeast Pacific off Peru. *Check List* 11(6): 1809. <doi.org/10.15560/11.6.1809>
- CPPS. 1997.** Estudio nacional de la diversidad biológica marina y costera del Parque Nacional Machalilla - Ecuador. Programa de las Naciones Unidas para el Medio Ambiente, PNUMA, Comisión Permanente del Pacífico Sur, CPPS/PNUMA/PSE/IE 97(3): 1-66.
- Domínguez C & M Cobeña. 2019.** Estudio de comercialización de carne de tiburón en Ecuador, para entender las características específicas del mercado de carne de tiburón y sus subproductos en el país, 211 pp. WWF-Ecuador, Guayaquil.
- Ebert DA, M Dando & S Fowler. 2021.** Sharks of the world: A complete guide, 608 pp. Princeton University Press, Princeton.

- ESPOL, CEPLAES & ILDES. 1987.** La pesca artesanal en el Ecuador, 288 pp. Edición CEPLAES, Quito.
- Flachier A, J Sonnenholzner, D Pérez, L Jaramillo & E Espinoza. 1997.** Evaluación del Área Marina del Parque Nacional Machalilla, 266 pp. Instituto Ecuatoriano Forestal y de Áreas Naturales y Vida Silvestre, Dirección Nacional de Áreas Naturales y Vida Silvestre, Quito. <<https://rsis.ramsar.org/RISapp/files/642/documents/EC503mgt.pdf>>
- Huvneers C, DA Ebert & SFJ Dudley. 2015.** The evolution of chondrichthyan research through a metadata analysis of dedicated international conferences between 1991 and 2014. *African Journal of Marine Science* 37(2): 129-139.
- Kato S. 1968.** *Triakis acutipinna* (Galeoidea, Triakidae), a new species of shark from Ecuador. *Copeia* 1968(2): 319-325.
- Kyne PM, A Cevallos, S Hernández & DA Ebert. 2021.** *Triakis acutipinna*. The IUCN Red List of Threatened Species 2021. e.T39361A124406514. <<https://www.iucnredlist.org/species/39361/124406514>>
- Martínez-Ortiz J & M García-Domínguez. 2013.** Guía de campo condricios del Ecuador. Quimeras, tiburones y rayas, 246 pp. Ministerio de Agricultura, Ganadería, Acuacultura y Pesca (MAGAP) / Vice Ministerio de Acuacultura y Pesca, Quito.
- Martínez-Ortiz J, F Galván-Magaña, M Carrera-Fernández, D Mendoza-Intriago, C Estupiñán-Montaño & L Cedeño-Figueroa. 2007.** Abundancia estacional de tiburones desembarcados en Manta-Ecuador. En: Martínez-Ortiz J & F Galván-Magaña (eds). *Tiburones en el Ecuador: Casos de estudio*, pp. 9-27. EPESPO-PMRC, Manta.
- Prieto MN, JF Belisle & MS Cuvi. 1989.** Los pescadores artesanales de la costa ecuatoriana, 27 pp. CEPLAES-CIID, Quito.
- Robertson DR & GR Allen. 2015.** Shorefishes of the Tropical Eastern Pacific: online information system. Version 2.0. Smithsonian Tropical Research Institute, Balboa. <<https://biogeodb.stri.si.edu/sftpep/en/pages>>
- White WT, PM Kyne & M Harris. 2019.** Lost before found: A new species of whaler shark *Carcharhinus obsolerus* from the Western Central Pacific known only from historic records. *PLoS ONE* 14(1): e0209387. <<https://doi.org/10.1371/journal.pone.0209387>>

Editor: Francisco Concha
 Received 11 January 2020
 Accepted 23 May 2022