

MARINE RECORD

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First report of the whitesaddled catshark *Scyliorhinus hesperius* (Springer 1966) in Guatemala's Caribbean Sea

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Abstract

Background: The present study represents the first record of *Scyliorhinus hesperius* in Guatemala's Caribbean Sea.

Methods: Five male whitesaddled catsharks, *S. hesperius*, were captured in 200 m deep waters of Guatemala's Caribbean coast.

Results and Conclusion: All specimens were male with total lengths ranging from 420 mm to 510 mm. These fish represent the first record of mature male *S. hesperius*, the first record for this species in Guatemalan territorial waters, and a range extension in the Western Central Atlantic.

Keywords: Deep-water chondrichthyans, First record, Range extension, Caribbean,

Background

Scyliorhinidae (catsharks) constitute the largest shark family with at least 160 species distributed across 17 genera (Ebert et al. 1996). These species are broadly distributed throughout temperate and tropical waters, inhabiting the bottom of shallow and deep waters over 100 m (Nakaya 1975). Catsharks are small, demersal species, and relatively poor swimmers (Compagno et al. 2005).

The genus *Scyliorhinus* Blainville 1816, is comprised of 16 species distributed in cold, subtemperate to tropical waters (Ebert et al., 2015; Soares et al., 2016) including the eastern and western Atlantic and the Mediterranean (Rodríguez-Cabello et al. 2007; Ebert et al. 2015). In the western Atlantic, *Scyliorhinus* is most diverse and at least six species of *Scyliorhinus* are distributed in the Caribbean (Compagno, 1984) with three species occurring throughout the Central America Caribbean: *Scyliorhinus boa* Goode and Bean 1896, *S. retifer* Garman 1881, and *S. hesperius* Springer 1966 (Compagno, 1984).

S. hesperius was described by Springer (1966) based on an immature female holotype of 415 mm total length

(TL). Additionally Springer (1966) examined 12 specimens, sex not specified, ranging in total length from 177–460 mm. All specimens were captured between 274 m and 530 m depth in the Western Caribbean near Jamaica and Honduras and southward towards Panama and Columbia (Springer 1966). Later, Ross and Quattrini (2009) reported sightings of three individual sharks *S. hesperius* resting on thick coral rubble between 580–604 m depth, off of Jacksonville, Florida, while conducting deep water dives on deep reefs along the southeastern US continental shelf slope.

Maximum size for this species is based on a singular female *S. hesperius* (470 mm), with no information on its biology (Leandro 2004). Compagno (1988) reports two immature specimens from Nicaragua, one female and one male, 159 mm and 356 mm respectively. Size range of specimens reported in this study was 420–510 mm TL, all adult male sharks. This study represents the first report of adult male *S. hesperius* and also the largest *S. hesperius* specimen collected to date, based on morphometric data of specimen Rf. 252.

The whitesaddled catshark *S. hesperius* is currently listed by the International Union for the Conservation of Nature's Red List as Data Deficient due to insufficient information available to assess the species population status (Leandro 2004). No current information exists for

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this species' biology, and distributional limits are poorly known. This paper reports the first record of *S. hesperius* in Guatemalan waters, representing a range extension in Central America and the Caribbean.

Methods

On March 20th 2016, five whitesaddled catsharks were captured by artisanal fishermen of El Quetzalito, Izabal Department, in Guatemala (Fig. 1). These specimens were captured with a 1000 m wide bottom trammel net, consisting of one panel with 3.5 in. mesh size, set at 200 m depth.

All specimens were initially kept on ice prior to preservation in formaldehyde (10%) for 3 weeks and transferred to ethyl alcohol (70%) for final preservation. The specimens were donated to the Laboratory of Biological Science and Oceanography, Centro de Estudios del Mar y Acuicultura (CEMA) of the Universidad San Carlos de Guatemala (USAC). The specimens are part of the collection registered to the Consejo Nacional de Áreas Protegidas (CONAP) under the reference numbers (Rf) 252, 253, 254, 255 and 256.

The five specimens were sexed and measured after being preserved. A total of 91 morphometric measurements were taken (Table 1) as proposed by Compagno (2001). Measurements are expressed as percentages of total length (%TL). All specimens were examined and identified using identification guides developed by Compagno (1984, 2001). Maturity for males was determined by the full calcification of claspers.

Results

Systematic account

Family Scyliorhinidae Gill, 1862

Scyliorhinus Blainville, 1816

Scyliorhinus hesperius Springer, 1966

Common name: Whitesaddled catshark.

Material examined

Rf 252 specimen: male, mature, 510 mm TL (Fig. 2a);

Rf 253 specimen: male, mature, 455 mm TL (Fig. 2b);

Rf 254 specimen: male, mature, 429 mm TL (Fig. 2c);

Rf 255 specimen: male, mature, 435 mm TL (Fig. 2d);

Rf 256 specimen: male, mature, 420 mm TL (Fig. 2e).

All specimens were caught approximately 15 Km north of El Quetzalito, Izabal, Guatemala (15° 49.776 N, -88° 12.340 W), at approximately 200 m, based on known length of net deployed.

Description

Color pattern variable, of seven to eight dark saddles with large light spots concentrated in the saddle marks. Background coloration is light brown on the dorsal surface and paler on the ventral surface. First dorsal fin originates behind pelvic fins, and larger than second dorsal fin (Fig. 2). Lower labial furrows present (Fig. 3).

Discussion

This study provides multiple first records for *S. hesperius* with the largest of the species described based on Reference 252 and also the first mature males. This study further supports the extension of the known range

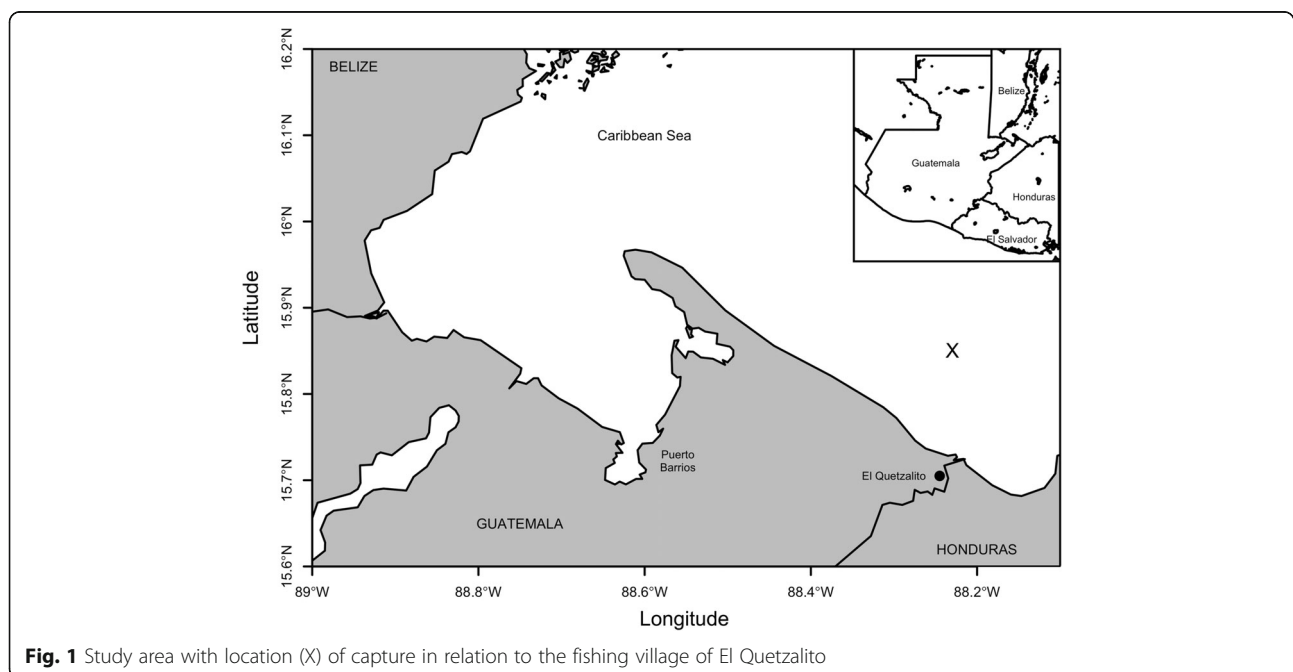


Fig. 1 Study area with location (X) of capture in relation to the fishing village of El Quetzalito

Table 1 Morphometric measurements (mm) of individuals of five male specimens of *Scyliorhinus hesperius*

Measurements	Rf. 252	Rf. 253	Rf. 254	Rf. 255	Rf. 256
Total length (mm)	510.0	455.0	429.0	435.0	420.0
Fork length	440.0	401.0	381.0	390.4	370.0
Precaudal fin length	400.0	358.0	335.0	345.5	330.0
Pre-second dorsal-fin length	350.0	315.0	293.3	303.1	272.2
Pre-first dorsal-fin length	247.6	235.2	220.3	234.9	204.7
Head length	98.1	93.8	91.8	97.2	90.0
Prebranchial length	69.4	67.2	66.3	68.8	58.2
Prespiracular length	52.1	50.4	52.2	53.5	49.4
Preorbital length	28.8	26.9	26.4	27.3	26.4
Prepectoral-fin length	91.3	86.8	83.8	82.1	75.3
Prepelvic-fin length	205.2	186.1	178.8	189.7	175.2
Snout-vent length	221.2	200.3	190.9	204.8	197.9
Preanal-fin length	304.3	277.9	268.2	278.2	253.2
Interdorsal space	55.1	53.8	45.0	47.9	40.1
Dorsal caudal-fin space	30.4	23.6	23.0	22.0	20.0
Pectoral-fin pelvic-fin space	96.4	86.2	79.4	82.0	76.6
Pelvic-fin anal-fin space	70.6	64.2	58.0	62.1	52.7
Anal-fin caudal-fin space	48.3	39.5	45.5	39.3	43.0
Pelvic-fin caudal-fin space	155.5	139.1	130.4	132.0	127.0
Vent caudal-fin length	184.9	167.8	168.6	159.8	164.0
Prenarial length	14.5	12.4	13.4	12.5	12.3
Preoral length	22.2	20.9	18.9	20.7	18.2
Eye length	20.3	18.2	18.4	20.0	19.9
Eye height	6.7	5.1	5.1	5.2	4.2
Intergill length	30.3	27.7	23.4	28.4	23.8
First gill slit height	7.5	6.5	5.2	5.8	4.6
Second gill slit height	6.5	5.3	4.5	4.8	3.8
Third gill slit height	8.7	7.9	5.1	5.9	5.2
Fourth gill slit height	6.3	5.7	3.8	5.3	4.5
Fifth gill slit height	4.9	4.5	3.7	5.1	4.5
First dorsal-fin length	45.7	39.8	39.9	38.4	34.3
First dorsal-fin anterior margin	46.8	42.5	44.1	41.8	36.4
First dorsal-fin base	31.3	27.4	29.2	28.2	25.4
First dorsal-fin height	34.4	24.2	21.2	23.7	23.5
First dorsal-fin inner margin	14.7	14.2	14.2	12.3	9.8
First dorsal-fin posterior margin	29.2	22.7	22.1	22.2	19.8
Second dorsal-fin length	41.2	31.8	35.4	32.2	30.6
Second dorsal-fin anterior margin	31.5	29.6	32.3	31.2	28.4
Second dorsal-fin base	25.5	20.7	23.1	21.0	21.3
Second dorsal-fin height	21.6	15.5	13.0	14.9	14.8
Second dorsal-fin inner margin	14.1	12.2	10.6	10.6	10.1
Second dorsal-fin posterior margin	16.3	16.0	14.5	14.3	11.0
Pectoral-fin anterior margin	67.3	61.2	60.1	59.1	54.0
Pectoral-fin base	57.0	52.0	51.3	49.7	46.7
Pectoral-fin inner margin	29.0	26.6	24.8	26.1	23.5
Pectoral-fin posterior margin	48.2	45.7	41.5	42.9	38.5

Table 1 Morphometric measurements (mm) of individuals of five male specimens of *Scyliorhinus hesperius* (Continued)

Pectoral-fin height	50.9	50.8	47.7	51.0	40.3
Dorsal caudal-fin margin	107.5	97.4	96.9	93.7	89.0
Preventral caudal-fin margin	14.8	11.5	13.8	11.4	8.3
Upper postventral caudal-fin margin	24.2	28.1	25.6	22.4	27.9
Lower postventral caudal-fin margin	46.9	44.5	45.3	40.0	36.4
Caudal-fin fork width	26.5	26.2	26.1	25.6	20.5
Caudal-fin fork length	49.6	46.7	45.1	45.5	42.3
Subterminal caudal-fin margin	22.9	18.9	19.0	20.2	18.8
Subterminal caudal-fin width	11.4	9.2	10.3	9.2	8.2
Terminal caudal-fin margin	29.0	26.4	23.2	24.2	20.4
Terminal caudal-fin lobe	36.7	30.0	28.9	30.8	27.3
Pelvic-fin length	58.8	55.7	48.4	51.4	49.0
Pelvic-fin anterior margin	36.9	35.8	32.2	33.7	31.1
Pelvic-fin base	31.1	30.7	28.8	26.8	25.8
Pelvic-fin height	29.0	19.8	28.2	18.7	18.1
Pelvic-fin inner margin (length)	27.9	23.4	22.7	20.8	20.8
Pelvic-fin posterior margin (length)	39.4	35.9	34.5	35.2	35.5
Anal-fin length	53.5	49.9	45.8	47.5	42.0
Anal-fin anterior margin	34.4	34.7	36.0	36.0	28.8
Anal-fin base	41.7	37.5	35.6	34.9	32.9
Anal-fin height	19.6	16.4	16.8	14.5	15.3
Anal-fin inner margin	12.5	14.3	12.5	12.0	11.2
Anal-fin posterior margin	28.0	25.7	23.1	24.5	17.4
Head height	33.5	33.7	34.0	29.8	30.3
Trunk height	47.1	39.0	41.3	43.0	27.3
Abdomen height	31.4	25.8	28.9	26.4	26.2
Tail height	35.7	30.0	31.5	27.3	26.8
Caudal-fin peduncle height	15.5	16.8	14.3	13.4	12.8
Mouth length	16.9	15.6	15.2	14.7	18.4
Mouth width	32.0	25.4	28.2	26.8	23.3
Upper labial-furrow length	2.2	3.0	3.0	2.3	1.5
Lower labial-furrow length	6.0	5.0	5.1	6.1	5.2
Nostril width	9.9	9.8	9.0	10.3	10.3
Internarial space	8.0	7.9	7.8	7.9	5.7
Interorbital space	29.9	26.6	28.8	23.9	26.6
Spiracle length	3.5	2.8	2.9	2.2	1.9
Eye spiracle space	4.0	4.1	4.2	4.1	3.5
Head width	49.6	44.0	40.3	44.4	39.9
Trunk width	40.5	43.4	41.4	40.9	35.9
Abdomen width	19.6	15.2	14.4	13.8	12.9
Tail width	26.5	21.0	22.6	21.9	21.4
Caudal-fin peduncle width	8.0	7.7	9.0	6.1	6.8
Clasper outer length	22.7	20.4	19.4	20.3	20.1
Clasper inner length	37.5	33.7	35.0	31.4	34.1
Clasper base width	4.9	4.8	4.0	4.3	3.7

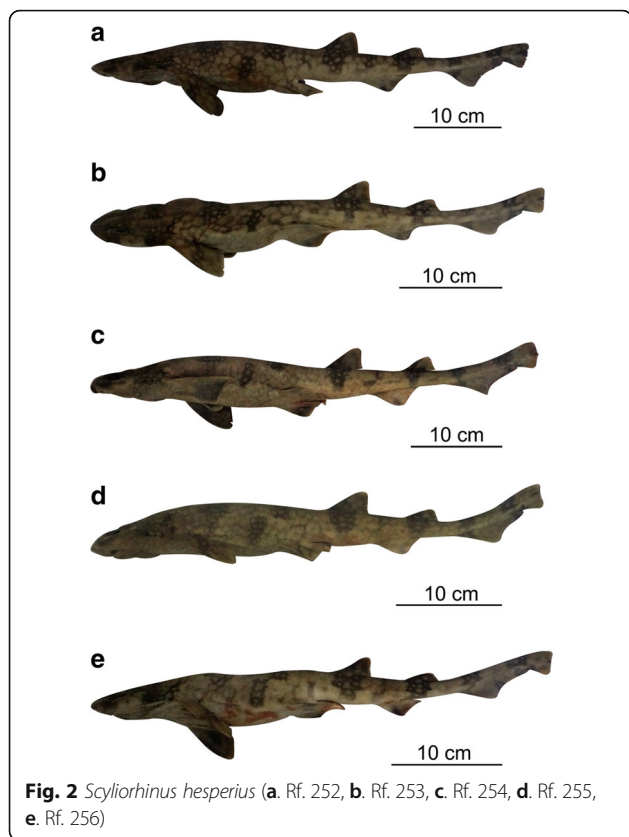


Fig. 2 *Scyliorhinus hesperius* (a. Rf. 252, b. Rf. 253, c. Rf. 254, d. Rf. 255, e. Rf. 256)

of *S. hesperius* in the Caribbean while including a first record for the species in Guatemala. Although the whitesaddled catshark has been recorded in the Western Central Atlantic in Honduras, Panamá and Colombia (Kyne et al. 2012), Ross and Quattrini's regional study

(2009) and this study suggest that the species' range may be more extensive than originally thought.

Knowledge of *S. hesperius* basic biology is limited. By comparison, considerable literature exists on *S. canicula*, a relatively abundant catshark species distributed throughout the Eastern North Atlantic and Mediterranean (Sims et al. 2001; Rodríguez-Cabello et al. 2007; Ebert et al. 2015). In south-west Ireland, an acoustic tagging study of four *S. canicula* revealed that two tagged females exhibited alternative behavioural strategies compared to the tagged two males, a difference resulting in spatial segregation of the sexes by habitat (Sims et al. 2001). Sims (2003) further reports that sexual segregation in this species occurs primarily as a consequence of male avoidance by females. In the western Mediterranean, segregation between juveniles and adults occurs for *S. canicula* where juveniles are found in depths greater than 100 m while adults almost exclusively occupy shallower depths Massuti and Moranta (2003). By comparison, in the Northern Aegean Sea, the pattern of vertical distribution of *S. canicula* showed that individuals did not exhibit any sexual segregation and juveniles and adults were found together in the bathyal zone, often located swimming near the benthos D'Onghia et al. (1995). Considering the range of behavioral strategies demonstrated by members of the genus *Scyliorhinus*, it is currently unclear if *S. hesperius* exhibits sexual and size segregation in the Caribbean. This study's record of male-only specimens raises the question if *S. hesperius* segregate by sex in waters 200 m deep in Guatemala's Caribbean waters. According to artisanal fishers interviewed, this species is rarely captured in

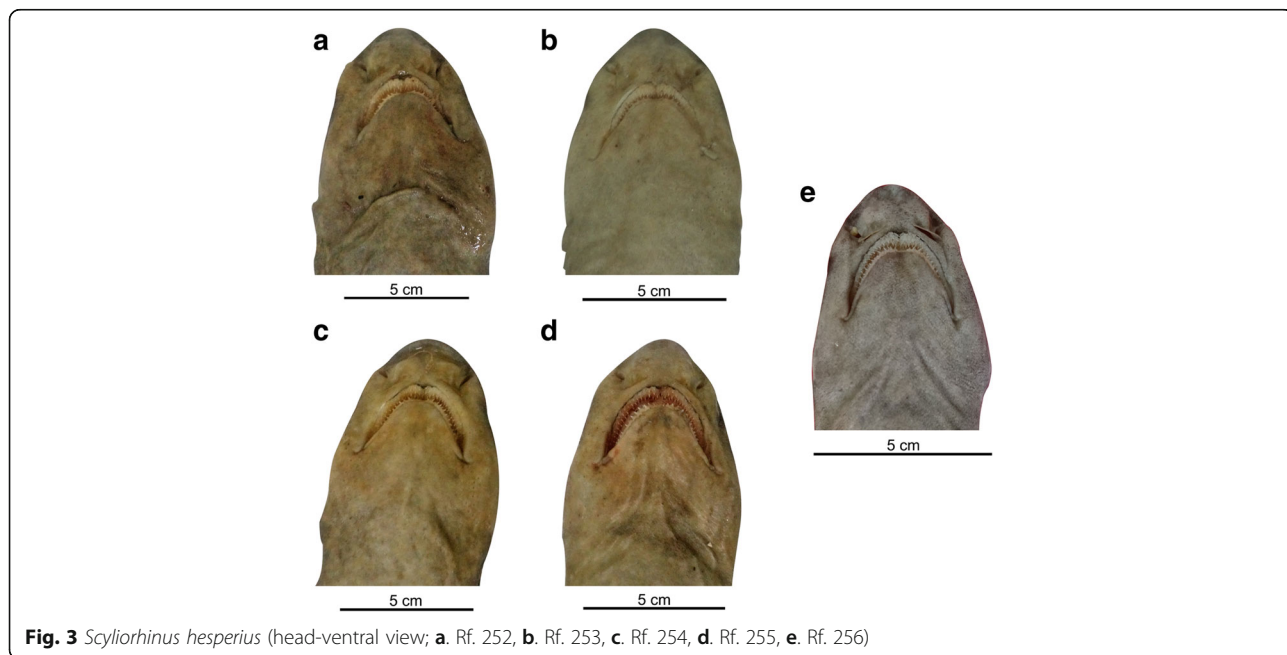


Fig. 3 *Scyliorhinus hesperius* (head-ventral view; a. Rf. 252, b. Rf. 253, c. Rf. 254, d. Rf. 255, e. Rf. 256)

the fishery and never utilized due to the species' small size. These results suggests a further need for fisheries-independent studies to elucidate habitat preferences and distribution by sex and size of *S. hesperius*.

Conclusions

This paper provides noteworthy multiple firsts records of *S. hesperius* in Guatemalan waters, that represents a range extension in Central America and the Caribbean, the largest *S. hesperius* and the first mature males collected to date. Future studies are needed to identify the behavior and ecology of *S. hesperius* in the Caribbean in light of increasing fisheries effort.

Abbreviations

Km: Kilometer; M: Meter; Mm: Millimeter; TL: Total length

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Availability of data and materials

The specimens are available at the Laboratory of Biological Science and Oceanography, Centro de Estudios del Mar y Acuicultura (CEMA) of the Universidad San Carlos de Guatemala (USAC). The specimens are part of the collection registered to the Consejo Nacional de Áreas Protegidas (CONAP) under the reference numbers (Rf) 252–255. Additionally, photographs and dataset supporting the conclusions of this article are included.

Authors' contributions

AH and FP participated in the identification of the species, recorded the morphometric data of all specimens, and contributed to draft the manuscript. RTG contributed to draft the manuscript. All authors read and approved the final manuscript.

Competing interest

The authors declare that they have no competing interests.

Consent for publication

Not applicable

Ethics approval

The work was carried out under permit N°00,263-B, issued by the Consejo Nacional de Áreas Protegidas (CONAP), Guatemala.

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