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New record of *Zameus squamulosus* (Chondrichthyes: Squaliformes: Somniosidae) in the Southern Gulf of Mexico

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Abstract

Zameus squamulosus is a somniosid shark with a patchy world-wide distribution that has been reported throughout the Atlantic, Indian, western, north, central and south-eastern Pacific Oceans. In the Northern Gulf of Mexico *Zameus squamulosus* is occasionally captured by longlines in deep waters off the coast of Florida, but until now there were no records of the species in the Southern Gulf of Mexico. Four specimens of *Zameus squamulosus* were collected in 2004 and 2009 on the continental slope of the Gulf of Mexico. Collections were made at depths of 698 m and 701 m. These specimens constitute the first records of this species for the southern Gulf of Mexico and, as they were captured with bottom associated trawls, we infer that this species is more commonly found at the bottom ocean.

Keywords: New record, Southern Gulf of Mexico, Velvet Dogfish, *Zameus squamulosus*

Introduction

Zameus squamulosus was first described as *Centrophorus squamulosus* in 1877 by Günther from a female specimen collected in Japan. Barbosa du Bocage & de Brito Capello 1864 reassigned this species to the genus *Scymnodon*. Later Jordan & Fowler in 1903 designated this species as the type for their newly described genus *Zameus*, but Bigelow & Schroeder (1957) concluded that *Zameus* was a junior synonym of *Scymnodon*. After morphological studies Taniuchi & Garrick (1986) resurrected the genus *Zameus* and redefined *Scymnodon* as a monotypical genus from the North Atlantic. White et al. (2014) placed *Zameus* as a monotypical genus excluding the species *Zameus ichiharai* (Yano & Tanaka 1984), now assigned to *Scymnodon*.

Zameus differs from *Scymnodon*, among other characters, in the presence of a medial tooth in the lower jaw (Fig. 1) and of dermal denticles with transverse ridges (Fig. 2). Recent molecular studies have confirmed the distinctiveness of the genus *Zameus* from *Scymnodon*, and place it closer to the genus *Centroselachus* (Naylor et al. 2012).

Zameus squamulosus is a poorly known somniosid shark that has a patchy world-wide distribution and has been reported throughout the Atlantic, Indian, western, north, central and south-eastern Pacific Oceans (Compagno et al. 2005; Akhilesh et al. 2013 and Ebert et al. 2014). This shark is epipelagic and bathypelagic, and is usually found off continental and insular slopes, on or near the bottom at depths of 550 to 1,450 m, but also found well off the bottom at depths between 0 and 580 m in waters up to 2,000–6,000 m deep (Ebert et al. 2014).

In the Northern Gulf of Mexico *Zameus squamulosus* is occasionally captured by longlines in deep waters off the coast of Florida (Castro 2011), but until now there were no records of the species in the Southern Gulf of Mexico.

Four female specimens of *Zameus squamulosus* were captured during two separate collecting trips, conducted by the Research Vessel (RV) 'Justo Sierra' in the continental slope of Campeche and Veracruz. These records represent evidence of the presence of *Zameus squamulosus* in the Southern Gulf of Mexico.

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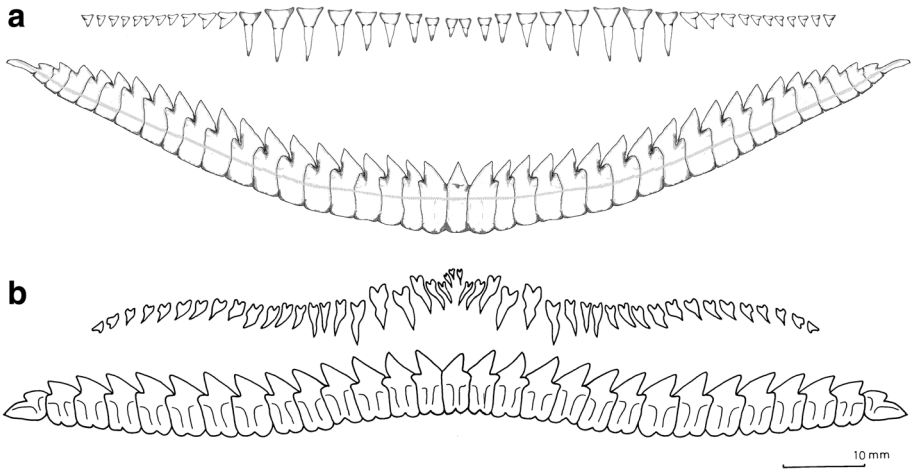

Fig. 1 Front view of teeth of *Zameus squamulosus* CNPE-IBUNAM 14608 (**a**) and *Scymnodon ichiharai* (**b**)

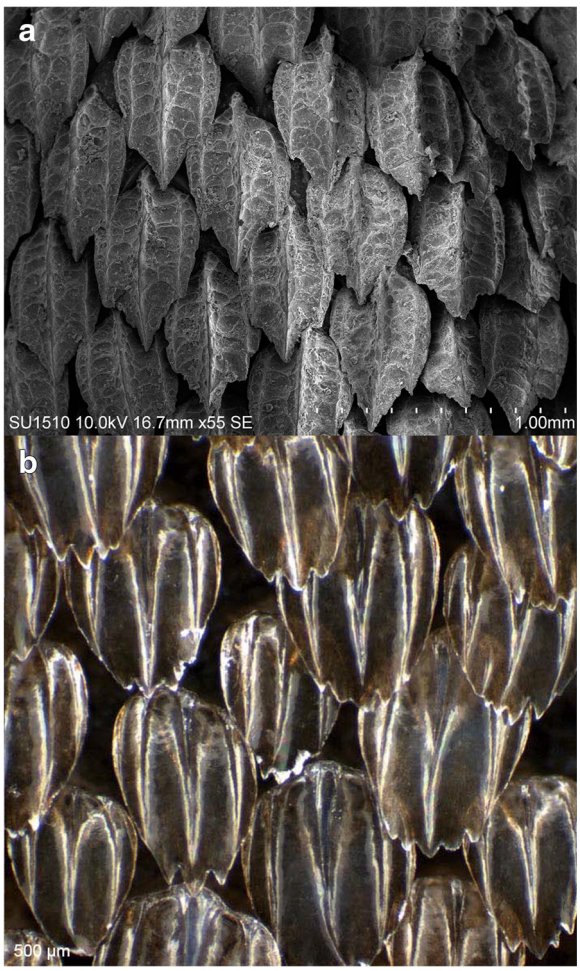

Fig. 2 Dermal denticles of *Zameus squamulosus* CNPE-IBUNAM 14608 (**a**) and *Scymnodon ichiharai* (**b**)

Materials and methods

The identification of the specimens was based on McEachran & Fechhelm (1998), Castro (2011) and Ebert et al. (2013). Measurements (Table 1), were presented as a percentage of the total length (TL), were taken after Ebert & Stehmann (2013) and were made in preserved specimens. Specimens were fixed in 10 % formalin and subsequently preserved in 70 % ethanol. All of the specimens were deposited in the Colección Nacional de Peces of the Instituto de Biología, Universidad Nacional Autónoma de México (CNPE-IBUNAM).

Systematics

Order SQUALIFORMES
Family SOMNIOSIDAE
Genus *Zameus* Jordan & Fowler 1903
Zameus squamulosus (Günther 1877)
(Fig. 3)

Results

Two specimens (CNPE-IBUNAM 14608) were captured on 2004–07–27 at a depth of 689 m, using a 12 m long, 9 m wide and 1.5 m tall semi-balloon otter trawl with a 6.35 cm mesh, during the Sigsbee VII project (22.41722 – 96.61110). The other two specimens (CNPE-IBUNAM 16547) were captured on 2009–08-23 at a depth of 701 m, using a 12 m long, 9 m wide and 1.5 m tall semi-balloon otter trawl with a 6.35 cm mesh, during the COBERPES III project (18.97537–94.12077). Both campaigns were conducted over the continental slope in the Gulf of Mexico (Fig. 4.).

Specimens were identified as *Zameus squamulosus* in laboratory. All of them show the distinctive transverse

Table 1 Morphometric and meristic data for the specimens of *Zameus squamulosus* deposited at the Colección Nacional de Peces of the Instituto de Biología, Universidad Nacional Autónoma de México (CNPE-IBUNAM). Measurements are expressed as a percentage of total length (% TL)

Measurements	CNPE-IBUNAM 14608	CNPE-IBUNAM 14608	CNPE-IBUNAM 16547	CNPE-IBUNAM 16547
Total length	330	290	270	250
Precaudal fin length	80.3	73	76	80
Prenarial length	1.5	1.3	2.1	2.8
Preoral length	8.4	8.2	8.8	9.6
Preorbital length	5.4	6.2	6.2	6.8
Head length	22.7	24	22.2	24
Prepectoral fin length	23	24.4	24	26
Prepelvic fin length	60.6	60.3	59.2	60.6
Prefirst dorsal fin length	43.7	49.3	38.8	40
Presecond dorsal fin length	65.6	65.5	61.1	66
Interdorsal width	19	16	17.4	18.4
Pectoral fin–pelvic fin space	26	26.5	25.18	32
Eye length	4	3.4	3.7	3.2
Eye height	2.4	2.7	2.9	2.8
Mouth length		3.7	4.2	4
Mouth width	7.2	6.8	7.4	7.7
Upper labial furrow length	3.6	3.4	3	3.6
Lower labial furrow length	2.1	2	2	2.4
First gill slit length	2.1	1.9	2	2
Fifth gill slit length	2.1	2.2	2.3	2.1
Head height	5.4	7.5	5.1	7.6
Head width	12.1	11.3	11.1	12.8
Trunk height	11.4	12	8.8	10.8
Trunk width	10.6	10.3	9.6	10.4
Girth	36.3	32.7	22	32
Pectoral fin length	11.5	12.7	10	11.2
Pectoral fin base length	5.1	5.1	4.8	4.8
Pectoral fin height	5.7	5.5	5	4
Pelvic fin length	11	10	13.3	8
Pelvic fin base length	3	2.7	2.5	2.6
Pelvic fin height	5.4	4.8	4.4	2.4
First dorsal fin length	9	9.3	9.2	7.6
First dorsal fin base length	4.8	5.5	5.1	4.4
First dorsal fin height	3	3	3.7	3.6
Second dorsal fin length	7.6	9.1	8.1	8
Second dorsal fin base length	7.2	6.8	7.7	6.8
Second dorsal fin height	5.1	5.1	4.8	3.6
Dorsal caudal fin margin	21.8	22.7	20	18.8
Upper tooth counts	44	47	46	46
Lower tooth counts	37	40	40	40

Fig. 3 Lateral view of *Zameus squamulosus* CNPE-IBUNAM 14608 (**a**) and *Scymnodon ichiharai* (**b**)

ridges on their dermal denticles (Yano & Tanaka 1984; Taniuchi & Garrick 1986) (Fig. 2). Specimens are also dark colored and low-flat headed (Head height 5.1–7.6 % TL) with a short-narrow snout (Preoral length 8.2–9.6 % TL). Their mouths are nearly transverse and narrow (Mouth wide 6.8–7.7 % TL) with well-developed labial furrows (length of upper labial furrow 3–3.6 %TL and length of lower labial furrow 2–2.4 %TL). Teeth in the lower jaw are large, broad and with knife-shaped cusplets. Teeth in the upper jaw are small and lanceolate, without cusplets (Fig. 1). Both dorsal fins are preceded by a very minute spine. First dorsal fin is long (7.6–9.2 % TL), narrow at its

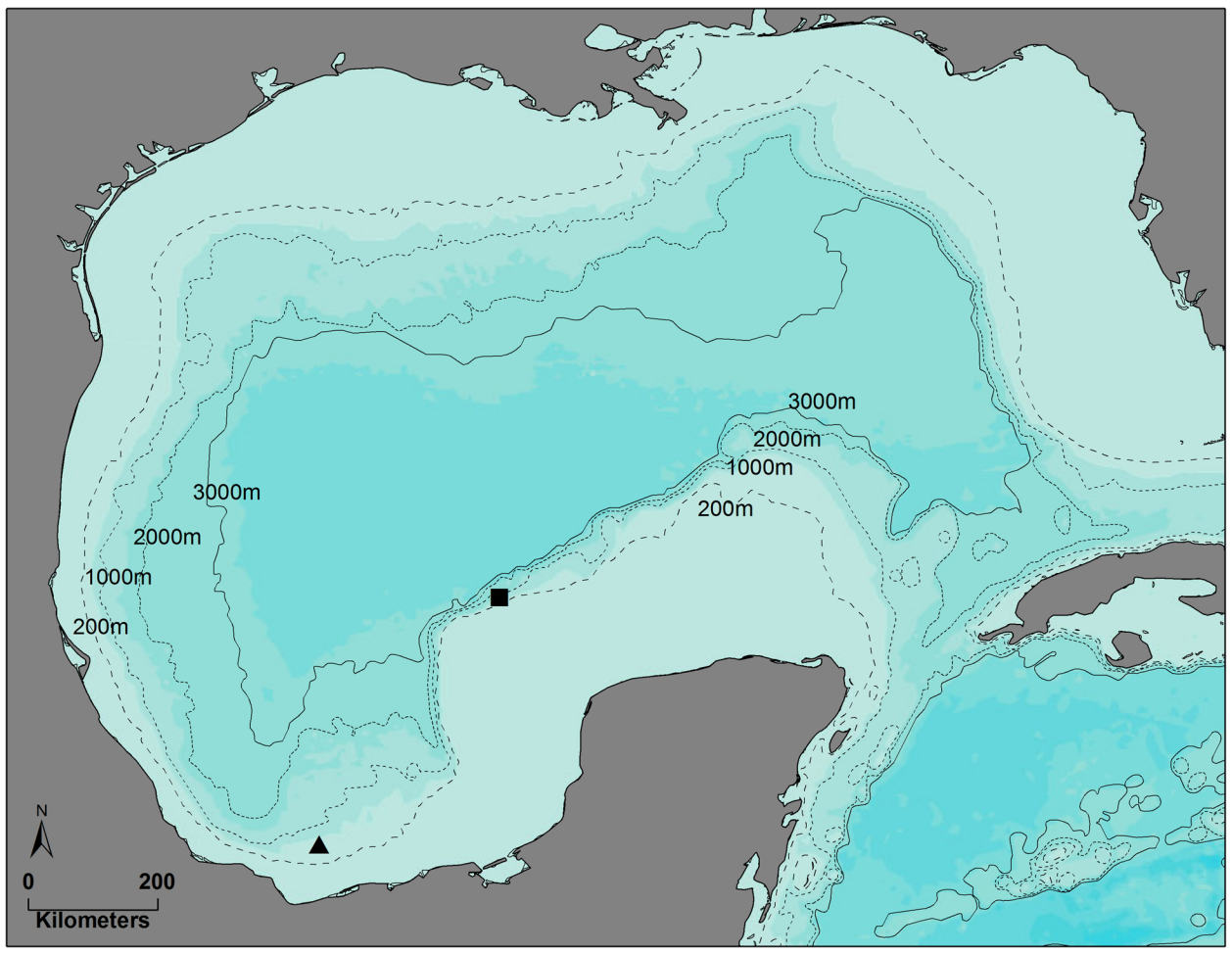

Fig. 4 Locations of the reported specimens of *Zameus squamulosus* (Square, CNPEIBUNAM 14608; Triangle, CNPE-IBUNAM 16547)

base (4.4–5.5 %TL) and inserted posteriorly to the pectoral fin. Second dorsal fin is small (7.6–9.1 %TL) with a wide base (6.8–7.7 % TL). Rear tips of the pectoral fins are short and broadly rounded. Anal fin is absent and caudal fin lacks subterminal notch (see Table 1 for complete meristics of the four specimens).

Conclusion

These are the first confirmed records of *Zameus squamulosus* in the Southern Gulf of Mexico and therefore increase the number of known shark species in Mexico. *Zameus squamulosus* has been recorded in catches at midwater trawls (Cadenat & Blache 1981), on pelagic longlines (Taniuchi 1990; Last & Stevens 2009) and very close to the surface (Wetherbee & Crow 1996), but although the specimens reported here were captured in the depth range of the species already described (550–1,450 m), they were collected in a trawl associated to the bottom, which supports the idea of Last & Stevens (2009) and Wetherbee & Crow (1996) that this species is more commonly found at the bottom.

Abbreviations

CNPE-IBUNAM, colección nacional de peces, Instituto Biología, Universidad Nacional Autónoma de México; RV, research vessel; TL, total lenght.

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Authors' contributions

EV identified, determined and measured the specimens, elaborated the illustrations and drafted the manuscript. AM performed the map elaboration and participated in the measurement of the specimens and writting of the publication. CL participated in the measurement of the specimens and writting of the publication. HE participated in the writting of the publication and coordination of the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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