



## New specimens and records of chondrichthyan fishes (Vertebrata: Chondrichthyes) off the Mexican Pacific coast

### Nuevos ejemplares y nuevos registros de peces cartilagosos (Vertebrata: Chondrichthyes) de la costa del Pacífico mexicano

Gorgonio Ruiz-Campos<sup>1\*</sup>, José Luis Castro-Aguirre<sup>2</sup>, Eduardo F. Balart<sup>3</sup>, Lucía Campos-Dávila<sup>3</sup> and Rafael Vélez-Marín<sup>4</sup>

<sup>1</sup>Colección Ictiológica, Facultad de Ciencias, Universidad Autónoma de Baja California. Apartado postal 233, 22800 Ensenada, Baja California, México.

<sup>2</sup>Departamento de Pesquerías y Biología Marina, Centro Interdisciplinario de Ciencias Marinas, Instituto Politécnico Nacional. Apartado postal 592, 23000 La Paz, Baja California Sur, México.

<sup>3</sup>Colección Ictiológica, Centro de Investigaciones Biológicas del Noroeste, S.C. Apartado postal 128, 23090 La Paz, Baja California Sur, México.

<sup>4</sup>Centro Regional de Investigación Pesquera-Instituto Nacional de la Pesca. Playa Ventanas s/n Carretera a la Termoeléctrica, 28200 Manzanillo, Colima, México.

\*Correspondent: gruz@uabc.mx

**Abstract.** New specimens and new records of occurrence for 10 species of chondrichthyan (elasmobranch and chimaeroid) fishes previously unknown or little documented for the continental shelf of the Mexican Pacific are reported. This contribution provides the first record of *Centroscyllium nigrum*, *Isurus paucus*, and *Bathyraja trachura* for the Mexican Pacific, as well as new specimens of *Hydrolagus colliei*, *Hexanchus griseus*, *Echinorhinus cookei*, *Pseudocarcharias kamoharai*, and *Raja velezi* for the western coast of the Baja California Peninsula, including the intermediate record within the known distribution range for *Apristurus kampae*, and the southernmost record for *Raja inornata*.

Key words: sharks, skates, chimaeras, Baja California Peninsula, eastern Pacific, Mexico.

**Resumen.** Se reportan nuevos ejemplares y nuevos registros de concurrencia para 10 especies de elasmobranquios previamente desconocidos o con muy poca documentación en aguas del Pacífico mexicano. Esta contribución ofrece el primer registro de *Centroscyllium nigrum*, *Isurus paucus*, y *Bathyraja trachura* en el Pacífico mexicano; así como nuevos ejemplares de *Hydrolagus colliei*, *Hexanchus griseus*, *Echinorhinus cookei*, *Pseudocarcharias kamoharai* y *Raja velezi* en la costa occidental de la península de Baja California, con la inclusión del registro intermedio en el ámbito de distribución conocida para *Apristurus kampae*, y el registro más meridional para *Raja inornata*.

Palabras clave: tiburones, rayas, quimeras, península de Baja California, Pacífico oriental, México.

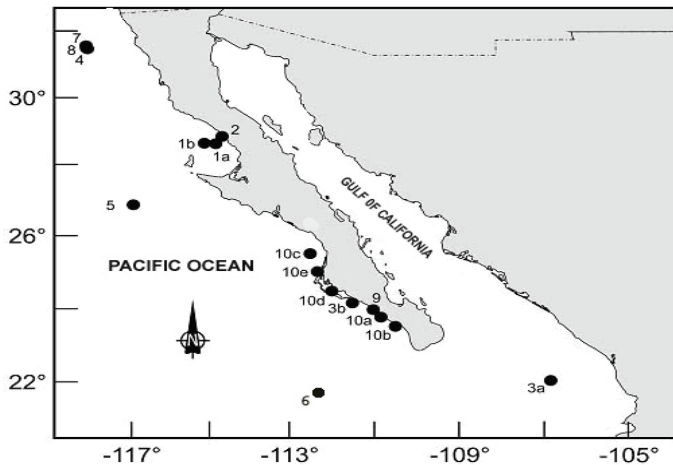
## Introduction

Regarding biodiversity, the Pacific coast of Mexico has undergone numerous surveys at different spatial scales and seasons (cf. Salazar-Vallejo and González, 1993). The cartilaginous fishes or chondrichthyans, especially sharks and skates (subclass Elasmobranchii), represent an important natural resource of great interest to coastal fisheries in Mexico, with approximately 104 species of sharks (Espinosa Pérez et al., 2004) and 87 forms of skates (Castro-Aguirre and Espinosa Pérez, 1996), but excessive fishing efforts has led to population declines in many species of this highly specialized group (Baum

and Myers, 2004; Robbins et al., 2006). Knowledge of the species richness of sharks and other cartilaginous fish in a geographical region should be the initial basis for any program of sustained conservation over the long term. Here, we present new data and records of some previously unknown or little known species of cartilaginous fish that inhabit deep and near-surface waters along the Mexican Pacific coast.

## Materials and methods

Specimens of the 10 species reported here were obtained from different dates and sites along the continental shelf of the Mexican Pacific ocean (Fig. 1), on board the



**Figure 1.** Map showing the new records of chondrichthyes in the Pacific of Mexico. 1, *Hydrolagus colliei*; 2, *Hexanchus griseus*; 3, *Echinorhinus cookei*; 4, *Centroscyllium nigrum*; 5, *Pseudocarcharias kamoharai*; 6, *Isurus paucus*; 7, *Apristurus kampae*; 8, *Bathyraja trachura*; 9, *Raja inornata*, and 10, *Raja velezi* (cf. Table 1 for details of sites and specimens).

### Taxonomic summary

**Material examined.** A 392 mm long (tail filament absent) male spotted ratfish (CIBN-4339; Fig. 2A) collected off Bahía Sebastián Vizcaíno (28°37.934'N, 114°52.402'W; Fig. 1: 1a) on 15 March 2007 at 117 m depth. This ratfish was taken during a study of stock assessment of demersal fish and macroinvertebrates along the western coast of the Baja California peninsula aboard the R/V BIP XII. A female specimen of 362 mm TL (CIBN-2083) collected on 20 May 1995 at 28°38.638'N, 115°07.619'W (Fig. 1: 1b) using bottom trawling at 160 m depth by the R/V "El Puma".

The known distribution of spotted ratfish is from the western Gulf of Alaska (Mecklenburg et al., 2002) to near Punta Prieta off the outer coast of the Baja California Peninsula (26°59'N, 114°02'W and 27°01'N, 114°02'W) (González-Acosta et al., 1999). Other authors considered Bahía Sebastian Vizcaíno (28°40'N, 114°17'W and 27°51'N, 115°05'W) and Isla Cedros as the southernmost limits (Miller and Lea, 1972; Knaggs et al., 1975). Previous reports of this species in Mexican waters include the central part of the Gulf of California northward, including Isla Tiburón (Baldwin, 1961; Mathews, 1975) and Bahía de La Paz (Balart et al., 1995).

Order Hexanchiformes

Family Hexanchidae

***Hexanchus griseus*** (Bonnaterre, 1788). Bluntnose sixgill shark.

### Taxonomic summary

**Material examined.** A small female 712 mm long bluntnose sixgill shark (CIBN-4338; Fig. 2B) collected with a shrimp trawl net off Bahía Sebastián Vizcaíno (28°50.808'N, 114°42.773'W, Fig. 1: 2) on 20 March 2007 at 85 m depth. This specimen was obtained during a study of stock assessment of demersal fish and macroinvertebrates aboard the R/V BIP XII.

This species has a patchy distribution worldwide (Bigelow and Schroeder, 1948; Compagno et al., 2005). In the eastern Pacific, it has been recorded from the Aleutian Islands to Bahía de Todos Santos in the northern part of the Baja California Peninsula (31°46'N, 116°45'W) (Miller and Lea, 1972; Compagno, 1984; Ebert, 1986; Mecklenburg

following vessels of research (R/V) or fishing (F/V): R/V BIP XII, R/V BIP II, R/V El Puma, F/V Tiburón II, F/V Pacific Breeze, F/V Royal Venture, and F/V Marflota III. Several types of fishing gear were used for the collecting of specimens, such as demersal traps, long line and shrimp trawl nets (see species account for more details on the collection methods). Fishes were fixed with a 10% formalin solution (buffered with sodium borate), washed, preserved in 50% isopropanol, identified in the laboratory, and finally catalogued and deposited in the following fish collections: Universidad Autónoma de Baja California (UABC) at Ensenada, Baja California, the Centro Interdisciplinario de Ciencias Marinas-Instituto Politécnico Nacional (CICIMAR-CI), La Paz, Baja California Sur, and the Centro de Investigaciones Biológicas del Noroeste (CIBN), La Paz, Baja California Sur. The nomenclature and taxonomic arrangement followed Nelson et al. (2004). For each species or specimen(s), we provide *examined material* that includes information on total length (mm), collecting site (geographic coordinates), date and name of the fishing boat, and depth of catch (m); as well as *comments* regarding the known distribution range, taxonomic and biogeographic aspects and other data about the taxon.

### Results

Ten species belonging to 8 families and 6 orders of cartilaginous fishes were collected and described as follows.

Order Chimaeriformes

Family Chimaeridae

***Hydrolagus colliei*** (Lay and Bennett, 1839). Spotted ratfish.

et al., 2002) and in Chile (Chirichigno and Vélez, 1998). Castro-Aguirre et al. (2003) recorded this species off Bahía Magdalena-Almejas (25°26.9'N; 113°3.4'W). The bluntnose sixgill shark is considered as a “lower risk near-threatened species” in the 2007 IUCN Red List.

Order Squaliformes  
Family Echinorhinidae

*Echinorhinus cookei* Pietschmann, 1928. Prickly shark.

#### Taxonomic summary

*Material examined.* A female 2 940 mm long captured with a long line near the surface on 26 March 1987 at 22°11'N, 106°51'W (Fig. 1: 3a), on board the fishing vessel “Tiburón II”. Because this specimen was measured and quickly processed on board, it was not available as a voucher. Another 810 mm female (CIBN-2997, Fig. 2C) was collected off the Pacific coast of the Baja California Peninsula on 2 February 2003 at 24°09.483'N, 111°30.274'W (Fig. 1: 3b). The specimen was captured in a commercial crab trap at 127–181 m depth by the fishing vessel “Pacific Breeze”.

This specimen is the third record of a prickly shark along the west coast of the peninsula. The prickly shark is a rare, deep-dwelling shark known only from the Pacific Ocean. It ranges across the Pacific Ocean, Japan, Korea, Philippines, Hawaii, southern Australia, and New Zealand (Compagno et al., 2005) and off the coast of Oregon (Ebert, 2003) and central California USA (Hubbs and Clark, 1945; Collyer, 1953), as well as in Ecuador (Bearéz, 1996), Peru (Chirichigno, 1963), and Chile (Flores and Rojas, 1979). Along the Pacific coast of Mexico, this shark had been recorded off Isla Guadalupe (Collyer, 1953), inside the Gulf of California (Chávez-Ramos and Castro-Aguirre, 1974; Álvarez-León and Castro-Aguirre, 1983, Meléndez and Villavicencio, 1998), Michoacán (Aguirre et al., 2002), and Isla Socorro in the Revillagigedo Archipelago (Meléndez and Villavicencio, 1998). This species is considered “near-threatened” because it appears to be a small, fragmented population with low resilience to fishing efforts (IUCN, 2007). The taxonomic status of *Echinorhinus brucus* (Bonaterre) and *E. cookei* is still under discussion (i.e., Garrick, 1960).

Family Etmopteridae

*Centroscyllium nigrum* Garman, 1899. Combtooth dogfish.

#### Taxonomic summary

*Material examined.* Three combtooth dogfish captured with demersal traps in the northwestern Pacific coast of Baja California, aboard the “Royal Venture” fishery vessel

while fishing for sablefish *Anoplopoma fimbria*. The first specimen, a 406 mm female (UABC-1286; Fig 2D) was caught 137 km west-southwest of Ensenada (at 31°29.97'N, 118°08.12'W, Fig. 1: 4) on 9 October 2001. The other 2 female specimens (UABC-1282, 466 mm; CICIMAR-CI-6377, 410 mm) were caught on the same date about 173 km west of Punta Santo Tomás (at 31°32.61'N, 118°7.07'W). The catch depth for the 3 specimens was ~900 m.

Records of *Centrophorus granulosus* in Southern California (e.g., SIO-84-40, Santa Catalina Basin, 33°05.6'N, 117°59.3'W, depth 1 000 m) are probably *C. nigrum*, which was recently found off the Pacific coast of Colombia by Rubio et al. (2005). Concerning taxonomy, the name *C. granulosus* (Bloch and Schneider, 1801) is a junior synonym of *Etmopterus granulosum*, a species only known in the southern part of the Atlantic along the South American coast and along the southwestern coast of Africa, but not in the eastern Pacific (cf. Espinosa Pérez et al., 2004). The 3 specimens from offshore from northwestern Baja California are the first records in the Pacific off the Mexican coast.

Order Lamniformes

Family Pseudocarchariidae

*Pseudocarcharias kamoharui* (Matsubara, 1936). Crocodile shark.

#### Taxonomic summary

*Material examined.* An adult female crocodile shark 990 mm long (CICIMAR-CI-6371; Fig. 2E) captured with a long line on the open sea near the surface on 26 November 2000 at 26°52'N, 116°59'W (Fig. 1: 5); the sea floor at this location is at 950 m depth.

This specimen represents the second record of this species in the northeastern Pacific; the first one was reported by Long and Seigel (1997) at 960 km off the western coast of the Baja California Peninsula (25°40'N, 129°00'W); Meléndez et al. (2006) reported the second record in the southeastern Pacific. This species is widely distributed through tropical and subtropical areas, especially in pelagic habitats from the surface to ~600 m (Compagno et al., 2005).

Family Lamnidae

*Isurus paucus* Guitart Manday, 1966. Longfin mako.

#### Taxonomic summary

*Material examined.* A 1 440 mm long adult female longfin mako, without ova, weighing 18.83 kg, caught at open sea (21°44'N, 112°10'W, Fig. 1: 6) on 15 March 2002. Sea surface temperature at the time of capture was 22.3°C and the seafloor depth was ~1 200 m. The specimen was

taken using a longline by the fishing vessel “Marflota III” and measured aboard. Because the specimen was quickly processed on board and it was unavailable as a voucher.

This species is cosmopolitan throughout tropical and subtropical seas of the world oceans, although rarely recorded (Compagno et al., 2005). Previous to this report, it had only been recorded in the eastern Pacific at Anacapa and Santa Barbara Islands, California, U.S.A. (Ebert, 2003). Our finding is the first report off the Mexican Pacific coast.

Order Carcharhiniformes

Family Scyliorhinidae

*Apristurus kampae* Taylor, 1972. Longnose catshark.

#### Taxonomic summary

*Material examined.* A 488 mm female longnose catshark (UABC-1288, Fig. 2F) caught in a demersal trap used for catching sablefish (*Anoplopoma fimbria*) by the fishing vessel “Royal Venture” on 9 October 2001. The capture site is 173 km off Punta Santo Tomás (31°32.61'N, 118°7.07'W, Fig. 1: 7) where the sea floor is at 900 m depth.

Although this catshark occurs off southern California and has a postulated distribution extending to the Galápagos Islands (Miller and Lea, 1972), there is no published record for the west coast of the Baja California Peninsula. Previous reports of this species in Mexican waters include those of the holotype in the central part of the Gulf of California at 1,830-1,888 m depth (Taylor, 1972; Castro-Aguirre, 1981; Espinosa Pérez et al., 2004) and the Galápagos Islands at 457 m (Castro, 1983). There appear to be 2 related species in the eastern Pacific, although not recorded in Mexican waters: *A. nasutus* De Buen, 1959 (possibly a synonym of *A. brunneus*) from Peru and Chile and *A. stenseni* (Springer, 1979) from Bahía de Panamá (Espinosa Pérez et al., 2004). Our finding of *A. kampae* represents an intermediate position in the eastern Pacific between the Gulf of California and southern California, therefore confirming its occurrence on the western coast of the Baja California peninsula.

Order Rajiformes

Family Rajidae

*Raja inornata* Jordan and Gilbert, 1880. California skate.

#### Taxonomic summary

*Material examined.* Two male California skates 513 and 523 mm (CIBN-877; Fig. 2G) trawled with a shrimp net at 89 m depth off Bahía Magdalena (23°58.738'N, 111°01.257'W; Fig. 1: 9) aboard the R/V BIP II on 21 March 1998.

This species occurs from the Straits of Juan de Fuca, Washington, to the coast off Bahía Magdalena-Almejas in Baja California Sur (Miller and Lea, 1972; McEachran, 1995; Castro-Aguirre and Espinosa Pérez, 1996; Ebert, 2003), and there is an isolated population in the Gulf of California (Castro-Aguirre et al., 1970; McEachran and Miyake, 1988; Castro-Aguirre and Espinosa Pérez, 1996). Our voucher specimens represent the southernmost documented record of the taxon on the western coast of the Baja California peninsula.

*Bathyraja trachura* (Gilbert, 1892). Roughtail skate.

#### Taxonomic summary

*Material examined.* A 285 mm female roughtail skate (UABC-1287, Fig. 2H) captured along with the combtooth dogfish *Centroscyllium nigrum* (UABC-1286) at 137 km W off Ensenada (31°29.97'N, 118°08.12'W; Fig. 1: 8) on 9 October 2001.

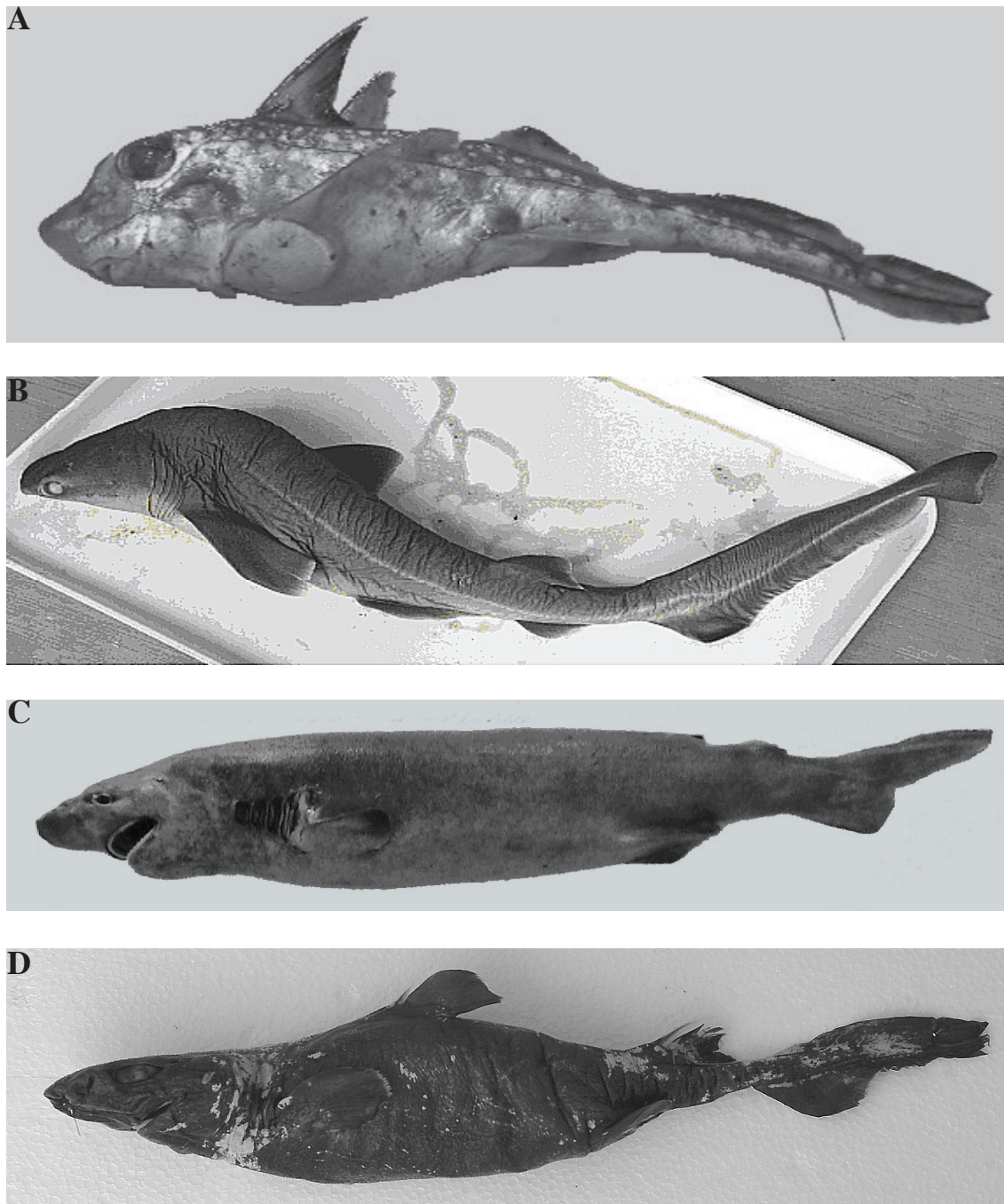
This uncommon skate has a distribution from north of Isla Guadalupe (Miller and Lea, 1972) to the eastern Bering Sea and Aleutian Islands, the western Bering Sea from Cape Navarin to Commander Islands, northern Kuril Islands and Sea of Okhotsk at depths from 400 to 1,994 m (Mecklenburg et al., 2002). On the continental shelf of southern California, this species has been collected at 91 m off Point Loma near San Diego (32°44.4'N, 117°20.9'W) on 4 March 1995 (SIO 95-3). Our specimen from northwestern the peninsula is the first finding of roughtail skate from the continental shelf of the Mexican Pacific.

*Raja velezi* Chirichigno, 1973. Rasptail skate.

#### Taxonomic summary

*Material examined.* Six specimens taken with a shrimp trawl net at depths from 75 to 110 m between 23°32.960' and 25°31.795'N (Fig. 1: 10a-e) aboard the R/V BIP II during 2 cruises devoted to study demersal fish and macroinvertebrates in 1998 off the western coast of the Baja California peninsula (Table 1). The photograph of the smallest male (CIBN-831; 467 mm) is shown in Fig. 2-I.

The findings of specimens reported here might be associated with the El Niño event of 1997-1998 (Balart et al., 2002). This species occurs from the Gulf of California to Peru, including the Galápagos and Malpelo Islands (Chirichigno, 1973; Bearéz, 1996; Grove and Lavenberg, 1997; Robertson and Allen, 2002). Previous mentions of this species in Mexican waters include those of Balart et al. (1995) and McEachran (1995) in the Gulf of California. On the west coast of the Baja California Peninsula there are reports in Bahía Almejas (Love et al., 2005), and between Bahía San Juanico and Cabo Falso



**Figure 2.** (A), *Hydrolagus colliei* (CIBN-4339, 392 mm TL), west coast of Baja California Peninsula, 5 March 2007. (B), *Hexanchus griseus* (CIBN-4338, 712 mm TL), Bahía Sebastián Vizcaíno, Baja California, 20 March 2007. (C), *Echinorhinus cookei* (CIBN-2997, 810 mm TL), west coast of Baja California Peninsula, 2 February 2003. (D), *Centroscyllium nigrum* (UABC-1286, 406 mm TL), ca. 173 km off Punta Santo Tomás, Ensenada, Baja California. (E), *Pseudocarcharias kamoharai* (CICIMAR-CI: 6371, 990 mm TL), open sea near the surface (26°52'N, 116°59'W), 26 November 2000. (F), *Apristurus kampae* (UABC-1288, 488 mm TL), 173 km west of Punta Santo Tomás, Baja California, 9 October 2001. (G), *Raja inornata* (CIBN- 877-2, 523 mm TL), west coast of Baja California Peninsula, 21 March 1998. (H), *Bathyraja trachura* (UABC-1287, 285 mm TL) captured with specimen of *Centroscyllium nigrum* mentioned above. (I), *Raja velezi* (CIBN-831, 467 mm TL), west coast of Baja California Peninsula, 20 March 1998. Photographs A–C, G–I (E. F. Balart) and D–F, H (G. Ruiz-Campos).





(*Isurus paucus*, *Centroscyllium nigrum* and *Bathyraja trachura*) represented new records for the continental shelf of the Mexican Pacific. The remaining 7 species, although previously reported for the Mexican Pacific (cf. Compagno et al. 2005; Ebert, 2003), represented new specimens (*Hydrolagus colliei*, *Hexanchus griseus*, *Echinorhinus cookei*, *Pseudocarcharias kamoharai* and *Raja velezi*) for the western coast of the Baja California peninsula, including the intermediate record within the known distribution range for *Apristurus kampa*, or the southernmost record for *Raja inornata*.

**Acknowledgments**

We thank Oscar Pedrín-Osuna and the crews of the fishing vessels “Royal Venture”, “Marflota III” and “Tiburón II”, for providing the voucher specimens from their commercial catches. Funding and logistic support aboard the R/V BIP II and R/V BIP XII was provided by Centro de Investigaciones Biológicas del Noroeste (Project EP2) and SAGARPA-CONACYT (Projects 2003-02-019 and 2003-C01-179). Ira Fogel, editor at CIBNOR, provided

(Castro-Aguirre and Espinosa Pérez, 1996); in all these cases, there are no voucher specimens.

**Remarks**

Three of the 10 species collected in the present study

a significantly improved English style. Our thanks also go to COFAA, EDI, CONABIO and SNI-CONACYT for supporting this research, and an anonymous reviewer for the useful comments to the manuscript. Finally, the biological specimens and some other data, are Mexican federal property, however, they are considered as scientific matter, and can be published with no restrictions.

**Table 1.** Basic data of specimens of *Raja velezi* collected on the outer continental shelf of Baja California Sur, Mexico. TL: total length; DW: disc width. The collecting sites of the specimens 10a-e are depicted in figure 1. \* = same collecting site

Specimen	Catalog number (CIBN)	Sex	TL (mm)	DW (mm)	Date	Latitude N	Longitude W	Depth
10a	831	male	467	362	20 Mar. 1998	23°46.490'	110°51.771'	110
10b	1571	Male	530	433	9 Oct. 1998	23°32.960'	110°30.894'	106
10c	1991	Male	692	556	27 Sep. 1998	25°31.795'	112°30.123'	108
10d	1993	female	780	730	6 Oct. 1998	24°28.671'	112°01.912'	75
10e*	1996	Male	720	565	26 Oct. 1998	25°01.493'	112°20.571'	84
10e*	1996	female	780	770	26 Oct. 1998	25°01.493'	112°20.571'	84

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