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Research note

New eastern Pacific Ocean record of the rare deep-water fish, *Psychrolutes phrictus* (Scorpaeniformes: Psychrolutidae)

Registro nuevo en el océano Pacífico oriental de un pez raro de profundidad, Psychrolutes phrictus (Scorpaeniformes: Psychrolutidae)

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Abstract

Psychrolutes phrictus is a benthic deep sea fish known from the eastern North Pacific. On 30 March 2008, a specimen of the blob sculpin *P. phrictus* (297 mm LT) was caught off the Guerrero coast, Mexico (17°45'24"N, 101°59'04"W). The blob sculpin was taken at a depth of 1,100 m within a temperature range of 3.88–4.25 °C, where hypoxic (0.57–0.39 mg/l) conditions prevailed; the specimen was captured over a muddy bottom using a benthic sledge. Representatives of this species had never been reported off the Mexican Pacific coast; our new record extends the known southernmost range by 1,733 km, from 33°19'N to 17°45'N for the American coast. Although high variations in morphometric and meristic values are known for the 4 species of the genus *Psychrolutes* (*P. paradoxus*, *P. phrictus*, *P. sigalutes*, and *P. sio*) from the eastern Pacific Ocean, a combination of traits and species distribution allow us to identify this specimen as *P. phrictus*.

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Keywords: Blob sculpin; Benthic; Mexican Pacific coast; Hypoxic conditions; Morphometrics; Meristics

Resumen

Psychrolutes phrictus es un pez bentónico de profundidad, que se distribuye en el Pacífico Norte. El 30 de marzo de 2008 se capturó un espécimen del pez gota *P. phrictus* (297 mm LT) frente a las costas de Guerrero (17°45'24" N, 101°59'04" W), a una profundidad de 1,100 m, temperatura de 3.88 a 4.25 °C, donde las condiciones de hipoxia prevalecen (0.57-0.39 mg/l); el arrastre se realizó con un patín béntico sobre un fondo fangoso. A la fecha no se había documentado ningún ejemplar de esta especie en las costas de México, por lo que este nuevo registro extiende el intervalo más sureño de distribución 1,733 km de 33°19' N a 17°45' N para la costa americana. Aun cuando las variaciones merísticas y morfológicas son grandes en las 4 especies del género *Psychrolutes* (*P. paradoxus*, *P. phrictus*, *P. sigalutes* y *P. sio*) en el océano Pacífico oriental, una combinación de caracteres y de su distribución permiten determinar el espécimen en cuestión como *P. phrictus*.

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Palabras clave: Pez gota; Bentónico; Costa pacífica mexicana; Hipoxia; Morfometría; Merística

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The family Psychrolutidae [Günther, 1861](#) is characterised by having large heads and bodies that taper back into small, flat tails, a spinous dorsal fin buried in loose skin and flesh ([Jordan & Gilbert, 1882](#)), a suborbital stay, pseudobranchiae, pelvic fins of thoracic position, 3 and a half gill arches, naked skin ([Günther,](#)

Table 1

Counts and measurements of *Psychrolutes phrictus* from the Mexican Pacific coast, ICMYL.D.882, compared with published data (Matarese & Stein, 1980; Stein & Bond, 1978; Yabe, Maruyama, & Amaoka, 1983). Quality (Q) indicates if the corresponding measurement of the ICMYL.D.882 is above, below, or inside the range reported in the literature. Morphometric measurements as a percentage of standard length (% SL) and head length (% HL).

Counts	ICMYL.D.882			Literature		Q	
				Min	Max		
Dorsal fin spines	VIII			VII	VIII	Inside	
Anal fin rays	13			12	14	Inside	
Pectoral fin rays	21			22	26	Below	
Pelvic fin rays	I,3			I,3	I,3	Inside	
Caudal fin rays	13			13	13	Inside	
Gill rakers first arch	7 + 2			9	13	Inside	
Vertebrae	33			33	36	Inside	
Abdominal	12			12	13	Inside	
Caudal	21			21	24	Inside	
Character	mm	(%SL)	(%HL)	(%SL)	Q	(%HL)	Q
Total length	297						
Standard length	222						
Measurements							
Predorsal length	108.3	49	98				
Snout-anus length	144	65	131			93.8–132.2	Inside
Prepectoral length	73	33	66				
Prepelvic length	87	39	79				
Pectoral fin length	59	27	54			44.9–62.3	Inside
Pectoral fin spine length	29	13	26				
Pelvic fin length	27	12	25				
Pelvic fin spine length							
Pectoral base	48	22	44				
Dorsal fin length	120	54	109				
Caudal fin length	75	34	68				
Caudal peduncle length	17	8	15				
Caudal peduncle depth	19	9	17	6.7–8.3	Above		
Head height (Body depth)	80	36	73	23.3–34.5	Above		
Head length	110	50	100	41–60.6	Inside		
Heath width	126	57	115				
Snout length	34	15	31	13.3–14.3	Above	30.3–35.7	Inside
Eye diameter (horizontal)	11	5	10			7.9–13	Inside
Eye diameter (vertical)	8	4	7				
Interorbital space	52	23	47			33.2–47.6	Inside
Internostril space	37	17	34				
Superior jaw length	27	12	25				
Inferior jaw length	21	9	19				

1861), and 7 branchiostegal rays (Yabe, 1984). In the eastern Pacific Ocean, 4 species of the genus *Psychrolutes* have been reported: *Psychrolutes paradoxus* Günther, 1861 occurs from the North Pacific to northern Bering Sea (Eschmeyer & Fong, 2015). *Psychrolutes phrictus* Stein and Bond, 1978 occurs between California and the northern Bering Sea (Stein & Bond, 1978); *Psychrolutes sigalutes* (Jordan & Starks, 1895) from the Bering Sea to eastern North Pacific (Eschmeyer & Fong, 2015); and *Psychrolutes sio* Nelson, 1980 from northernmost Peru to central Chile (Nelson, Chirichigno, & Balbontin, 1985). Confirmation of the taxonomic identity of this specimen was made by comparison of the meristic and morphometric characters reported for the 4 species from the eastern Pacific Ocean (Tables 1 and 2).

Representatives of *P. phrictus* have never been reported off the Mexican Pacific coast; thus our new record extends the known southernmost range 1,733 km from 33°19'N (LACM, 2015) to 17°45'N off the western American coast (Fig. 1). The

blob sculpin was collected on 30 March 2008 using a benthic sledge at a depth range of 1,100–1,199 m and a water temperature range of 3.88–4.25 °C, where hypoxic (0.57–0.39 mg/l) conditions prevailed, during the oceanographic cruise Talud XII, Sta. 13 south-east of Petacalco, Guerrero, México (17°45'24"N, 101°59'04"W). The specimen was collected by the R.V. El Puma of the Universidad Nacional Autónoma de México. Because of the uniqueness of this specimen, it was fixed in 10% formalin and later preserved in 70% ethanol. The specimen was deposited in the reference collection (fishes) of the Instituto de Ciencias del Mar y Limnología, Unidad Académica Mazatlán, with the catalogue number ICMYL.D.882.

Measurements and counts follow Nelson (1982). Electron tomography was taken to enable the count of vertebrae and facilitate the examination of branchiostegal rays, using a Toshiba Multislice CT. Axial, sagittal, and coronal reformatting and 3D reconstructions (slice interval: 0.6 mm) were performed on

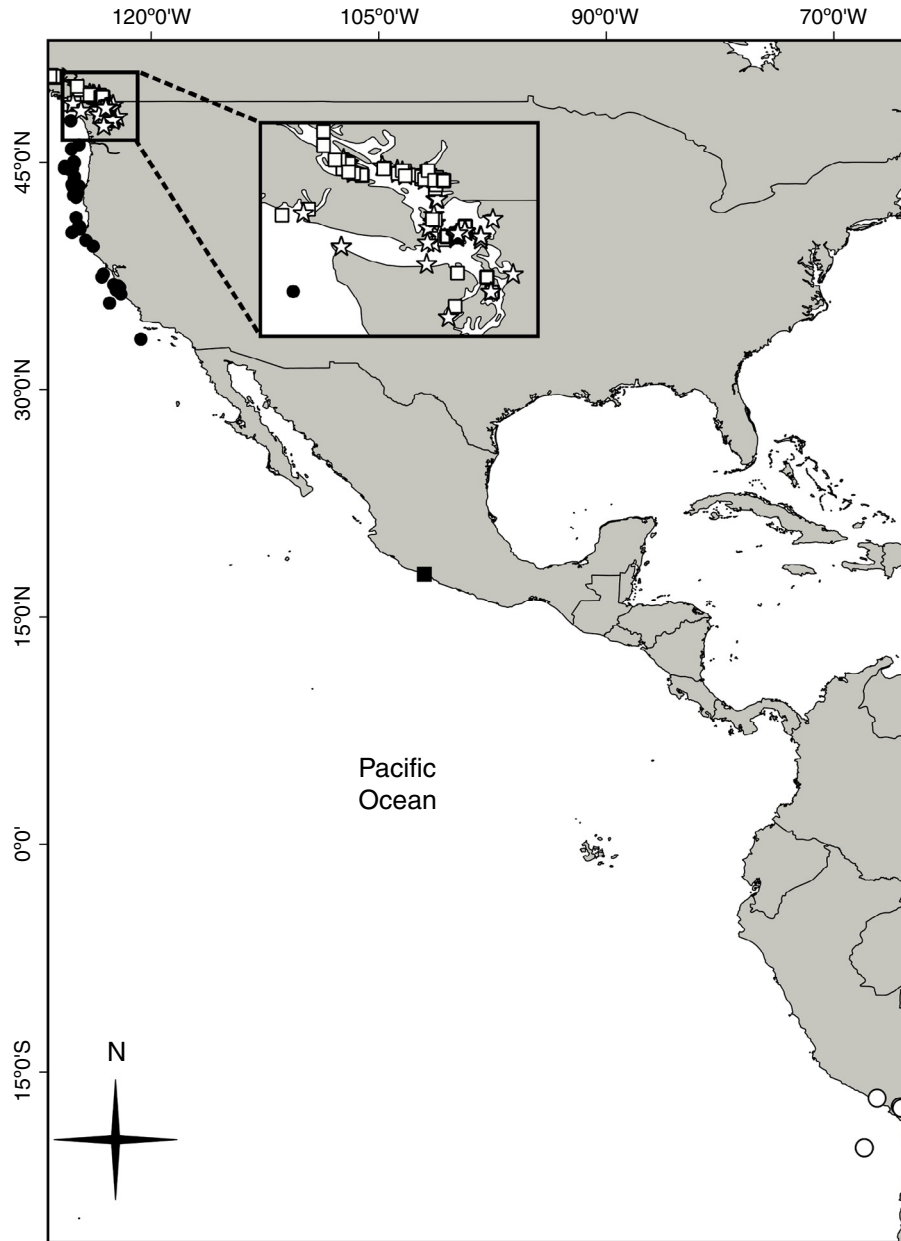


Figure 1. Distribution map of *Psychrolutes* species reported in the eastern Pacific Ocean: *P. paradoxus* (open star), *P. phrictus* (black circle), *P. sigalutes* (open square), *P. sio* (open circle) and new *P. phrictus* record ICMYL.D.882 (black square).

Sources: Eschmeyer and Fong (2015), LACM (2015), Matarese and Stein (1980), Nelson et al. (1985), Stein and Bond (1978).

Osirix 6.5. All measurements were performed 2 months after the preservation of the specimen. Lateral line pores were counted using a dissecting microscope. A distribution map was created using QGIS 2.10, and the figure was prepared with Inkscape 0.48.

The colour of the specimen before preservation was greyish brown above and below, with mottling sometimes present, especially on the ventral area; fins darker than body, margin of rays lighter than fins. The peritoneum was pale (Fig. 2). After preservation, the body colouration was uniformly brownish, paler on the ventral face, mottling not as evident as before preservation; fins darker than body, margin of rays lighter than fins. The lateral-line pore count was incomplete because

portions of skin were lost in some areas of the body, although 4 pores were observed. The diameters of the anteriormost lateral line pores were smaller than those of posteriormost position; diameter increased gradually towards the caudal area.

The morphological characters of the specimen examined here are concordant with those described for *P. phrictus* and data available in the literature (Table 1). However, our specimen has a deeper head (38% SL vs. 23.3–34.5% SL) and a higher caudal peduncle depth (9% SL vs. 6.7–8.3% SL). These differences are minimal and could be associated with the allometry by age, size, or sex of the specimens, even a limited sample size for description of the variation of these characters; also, morphometric variations among the members of the family Psychrolutidae

Table 2
Morphological, meristic, shape, and distribution of *Psychrolutes phrictus* from the Mexican Pacific Coast, ICMYL.D.882 compared with published data for the 4 species reported in the eastern Pacific Ocean: *P. phrictus*, *P. sigalutes*, *P. paradoxus*, and *P. sio*. Sources Eschmeyer, Herald, and Hammann (1983); Eschmeyer and Fong (2015), Fricke (1990), Günther (1861), Jackson and Nelson (1998), Jordan and Starks (1895), Matarese and Stein (1980), Nelson (1980, 1982), Nelson et al. (1985), Stein and Bond (1978), Yabe et al. (1983).

Attribute	ICMYL.D.882	<i>P. phrictus</i>	<i>P. sigalutes</i>	<i>P. paradoxus</i>	<i>P. sio</i>
Head length %SL	50	41.1–60.6	33	40.2–44.4	40.8–45.9
Jaws	Upper jaw protruding	Upper jaw protruding	Lower jaw protruding	Jaws nearly equal	Jaws nearly equal
Dorsal fin rays	VIII, 17	VII–IX, 19–20	VII–VIII, 16–19	IX–XII, 12–17	VII–VIII, 16–18
Pectoral fin rays	21	22–26	14–18	19–23	21–22
Anal fin rays	13	13	12–15	10–14	13–14
Anus	Between anal fin and pelvic fin	Between anal fin and pelvic fin	Immediately in front of anal fin	Between anal fin and pelvic fin	Between anal fin and pelvic fin
Gill rakers	7 + 2	9–13	7		
Vertebrae	33	33–35	33–35	34–37	32–34
Pectoral fin length %HL	54	44.9–62.3	120	92.6	56.5–65.2
Pectoral fin extending	To first third of anal fin	To first third of anal fin	To half of anal fin	To half of anal fin	To first third of anal fin
Maximum SL	222 mm	560 mm	83 mm	58 mm	345 mm
Depth range (m)	1,100	660–2,800	0–225	0–220	700–1,200
Distribution in the eastern Pacific Ocean	Central Mexican Pacific	From Alaska to California	From Alaska to Washington	From Alaska to Washington	From Peru to Chile
Peritoneum	Pale	Pale	Blackish	Blackish	Blackish
Colour	Relatively uniform, grey-brown, mottling sometimes present (especially on ventral area)	Relatively uniform, greyish or blackish, mottling sometimes present (especially on head), ventral surface often white	Relatively uniform	Brownish-grey, with large deep-brown blotches; caudal and pectoral fins dotted and spotted with black	Relatively uniform (no distinct banding or spotted pattern)

are great, probably because of the easily distortable nature of their bodies during or subsequent to capture (Jackson & Nelson, 2006; Stein & Bond, 1978).

Meristically, differences were found in the count of dorsal fin rays in our specimen when compared with that reported in literature (17 vs. 19–20) and pectoral fin rays (21 vs. 22–26) (Table 1). For the 4 species of *Psychrolutes* reported in the Eastern Pacific, variations were observed in the count of dorsal fin rays: *P. paradoxus* (12–17), *P. sigalutes* (16–19), *P. sio* (16–18), and *P. phrictus* (19–20); in the case of the number of pectoral fin rays, it was lower in *P. sio* (21–22), *P. paradoxus* (19–23), and *P. sigalutes* (14–18) than in *P. phrictus* (22–26) (Table 2).

Within the family Psychrolutidae, Byrkjedal, Hadler-Jacobsen, Rees, and Orlov (2014) evaluated the variation in

descriptive taxonomic characters of 3 species of the genus *Cottunculus* and found 5 diagnostic characters to vary geographically (east-west). Three showed a significant correlation with the depth of capture.

The specimen of *P. phrictus* reported here is distinguished from other members of the genus (*P. paradoxus*, *P. sigalutes*, and *P. sio*) by differences in the head length as a proportion of SL and relative pectoral fin length as a proportion of HL; from *P. paradoxus* by pectoral fin rays extending to half of the anal fin, jaws nearly equal anteriorly, maximum SL 58 mm, distribution northeastern Pacific Ocean from Alaska to Washington, depth range 0–220 m, and colour pattern; also *P. phrictus* differs from *P. sigalutes* by its pectoral fin rays extending to half of the anal fin, lower jaw protruding slightly beyond upper jaw, maximum SL 83 mm, anus immediately in front of anal fin, with a distribution range in the northeastern Pacific Ocean from Alaska to Washington, depth range 0–225 m, and colour pattern; finally, *P. phrictus* is discriminated from *P. sio* by having jaws nearly equal anteriorly, a distribution range in the southeastern Pacific from Peru to Chile, a depth range 700–1,200 m, colour pattern, and dark peritoneum (Table 2).

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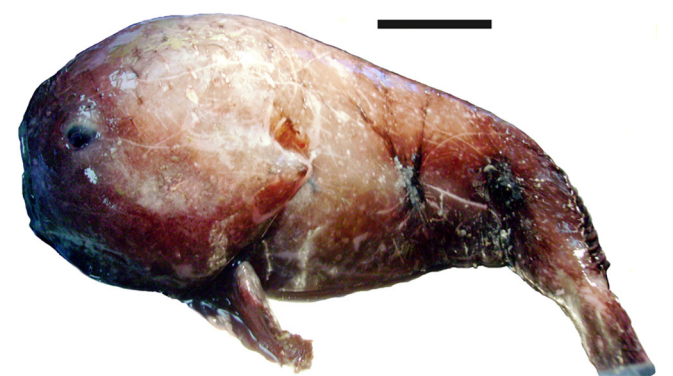


Figure 2. Left side of *Psychrolutes phrictus* before preservation ICMYL.D.882, bar = 50 mm.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.rmb.2016.06.013.

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