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 especímen 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 bético 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 especímen 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,
and 7 branchiostegals 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 branchiostegals rays, using a Toshiba Multislice CT. Axial, sagittal, and coronal reformatting and 3D reconstructions (slice interval: 0.6 mm) were performed on
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.
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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**Table 2**


<table>
<thead>
<tr>
<th>Attribute</th>
<th>ICMYL.D.882</th>
<th>P. phrictus</th>
<th>P. sigalutes</th>
<th>P. paradoxus</th>
<th>P. sio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head length %SL</td>
<td>50</td>
<td>41.1–60.6</td>
<td>33</td>
<td>40.2–44.4</td>
<td>40.8–45.9</td>
</tr>
<tr>
<td>Dorsal fin rays</td>
<td>VII, 17</td>
<td>Pectoral fin rays (21 vs. 22–26) &amp; Pectoral fin rays (21 vs. 22–26) &amp; Pectoral fin rays (21 vs. 22–26) &amp; Pectoral fin rays (21 vs. 22–26)</td>
<td>Pectoral fin rays (21 vs. 22–26) &amp; Pectoral fin rays (21 vs. 22–26) &amp; Pectoral fin rays (21 vs. 22–26) &amp; Pectoral fin rays (21 vs. 22–26)</td>
<td>13 &amp; 12–15 &amp; 7 &amp; 13 &amp; 9–13</td>
<td></td>
</tr>
<tr>
<td>Pectoral fin rays</td>
<td>21</td>
<td>22–26</td>
<td>14–18</td>
<td>19–23</td>
<td>21–22</td>
</tr>
<tr>
<td>Anal fin rays</td>
<td>13</td>
<td>13</td>
<td>12–15</td>
<td>10–14</td>
<td>13–14</td>
</tr>
<tr>
<td>Anus</td>
<td>Between anal fin and pelvic fin</td>
<td>Immediately in front of anal fin</td>
<td>Between anal fin and pelvic fin</td>
<td>Between anal fin and pelvic fin</td>
<td>Between anal fin and pelvic fin</td>
</tr>
<tr>
<td>Gill rakers</td>
<td>7 + 2</td>
<td>7</td>
<td>33–35</td>
<td>34–37</td>
<td>32–34</td>
</tr>
<tr>
<td>Vertebræ</td>
<td>33</td>
<td>9–13</td>
<td>120</td>
<td>92.6</td>
<td>56.5–65.2</td>
</tr>
<tr>
<td>Pectoral fin length %HL</td>
<td>54</td>
<td>44–62.3</td>
<td>120</td>
<td>92.6</td>
<td>56.5–65.2</td>
</tr>
<tr>
<td>Pectoral fin extending</td>
<td>To first third of anal fin</td>
<td>To first third of anal fin</td>
<td>To half of anal fin</td>
<td>To half of anal fin</td>
<td>To first third of anal fin</td>
</tr>
<tr>
<td>Maximum SL</td>
<td>222 mm</td>
<td>560 mm</td>
<td>83 mm</td>
<td>58 mm</td>
<td>345 mm</td>
</tr>
<tr>
<td>Depth range (m)</td>
<td>1,100</td>
<td>660–2,800</td>
<td>0–225</td>
<td>0–220</td>
<td>700–1,200</td>
</tr>
<tr>
<td>Distribution in the eastern Pacific Ocean</td>
<td>From Alaska to California</td>
<td>From Alaska to Washington</td>
<td>Washington Blackish</td>
<td>Blackish</td>
<td>Blackish</td>
</tr>
<tr>
<td>Peritoneum</td>
<td>Pale</td>
<td>Relatively uniform</td>
<td>Relatively uniform</td>
<td>Relatively uniform</td>
<td>Relatively uniform</td>
</tr>
<tr>
<td>Colour</td>
<td>Relatively uniform, grey-brown, mottling sometimes present (especially on ventral area)</td>
<td>Relatively uniform, greyish or blackish, mottling sometimes present (especially on head), ventral surface often white</td>
<td>Relatively uniform</td>
<td>Relatively uniform</td>
<td>(no distinct banding or spotted pattern)</td>
</tr>
</tbody>
</table>

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**Figure 2.** Left side of *Psychrolutes phrictus* before preservation ICMYL.D.882, bar = 50 mm.
by the Coordinación de la Investigación Científica, UNAM. Tomography was supported by the Conacyt project 179467. Two anonymous reviewers made useful comments on the manuscript that improved the content and clarity of the information.

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.

References


