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Research note

New depth record of *Cherublemma emmelas*, black brotula (Ophidiiformes: Ophidiidae) from the Gulf of California, Mexico

Nuevo registro de profundidad de *Cherublemma emmelas*, brótula negra (Ophidiiformes: Ophidiidae) en el golfo de California, México

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Abstract. Seven black brotulas *Cherublemma emmelas* inhabiting deep-sea soft bottom in the southeastern Gulf of California were collected using a benthic sledge during 2 oceanographic cruises (TALUD project) at a depth range of 905 to 1 010 m, a temperature range of 4.6 to 5.2°C, and hypoxic (0.13 to 0.20 ml/l) conditions. Until now, the presence of *C. emmelas* below 750 m had not been reported in the literature. This new record extends the known depth range of occurrence approximately 260 m deeper than the previously reported limit.

Key words: *Cherublemma emmelas*, Gulf of California, new record, maximum depth, hypoxic conditions.

Resumen. En el sureste del golfo de California, se recolectaron 7 brótulas negras *Cherublemma emmelas*, que habitan los fondos blandos del talud continental. Durante 2 cruceros oceanográficos (proyecto TALUD), los organismos se capturaron con un trineo bentónico entre los 905 y 1 010 m de profundidad, registrándose temperaturas entre 4.6 a 5.2°C, y donde prevalecen condiciones hipóxicas (0.13 a 0.20 ml/l). Hasta ahora, la presencia de *C. emmelas* por debajo de los 750 m de profundidad no ha sido documentada. Este nuevo registro extiende el intervalo de distribución a aproximadamente 260 m más profundo que el límite previamente reportado.

Palabras clave: *Cherublemma emmelas*, golfo de California, nuevo record, profundidad máxima, condiciones hipóxicas.

Cherublemma emmelas (Gilbert, 1890) is a bathydemersal species found in the tropical eastern Pacific from Baja California to northern Chile. Studies on its biology are scarce, and information available is mostly restricted to its taxonomy (Lea, 1995; Ambrose, 1996; Nielsen et al., 1999) and distribution (Castro-Aguirre and Balart, 1996; Sielfeld and Vargas, 1996; Pequeño 2000). Adults are found at depths between 70 and 750 m, juveniles are encountered at shallower depths (Lea, 1995), and larvae and prejuveniles are mesopelagic (Ambrose, 1996; Sielfeld and Vargas, 1996; Nielsen et al., 1999). Until now, the presence of *C. emmelas* below 750 m had not been reported in the literature. A single, deeper record (700-900 m) exists based on material deposited in the Ichthyological Collection of the California Academy of Sciences under vouchers CAS 40398 and CAS 54941.

The deep sea is typified by low temperature, extremely high hydraulic pressure, nonphotosynthetic light, and relatively low influx of utilizable organic material derived from primary production in surface waters (Morita, 1999). The vertical distribution of oxygen in the southeastern Gulf of California indicates the presence of 3 successive environments. The well-oxygenated epipelagic zone ranges from the surface to about 80-125 m, with oxygen concentrations 2 ml/l or greater. Deeper into the water column, a wide hypoxic (< 0.1 ml/l) to almost anoxic mesopelagic zone is found, extending roughly from 150-200 m to 600-800 m. The deep water benthic-demersal environment is almost anoxic in localities shallower than 600-800 m but oxygen content is higher in deeper localities; oxygen reaches values of 0.5-1.0 ml/l in the depth range of 800-1 300 m. In deeper water, there is a strong recovery of oxygen content, which progressively reaches values above 2.0 ml/l in depths greater than 2 000 m (Hendrickx, 2001; Zamorano et al., 2007). Epibenthic

water temperature decreases regularly from 6.2°C at the shallowest station (approximately 700 m) to 2.0°C at the deepest station (approximately 2 100 m), at depths of 700-1 100 m temperature range was 3.6 to 6.2°C (Hendrickx, 2003; Mendez, 2007; Zamorano et al., 2007).

Specimens were collected aboard the R/V “El Puma” of the Universidad Nacional Autónoma de México. The sampling device, a 2.35 m wide, 0.90 m high epibenthic sledge equipped with a collecting net of about 5.5 cm stretched mesh size, was operated at depths of 400 to 2 250 m in the Gulf of California. Every fishing operation lasted 30 min, at a ship speed of 2 knots. Sampling depth was estimated with an analogical Edo Western echo sounder. Temperature and oxygen concentrations were measured approximately 10 m above the bottom with a CTD. Specimens were fixed with a 4% formaldehyde sea water solution for at least 1 week, washed with tap water, preserved in 70% ethanol, and identified in the laboratory. The identification guide of Lea (1995) was used for identification.

A total of 6 females (TL, 100-182 mm) were caught on June 6th, 2001 (TALUD VII, St. 18, 24°15'00"N, 108°17'06"W), at a depth range of 950-1 010 m. Only 1 male (TL, 210 mm) was caught on February 11th, 2007 (TALUD X, St. 14, 27°44'03"N, 111°36'49"W), at a depth of 905-943 m. The temperature range at this sampling station was 4.6 to 5.2 °C (Table 1).

The vertical distribution of dissolved oxygen concentration (Fig. 1) indicated critical hypoxic conditions (< 0.1 ml/l) at depths between 300 and 800 m, but oxygen content was slightly higher in deeper localities; oxygen concentration measured close to bottom reached values of 0.13-0.20 ml/l (moderate hypoxia < 0.5 ml/l) at depth approximately of 933 and 1 000 m (TALUD VII St. 18 and TALUD X St. 14 respectively). In the southeastern Gulf of California, epibenthic dissolved oxygen concentration < 0.5 ml/l always and occasionally < 0.1 ml/l limits the occurrence of macroinvertebrate species that cannot tolerate severe hypoxic conditions (Hendrickx 2001,

2003). However, for *Cherublemma emmelas*, this does not represent a barrier for dispersion from the mid-shelf into deeper waters (depth range 70 to 1 000 m).

Due to their rare occurrence and the lack of earlier systematic studies of deep-sea communities off the Pacific coast of Mexico, information related to occurrence of deep-water species is uncertain and a poor definition of bathymetric distributional limits exists. This new record extends the known bathymetric range by approximately 26 atm, in an area where hypoxic (0.13 to 0.20 ml/l) conditions prevailed. The updated information on *C. emmelas* distribution provided in this report will help in unraveling the rich deep-sea ichthyofaunal biodiversity of Mexico, which, at this point, is poorly understood.

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Table 1. Sampling stations where *C. emmelas* were caught deeper than 900 m during the TALUD VII and X cruises in the Gulf of California. Oxygen and temperature measured at bottom level. M = male; F = female, TL= total length

TALUD	Station	Date	Lat. N	Long. W	Depth range (m)	O ₂ (ml/l)	Temp. (°C)	Material examined
VII	18	7/Jun/01	24°15'00"	108°17'06"	950-1010	0.13	5.2	6 F (TL 182, 182, 181, 178, 116, 100 mm)
X	14	11/Feb/07	27°44'03"	111°36'49"	905-943	0.20	4.6	1 M (TL 210 mm)

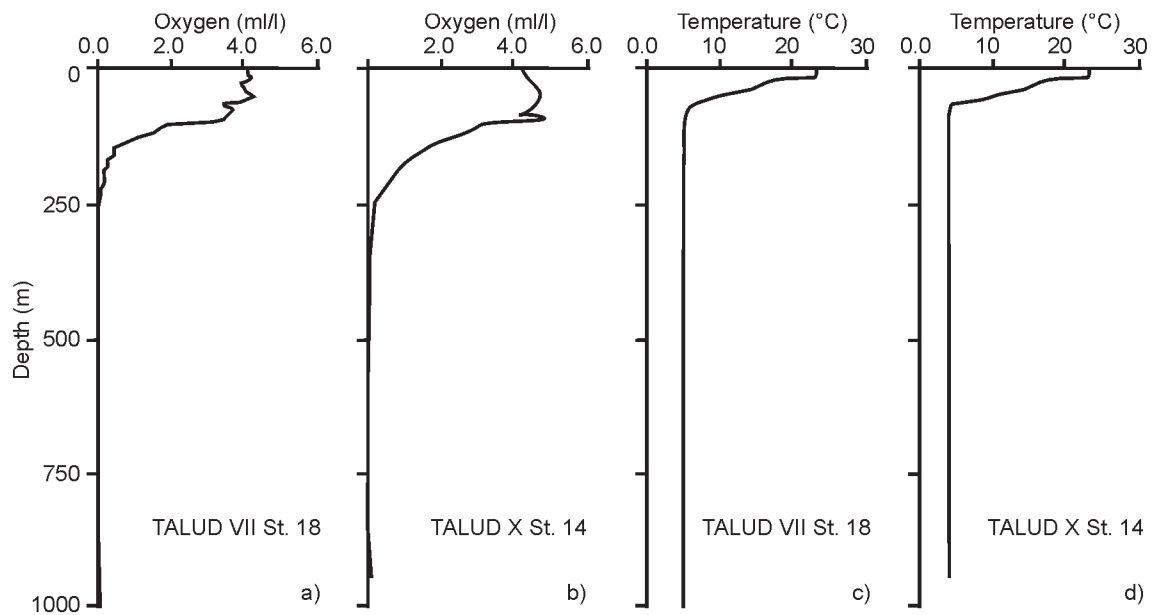


Figure 1. Vertical distribution of the dissolved oxygen concentration (a-b) and temperature (c-d) measurements recorded for TALUD VII St. 18 and TALUD X St. 14 respectively.

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