FIRST RECORD OF THE GENUS *OEDICEROIDES* (AMPHIPODA: AMPHILOCHIDEA: OEDICEROTIDAE) FOR THE GULF OF MEXICO, WITH THE DESCRIPTION OF A NEW SPECIES

Primer registro del género *Oediceroides* (Amphipoda: Amphilochidea: Oedicerotidae) del Golfo de México, con la descripción de una especie nueva

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ABSTRACT

The genus *Oediceroides* Stebbing, 1888 represents a group of 23 species of amphipods that live from shallow coastal areas to abyssal plains. Most of these species have been collected in deep waters from localities in the South Atlantic and Pacific Oceans, and only one species has been found in the Mediterranean Sea. Many oediceroids inhabit waters more than 200 meters deep with only four species confined to shallow waters. This is the first occasion in which a species belonging to the genus *Oediceroides* is recorded for the Gulf of Mexico. Here, we describe *O. improvisus* **sp. nov**., a species of marine deep-water amphipod collected in 925 meters of water. This species has carapace, mouthpart and pereopodal characters that unite it with other members of the genus. It differs from all other species due to unique rostral and pereopod seven characters, all discussed in detail further in this description. To date, only 20 deep-sea (>200 meters) benthic amphipods have been recorded in the Gulf of Mexico, in comparison with more than 200 species of shallow water representatives from the same region. Our study provides evidence that the deep waters of the Gulf of Mexico still hold undescribed biodiversity.

Keywords: Amphipoda, Oedicerotidae, *Oediceroides*, Gulf of Mexico, deep sea.

RESUMEN

El género *Oediceroides* Stebbing, 1888, es un grupo de 23 especies de anfípodos que viven desde las áreas costeras poco profundas hasta las llanuras abisales. La mayoría de estas especies se han recolectado en aguas profundas de varias localidades en los océanos Atlántico Sur y Pacífico, y solo se ha encontrado una especie en el Mar Mediterráneo. Las especies de esta familia habitan en aguas de más de 200 metros de profundidad con solo cuatro especies confinadas a aguas poco profundas. Esta es la primera ocasión en la que se registra una especie del género *Oediceroides* para el Golfo de México. En la presente contribución se describe a *O. improvisus*, una nueva especie de anfípodo marino de aguas profundas que se encontró 925 metros de profundidad. Esta especie posee caracteres morfológicos comunes a los representantes del género; sin embargo, difiere de todas las demás especies debido a caracteres únicos en relación al rostro y al séptimo pereópodo, todos discutidos en detalle más adelante en esta descripción. Hasta la fecha, solo se han registrado 20 anfípodos bentónicos de aguas profundas (>200) en el Golfo de México, en comparación con las más de 200 especies de representantes de aguas someras de la misma región. Esta nueva especie proporciona evidencia de que queda mucha diversidad por descubrir en las aguas profundas del Golfo de México y los esfuerzos de muestreo futuros deberían apuntar a esta región.

Palabras clave: Amphipoda, Oedicerotidae, *Oediceroides*, golfo de México, profundidad marina.

INTRODUCTION

Although the deep sea (>200 m) is among the largest ecosystems on the planet, it remains one of the least studied (Ramirez & Billett, 2006). The lack of knowledge is largely due to the challenges of collecting in this environment. Sampling in the deep sea is financially expensive, labor-intensive and challenging due to the low temperatures and high pressures found at increasing depths (Sweetman *et al*., 2017). Aside from these challenges, the deep sea contains a wealth of biodiversity still left to be discovered. It has been suggested that most of the species collected in the soft benthos of the bathyal or abyssal plains are new to science (Rex *et al*., 1993; Brandt *et al*., 2007; Danovaro *et al*., 2010; Ortiz *et al*., 2018; Patel *et al*., 2020).

To date, the collection of amphipods in the Gulf of Mexico have been in shallow waters and, to a lesser extent, across the continental shelf and the continental upper slope of the northern region (Winfield *et al*., 2006). Conversely, the fauna of the southern Gulf, especially those that live in the deep waters of the central Gulf, have been less studied (Winfield *et al*., 2006; Lecroy *et al*., 2009). Across the deep waters of the Gulf of Mexico, only 20 species of deep-water amphipods belonging to 14 families and 17 genera have been recorded (Varela & Gomez, 2015; Winfield *et al*., 2016, 2021; Ortiz *et al*., 2018).

The family Oedicerotidae has 45 genera and more than 240 species distributed worldwide from littoral to abyssal zones (Barnard, 1961). Many oedicerotids dig burrows in soft bottom habitat by using their modified pereiopods which contain enlarged and spinose articles. The genus with the highest number of species is *Monoculodes* Stimpson, 1853 with 31 species that are distributed throughout the Northern Hemisphere from the littoral to bathyal zones. Within the Gulf of Mexico, only four shallow water oedicerotid species have been recorded. Two of them, *Hartmanodes nyei* (Shoemaker, 1933) and *Americhelidium americanun* (Bousfield, 1973), have distributions that span the entire Gulf of Mexico, while *Ameroculodes miltoni* Foster, 2002 and *Perioculodes cerasinus* Thomas and J. L. Barnard, 1985, can be found in the northeast and southeast regions of the Gulf, respectively (LeCroy *et al*., 2009).

The genus *Oediceroides* currently has 23 species and a distribution that ranges from shallow to abyssal depths, with only 4 species found in waters with a depth greater than 1500 meters (Sttebing, 1888; Shoemaker, 1925; Barnard, 1937; Barnard, 1961). These species have been found mostly in southern locations of the Atlantic and Pacific oceans and only one species, *O. pilosa* Ledoyer, 1983 has been recorded for the Mediterranean Sea. In this work we present *Oediceroides improvisus* sp. nov., from the northern Gulf of Mexico. This is the first finding of the genus *Oediceroides* for the Gulf of Mexico.

OBJECTIVES

- To provide the first record of the genus *Oediceroides* for the Gulf of Mexico and the description of a new deep-sea amphipod species.

MATERIALS AND METHODS

The material used in this study comes from one expedition in the northern Gulf of Mexico in 2018 on the R/V Point Sur as part of the Deep Pelagic Nekton Dynamics of the Gulf of Mexico (DEEPEND) consortium (http://www.deependconsortium.org) funded by the Gulf of Mexico Research Initiative (GOMRI).

Sample was collected with a Multiple Opening/Closing Net and Environmental Sensing System (MOC–10) rigged with six 3–mm mesh nets. During one of the trawls the net accidentally hit the bottom and trawled for a short period of time before being lifted onto the deck of the ship for inspection. Among the limited material collected in the net we found the amphipod that is described in this paper. For more details on the sorting and processing of the collected sample see (Cook *et al.,* 2020; Varela *et al*., 2021). The vouchered material has been deposited in the National Museum of Natural History (USNM #1645589).

Drawings of the specimen were made using a Wild M5 dissecting microscope with a *camera lucida* (Figs. 1–3). Total length (tl) was measured in millimeters (mm) from the tip of the rostrum to the posterior margin of the telson.

RESULTS

Taxonomy

Oediceroides improvisus **sp. nov**. (Figures 1–3)
lsid:zoobank.org:pub:6D9A58B9-E8D1-4145-81FE-C96BC15CD7F7

Type Material. Holotype: Non-ovigerous female, 17 mm (tl), Gulf of Mexico (29° 01” N and 87° 31” W). Collected 21 July 2018, 925 meters deep on mud; MOCNESS plankton net. Cruise DP06 (DP06–21JUL18–MOC10–B175N2–104–N0). R/ V Point Sur. National Museum of Natural History (NMNH #1645589) and Florida International University Crustacean Collection (FICC), HBG 9257.

Diagnosis. Body segments that are dorsally smooth and without tubercles; the propodus of both gnathopods no more than twice as long as carpus; rostrum, slender, blunt and extends half of the second article of antenna 1; coxa of pereopod 6 with posterior lobe much deeper than anterior lobe; pereopod 7 with the merus almost twice the length of the carpus and the carpus and propodus almost the same width.

Diagnosis. Segmentos corporales dorsalmente lisos y sin tubérculos; el propodito de ambos gnatópodos no es más del doble de largo que el carpopodito, rostro, delgado, romo, se extiende la mitad de la longitud del segundo artejo de la antena 1; coxa del pereópodo 6 con lóbulo posterior mucho más profundo que el lóbulo anterior; pereópodo 7 con el meropodito casi dos veces la longitud del carpopodito y carpopodito y propodito casi del mismo ancho.

Description. Head as long as the first three segments of body; rostrum as long as the head, narrow, evenly rounded at apex, curved slightly downward and almost reaching the half of the second article of antenna 1, lateral lobes prominently produced forward and obliquely truncated. Pereonite 1 shorter than the measured head, without the rostrum; pereonite 2 subequal to pereonite 1; pereonites from 1 to 6 lack middorsal or dorsolateral processes. Pleonites 1–3 and urosomites 1–3 lack middorsal or dorsolateral processes (Fig. 1A).

Antenna 1 (Fig. 1B) peduncle with three articles, article 1 subequal in length as article 2; article 3 is the shortest. All the articles with feathery setae in the surface. Antenna 2, missing in the specimen.

Right mandible (Fig. 1C) short and stout, cutting-edge with two small, dark teeth at base of cutting edge; *lacinia mobilis* with five teeth; left mandible (Fig. 1D) with two teeth in the cutting edge and two teeth in the *lacinia mobilis*, molar very prominent with triturating surface concave, distal margin with seven accessory setae in both mandibles. Mandibular palp long, 3–segmented, third article nearly as long as second; second and third articles provided on their lower edges with a row of setae.

Maxilla 1 with the internal lobe ovoid, distal margin with 5 feathery setae, distal margin of external lobe with nine robust setae; palp exceeds the length of the external lobe, article 1 short, article 2 curved and elongated with long distal setae (Fig. 1E). Maxilla 2 with both lobes subtriangular, both with long simple distal setae, internal lobe with 9 long setae and external lobe with 14 long marginal setae and groups of minute lateral and facial setae (Fig. 1F).

Maxilliped with the internal lobe that reaches less than half the length of the external lobe, with five long marginal setae and eight robust distal setae; outer lobe widely rounded distally, with seven distal setae, internal margin with setae. Internal and external margins of the palp with groups of long setae, article 4 with a small seta on the internal margin (Fig. 1G).

Epistoma wider than long. Upper lip evenly rounded on lower edge (Fig. 1H). Lower lip devoid of internal lobes; external lobes and mandibular process, subtriangular, margins with short and simple setae (Fig. 1I).

Gnathopod 1, coxa greatly expanded and extended straight forward, basis slender and slightly curved, anterior margin with numerous and long setae; ischium short, subtriangular, with distal setae in the posterior margin; merus slightly longer than ischium with setae in the posterior margin; carpus shorter than propodus with lower margin produced into a prominent lobe, the edge of which is provided with many setae, propodus slightly expanded distally, suboval, palm very convex, defined by one robust seta and furnished throughout with groups of setae; dactylus slender, slightly curved, smooth, and about the length of the fixing palm. (Fig. 2A).

Gnathopod 2, with coxa 2 comparatively narrower than coxa 1 with sides nearly parallel. Basis linear and slender, provided on anterior margin with setae, ischium and merus similar to gnathopod 1; carpus wider than propodus and about two-thirds as long, lower margin produced into a very prominent lobe which is margin with setae, propodus and dactylus as in gnathopod 1 (Fig. 2B).

Pereopod 3 with coxa broader than coxa 2 with sides nearly parallel; basis long and slender with long and plumose setae along both margins, ischium is the smallest of the articles, with a group of distal setae. Merus, carpus and propodus slender and elongated and provided with long and short setae, dactyl is slender, slightly curved and nearly as large as the propodus (Fig. 2C).

Pereopod 4, coxa 4 deeper than coxa 3, anterior margin convex and posterior margin slightly concave, basis, ischium, merus carpus, propodus and dactyl similar to pereopod 3 (Fig. 2D).

Pereopod 5 with coxa 5 slightly over half the depth of coxa 4, posterior lobe much deeper than anterior lobe, basis widest through the upper third of article, posterior margin slightly convex and provided with plumose setae; ischium is the smallest of the articles, with setae in the posterior and distal margins; merus and carpus slender with setae in both margins; propodus and dactyl missing (Fig. 3A).

Pereopod 6 with coxa shallower than coxa 5, posterior lobe much deeper than anterior lobe, basis and ischium similar to pereopod 5. Merus, carpus, propodus and dactyl are missing (Fig. 3B).

Pereopod 7 with coxa small, smaller than coxa 6, widest at anterior margin. Basis and ischium similar to pereopods 5 and 6, merus longer and wider than carpus with setae in both margins, carpus slightly smaller than propodus with setae in posterior margin, propodus slender with setae in both margins, dactyl missing (Fig. 3C).

Epimera 1–3 with anteroventral and posteroventral angles evenly rounded and provided with a fringe of setae (Fig. 3D). Telson as long as wide, distally emarginated (Fig. 3E). Uropod 1, broken, missing both rami, lateral margin with simple setae (Fig. 3F); uropods 2–3, missing in the specimen.

Color. Initial documentation of color in the freshly collected specimen was not recorded. However, a few days after the specimen was transferred to 80% ETOH the head and part of the rostrum appeared pink while the upper region of the body segments 1–7 had blue-glisten tonalities. This coloration eventually vanished with extended preservation in ethanol.

Size: 17 mm total length.

Habitat: Mud.

Type Locality: northern Gulf of Mexico (29° 01" N and 87° 31" W).

Etymology. This species is called "improvisus" due to the unexpected way in which the material was collected.

Remarks

Oediceroides improvisus **sp. nov**. has several characters that distinguish it from all other species in the genus except *O. abyssorum* (Shoemaker, 1925) from Guadalupe Island in the Pacific Ocean. These characteristics include body segments that are dorsally smooth and without tubercles, the propodus of both gnathopods no more than twice as long as carpus, and a rostrum that is slender, blunt and apically longer than article 1 of antenna 1. Nevertheless, *O. improvisus* **sp. nov**., contains a set of diagnostic characters unique to this species. This includes a rostrum that extends half the length of the second article of antenna 1, coxa of pereopod 6 with posterior lobe much deeper than anterior lobe, pereopod 7 with the merus almost twice the length of the carpus and the carpus and propodus almost the same width. Conversely, in *O. abyssorum,* the rostrum barely reaches the end of article 1 of antenna 1, coxa 6 possesses an anterior lobe much deeper than posterior lobe, and pereopod 7 has a merus and carpus of similar length and a propodus more slender than the carpus. This is the first species of the genus *Oediceroides* recorded for the Gulf of Mexico. This study highlights the diversity that is still left to be discovered in the deep sea and especially for taxa that can be found in burrows or benthic sediments.

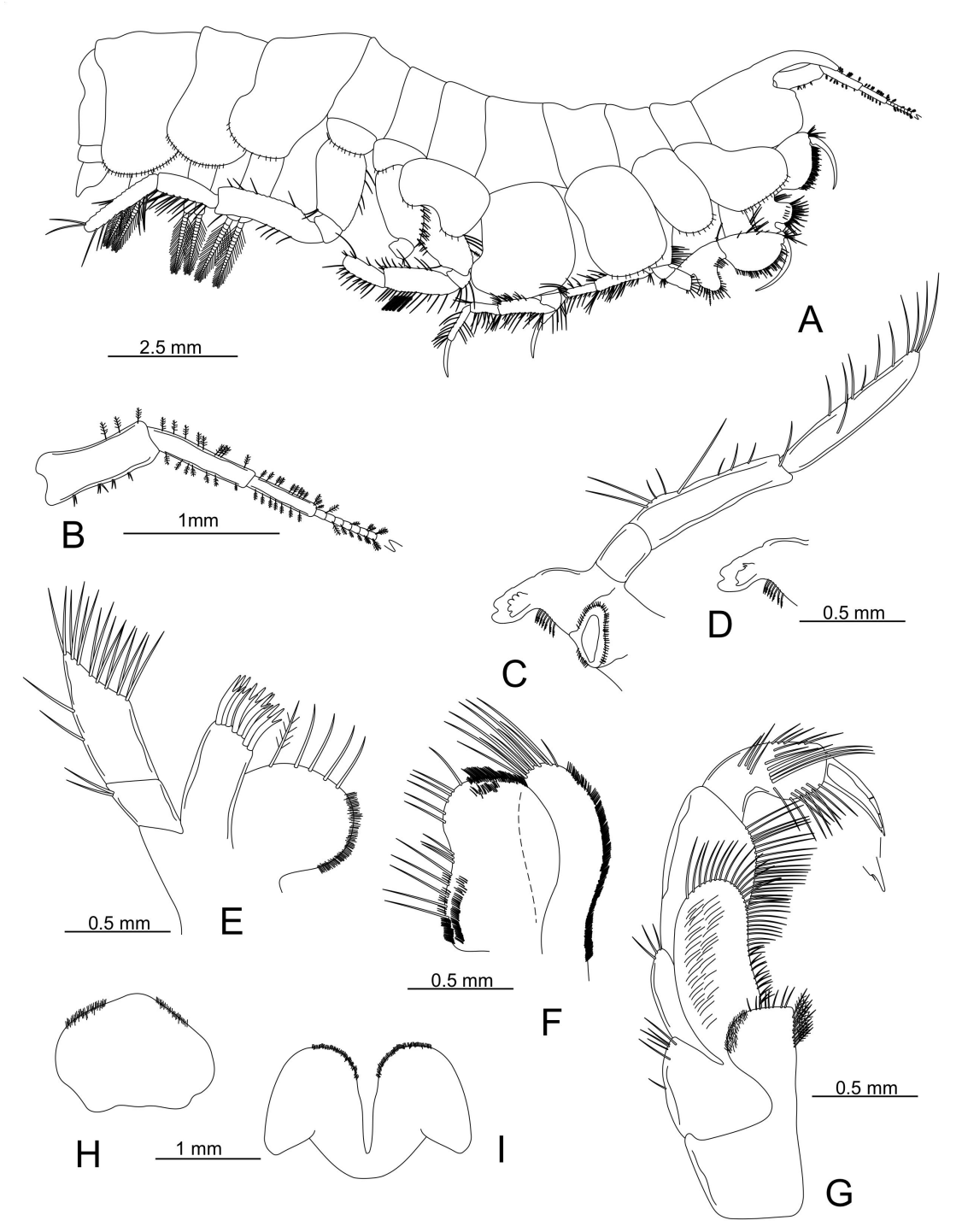

Figure 1. *Oediceroides improvisus* **sp. nov.** (I). A, lateral view of the specimen; B, antenna 1; C, left mandible; D, rigth mandible (cutting edge and *lacinia mobilis*); E, maxilla 1; F, maxilla 2; G, maxilliped; H, upper lip; I, lower lip.

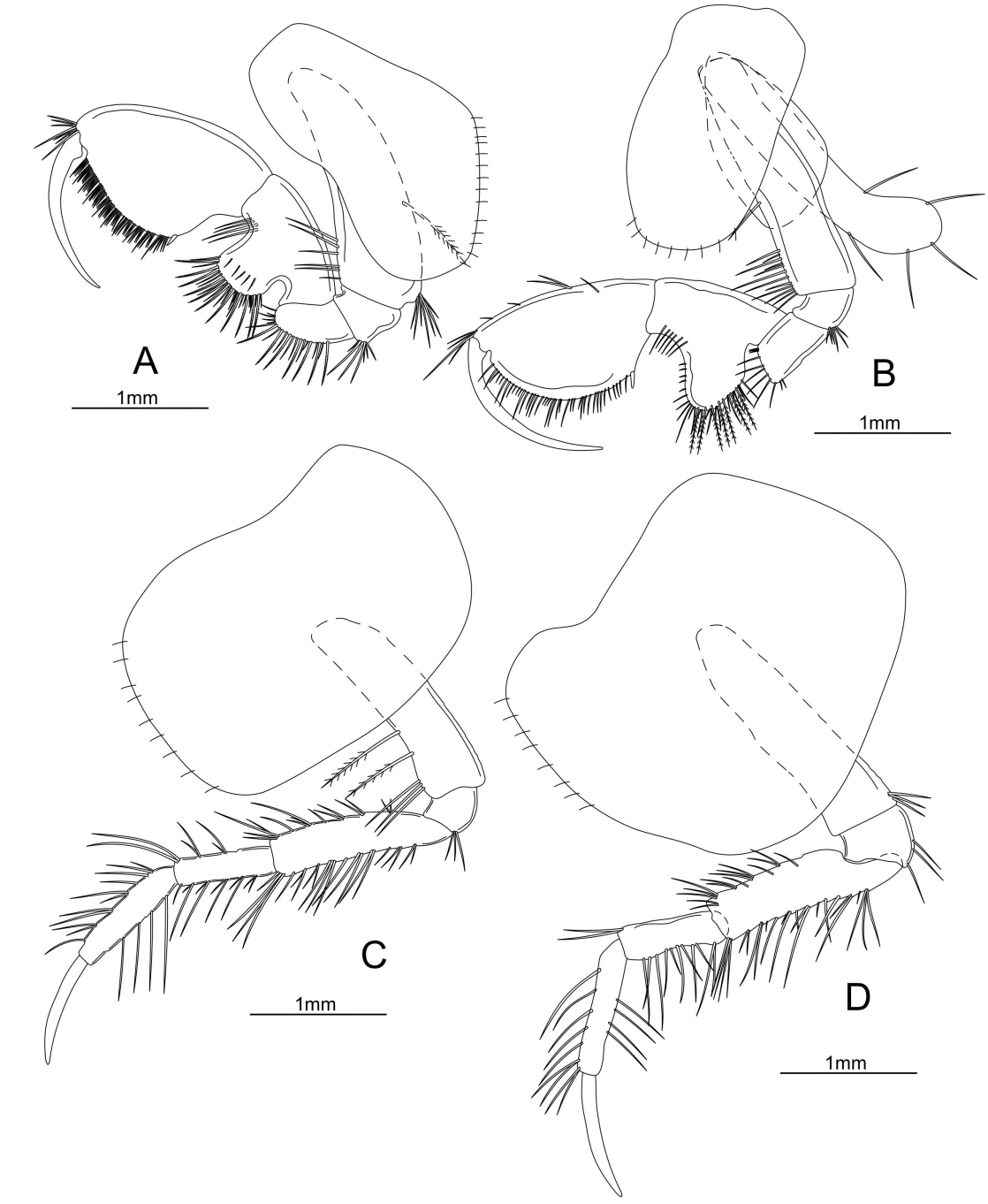

Figure 2. *Oediceroides improvisus* **sp. nov.** (II). A, gnathopod 1; B, gnathopod 2; C, pereopod 3; D, pereopod 4.

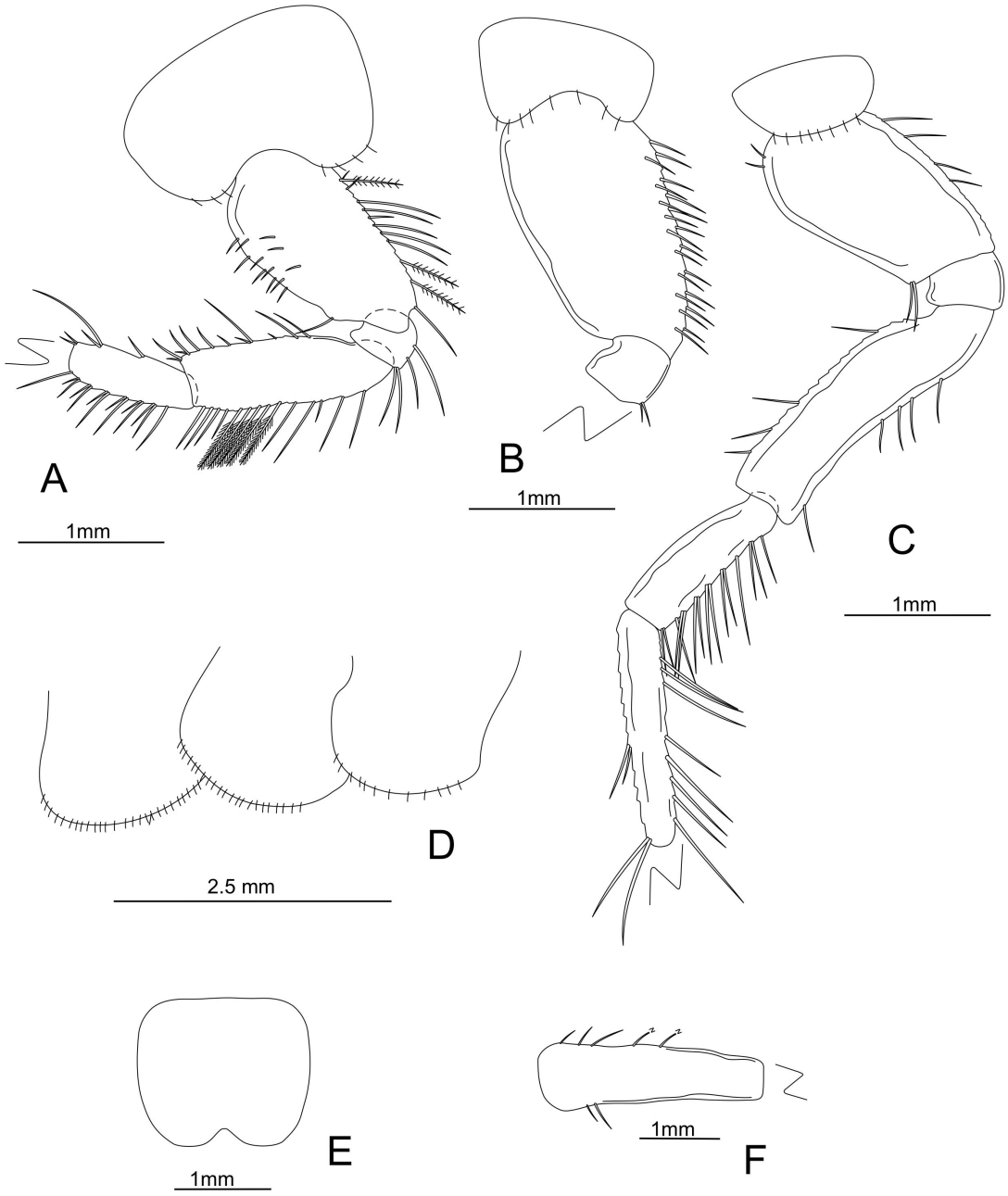

Figure 3. Oediceroides improvisus **sp. nov.** (III). A, pereopod 5; B, pereopod 6; C, pereopod 7; D, epimera; E, telson; F, fragment of the uropod 1.

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