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A New Crab, *Costacopluma bifida* (Crustacea, Decapoda) from the Palaeocene of Venezuela

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Abstract

A new species of crab, *Costacopluma bifida,* is described from a borehole core of the Guasare Formation (Palaeocene) from Lake Maracaibo, Venezuela. This discovery extends the known geographic, but not stratigraphic, range of the genus *Costacopluma.* Morphological details of *C. bifida* reveal a closer affinity between *Costacopluma* and *Archaeopus* than previously realized, which possibly strengthens the assignment of both genera to the same family (Retroplumidae). The interpreted depositional environment of the new specimen is shallow marine, the same as for other occurrences of *Costacopluma* described in the literature, suggesting that the genus as a whole preferred the shallow marine environment.

Key words: Crustacea, Decapoda, Retroplumidae, *Costacopluma bifida* sp. nov., Palaeocene, Venezuela.

Introduction

Sedimentological studies of an oilwell core by two of the authors (RH and BC) have produced a fossil crab, identified as a new species of *Costacopluma*. The isolated fossil is novel in being the first crab reported from the Palaeocene of Venezuela. In addition, the find is important palaeontologically because it: 1) defines another Palaeocene species of *Costacopluma*; 2) extends the known geographic range of *Costacopluma*; and 3) provides support for the retention of *Costacopluma* in the family Retroplumidae.

Locality and Stratigraphy

The studied core is from borehole VLC-812 (9°21', 71°30'W) in Lake Maracaibo, Zilia state, Venezuela. The crab specimen occurs at 13776' (4,200 m), within a laminated shale bed 3.5 m thick. This bed is the topmost shale in an interval of limestones and shales known as the Guasare Formation (Palaeocene; González de Juana *et al.*, 1980). Sharply overlying the crab-bearing bed is the basal sandstone of the Misoa Formation, which consists of sandstones and shales dated as lower to middle Eocene (Van Veen, 1972). The contact between the Guasare and Misoa Formations is an unconformity (Brondijk, 1967).

Systematic Description

Section Thoracotremata Guinot, 1977
Family Retroplumidae Gill, 1894

Genus *Costacopluma* Collins & Morris, 1975

Type species: *Costacopluma concava* Collins & Morris, 1975 by original designation.

Costacopluma bifida sp. nov.
(Pl. 8, Figs. 1-3; Pl. 9, Figs. 1-4)

Material: An external mould of a carapace, locally retaining shell material, on a bedding plane in a core sample of shale from 13776' in borehole VLC -812, in Lake Maracaibo, Venezuela. The holotype specimen (MBLUZ P-1242) is housed in the Sectión de Paleontología, Museo de Biología, Facultad de Ciencias, Universidad del Zulia, Maracaibo, Venezuela.

Derivation of name: The trivial name refers to the bifid rostrum.

Diagnosis: Carapace subovate, width slightly exceeding length, a bifid rostrum and broad (probably) depressed transverse ridges, anterior ridge interrupted medially.

Description: The carapace is subovate in outline, the length being about seven eighths of the greatest width, which occurs a little before midlength; the anterolateral margins are gently rounded, the posterolateral margins more so; the posterior angles are rather sharp and lead by shallow, nearly straight coxigeal incisions to the posterior margin which is weakly concave medially, bounded by a fine ridge and an elongate node at the outer angles. The orbitofrontal margin occupies about two thirds of the carapace width; the rostrum is produced, narrow and bifid with the points bluntly rounded, its narrowly raised sides lead to a median sulcus extending shortly onto the carapace; moderate ocular embayments lead to the slightly raised orbital margin which is divided into two parts about midlength by a triangular supraorbital spine, the inner part concave and straight, the outer concave and slightly receding to a sharp outer orbital spine. The cervical furrow crosses the midline in a shallow curve about three fourths distant from the front, turns sharply forwards to the anterior angle of the mesogastric lobe, turns outwards and is sinuous to the margin. The three ridges characterising the genus are broad and moderately tumid: the first, comprising the epigastric and mesogastric lobes, does not quite reach the lateral margin, it is weakly concave, almost parallel sided and interrupted on either side of the base of the short, broadly triangular anterior mesogastric process. The epi- and mesobranchial lobes forming the median ridge are down-curved and recessed at the margin with the mesogastric lobe. The anterior margin of the metabranchial lobes, which with the cardiac region forms the third ridge, is concave and directed a little anteriorly, the metabranchial lobe becoming trapezoidal in outline. The rounded triangular cardiac region is about one third of the greatest carapace width.

The surface ornament appears to consist of minute regular sized granules.

The chelipeds are subequal, the right slightly the larger; extended, their length would be about one and half times greater than the carapace width; the propodus is moderately stout and incurved. The ?1st and ?2nd pereiopods (2nd and 3rd limbs) are very long and delicate; the extended length of the ?1st would exceed the carapace width by one and a half times. There is a median ridge on the short lanceolate dactylus which is about half the length of both the propodus and carpus, about one fourth that of the merus and half that of the basi-ischium. The limb articulates opposite the posterior angle. The ?2nd pereiopod is comparatively shorter and the merus is bowed rather than straight as in the ?1st; it articulates opposite the upper half of the coxigeal incision.

Discussion

Comparison with other species of *Costacopluma*

The preservation of the specimen—an external mould, locally retaining shell — presents problems regarding the prominence of the surface features; the definition of the lobes, however, is reasonably clear.

Costacopluma bifida differs from the type, *Costacopluma concava*, in its more rounded carapace outline; in addition, the transverse ridges are broader, the 1st being interrupted at the midline by the anterior mesogastric process and not quite reaching the lateral margin. As now known, the rostrum of *C. concava* is spatulate, not triangular as described by Collins and

Morris (1975), but not bifid as in *C. bifida*. As preserved, the rostrum of *Costacopluma senegalensis* (Remy, 1959) (Palaeocene of Senegal) is triangular, otherwise the carapace differs in much the same details as *C. concava*, except that the anterior ridge does not reach the margin.

Two species, *Costacopluma mexicana* Vega & Perrilliat, 1989 and *Costacopluma bishopi* Vega & Feldmann, 1992 have been described from the Maastrichtian of Mexico. In neither of these species does the anterior ridge reach the lateral margin. The comparative posterior margin-width/greatest carapace-width of *C. mexicana* and *C. bifida* more or less agree, but the orbitofrontal margin of *C. mexicana* is about half the greatest carapace width compared to about two thirds in *C. bifida*; the rostrum of *C. mexicana* is said by Vega and Feldmann (1992) to be trapezoidal, although in a figure (Vega and Perrilliat, 1989, fig. 2b) it appears vaguely bifid, the ocular construction is deeper than in *C. bifida* and the supraorbital spine is nearer the outer orbital spine rather than median as in *C. bifida*. The upper margins of the lateral portions of the 3rd ridge of *C. bifida* are concave and the metabranchial lobes are trapezoidal rather than triangular as in *C. mexicana*. *C. bishopi* has a more ovate carapace with shorter anterolateral margins and a wider posterior margin than *C. bifida*; the rostrum is subquadrate and the supraorbital spine occurs closer to the midline; the median part of the epi-mesobranchial ridge is lobate and not indented as in *C. bifida* and the cardiac region is comparatively wider. The Upper Campanian *Costacopluma binodosa* Collins & Rasmussen, 1992 from West Greenland differs in having a relatively narrower posterior margin, narrow epi-metabranchial ridges and conspicuous nodes above the posterior angles.

The preservation of segmented chelipeds and pereiopods is unique among known species of *Costacopluma*. There is a remarkable similarity in the juxtaposition of the chelipeds and pereiopods with those of *Archaeopus* relative to their articulation and position of sternites (see Rathbun, 1908; Collins *et al.*, 1993). There would appear to be less space between the articulation of the chelipeds and ?1st pereiopods than observed by Rathbun (1908) for *A. antennatus* and by Collins *et al.* (1993) for *A. ezoensis* (Nagao, 1941). The extended length of the chelipeds of *A. antennatus* and *A. ezoensis* reaches about twice the carapace width, whereas in *C. bifida* they extended to about one and a half times the carapace width. Collins and Morris (1975) refers the coxigeal incisions of *C. concava* to the 5th limbs, but this is clearly not the case, because the 4th and 5th limbs would probably have occupied a subdorsal position similar to that envisaged for *Archaeopus*.

Age and palaeobiogeography

With regard to the age of the crab, the Guasare Formation in the Maracaibo Basin has been dated as Palaeocene (Gonzáles de Juana *et al.*, 1980). Thus, a Palaeocene age is implied for the new specimen, consistent with the presently known stratigraphic range of *Costacopluma*, which extends from the Coniacian (*C. concava* Collins & Morris, 1975) to the Upper Eocene Priabonian (*Costacopluma* sp., Müller & Collins, 1991).

Geographically, the genus has spread far afield with time. The earliest known species, *Costacopluma concava* Collins & Morris, 1975, occurs in the Coniacian, Upper Campanian and ?Maastrichtian of Nigeria. By the late Campanian, *C. binodosa* Collins & Rasmussen, 1992 had reached West Greenland. Subsequently, by Maastrichtian times, *C. concava* occurred in northern India (Gaetani *et al.*, 1983), while *C. mexicana* Vega & Perrilliat, 1989 and *C. bishopi* Vega & Feldmann, 1992 were present in Mexico. In the Palaeocene, the genus occurred in Senegal (*C. senegalensis* (Remy, 1959)) and Venezuela (*C. bifida*). By the Late Eocene, *Costacopluma* sp. (Müller and Collins, 1991) was present in Hungary. Two further species have recently been discovered in Brazil and Argentina (*in lib.* R. M. Feldmann, May, 1994).

Affinities of *Costacopluma*

In his discussion of the Retroplumidae, Via (1957, p. 554; 1969, p. 333 *et seq*) postulated that the origin of the family (in which he included *Archaeopus, Retropluma* and *Ophthalmoplax*) lay in the Americas, with *Archaeopus* close to the root stock, during the Cretaceous, but in their discussion of *C. concava*,

Collins and Morris (1975) cast some doubt on this and proposed an African provenance on the basis that the Coniacian age of *C. concava* from Nigeria predated the earliest known American retroplumid species. The position of *Costacopluma* within the Retroplumidae was subsequently discussed by Bishop (1983) who concluded that "the ancestral morphotype would not differ significantly from *Archaeopus*".

In a systematic survey of Recent and fossil retroplumids, de Saint Laurent (1989) introduced a new Recent genus, *Bathypluma*, a family Costacoplumidae, to contain *Costacopluma*, and a superfamily, Retroplumoidea Gill, 1894 from which she excluded *Archaeopus*. Vega and Feldmann (1992), arguing against this, retained the earlier family, Retroplumidae, and included in it *Archaeopus*, *Bathypluma*, *Costacopluma*, *Cristipluma* and *Retropluma*; they also maintained the concept of a North America origin for the family.

With knowledge of the chelae and pereiopods and their juxtaposition to the carapace of *Costacopluma bifida*, it becomes evident that there is a greater affinity of *Costacopluma* to *Archaeopus* than to heretofore considered, possibly supporting the inclusion of both genera in the same family.

Vega and Feldmann (1992) suggested that two phyletic groups were apparent in *Costacopluma* an African group containing *C. concava* and *C. senegalensis*, and an American group with *C. mexicana* and *C. bishopi*. As remarked above, the carapace surface of *C. bifida* is not clearly defined; nevertheless it meets most of Vega and Feldmann's requirements for inclusion in the American group, differing in the (apparently) comparatively wide spaces between the ridges.

Depositional environment

The depositional environment of the Guasare Formation has long been interpreted as a marine shelf, based on a diverse fauna of molluscs and foraminifera (Zambrano *et al.*, 1971; González de Juana *et al.*, 1980). Such an interpretation for *C. bifida* is consistent with published interpretations for other species of *Costacopluma*: for example, Collins and Morris (1975) inferred a shallow marine environment up to 50 m deep for *C. senegalensis*, based on environmental interpretation by Tessier (1952); Gaetani *et al.* (1983) found *C. concava* in strata interpreted as shallow marine; Müller and Collins (1991) reported *Costacopluma* sp. in a coral-bearing bed which they interpretiated as shallow marine or lagoonal; Collins and Rasmussen (1992) recorded *C. binodosa* in "undifferentiated marine shales"; and Vega and Feldmann (1992) inferred a "shallow platform setting" for *C. bishopi*, based partly on a diverse associated fauna including corals, ammonites and echinoids. Thus, it appears that *Costacopluma* as a genus preferred normal marine salinities and shelf depths.

Previous fossil crab discoveries in Venezuela

Van Straelen (1938) gave descriptions of, and illustrated, six species of crabs from Falcon and Lara states, ranging in age from Late Eocene to Miocene. In addition to *Xanthopsis rathbunae* Maury, 1930, three new species were recognized (*Calappa laraensis*, *Raninoides rathbunae* and *Parthenope venezuelensis*) and two new genera and species (*Eoinachoides senni* and *Falconoplax kugleri*).

In the Cretaceous of Barinas state, Sánchez and Lorente (1977) identified crab remains as belonging to the subfamily Hexapodinae.

The new specimen is the first *Costacopluma* reported from Venezuela, thereby broadening the known taxonomic range of Venezuelan fossil crabs.

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ベネズエラの古第三系産のカニ化石の一新種，
Costacopluma bifida

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要　　旨

ベネズエラ・Lake Maracaibo の Guasare 層産十脚甲殻類の新種 *Costacopluma bifida* を記載する．この発見は *Costacopluma* の地理的分布を広げるものである．*C. bifida* の形態的特徴は，*Costacopluma* と *Archaeopus* の間に密接な系統関係があること，両属ともに同科（ユウレイガニ科）に含まれることを示す．この化石種は，従来知られているものと同様に浅海に生息していたものと解釈される．

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Explanation of Plate

Plate 8

Figs. 1-3. *Costacopluma bifida* sp. nov.

Fig. 1. × 3.2.

Fig. 2. Carapace and limbs, × 10.0.

Fig. 3. Distal segments of left ?2nd pereiopod, × 15.0.



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2



3

Plate 9

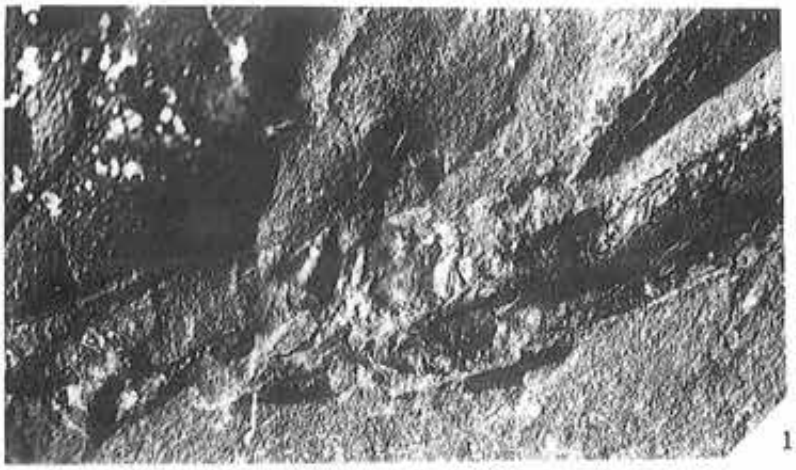
Figs. 1–4. *Costacopluma bifida* sp. nov.

Fig. 1. Detail of juxtaposition of left-hand pereiopods to posterior angle of carapace, × 15.0.

Fig. 2. Detail of juxtaposition of right-hand ?1st/2nd pereiopods to posterior angle of carapace, × 15.0.

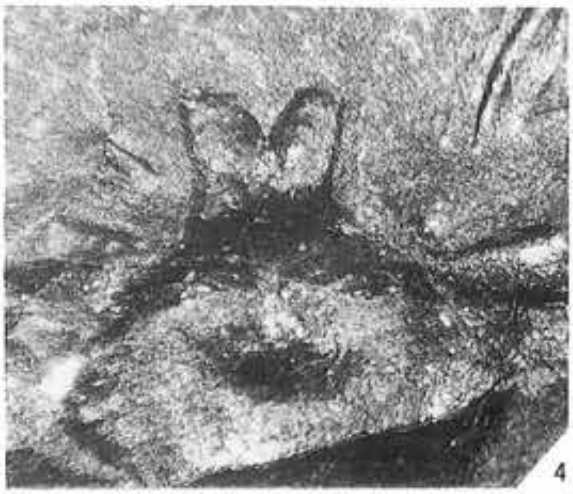
Fig. 3. Details of left chela and rostrum, × 15.0.

Fig. 4. Rostrum, × 25.0.


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