

Eocene crabs (Crustacea, Brachyura) from Bonaire, Netherlands Antilles

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Recently discovered crabs from the Middle to Upper Eocene of northern Bonaire, Netherlands Antilles, include well-preserved carapaces of *Montezumella rutteni* Van Straelen, originally described from an incomplete holotype. The more comprehensive description of this species provided herein includes documentation of the first attributable left cheliped of *Montezumella*. From the same locality, *Ocalina sublevis* sp. nov. considerably extends the known geographic range of this genus. Both of these Tethyan decapod genera apparently migrated west from the Mediterranean region during the Eocene. Despite these new determinations, decapod crustaceans remain poorly known from the Eocene of the Antillean islands. Additionally, *Callianassa pustulosa* Withers from the Eocene basal complex of Barbados is tentatively re-assigned to *Callichirus*.

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Introduction

The first species of fossil decapod crustaceans ('crabs') to be made known from Bonaire were described by Van Straelen (1933); *Calappilia bonairensis* and *Montezumella rutteni*, each represented by a single carapace. They remained a unique collection until S.K.D. discovered a small, undescribed lot of crab remains, part of the Creutzberg Collection, in the Nationaal Natuurhistorisch Museum, Leiden. This new material not only allows a more detailed description of *M. rutteni*, founded on an oblique left half of a carapace, but includes a left cheliped which can be confidently attributed to that species; this is the first cheliped within *Montezumella* to be described. Also in the collection is a carapace of a new species of *Ocalina* Rathbun, 1929, *Ocalina sublevis* sp. nov., only the third member of the genus to be described, which greatly extends its geographical range from the type locality in Alachua County, Florida.

Montezumella originated in the Mediterranean region (southern Tethys) during the Middle Eocene and subsequently dispersed to Europe, the Caribbean and Pacific regions by the Late Eocene (Portell & Collins, 2002). With the recent inclusion of

Palaeocarpilius straeleni Remy & Tessier in *Ocalina* by Schweitzer (2003), this genus is also recognised to have a Tethyan distribution. Thus, available data suggest that both *Montezumella* and *Ocalina* took a westerly migration route, and, reaching the Caribbean, diverged northwards into Florida by the Late Eocene. Analogous patterns of migration are recognised for other members of the vagile benthos, such as the echinoid *Clypeaster* (Poddubiuk, 1985). Continuing westwards, *Montezumella* also reached Mexico and the Pacific slope of North America by the Late Eocene. One species, *Montezumella casayeten-sis* Rathbun, survived into the Late Oligocene or Early Miocene of Panama. A record from the Neogene of Fiji awaits reassessment of the only available specimen (Portell & Collins, 2002, p. 598).

Other occurrences of decapods from the Netherlands Antilles are discussed in Collins & Donovan (2004). Specimens discussed herein are deposited in the Nationaal Natuurhistorisch Museum, Leiden, The Netherlands (RGM), the Natural History Museum, London (BMNH), and the Institut royal des Sciences naturelles de Belgique, Brussels, Belgium (IRScNB).

Eocene crabs of the Antilles

Eocene crabs described from the Antillean islands are remarkably few in number and, for the most part, poorly known. For example, *Lophoranina* (as *Ranina*) *porifera* (Woodward, 1886) was named only from a figure (*ibid.*, pl. 2, fig. 18) of a partial carapace from the Upper Eocene (Donovan, 1994, fig. 12.4) San Fernando Formation of Trinidad, despite original confusion that the holotype was Oligocene (Rathbun, 1919b).

Withers (1924) described a number of decapod species from the Lower-Middle Eocene (Robinson, 1994, fig. 6.5) Chapelton Formation, Yellow Limestone Group, of Jamaica (Morris, 1993; Donovan *et al.*, 2003, table 1); *Callianassa gigantea*, *Callianassa subplana*, *Callianassa trechmanni*, *Eriosachila* (as *Hepaticus*) *bartholomaeensis*, *Varuna?* sp., *Callinectes jamaicensis* and *Xanthilites rathbunae*. Withers considered the latter to include *Xanthilites* sp. from the Eocene Plaisance Formation of Haiti (Rathbun, 1923), known only from a propodus. Not unusually, the callianassids are in need of detailed revision.

Callianassa pustulosa and *Callianassa menziesi* were described by Withers (1926) from the Lower to Middle Eocene Scotland Beds of Barbados (= basal complex *sensu* Speed, 1994, 2002), formerly considered to be Oligocene. In the same paper, Withers referred a damaged left propodus to *Callianassa lacunosa* Rathbun, 1919a, originally described from the Culebra Formation of Panama. *Callianassa pustulosa* retains a fixed finger and has a deep proximal excavation, a character of *Callichirus* Stimpson, 1866, the propodus differing from the illustration of Manning & Felder (1986, fig. 1c) only in being rather more quadrate and in having a smooth, rather than cuspid, fixed finger. In this respect it is close to *Callichirus? symmetricus* Feldmann & Zinsmeister, 1984, from the Eocene of Antarctica. Therefore, *Callianassa pustulosa* is placed tentatively in *Callichirus*. *Callichirus? pustulosa* is only the fourth known fossil taxon attributed to this genus (Portell & Agnew, 2004) and the first to be recorded from the Caribbean. The present (disjunct) range of *Callichirus* is the eastern Pacific, West Africa and the west coast of South Africa; the occurrence of a fossil member of this genus in the Caribbean region is thus not unexpected. Other species reported from the Eocene basal complex of Barbados are *Falconoplax bicarinella* Collins & Morris, 1976, and

Palaeopinnixa peronata Collins & Morris, 1976.

Locality and horizon

The holotype of *Montezumella rutteni* Van Straelen, 1933, comes from south-west of Seroe Montagne, western Bonaire (Van Straelen, 1933, p. 4; Fig. 1 herein). The RGM specimens (and, presumably, that of the BMNH) are all from the same locality. Notes by the collector of the RGM material, Mr. Peter Creutzberg, state “voorin in een klein gebiedje,” that is, in front [of Seroe Montagne?] in one small area, crabs occurring in a limited interval. This locality is a steep hillside with thorny scrub cover. The commonest fossils in the float of yellow-weathering limestone rubble are mouldic gastropods, lucinid bivalves and solitary scleractinians. A note with BMNH In 44608, written by Dr. C.T. Trechmann (1884-1964), states, “The rock is rather like the [Eocene] Yellow Limestone of Jamaica.” Montagne Formation, Middle to Upper Eocene (Jackson & Robinson, 1994, p. 257). GPS N 12°13.86' W 68°21.84'.

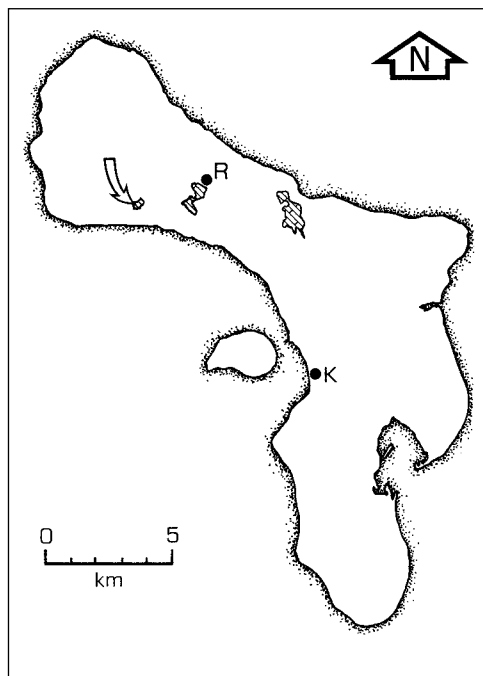


Fig. 1. Outline map of Bonaire, showing the outcrop of the Eocene Montagne Formation and coeval units (oblique brick sculpture) (simplified after Herweijer, 1979, pl. 4; see also Beets *et al.*, 1977, pl. 3; Jackson & Robinson, 1994, fig. 14.4a). The approximate position of the decapod crustacean fossil locality is marked by an arrow. Key: K = Kralendijk; R = Rincon; coastline stippled.

Systematic palaeontology

Order Decapoda Latreille, 1803
 Infraorder Brachyura Latreille, 1802
 Section Heterotremata Guinot, 1977
 Superfamily Cancroidea Latreille, 1803
 Family Cheiragonidae Ortmann, 1893
 Genus *Montezumella* Rathbun, 1930

Type species — *Montezumella tabulata* Rathbun, 1930, p. 4, by monotypy (Upper Eocene, Mexico).

Other species — *Montezumella amenosi* Vía, 1959 (Middle Eocene, Spain); *M. casayetenensis* Rathbun, 1937 (Upper Oligocene or Lower Miocene, Panama); *M. eichhorni* Schweitzer

& Salva, 2000 (Upper Eocene, Washington State); *M. elegans* (Lőrenthey in Lőrenthey & Beurlen, 1929) (Upper Eocene, Hungary and Italy); *M. fraasi* Lőrenthey, 1909 (Middle Eocene, Egypt); *M. lamiensis* Rathbun, 1934 (Neogene, Fiji); *M. microporosa* Portell & Collins, 2002 (Upper Eocene, Florida); *M. pumicosa* Beschin *et al.*, 2002 (Eocene, Italy); *M. ruttteni* Van Straelen, 1933 (Upper Eocene, Bonaire); *M. scabra* Quayle & Collins, 1981 (Upper Eocene, England and Italy).

Diagnosis — See Glaessner (1969, p. R508).

Range — Middle Eocene to Upper Oligocene or Lower Miocene, Neogene(?).

***Montezumella ruttteni* Van Straelen, 1933**

Pls. 1, 2.

1933 *Montezumella ruttteni* Van Straelen, 1933, p. 3, fig. 2.

Holotype — A partial carapace in the collections of the IRScNB.

Other material — Three carapaces, RGM 216086 and 216087, and BMNH In 44608 (part and counterpart), and an attributed left cheliped, RGM 216088.

Locality and horizon — Southwest of Seroe Montagne, western Bonaire (Fig. 1). Montagne Formation, Middle to Upper Eocene. The biogeography of *Montezumella* was discussed by Portell & Collins (2002).

Description of carapace — Carapace rounded pentagonal in outline, almost as long as wide, widest anterior of the midline (between 3rd and 4th anterolateral spines). Moderately arched longitudinally, being more steeply inclined anteriorly, and weakly arched in transverse section. Details of orbitofrontal margin not well preserved, but it probably occupied about two thirds of the carapace width; there is a suggestion of a low, arched upper orbital margin and a notch before an outer orbital spine of circular section. Of four spines lining the anterolateral margins, separated by rectangular notches, the 1st to 3rd increase in size posteriorly and are rounded triangular in outline; the 4th is smaller than the 3rd and sharply triangular. Almost straight posterolateral margins converge to broadly rounded posterior angles. The posterior margin is about as wide as the front. The gastric regions are well defined by broad, shallow grooves. From the margin the cervical furrow curves round the rounded-triangular hepatic region to unite with a broader hepatic furrow, curving sharply, that is, broadly V-shaped, behind the mesogastric lobe and being interrupted at the midline. From a groove isolating a small triangular epibranchial lobe the lateral course of the branchiocardiac furrow is obscured by granules; it becomes broader and straight behind the mesobranchial lobe, then turns sharply towards the cardiac region; dividing, it bounds the quadrate anterior part of the urogastric lobe anteriorly and, posteriorly, bounds the lingulate cardiac region. The anteromesogastric process forms a long isoceles triangle terminating level with large, subovate protogastric lobes. On RGM216086, coarse granules distributed more or less bilaterally symmetrically crowd the gastric region and on each protogastric lobe granules

tend to form two ridges with a smooth area between, parallel with a granular row lining the margin of the anteromesogastric process. There are groups of granules on each anterolateral spine and on the branchial region, the granules become laterally and vaguely lineally constrained, the median area being scabrous. Granules on the smaller carapace, RGM 216087, are more delicate and more evenly distributed over the entire surface; also, nodes in an inverted V are present on the cardiac region. These differences possibly indicate sexual dimorphism.

Description of left cheliped — Merus, height a little more than half the length, narrowing slightly posteriorly; a weak groove on convex outer surface; upper margin nearly straight, edge rounded with a strong spine over carpal margin and another a short way behind; lower margin weakly convex with an indentation and blunt spine at lower carpal angle; surface coarsely reticulate to an obscure 'ridge' bounding the lower margin. Carpus obliquely quadrate, about one third longer than high; outer surface tumid, weakly grooved and bounded with tubercles before propodal margin and deeply grooved before a semicircular articulating boss; surface reticulated with a curving row of five or six tubercles uniting proximally with a lower, concave row. Propodus, distal height of manus almost equal to length; upper margin nearly straight, obliquely excavate proximally to half distal height; a groove bounds the carpal articulation; lower margin curved proximally, then straight to length of fixed finger; upper surface flat, bounded by inner and outer tuberculated ridges, the outer ridge forming uppermost of five similarly tuberculated ridges, the 2nd weakest, just over mid-height; the 3rd row is the strongest while the subconcave 4th continues onto the fixed finger; the 5th ridge lines the basal margin; median part of the interdigital margin convex. Fixed finger about two thirds length of manus and a proximal height half that of manus; occludent margin, directed straight to tip, lined with three(+) large rounded cusps. Upper margin of dactylus weakly convex, two rounded cusps are preserved distally.

Discussion — An attenuated anteromesogastric lobe and convex rather than straight posterolateral margins immediately distinguish the type species, *M. tabulata*, which lacks a postfrontal depression, the presence or absence of which cannot be established in the available specimens of *M. ruttleri*. The dorsal surface of *M. tabulata* is irregularly granulated in much the same way as RGM 216087.

Although differing in features such as carapace proportions and nature of the anterolateral spines, a prime distinguishing character from *M. ruttleri* lies in the surface ornament, peculiar to each of the other known species within this genus (Portell & Collins, 2002). In other species of *Montezumella*, the ornament consists of fine granules developed, particularly on the branchial region, in transverse rows which may be entire or symmetrically arranged or not. *Montezumella casayensis* retains a surface ornament of individual tubercles, but they are coarser and more evenly dispersed than in *M. ruttleri*, which also has a shorter, narrower anteromesogastric process and a narrower anterior portion of the cardiac region.

The larger carapace, RGM 216086, is almost one third larger than the holotype. With the exception of the orbitofrontal region, both RGM carapaces retain almost entire surfaces. A fifth(?) pereopod merus preserved with RGM 216086 has charac-

ters sufficiently akin to the isolated left cheliped for the latter to be assigned to *M. rutteni* with confidence.

Superfamily Xanthoidea MacLeay, 1838

Family Carpiliidae Ortmann, 1893

Genus *Ocalina* Rathbun, 1929

Type species — *Ocalina floridana* Rathbun, 1929, p. 2, by monotypy (Upper Eocene, Florida).

Other species — *O. straeleni* (Remy & Tessier, 1954) (Lower Lutetian (lowermost Middle Eocene), Senegal); *O. sublevis* sp. nov.

Diagnosis — See Glaessner (1969, p. R520).

Range — Middle to Upper Eocene.

***Ocalina sublevis* sp. nov.**

Pl. 3.

Etymology — Referring to the smoother surface of the carapace compared with *O. floridana*.

Type material — Holotype, RGM 216089, part cast and part decorticated carapace. The only specimen known.

Locality and horizon — Southwest of Seroe Montagne, western Bonaire (Fig. 1). Montagne Formation, Middle to Upper Eocene.

Diagnosis — Carapace subovate with ten anterolateral lobules; orbitofrontal width about half carapace width; dorsal surface lobulate on gastric region, less so on branchial region.

Description — Carapace transversely ovate, about two-thirds wider than long, moderately concave transversely, more strongly so longitudinally. Details of front not preserved. The orbitofrontal margin takes up about half the carapace width; of this, the almost circular orbits, in line with the carapace curvature, occupy the outer thirds. Thickened upper orbital margins are slightly raised and vaguely tuberculate (possibly due to indifferent preservation). There is a deep sinus in the lower orbital margin close to the outer orbital node. The anterolateral margins are longer than the posterolateral margins and lined with ten lobules increasing in size to the lateral angle, followed by a small, feebly ridged lobule. The almost straight posterolateral margins are inclined at about 20° to the midline. Lobes and regions weakly defined; from the margin, the cervical furrow makes three short loops to unite with the stronger hepatic furrow, then turns straight towards the base of the mesogastric lobe; the median course is not preserved. The protogastric lobes appear to be smooth; large, flattened nodes, with a

smaller one between the inner pair, make up the hepatic region; the epibranchial lobe has two or three similar nodes. A cuneiform urogastric lobe is weakly defined from a long, lingulate cardiac region.

Discussion — The new species compares well with *Ocalina floridana* in general carapace outline, orbitofrontal width/carapace width proportions and presence of ten marginal lobes. Differences in preservation hamper comparison of surface ornament; the gastric lobules compare favourably, but those on the branchial region are confined to the lateral margins. The lateral course of the cervical furrow is more obvious in *O. sublevis*. The ‘ridged,’ ultimate lateral lobe is continued in *O. floridana* as two or three nodes. The recently reassigned (Schweitzer, 2003) *Ocalina straeleni* differs from *O. sublevis* in having a relatively smooth dorsal surface, less well-developed anterolateral tubercles and a virtual absence of a ‘branchial ridge’ extending from the last lateral tubercle.

Acknowledgements

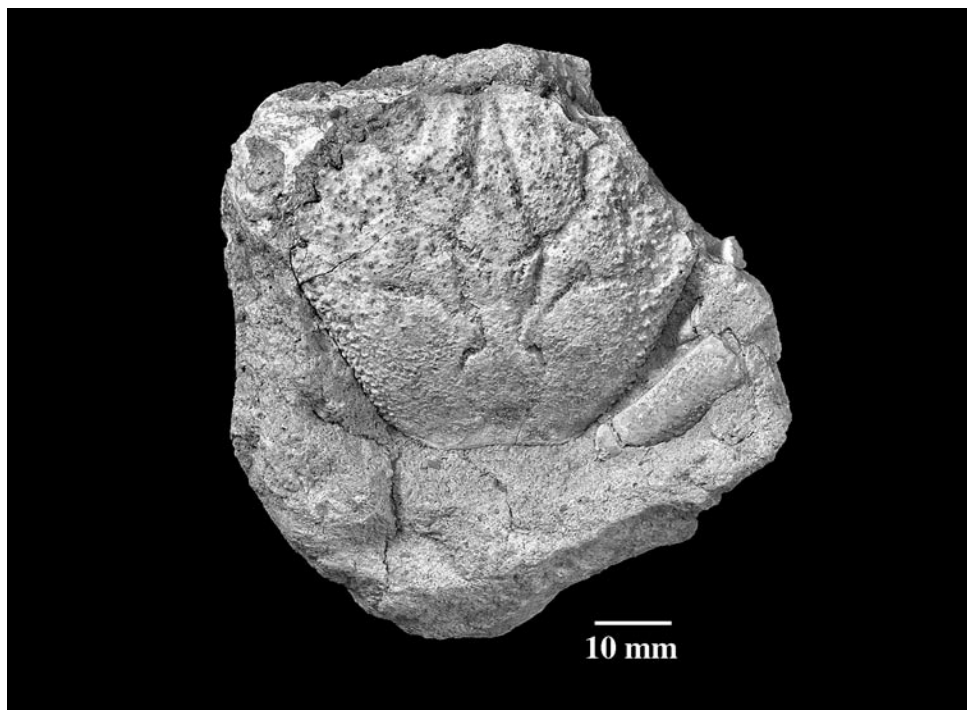
RGM specimens described herein were collected by Mr. Peter Creutzberg. S.K.D. thanks the Nationaal Natuurhistorisch Museum, Leiden, for supporting fieldwork in Bonaire in 2003. J.S.H.C. thanks Mr. W.J. Wildenberg (RGM) for arranging the loan of these specimens. The photographs were taken by the Photographic Unit and compiled as plates by Mr. D.N. Lewis (both BMNH). Comments by Professor Z. Kielan-Jaworowska are gratefully acknowledged. We thank our referees, Dr. J.W.M. Jagt (Natuurhistorisch Museum Maastricht) and Mr. R.W. Portell (Florida Museum of Natural History, Gainesville), for their perspicuous comments. This is a contribution to S.K.D.’s Nationaal Natuurhistorisch Museum project “Caribbean palaeontology.”

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**Plate 1**

Montezumella rutteni Van Straelen, 1933, Eocene Montagne Formation of Bonaire. RGM216086, large carapace, dorsal view.

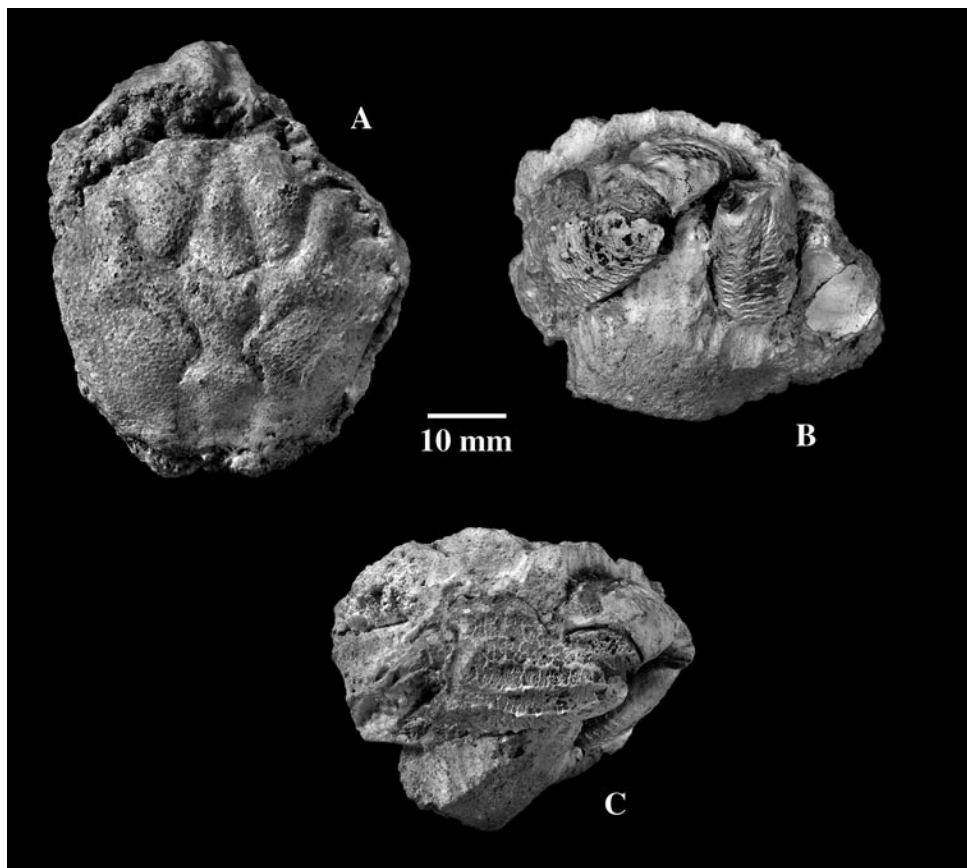
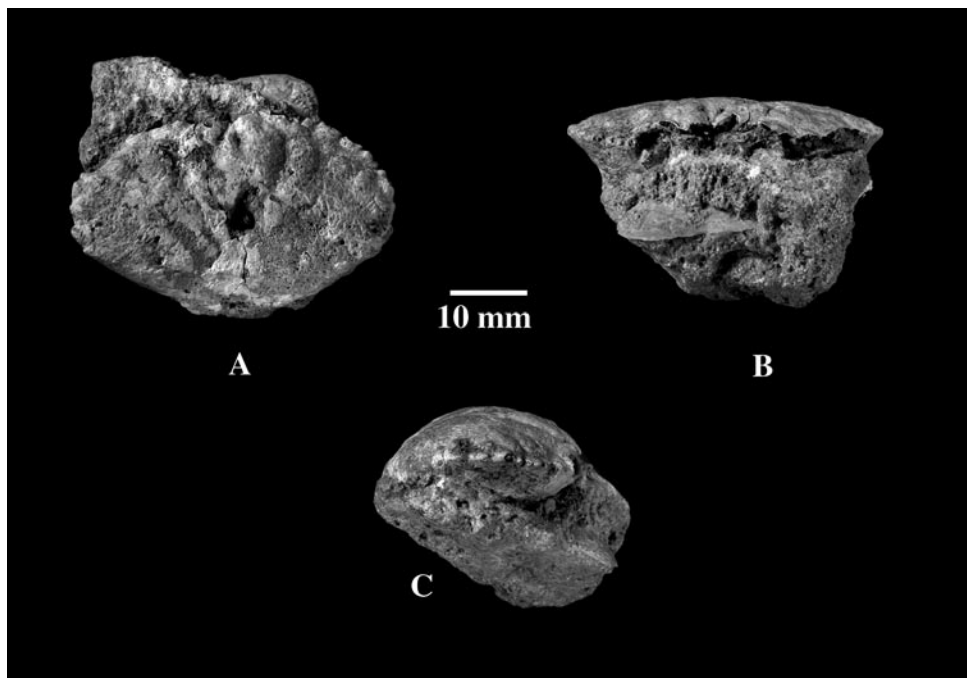


Plate 2

Montezumella rutteni Van Straelen, 1933, Eocene Montagne Formation of Bonaire.

Fig. A. RGM 216087, carapace with finer, more evenly distributed surface ornament than RGM216086 (see Pl. 1).

Figs. B, C. RGM 216088, two views of attributed left cheliped.

**Plate 3**

Figs. A-C. *Ocalina sublevis* sp. nov., Eocene Montagne Formation of Bonaire. RGM 216089, holotype, carapace. Dorsal (A), anterior (B) and right lateral views (C).