

# Decapod crustacean ‘odds and ends’ from the Maastrichtian type area (southeast Netherlands, northeast Belgium)

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Strata of latest Cretaceous (late Maastrichtian) and earliest Paleogene (early Paleocene) age in the (extended) type area of the Maastrichtian Stage are comparatively rich in decapod crustaceans. Particularly common are chelae of the callianassoid *Mesostylus faujasi* (Desmarest, 1822), followed by carapaces of various species of necrocarcinid and raninid, plus the ?longusorbiid *Binkhorstia ubaghsii* (van Binkhorst, 1857) and chelae of paguroids; other taxa are much rarer. Recently collected material, all stratigraphically well constrained, has enabled us to reinterpret, and reassign, a number of species. Specimens contained in old museum collections have proved indispensable in that respect. Undescribed taxa have also come to light; here a new dromioid, *Distefania(?) vanrijsselti* n. sp., is erected to accommodate a fragmentary carapace with a peculiar cauliflower-like ornament. Other new taxa are briefly commented upon, but not formally named. These include a few paguroids, a possible majoid, and a new portunoid.

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## Introduction

As recently noted by Klompmaker (2013), latest Cretaceous (latest Maastrichtian, c. 68-66 Ma) decapod crustacean assemblages from the extended type area of the Maastrichtian Stage (Fig. 1) are highly diverse. In fact, still new taxa have come to light in recent years, and the stratigraphic ranges of the various species have continued to be refined. Presented below are brief notes on a selection of anomuran and brachyuran taxa, mostly of latest Maastrichtian age, but some are of an early Paleocene (early and middle Danian) date. Material contained in old museum collections, inclusive of possible type specimens, is also illustrated. Formally named here is a new dromioid from

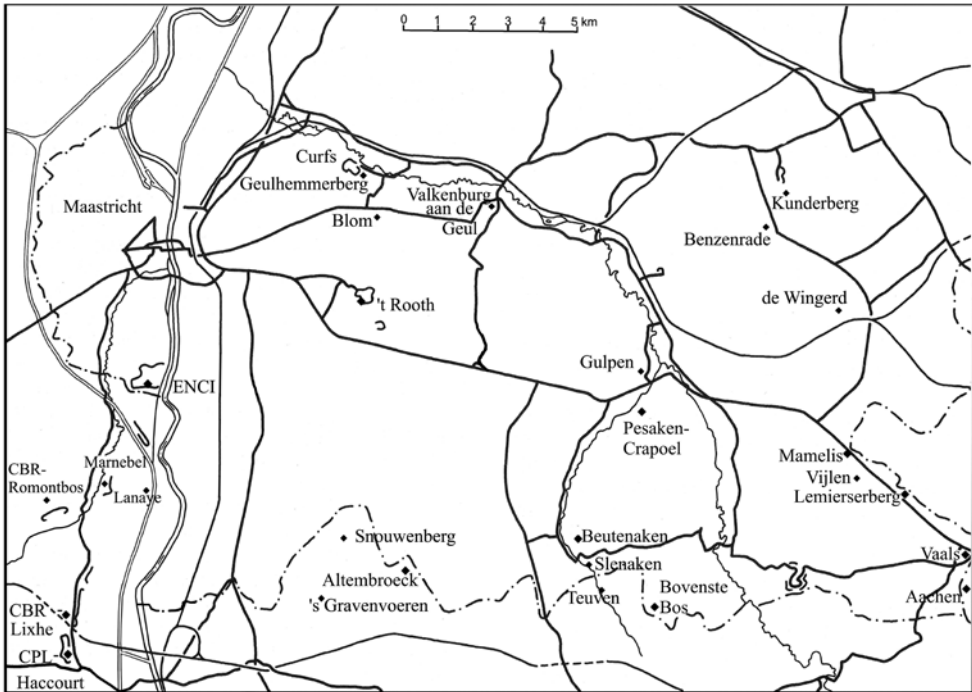


Fig. 1. Map of the study area, showing the most important localities (after Jagt & Jagt-Yazykova, 2012, fig. 1).

the basal Meerssen Member at the 't Rooth quarry (Bemelen, southern Limburg, the Netherlands). Other species will be named in forthcoming papers.

To denote the repositories of specimens illustrated and/or referred to in the text, the following abbreviations are used: IRScNB, Institut royal des Sciences naturelles de Belgique, Brussels, Belgium (MI = Mesozoic Invertebrates; T = type); MAB, Oertijdmuseum De Groene Poort, Boxtel, the Netherlands; RGM, Naturalis Biodiversity Center, Leiden, the Netherlands.

### Anomura

With the exception of two galatheoids, *Eomunidopsis meerssensensis* Collins, Fraaye & Jagt, 1995 (of which solely the holotype, MAB k.1032, is known) and *Galathea ubaghsi* Pelseneer, 1886 (now *Gastrosacus ubaghsi*; see Robins *et al.* 2013, p. 193, fig. 8.1), and a single porcellanid, *Petrolisthes inornatus* (Collins, Fraaye & Jagt, 1995) (compare Fraaije *et al.*, 2008, p. 199, pl. 2, fig. 6; holotype, MAB k. 0668), anomurans comprise mostly paguroids. So far only two diogenids have been formally named, viz. *Paguristes florum* Collins, Fraaye & Jagt, 1995 and *Annuntidiogenes sunuciorum* Fraaije, Van Bakel, Jagt & Artal, 2008 (Pl. 1, fig. 1). Of the former comparatively common isolated left and right chelae have been collected in recent years from the upper Maastricht Formation (Emael, Nekum and Meerssen members). Until recently, the latter constituted the sole paguroid

shield on record from the study area. The holotype, IRScNB MI 11053, is a near-complete corpse preserved *in situ* within a gastropod from the Kunrade Formation in the Kunrade area (southern Limburg, the Netherlands). A new partial shield (MAB k. 3314, leg. A. van den Engel) is now known from the Meerssen Member (Maastricht Formation) at the ENCI-HeidelbergCement Group quarry. It differs in several details from that of *A. sunuciorum* and probably represents an undescribed taxon very close to the extant *Aeropaguristes pilosus* (H. Milne Edwards, 1836). It is unlikely that the chela type described as *Paguristes floriae* belongs to this new species because of considerable differences in chelae morphology (compare Forest *et al.*, 2000, p. 69, fig. 220). Still unnamed paguroid material comprises both stout and thick-set (Pl. 1, figs. 2-4) as well as gracile chelae, some with large setal pores and an impressive comb of marginal spines on the left cheliped (Pl. 1, figs. 5, 6).

The majority of such chelae originate from the upper Nekum and Meerssen members; isolated fixed and moveable fingers of paguroids are also known, albeit more rarely, from deeper levels within the Maastricht Formation (Valkenburg, Gronsveld and Emael members).

## Brachyura

### Dromioidea

The cheliped type that Forir (1887) described as *Necrocarcinus ornatissimus* (Pl. 2, figs. 1-3, 5), of which *Prehepatus werneri* Fraaye & Collins, 1987 (Pl. 2, fig. 4) is a junior synonym, was linked to 'dynomenids' by Jagt *et al.* (2010), who proposed that the 'form genus' *Roemerus* Bishop, 1983 be employed for this and similar Early and Late Cretaceous forms, whenever found isolated (see e.g., de Tribolet, 1874, pl. 1, as *Gebia controversa*; Van Bakel *et al.*, 2012b; Kočová Veselská *et al.*, 2014). Similar to what has been stated above in the case of paguroids, conspecificity of named chelipeds and named carapace types can only be demonstrated when more or less completely preserved corpses or undisturbed moults are found. In that case, the oldest available name (irrespective of having been based on a cheliped or carapace) would have priority, but higher-level taxonomy would need to be based on the carapace (compare Van Bakel *et al.*, 2012b). Until recently, the only two 'dynomenid' carapaces known to be associated with *Roemerus ornatissimus* were *Stephanometopon granulatum* Bosquet, 1854 and *Graptocarcinus maastrichtensis* Fraaye, 1996c. Originally, Bosquet (1854, pl. 10, fig. 12a, b; see Fig. 2 here) based the former on a partial (anterior) carapace (IRScNB T 10652), since severely damaged (Pl. 3, fig. 1). Collins *et al.* (1995, p. 177, fig. 6A-D) illustrated a number of fragmentary carapaces (MAB k. 0834, k. 1017, k. 1019 and k. 1039) from the Meerssen Member in southern Limburg. On the basis of these, and of recently collected specimens, a composite of the dorsal carapace has now been produced (Pl. 3, fig. 2). Although differing in details, there is a clear resemblance to Bosquet's type, although it cannot be ruled out completely that more than one carapace-based taxon is in fact represented. In view of the overlap in stratigraphic distribution and the near-equal number of specimens recorded to date, the cheliped type *Roemerus ornatissimus* is here provisionally linked to the carapace type *Stephanometopon granulatum*. *Graptocarcinus maastrichtensis* is based on a single carapace (MAB k. 1082) which has generally obsolete

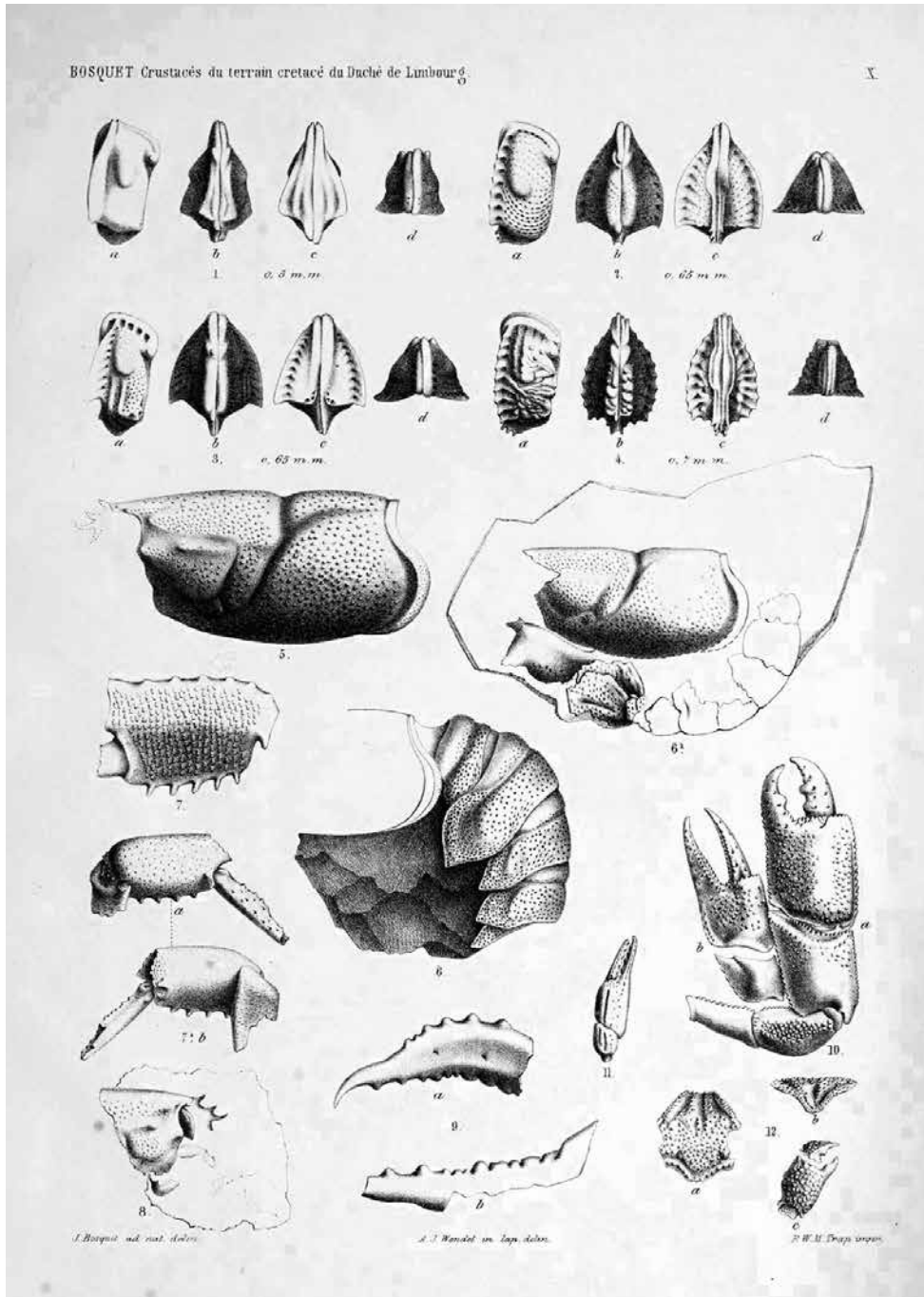


Fig. 2. Copy of Plate 10 of Bosquet (1854), with the type specimens of *Oncopareia heterodon* (Fig. 9a, b), *Aulacopodia riemsdyki* (Fig. 11) and *Stephanometopon granulatum* (Fig. 12a, b), to compare with Pl. 5, figs. 1, 2; Pl. 4, fig. 1, and Pl. 3, figs. 1, 2, respectively.

grooves, except for a distinct cervical and the median portion of the branchial grooves. Carapace ornament consists of uniformly coarse tubercles. A third, equally rare, species has lately been recovered from the basal Meerssen Member (Maastricht Formation; see below) in the area. A comparison with members of *Distefania* (see e.g., Schweitzer & Feldmann, 2010; Klompmaaker *et al.*, 2012; Feldmann *et al.*, 2013; Jagt *et al.*, 2014) suggests that '*S. granulatum* and the new form, with well-developed cervical, mesobranchial and metabranchial grooves and enlarged, cauliflower-like granules, are best accommodated in that genus, at least for now. The matter of the status of the genus *Stephanometopon*, assigned to the family Dynomenidae Ortmann, 1892 by Schweitzer *et al.* (2010, p. 65) would need to be readdressed.

Although the latest Maastrichtian brachyuran faunas do include a single species of *Dromiopsis* Reuss, 1859, namely *D. praelaevious* Collins, Fraaye & Jagt, 1995, from the upper Meerssen Member of which solely the holotype (MAB k. 1015) is known, it has subsequently become apparent that *D. mosae* Collins, Fraaye & Jagt, 1995 is not from the Maastricht area. Rather than originating from the Meerssen Member (Maastricht Formation) of the St Pietersberg area, south of Maastricht, as inferred by Collins *et al.* (1995, p. 181), the type material of *D. mosae* would appear to have been collected from the roughly coeval St. Symphorien Calcarene Formation in the Mons Basin, southern Belgium (see Robaszynski *et al.*, 2002).

The Geulhem Member (Houthem Formation), which overlies the Meerssen Member in the Vroenhoven-Kesselt (Limburg, Belgium) and in the Geulhem area (southern Limburg, the Netherlands; Jagt *et al.*, 2013), has proved to be rather poor in decapod crustaceans. Only two partial dromioid carapaces are now known, the best preserved of which (Pl. 3, fig. 3) appears to be closely related to *D. mosae*.

### Etyoidea

Of the cheliped-based taxon *Aulacopodia riemsdyki* Bosquet, 1854 (pl. 10, fig. 11) (see Fig. 2; Pl. 4, fig. 1), a number of recent finds are known, all from the upper Nekum and Meerssen members (Pl. 4, fig. 2; see also Collins *et al.*, 1995, fig. 12H). In view of the fact that this cheliped type overlaps in stratigraphic range with carapace-based taxa, such as '*Xanthosia semiornata* Jagt, Collins & Fraaye, 1991, *Xanthosioides delicata* (Fraaye, 1996a) (see Collins & Breton, 2009) and *Cretachlorodius enciensis* Fraaye, 1996b, it appears best referred to as Etyoidea *incertae sedis* for now. Schweitzer *et al.* (2012, p. 152) noted that, in view of imperfect preservation of the sole specimen known, *Xanthosioides delicata* would best be treated as '*Brachyura incertae sedis*'. Schweitzer *et al.* (2010, p. 129) assigned *Cretachlorodius* to the 'superfamily Xanthoidea: incertae sedis'. We must await the discovery of complete individuals in order to pursue this matter further. Differences in ornament and proportions suggest more than one species is involved.

### Palaeocorystoidea and Raninoidea

*Pseudomicippe granulosa* Pelseneer, 1886 is another taxon that is known solely from an isolated left dactylus (Pl. 4, figs. 3-5). Schweitzer *et al.* (2011, p. 362) considered this to be a probable calappid, for which they introduced the replacement generic name *Pseudomicippella*. As noted by Jagt *et al.* (2010) and Van Bakel *et al.* (2012a), we favour

assignment of this form to the necrocarcinid subfamily Paranecrocarcininae, being best linked to either *Paranecrocarcinus quadriscissus* (Noetling, 1881) or *P. vanbirgeleni* Fraaije, 2002, with which it co-occurs in the Nekum and Meerssen members (Maastricht Formation).

Of another form that has caused much confusion ever since its introduction, new material has been collected. Interpreted as an astacidean lobster, Bosquet (1854, pl. 10, fig. 9a, b) coined the name *Oncopareia heterodon* to accommodate isolated dactyli and propodi (Fig. 2; Pl. 5, figs. 1, 2) which he considered to be conspecific. A newly recognised specimen, with fixed and moveable fingers associated (Pl. 5, figs. 3, 4), shows that he was right, but also suggests that this is a relatively large podotreme crab, either a cenomanocarcinid or an orithopsid, which presumably had a thin-shelled carapace, prone to destruction during early phases of fossilisation.

Newly collected material also includes a rare, near-complete individual of the notopodine *Eumorphocorystes sculptus* (van Binkhorst, 1857), retaining both chelipeds (Pl. 6, fig. 1) and other appendages, including a falciform dactylus of one of the pereopods (P2/P3), as well as a fragmentary anterior carapace of a lyreiid from the upper Geulhem Member (middle Danian) at the former Curfs quarry (Geulhem, southern Limburg; Jagt *et al.*, 2013, fig. 16D). In having two anterolateral spines, this appears to be an undescribed form.

### Majoidea

Representatives of this superfamily (spider crabs) are documented as well, yet they appear to be exceedingly rare. The sole example available to date is a fragment of an anterior carapace (Pl. 6, fig. 2) from the upper Meerssen Member at the ENCI-Heidelberg Cement Group quarry. As far as can be told, this is reminiscent of members of the subfamily Inachinae MacLeay, 1838. None of the four genera of mid- and Late Cretaceous age currently known, *Priscinachus* Breton, 2009, *Cretamaja* Klompmaker, 2013, *Koskobilius* Klompmaker, 2013 and *Chondromaia* Feldmann, Schweitzer, Baltzly, Bennett, Jones, Mathias, Weaver & Yost, 2013, are similar. The stout bifid rostrum appears typical, but preservation of orbits, supraorbital fissures and dorsal carapace ornament are such that no more can be stated at this moment. In addition, carapace proportions cannot be assessed with only part of the carapace at hand.

### Portunoidea

The newest addition concerns a small 'population' of a portunoid, comprising more or less articulated individuals with sternal features and chelipeds, all from a restricted stratigraphic interval (near flint levels 20/21 of the Lanaye Member, Gulpen Formation) and geographic occurrence (Eben Emael area, Liège, northeast Belgium). Comparable forms have been recorded from the uppermost Maastrichtian of New Jersey, Delaware (Atlantic Coast; Landman *et al.*, 2007), Mississippi (Gulf Coast; Phillips *et al.*, 2014) and California (Nyborg *et al.*, 2014) and assigned to the family Icriocarcinidae Števcíć, 2005. The current lot reveals features of dorsal carapace, thoracic sternum and chelipeds (Pl. 7, fig. 1), although most individuals have suffered from varying degrees of decalcification. This form will be formally named in a forthcoming paper.

## Systematic palaeontology

### Genus *Distefania* Checchia-Rispoli, 1917(?)

*Type species* – *Distefania himeraensis* Checchia-Rispoli, 1917 (= *D. sicula* Checchia-Rispoli, 1917), by original designation.

*Diagnosis* – Front broadly triangular, anterior end straight to slightly concave or sulcate, steeply downturned; orbits and small augenrest shallow or moderately deep, forwardly directed to anterolaterally directed; fronto-orbital width about 55–80% maximum carapace width; cervical groove deep; markedly ornamented anterolateral margins, with spines sometimes quadrate in shape; carapace ovate, widest at about 60% the distance posteriorly; ovate swellings lateral to the cardiac region; posterolateral rim present; post-cervical groove and usually weaker branchiocardiac groove present (after Klompmaker *et al.*, 2012, p. 782).

#### *Distefania(?) vanrijsselti* n. sp.

Pl. 6, fig. 3.

2013 *Distefania* n. sp.; Jagt *et al.*, p. 43, fig. 1 (centre).

*Diagnosis* – Carapace (as reconstructed) of small size, width exceeding length, maximum width in posterior third, just above branchial groove; anterolateral margin apparently with up to five low spines (teeth); posterior margin entire(?); carapace regions only weakly inflated, metabranchial region concave; carapace grooves comparatively weak; ornament consisting of close-set granules of more or less uniform size, with clusters on cardiac and mesogastric lobes, as well as scattered, larger cauliflower-shaped tubercles.

*Derivation of name* – Named after Willy van Rijsselt (Maastricht), who collected the only specimen known to date and generously placed it in the collections of the Oertijdmuseum De Groene Poort, Boxtel.

*Holotype* – MAB k. 3315, the sole specimen known to date.

*Type locality* – 't Rooth quarry, Bemelen, southern Limburg (the Netherlands) (Fig. 1).

*Type horizon* – Basal portion (Caster Horizon + 0–2 m) of the Meerssen Member (Maastricht Formation), upper Maastrichtian, *Belemnitella junior* Zone.

*Description* – Carapace comparatively small (as reconstructed), estimated greatest width 28 mm, estimated length 23 mm; moderately arched in longitudinal and transverse sections, tallest across mesogastric region, with triangular cardiac region. Anterolateral margin near-straight anteriorly, notched by cervical groove, and gently rounded more posteriorly; posterolateral margin near-straight to faintly concave. Greatest carapace

width at *c.* 70 per cent from front (estimated); posterior margin probably near-straight, equalling *c.* 35 per cent of carapace width (estimated); front, inclusive of rostrum, not preserved; orbits not preserved. Anterolateral margins apparently with up to five low spines (or teeth), of which only poorly preserved bases remain; a row of up to eight cauliflower-shaped tubercles on posterolateral margin, and close-set, uniform granules along posterolateral and posterior margins.

Mesogastric region and epigastric lobes not preserved; scattered large, cauliflower-shaped tubercles on mesobranchial lobes; cervical groove rather inconspicuous, with deep central portion, faintly notching anterolateral margins; distinct, broadly triangular mesogastric lobe with row of tubercles defining posterior portion; branchial groove faint, gently convex; cardiac region triangular, slightly elevated; urogastric lobe divided by fairly wide median depression. Posterior portion of metabranchial region concave, but apparently lacking metabranchial groove.

Dorsal carapace surface covered with rather coarse, more or less uniform granules, larger ones occurring on mesogastric, urogastric and cardiac lobes; largest, cauliflower-shaped tubercles on mesobranchial and metabranchial regions.

*Discussion* – Although but a single, fragmentary carapace (right-hand portion) is currently available, the highly distinctive ornament alone suffices to differentiate this form from all species now assigned to *Distefania*. However, in the absence of important features of orbitofrontal region (orbits) and epigastric and mesogastric regions, assignment to that genus is provisional. The lack of well-developed anterolateral teeth (or spines) and a metabranchial groove imply that the new species cannot be attributed to the mid-Cretaceous genus *Trachynotocarcinus* Wright & Collins, 1972. The type species of that genus, *Trachynotus sulcatus* Bell, 1863, has better-developed postcervical grooves and a different ornament. *Palaeodromites naglei* Bishop, 1983, from the Albian of Texas, which was transferred by Collins & Donovan (2007) to *Trachynotocarcinus*, is more convex in longitudinal section, has a less distinct cervical groove and non-tuberculate dorsal surface. The two other carapace-based dromioids from the Maastrichtian type area are *Stephanometopon granulatum* Bosquet, 1854 (Pl. 3, figs. 1, 2) and *Graptocarcinus maasrichtensis* Fraaye, 1996c. The former differs markedly in the course of the cervical groove and ornament, while the latter has a different carapace shape, even less conspicuous grooves and a uniformly coarse ornament.

### Future work

Ongoing studies involve the description and naming of new paguroids, on the basis of both shields, isolated chelipeds and moveable fingers, and of the new goneplacoid (see above). As fieldwork continues, the stratigraphic ranges and facies preference patterns for the various species are expected to be refined, so as to allow conclusions on palaeoecology to be drawn. In addition, long-forgotten museum collections (mostly bulk samples), such as those at Brussels and Liège, will be screened. The recent discovery of galatheoids and a new species of *Binkhorstia* from material collected during construction of colliery shafts in the Campine area of northeast Belgium certainly is promising.



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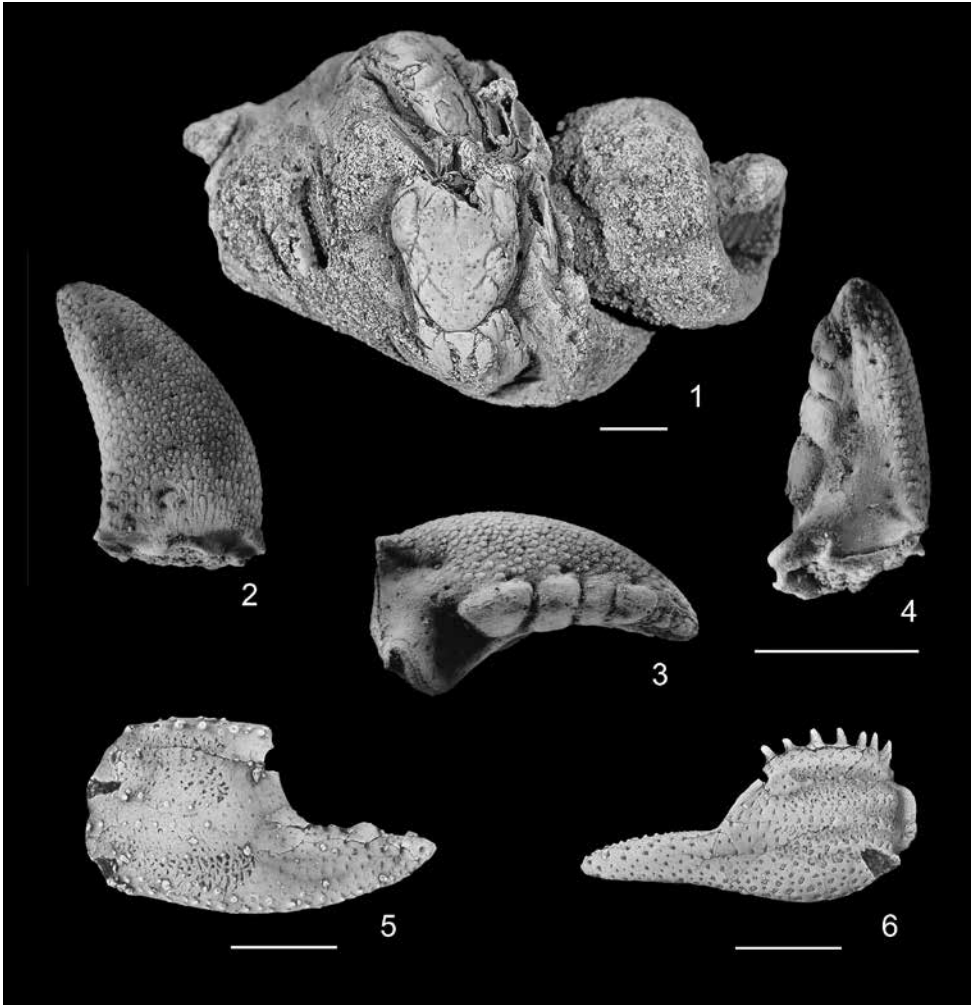
**Plate 1**

Latest Maastrichtian paguroids from the Maastrichtian type area. All scale bars equal 5 mm.

Fig. 1. Shield of *Annuntidiogenes sunuciorum* Fraaije, Van Bakel, Jagt & Artal, 2008 (IRScNB MI 11053, holotype), Kunrade Formation, Kunrade area, southern Limburg, the Netherlands.

Figs. 2-4. New species; moveable finger in various aspects (IRScNB collections, unnumbered), Maastricht Formation, precise level unknown, Maastricht area, the Netherlands.

Figs. 5, 6. New species; right and left cheliped, respectively (MAB k. 3316 and k. 3317, respectively), Maastricht Formation, Meerssen Member.



**Plate 2**

Figs. 1-3, 5. *Roemerus ornatissimus* (Forir, 1887) (IRScNB MI 11005, holotype), Maastricht Formation, lower/middle Meerssen Member, Maastricht area, the Netherlands.

Fig. 4. *Prehepatus weneri* Fraaye & Collins, 1987 (MAB k. 0017, holotype), a junior synonym of *R. ornatissimus*; Maastricht Formation, Meerssen Member, Blom quarry, Berg en Terblijt, the Netherlands.

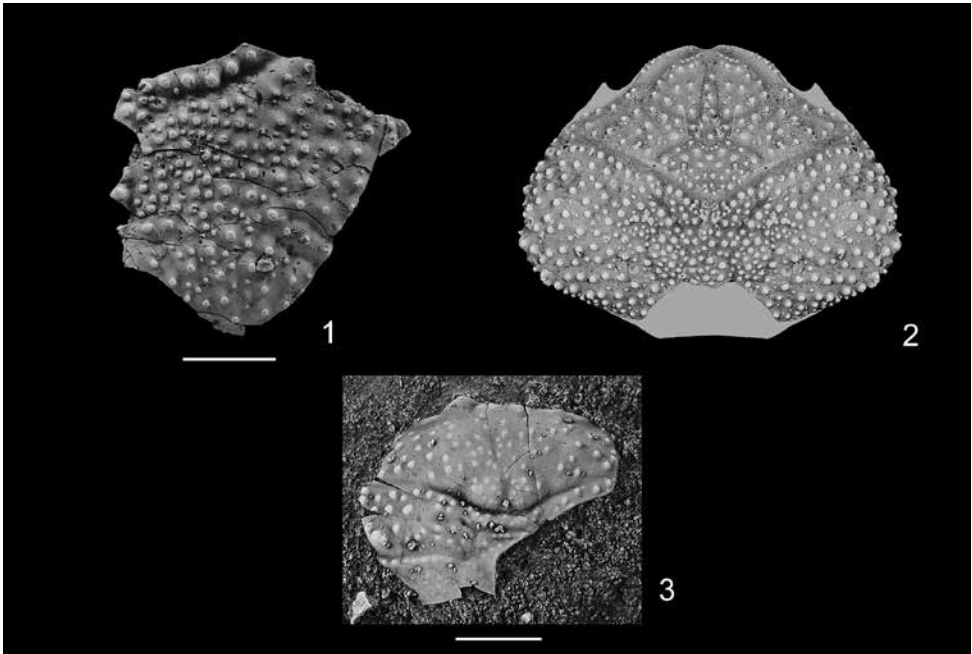
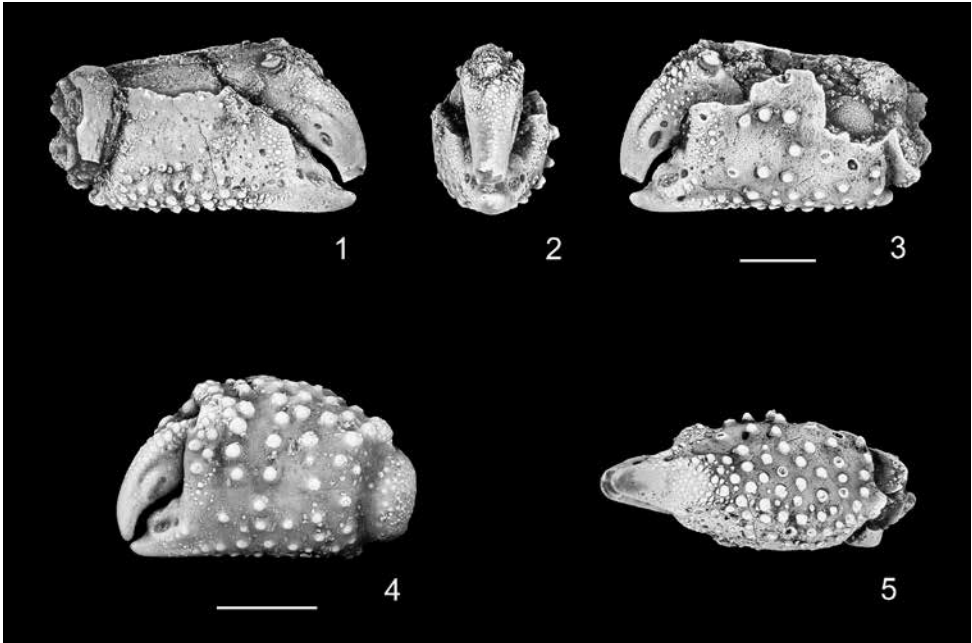
Scale bars equal 5 mm.

**Plate 3**

Fig. 1. *Stephanometopon granulatum* Bosquet, 1854, portion of carapace (IRScNB T 10652, holotype). Scale bar equals 5 mm.

Fig. 2. Composite of dorsal carapace (not to scale), based on material contained in the collections of the Oertijdmuseum De Groene Poort (Boxtel, the Netherlands), all from the upper Nekum and Meerssen members of southern Limburg (the Netherlands) and contiguous areas in Belgium (provinces of Limburg and Liège).

Fig. 3. *Dromiopsis* aff. *mosae* Collins, Fraaye & Jagt, 1995 (MAB k. 3318, leg. R.W. Dortangs), lowermost Geulhem Member (Houthem Formation), early Paleocene (early Danian), Vroenhoven, Limburg (Belgium). Scale bar equals 10 mm.



**Plate 4**

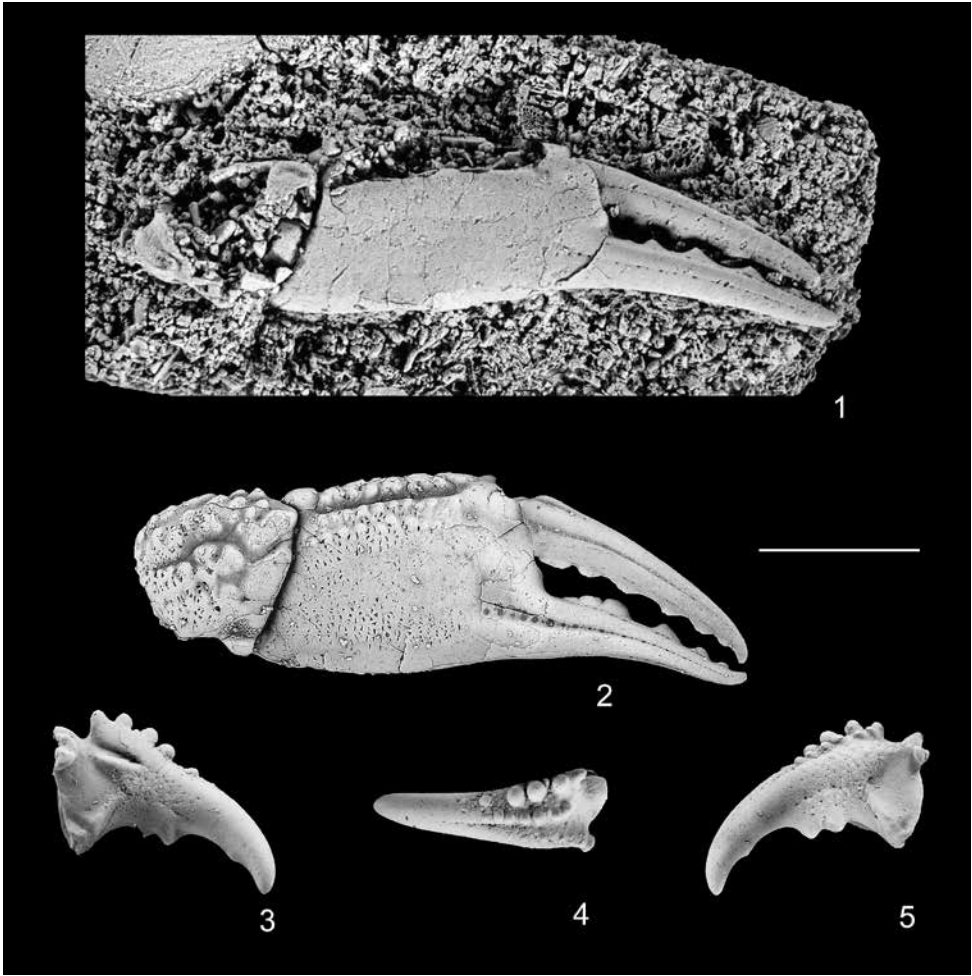
Fig. 1. *Etyoidea incertae sedis* (= *Aulacopodia riemsdyki* Bosquet, 1854), left cheliped (IRScNB T 10660, labelled as *A. lepida*, ?holotype).

Fig. 2. Composite of a right cheliped and an isolated moveable finger from the same stratigraphic unit (MAB k. 3319 and k. 3320), Meerssen Member (Maastricht Formation), late Maastrichtian, Meerssen Member.

Figs. 3-5. *Pseudomicippella granulosa* (Pelseneer, 1886), left dactylus (IRScNB MI 10670, holotype), in various aspects.

Scale bar equals 10 mm.



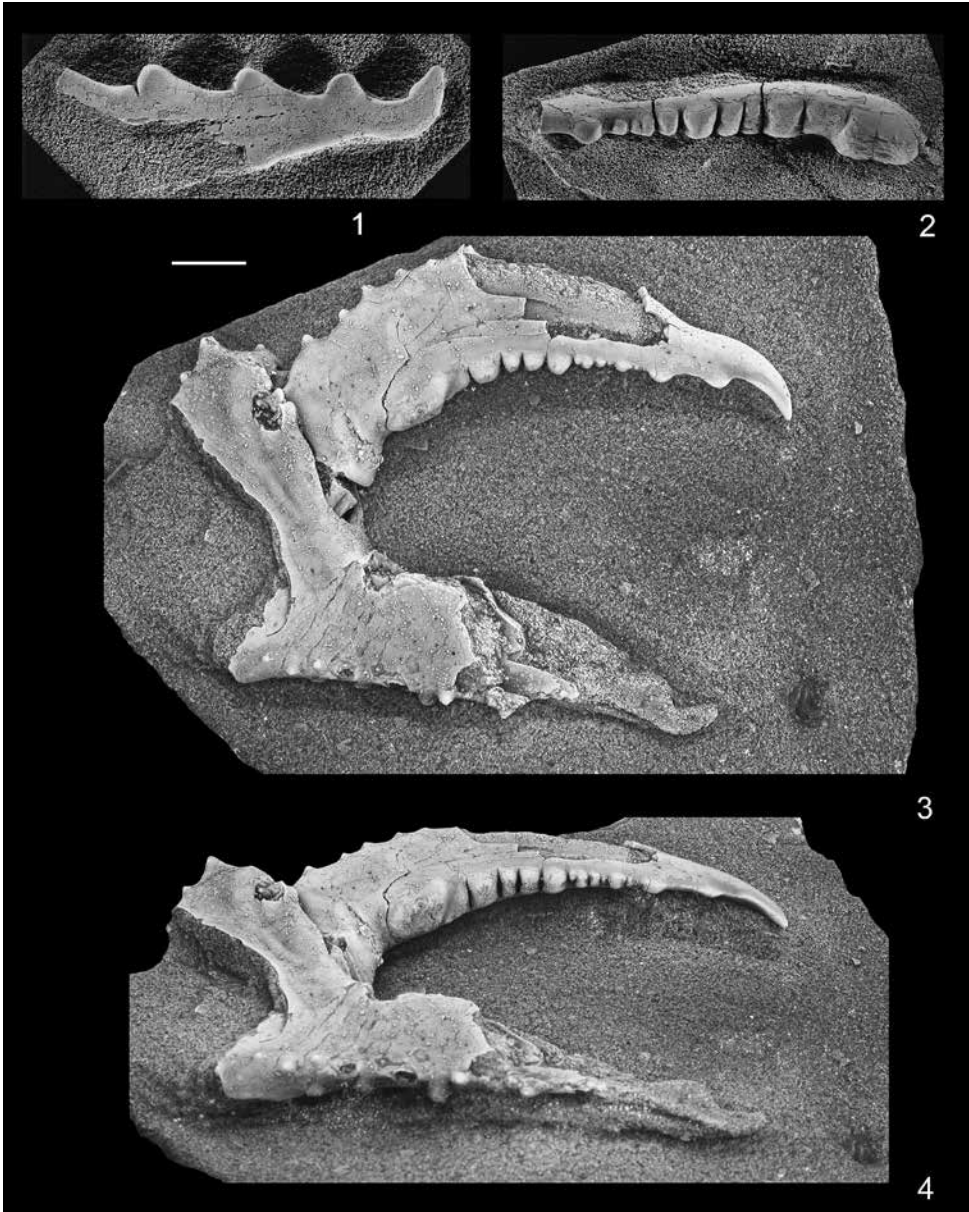


**Plate 5**

Figs. 1, 2. '*Oncopareia heterodon*' Bosquet, 1854, part of fixed finger and thick-set occlusal portion of moveable finger, respectively; possibly from Bosquet's (1854) type lot (IRScNB unregistered).

Figs. 3, 4. Right cheliped (RGM Jongmans Collection, unregistered) from the lower Maastricht Formation of southern Limburg or adjacent Belgian territory (precise locality unknown).

Scale bar equals 10 mm.



**Plate 6**

Fig. 1. *Eumorphocorystes sculptus* (van Binkhorst, 1857), major cheliped (MAB k. 3321), Schiepersberg Member (Maastricht Formation), ENCI-HeidelbergCement Group quarry, Maastricht, the Netherlands.

Fig. 2. A majoid, possibly related to the subfamily Inachidae (MAB k. 1500), Meerssen Member (Maastricht Formation), ENCI-HeidelbergCement Group quarry, Maastricht, the Netherlands .

Fig. 3. *Distefania(?) vanrijsselti* n. sp. (holotype, MAB k. 3315, leg. W. van Rijsselt), basal Meerssen Member (Maastricht Formation), late Maastrichtian, 't Rooth quarry, Bemelen, southern Limburg, the Netherlands.

All scale bars equal 10 mm.

**Plate 7**

Fig. 1. Portunoid n. sp. (MAB k. 3322a, leg. D. Eysermans), uppermost Lanaye Member (Gulpen Formation), Marnebel quarry complex, Eben Emael, Liège (Belgium). Scale bar equals 10 mm.

