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Ciliopagurus obesus, a new species of Oligocene hermit crab from northwest Belgium

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The basal portion of the Belsele-Waas Clay Member (Boom Clay Formation, Rupelian, Oligocene) as exposed at the Scheerders van Kerchove (SVK) clay pit, southwest of Sint-Niklaas (province of Oost-Vlaanderen, NW Belgium), has recently yielded material of a diogenid hermit crab with annulations and a stridulatory apparatus on the inner surface of the cheliped. This is here described as a new taxon, *Ciliopagurus obesus* n. sp., documenting one of the rare instances where a fossil paguroid may be assigned with certainty to an extant genus. Previous records of fossil hermit crabs (Paguroidea) are listed.

KEY WORDS: Paguroidea, Diogenidae, Oligocene, Belgium, new species.

Introduction

Although decapod crustacean remains abound in many Cainozoic strata in Belgium, in particular those of Eocene and Oligocene age, there are but few modern papers describing these faunas; notable exceptions are Collins & Smith (1993) and Verheyden (2002). From personal observations, we know that both public (see also Feldmann & Dhondt, 1991) and private collections contain abundant material of often exquisitely preserved specimens. In addition to the new diogenid hermit crab described in the present paper, a new cancrid from the Lower/Middle Pliocene of Oelegem (van Bakel *et al.*, 2003) and anomuran and brachyuran faunules from the Lillo Formation (Piacenzian, Pliocene) at Kallo (van Bakel *et al.*, in press) will shortly be published. Other projects (*e.g.*, linuparids and brachyurans from the Ypresian (Eocene) of Marke, Oligocene stomatopods from Sint-Niklaas) are under way.

The most complete, albeit outdated, listing of Cainozoic decapod crustaceans from Belgium is still that by van Straelen (1921). From strata of Oligocene age, he recorded a single nephropid lobster (*Homarus perceyi* van Beneden, 1872), a geryonid crab (*Coeloma rupeliense* Stainier, 1887) as well as *Portunus nodosus* van Beneden, 1883. According to Verheyden (2002), the last-named taxon is a *nomen nudum*; based on the same material, Stainier (1887) later erected its valid name, *Coeloma rupeliense*. These two species from the Boom Clay Formation, also illustrated by Geys & Marquet (1983, pl. 57, figs 1, 2), have recently been revised by Verheyden (2002).

Of note is the fact that van Straelen (1921, p. 122) listed but a single Cainozoic pagurid, *Pagurus* sp., from the 'Ledien' (= Lede Formation, Lutetian, Eocene) of the Brussels area, based on previous records by Galeotti (1837) and Le Hon (1862). From much younger, Pliocene, strata in the Antwerp area, van Bakel *et al.* (2000) listed *Pagurus* sp.; this is closely related to or conspecific with *P. bernhardus* Linné, 1758 (see van Bakel *et al.*, in press). The new diogenid described in the present note thus constitutes not only the third hermit crab on record from Cainozoic strata in Belgium, but also the first that is formally named. It is to be expected that there will be additional records of Cainozoic pagurids from Belgium, once the rich collections of molluscs, including bulk samples, in particular from Pliocene strata in the Antwerp area, have been meticulously screened. There is indirect evidence in the form of broken and/or abraded or encrusted/bored gastropod shells (compare Ehrenberg, 1931; Walker, 1988, 1989, 1992), which are known from various localities and stratigraphic levels.

Fossil paguroid records

Hermit crabs (Paguroidea) are obligatory occupants of empty gastropod and other molluscan shells, which explains why their often dissociated remains are fairly common in shell-rich deposits, such as coquinas. With the exception of a handful of records documenting *in situ* preservation of fossil pagurids within molluscan shells (see *e.g.*, Hyden & Forest, 1980; Feldmann & Keyes, 1992; Hu & Tao, 1996;

McLaughlin & Forest, 1997; Jagt *et al.*, 2000; Karasawa, 2002; Fraaije, 2003), most occurrences comprise isolated major claws (chelipeds). On account of their characteristic morphology, such claws are easily recognised as pagurid and distinguished from associated anomuran and brachyuran chelipeds.

For the most recent discussion of fossil hermit crabs, reference is made here to Schweitzer & Feldmann (2001) and Schweitzer *et al.* (2002). These authors noted that the Paguroidea as currently known in the fossil reord are in urgent need of revision; most fossil taxa have typically, and often routinely, been referred to the Diogenidae or Paguridae, thus masking true diversity at the family level. Characters important at the generic level include morphological features of dorsal carapace, abdomen, mouthparts, and appendages (other than the chelipeds), which are rarely preserved in fossils.

For most fossil hermit crabs, only (a) major claw(s) is (are) available; however, based on claw shape, size and ornament, a rough generic placement has generally proved possible. This is the case for Cretaceous pagurids which have been recorded from:

- Alabama, Arkansas, Texas, Mississippi and New Jersey (USA; see Rathbun, 1935; Stenzel, 1945; Roberts, 1962; Whetstone & Collins, 1982; Bishop, 1983a, b, 1986a, b);
- Mexico (Vega *et al.*, 1995);
- Germany (Mertin, 1941);
- northeast Belgium and the southeast Netherlands (Collins *et al.*, 1995; Jagt *et al.*, 2000, work under way);
- France (de Tribolet, 1875);
- Spain (Solé & Via, 1989);
- Antarctica (Aguirre-Urreta & Olivero, 1992; Olivero & Aguirre-Urreta, 1994).

These have been assigned to the genera *Paguristes* Dana, 1851, *Pagurus* Fabricius, 1775 (s. lat.), *Palaeopagurus* van Straelen, 1925, *Petrochirus* Stimpson, 1858; Bishop (1983a) and Bishop (1986b) erected new genera, *Roemerus* and *Parapaguristes*, respectively.

Cainozoic pagurids have mostly been assigned to the genera *Anapagurus* Henderson, 1888, *Calcinus* Dana, 1851, *Dardanus* Paul'son, 1875, *Diacanthurus* McLaughlin & Forest, 1997, *Diogenes* Dana, 1851, *Eocalcinus* Via, 1959, *Pagurus* (s. lat.), *Paguristes*, *Petrochirus* and *Pylopagurus* A. Milne Edwards & Bouvier, 1891, often with a query. Such records include:

- Chiapas, Mexico (Vega *et al.*, 2001);
- Jamaica (Morris, 1993; Collins *et al.*, 1996; Collins & Portell, 1998);
- North and South Carolina, Washington and California (USA; Rathbun, 1926; Blow & Manning, 1996; Schweitzer & Feldmann, 2001);
- the Netherlands (Holthuis, 1949);
- Austria (Glaessner, 1928; Bachmayer, 1951);
- northern Italy (Beschin *et al.*, 1994, 2000, 2002; de Angeli, 1995, 2000; Vicariotto, 1997);
- Spain (Via, 1959; Solé & Via, 1989);
- Hungary (Müller, 1975, 1979, 1984; Müller & Collins, 1991);
- Poland (Förster, 1979; Müller, 1996);
- Kyushu, Boso Peninsula and Ainoshima Island, Japan (Karasawa & Inoue, 1992; Kato & Karasawa, 1998; Karasawa, 1993, 1997, 2002);
- Taiwan (Hu & Tao, 1996);
- New Zealand (Hyden & Forest, 1980; McLaughlin & Forest, 1997).

In the present note we describe a new species of diogenid from Rupelian (Oligocene) strata exposed near Sint-Niklaas, which we assign to the genus *Ciliopagurus* Forest, 1995a. Forest (1995a) subdivided the widely distributed diogenid genus *Trizopagurus* Forest, 1952 into the genera *Trizopagurus* proper, *Strigopagurus*, and *Ciliopagurus*, as based on the shape of the cephalothoracic shield, the ornament of thoracic appendages, the organisation of pleopods and the development of stridulatory structures on chelipeds. In a subsequent paper (Forest, 1995b), he reassigned a Miocene species from Hungary to *Ciliopagurus*, making reference to its stridulatory features. The new species described here shows well-developed stridulatory structures as well, and extends the range of the genus *Ciliopagurus* downwards for another 15 Ma.

Systematic description

Abbreviation – Type specimens are deposited in the collections of the Oertijdmuseum de Groene Poort, Boxtel (the Netherlands; abbreviation MAB).

Superfamily Paguroidea Latreille, 1802
Family Diogenidae Ortmann, 1892
Genus *Ciliopagurus* Forest, 1995a, p. 43

Type species – *Cancer strigatus* Herbst, 1804, by original designation.

Ciliopagurus obesus n. sp.

Figures 1, 2

Diagnosis – Heterochelous diogenid, with identical shape and ornament of claws, stridulatory structures less pronounced in minor claw; ornament of transverse, more or less evenly distributed, entire striae, beaded in some larger specimens.

Derivation of name – Latin *obesus*, meaning thick, bulky, in reference to the shape and size of the major claw.

Material – Holotype, a left propodus, is MAB k.2365 (leg. T. Lambrechts) (Figures 1/1-3; 2/1); paratype, a right cheliped, is MAB k.2366 (leg. FH. Mollen)(Figure 2/2, 3).

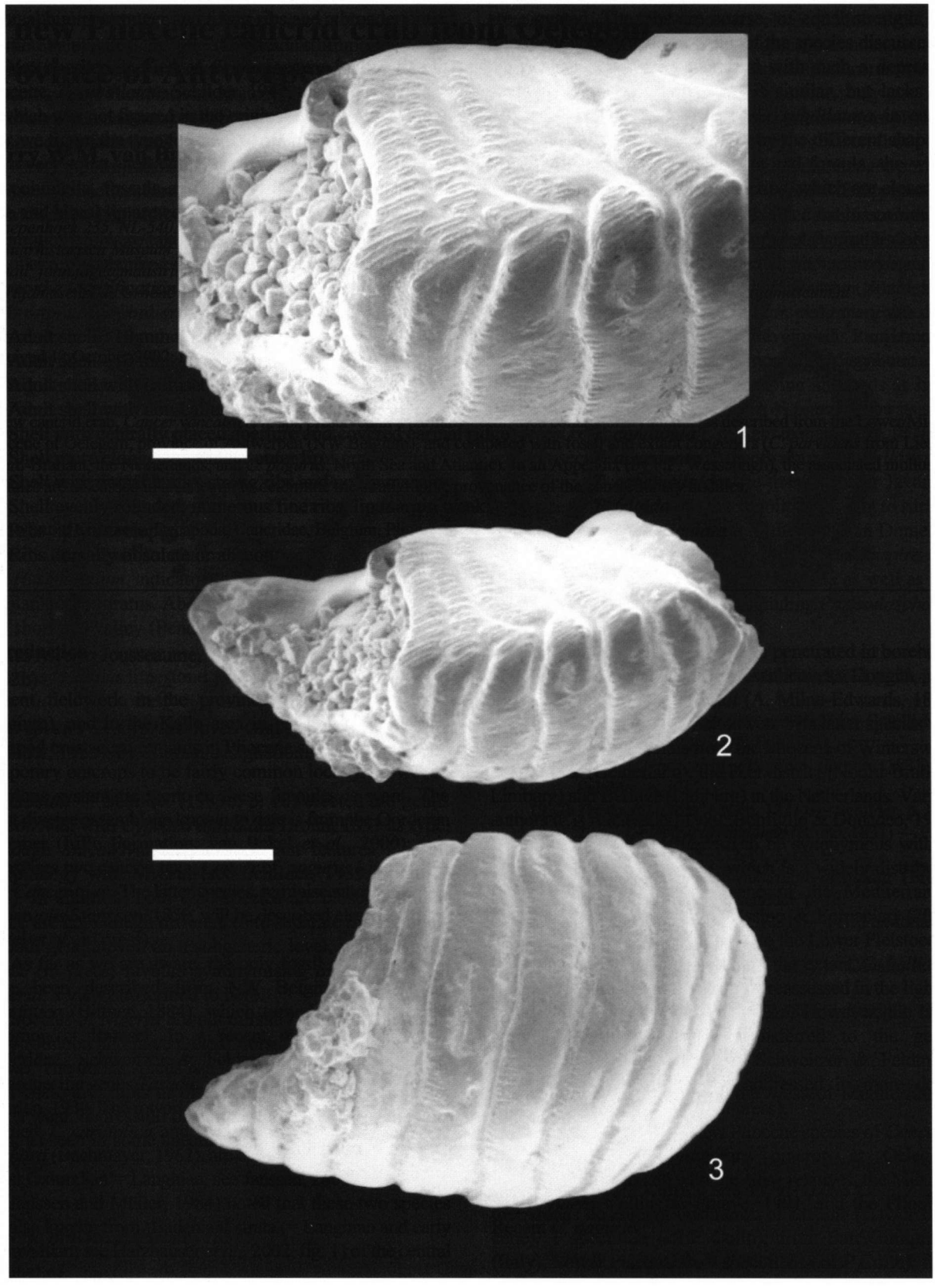

Figure 1. *Ciliopagurus obesus* n. sp., MAB k.2365 (**holotype**), basal portion of the Belsele-Waas Clay Member (Boom Clay Formation ; Rupelian, Oligocene) of the SVK clay pit near Sint-Niklaas (Belgium) ; 1 – detail of stridulatory apparatus (scale bar equals 1 mm) ; 2, 3 – inner and dorsal aspects, respectively, of left propodus (scale bar equals 2 mm) (SEM).

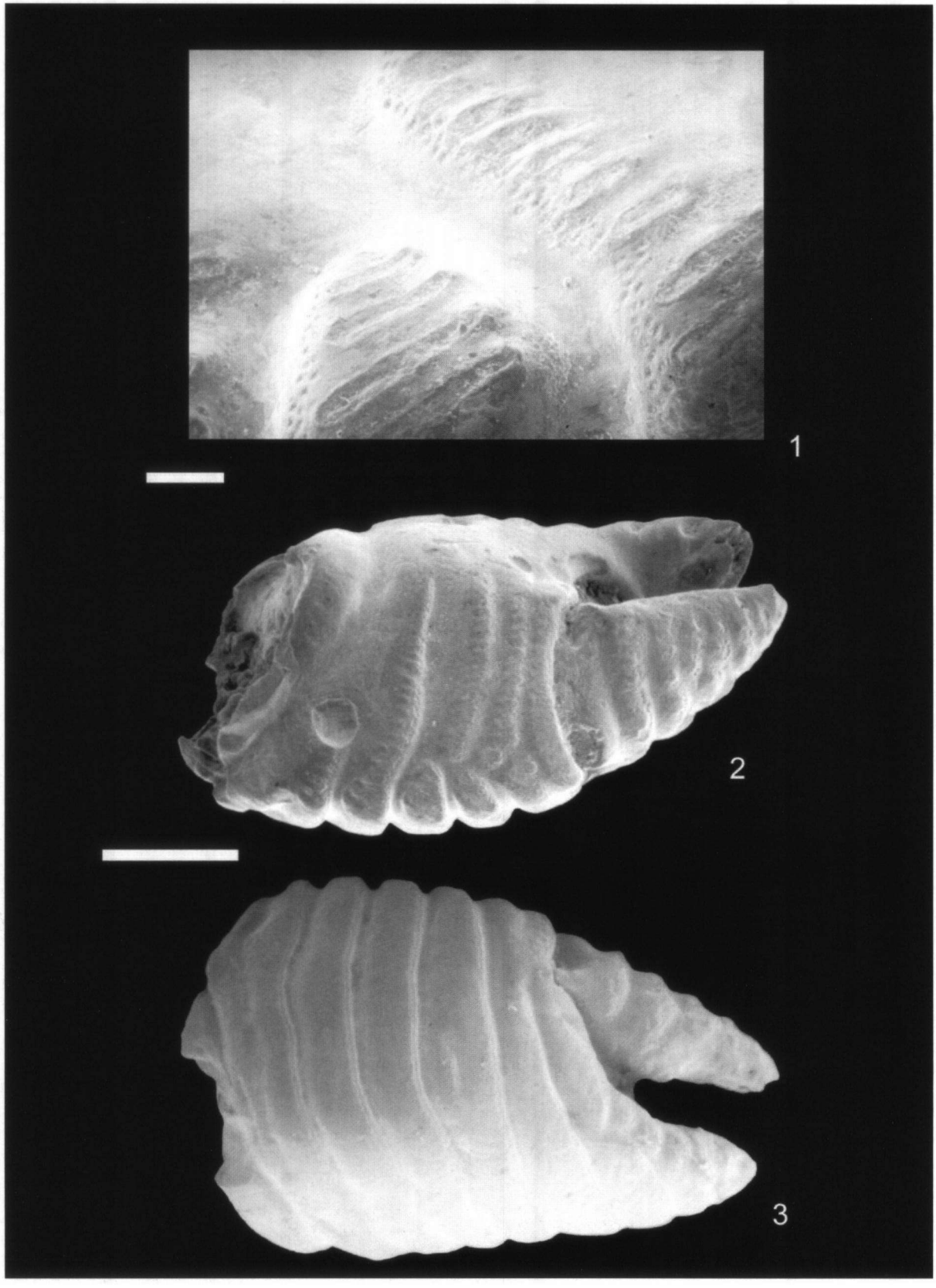

Figure 2. *Ciliopagurus obesus* n. sp., MAB k.2365 (**holotype**) and MAB k.2366 (**paratype**), basal portion of the Belsele-Waas Clay Member (Boom Clay Formation ; Rupelian, Oligocene) of the SVK clay pit near Sint-Niklaas (Belgium) ; 1 – detail of stridulatory apparatus (**holotype**; scale bar equals 200 µm); 2, 3 – inner and dorsal aspects, respectively, of right chela (**paratype**; scale bar equals 1 mm) (SEM).

Geography and stratigraphy – The present material comes from the basal portion of the Belsele-Waas Clay Member (Boom Clay Formation), as exposed at the Scheerders van Kerchove's Verenigde Fabrieken (SVK) clay pit near Sint-Niklaas (province of Oost-Vlaanderen, NW Belgium), and was collected by Frederik H. Mollen, Theo Lambrechts and Luc Anthonis. On calcareous nannofossil evidence (Steurbaut, 1986, 1992; see also Laga *et al.*, 2002), this unit was dated as Early to Middle Rupelian (Oligocene) or zone NP23 (*sensu* Martini, 1971). More detailed data may be found in a paper by Vandenberghe *et al.* (2002), to which reference is made.

Description – First chelipeds are heterochelous, with the left claw larger than the right one. Shape and ornament of both claws identical, but stridulatory apparatus less pronounced in the minor claw. Manus suboval with oblique upper margin, outer surface markedly convex in longitudinal and transverse cross sections. Lower propodus margin rounded, elevated distally towards tip of the fixed finger into which it curves continuously.

Fixed finger short, about one third of palmar length, stout and triangular; opposable face of fixed finger spoon like with sharp cutting edges; tip of finger rounded. There is an emargination in the cutting edge, situated proximally.

The weakly curved dactylus is broadly flattened, the opposable face armed with beaded ribs and cusped viewed from above. The cutting edge is straight with a weak notch situated proximally, opposite the emargination on the fixed finger.

Interdigital margin slanted, slightly concave with an indistinct indentation for the articular boss of the dactylus. The changeover of the interdigital margin with the upper margin of the fixed finger is obscure viewed from above. The carpal articulation margin is strongly curved, thickened.

The outer propodus surface is ornamented with transverse, more or less evenly distributed, entire striae, which are faintly beaded in larger specimens. Striae are slightly sinuous, running parallel to the carpal articulation margin, and curving towards the fixed finger, near the lower margin. Both upper and lower propodus margins are distinctly notched by the striae, the upper more than the lower.

The inner surface is convex and bluntly noded in transverse cross section and convex in longitudinal section, with both fingers inturned. The lower half of the inner surface is smooth, the upper half striated and scaled.

The upper distal part of the inner manus surface and the distal portion of the upper margin are covered in vertically arranged stridulatory ridges. The ridges increase in length towards the upper margin, the vertical trails of these decreasing in size proximally. Microscopic setae are present distally from the ridges and mainly on the opposing propodus margin.

Discussion – Striated paguroid claws are rare in the fossil record. From the 'Badenian' (= Langhian and Early Serravallian, Middle Miocene; see Harzhauser *et al.*, 2002) of Hungary, *Dardanus substriatiformis* (Lorenthey *in* Lorenthey & Beurlen, 1929) was described (see Müller, 1984), later reassigned to *Ciliopagurus* (Forest, 1995b). The same strata yielded *Dardanus hungaricus* (Lorenthey *in* Lorenthey & Beurlen, 1929), a species subsequently also recorded from the Miocene of northern Spain (Müller, 1993). The oldest record of a striated paguroid, as yet specifically unnamed, is that of Beschin *et al.* (2000, p. 9, pl. 1, fig. 3, as *Dardanus* sp.), who illustrated a specimen from the Eocene of northern Italy (see also de Angeli & Beschin, 2001).

Vega *et al.* (2001) have recently noted that some fossil species assigned to the genus *Dardanus*, amongst which are *D. hungaricus* and *D. arrosor* (Herbst, 1794), are in need of re-evaluation. The apparent absence of stridulatory structures and the fact that cheliped ornament differs, means that these two species cannot be assigned to *Ciliopagurus*.

The taxon which most closely resembles *C. obesus* n. sp. is *C. substriatiformis*, whose cheliped surface is also covered with ciliated striae, although these are more closely spaced and show more distinct tubercles (see Müller, 1984, pl. 17, figs 1-4). In the Hungarian species, striae extend straight towards the lower cheliped margin, whereas in *C. obesus* n. sp. they are curved towards the fixed finger. The outer surface in the new species is more convex than that in *C. substriatiformis*, with a much broader, more inturned fixed finger. The stridulatory ridges are longer and fewer in number than in the new species, and not as distinctly grouped.

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