

**Capedopecten anellus gen. et spec. nov. (Mollusca, Bivalvia: Pectinidae) from the Antwerp Sands (Miocene, Hemmoorian) in Belgium**

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*Capedopecten anellus* gen. et spec. nov. is introduced from the upper beds of the Antwerp Sands, Berchem Formation (Miocene, Hemmoorian, Oxlundian) in the Antwerp city area. The material was collected some 20 years ago from temporary exposures during the construction of the E3 'Kleine Ring' motorway and an underground parking. The new taxon closely resembles the well-known species *Korobkovia woodi* (Nyst), but it is easily distinguished by morphological details.

Key words: Bivalvia, Pectinidae, taxonomy, Miocene, North Sea Basin, Belgium.

During the late sixties several large scale excavations in and around the city of Antwerp offered excellent possibilities to study the well-known Miocene deposits of this area (Janssen & Van der Mark, 1968; De Meuter, Wouters & Ringelé, 1976). Extensive collections of fossil material, mainly molluscs, were assembled and are nowadays housed in many institutional and private collections.

The mollusc faunas of the various Miocene deposits had been monographically described in a number of papers by Glibert (1945, 1952, 1954). These papers were predominantly based on the collections of the Institut royal des Sciences naturelles de Belgique, Brussels, mainly containing material collected a long time ago, partly even in the first half of the 19th century (including e.g. the collection P. H. Nyst). As usual for older collections, the stratigraphical information accompanying the samples in the Brussels collection is frequently incomplete or even erroneous, which has led to incorrect conclusions on the relative age of the Edegghem and Antwerp Sands (Janssen & Van der Mark, 1969).

The new outcrops offered not only collecting possibilities, but also the stratigraphical sequences could be studied in detail. Nowadays there is no doubt whatsoever that both the Edegghem and the Antwerp Sands are Hemmoorian in age. De Meuter & Laga (1976) have given a concise summary of the litho- and biostratigraphy of the Miocene and Pliocene deposits.

It is not surprising, of course, that the enormous quantities of collected material yielded species hitherto unknown to occur in these deposits. Unfortunately only relatively few papers have been dedicated to this subject up to now, and the greater part of the newly gathered specimens rests unstudied in various collections. The main reason for this is the very large number of species involved and the severe difficulties in solving complicated problems in mollusc systematics. Thus, several species are recognized to represent 'faunae novae species', or as being new to science.

One of the latter species is an attractive, but very brittle, pectinid from the upper part of the Antwerp Sands, which at first glance resembles the common species *Korobkovia woodi*. There are, however, obvious differences, especially its size, and the species has for a long time been indicated as 'Pectinidae genus et species nov.'

The first author of this paper, who has studied Recent pectinids for several years, has lately developed a certain interest for Neogene pectinids as well and started to study palaeontological collections in The Netherlands, among which the relatively large holdings from the Antwerp area in the Rijksmuseum van Geologie en Mineralogie; Leiden. Here the new form resembling *Korobkovia* came up for discussion, of course, and a subsequent careful study of the available material led to the present paper in which a new genus and a new species are introduced.

### STRATIGRAPHICAL ORIGIN OF THE MATERIAL STUDIED

The sequence indicated with the denomination 'Antwerp Sands' comprises a series of beds within the Berchem Formation, differing from each other in sedimentological and palaeontological characteristics. The total thickness of the mainly blackish ('Sables noirs d'Anvers') Antwerp Sands may reach some 10 m. They overlie the usually non-fossiliferous and somewhat lighter coloured Kiel Sands. The Antwerp Sands in the type area are always decapitated by erosion. The disconformity represents hiatuses of variable importance. Locally Late Miocene Deurne Sands are found on top of the Antwerp Sands, but in other cases still younger Neogene deposits ('Sables à Hétérocètes', or equivalents of the Pliocene Kattendijk Sands) are found, or even Quaternary sediments ('Scheldt deposits'), containing large quantities or reworked, mainly Pliocene molluscs.

The upper half of the Antwerp Sands is strongly dominated by the presence of compact concentrations of the bivalve species *Glycymeris 'obovata' baldii* Glibert & Van de Poel, 1965, separated by less fossiliferous intervals. The complex with the *Glycymeris* concentrations was indicated as deposit no. 17 in Janssen & Van der Mark (1968: 80, fig. 1).

The new species described in this paper was, as far as we know, exclusively collected from just below the lowermost *Glycymeris* bed of deposit no. 17, in a mollusc association relatively rich in species and therefore quite extensively sampled. The base of this sandy bed is usually developed as a small disconformity with 'hard ground' characteristics. Burrowing bivalve species like *Panopea menardi* Deshayes, 1828, are frequently seen penetrating the lower boundary of this bed into the underlying, slightly more clayey and distinctly less fossiliferous bed.

### SAMPLING LOCALITIES

All samples studied originate from two different localities, one of them situated on the present E3 'Kleine Ring' motorway around Antwerp city, in the municipalities of Borgerhout and Berchem. The other one was a construction-pit in the centre of Antwerp, close to the Zoo, enclosed by the Ploegstraat and the Kievitstraat.

(1). Berchem/Borgerhout, province of Antwerp, Belgium. Temporary excavations along the proposed route for the E3 'Kleine Ring' motorway around Antwerp city,

map-sheet 15/3-4 (Antwerpen-Borgerhout) of the topographical map 1:25,000 of Belgium, located between coordinates  $x = 154,5$ ;  $y = 209,5$ , and  $x = 155,7$ ;  $y = 211,8$ .

Most of this material was collected during the years 1965-1970, but in 1987 and 1988 the reconstruction of an exit along the same motorway (exit Borgerhout) supplied renewed collecting possibilities, during which one valve of the new species was indeed collected (R. Pouwer collection).

The stratigraphical origin of the material, as described above, may be summarized as: Miocene, Hemmoorian (Oxlundian), Berchem Formation, Antwerp Sands, base of layer 17 in Janssen & Van der Mark, 1968.

Material from this locality is available in the following collections:

- coll. RGM, Leiden (= Rijksmuseum van Geologie en Mineralogie, Leiden). Specimens collected by the late Mr F. J. Janssen.
- coll. NMR (= Natuurhistorisch Museum, Rotterdam). Specimens collected by A. W. Janssen.
- coll. J. Gunst, Goes. Specimens collected by Mr. Gunst and by the late Mr. A. Haandrikman; locality of this latter material indicated as "Berchem, near gas-factory".
- coll. F. A. D. van Nieulande, Nieuw- en St. Joosland, Middelburg. Specimens collected by Mr. Van Nieulande.
- coll. M. Vervoenen, Aalst, Belgium. Specimen collected by Mr. Vervoenen.
- coll. R. Pouwer, Middelburg. Specimen collected by Mr. Pouwer during the recent temporary excavation at the Borgerhout exit.

2. Antwerp, province of Antwerp, Belgium. Temporary excavation for underground parking near the Zoo, enclosed by the Kievitstraat and the Ploegstraat (locality commonly indicated as "Antwerpen, Ploegstraat"). Map-sheet 15/3-4 (Antwerpen-Borgerhout) of the topographical map 1:25,000 of Belgium. Coordinates approximately:  $x = 153,775$ ;  $y = 211,550$ .

The stratigraphical origin of the material, as described above, may equally be summarized as: Miocene, Hemmoorian (Oxlundian), Berchem Formation, Antwerp Sands, base of layer 17 in Janssen & Van der Mark, 1968.

All samples were collected during the years 1965 and 1966. Material is available in the following collections:

- coll. RGM, Leiden. Specimens collected by M. van den Bosch, R. E. Hamstra and the late Ir. D. van der Mark.
- coll. NMR, Rotterdam. Specimens collected by A. W. Janssen.
- coll. H. P. J. Keukelaar, Nieuwpoort. Specimens collected by Mr. Keukelaar and Mrs T. P. Keukelaar-van den Berge, Wilhelminadorp.

## SYSTEMATICAL PART

### Description of *Capedopecten* gen. nov.

Diagnosis.—Shell moderately large, inaequivalve, orbicular and rather thin-walled. The anterior and posterior auricles are unequal and the hinge line is straight. External disc surface of both valves macroscopically smooth, but with fine irregular radial costae crossed by equally fine concentric lamellae near the umbo. On the entire shell surface a microscopic '*Camptonectes*' sculpture is present. Concentric growth lines occur near the ventral margin. An inactive ctenolium is present.

Type species.—*Capedopecten anellus* spec. nov.

Derivatio nominis.—The genus is, according to its general form, named after *capedo* (Latin) = a sacrificing dish.

Remarks.—*Capedopecten* resembles at first glance the associated genus *Korobkovia*; see descriptions of the type species *Korobkovia woodi* (Nyst, 1861) in e.g., Glibert (1945: 88, pl. 5, fig. 3a-c, s.n. *Amusium woodi*), Anderson [1964: 137, text-fig. 9a-b, s.n. *Amusium (Amusium) woodi*], and Janssen (1984: 53, pl. 24, figs. 3a-b, 4a-b). The genus *Korobkovia* was introduced by Glibert & Van de Poel (1965:10).

*Capedopecten* differs from *Korobkovia* by the complete absence of radial sculpture on the inner surface of the left valve. The external surface bears a fine radial and concentric sculpture in the umbonal region, which is absent in *Korobkovia*.

Also similar is the genus *Lentipecten* Marwick, 1928 [type species *L. hochstetteri* (Von Zittel, 1864) from the Early Miocene of New Zealand]. This generic name is also applied to North Sea Basin species, e.g. for the Eocene and Oligocene *L. corneus* (Sowerby, 1818). *Lentipecten* differs basically from *Capedopecten* by the absence of the complicated umbonal sculpture. A 'Camptonectes' microsculpture has never explicitly been mentioned for the type species of *Lentipecten*. It was placed in the genus *Pseudamusium* by Park (1905: 485) and Von Ihering (1907: 85), and in *Camptonectes* by Suter (1914: 43), whereas Von Teppner (1922: 95) classified this species with the genus *Amusium*. Such a microsculpture is present, however, in the species *L. corneus*. This was already described by Wood (1861-1871: 39): "Our shell, which is smooth to the naked eye, exhibits under a common hand-glass fine diverging striae, most distinct near the margins of the shell, and in well-preserved specimens they are plainly visible all over."

We could corroborate this in specimens from the Eocene of Belgium (localities Bambrugge, Meldert and Balegem, age Ledian), in which, however, the microsculpture is extremely fine and only visible in low angle light. In this material of *Lentipecten corneus* the 'Camptonectes' sculpture is considerably finer than in *Capedopecten*.

A further distinct difference between *L. hochstetteri* and *L. corneus* is the morphology of the posterior auricle, which is regularly rounded in *L. hochstetteri*. In *L. corneus* the transition between the dorsal and posterior margins of the same auricle is distinctly angular. For these reasons it might be necessary to reconsider the generic position of *L. corneus*.

Also the anterior right valve auricle of *L. hochstetteri* demonstrates a similarly rounded outline. In *L. corneus* the transition between the dorsal and anterior margins of the right valve anterior auricle is somewhat rounded, but still slightly angular. In *Capedopecten* the right valve anterior auricle has a shape similar to that of *L. corneus*.

Both *Korobkovia* and *Lentipecten* differ from *Capedopecten* by the morphology of the hinge line in the right valve. The upper margins of the anterior and posterior auricle are in line in both valves of *Capedopecten*, which therefore have a completely straight hinge line. These margins enclose an angle of some 125° in the right valve of the two other species, which therefore have a curved hinge line. Furthermore, both *Korobkovia* and *Lentipecten* possess auricular denticles, which are absent in *Capedopecten*.

It is very difficult and, in our opinion, hardly useful to speculate on the relationship of the genus *Capedopecten* within the strongly radiated pectinid group. The absence of any indication of radial sculpture elements on the inside of the valves points to a quite remote relationship with the *Amusium*-group. The macro- and microsculpture, on the contrary, indicate a closer resemblance with the *Camptonectes*-group, but other characters, such as the size of the shells, the shallow byssal sinus and the rounded outer mar-

gin of the right anterior auricle rather suggest a close relationship with the *Lentipecten*-group (the indication 'group' here applied in the sense of Hertlein in Moore, 1969).

***Capedopecten anellus* spec. nov.**

figs. 1-3, 5

Description.—Shell moderately large, inaequivalve, orbicular and quite thin-walled. Height and length commonly 50 to 75 mm, transverse diameter of such specimens may reach 12 mm. Both valves slightly convex, but semidiameter of left valve about twice that of the right valve. Auricles unequal. Anterior auricles about twice as long as posterior ones. In the posterior auricle of both valves the transition of the dorsal margin to the posterior margin is angular. This is also the case in the anterior auricle of the left valve, whereas this transition in the anterior auricle of the right valve is distinctly more rounded. Hinge line straight, dorsal margins of anterior and posterior auricles of both valves in line. Byssal sinus in anterior auricle of right valve very shallow. No auricular denticles are visible. An inactive ctenolium is present, visible with a 10 × magnification only. The umbonal angle of the disc is about 105°.

The external surface sculpture is different on the left and the right valves. On the left valve, just below the smooth dissoconch, about twenty fine, irregular, somewhat granulated radial costae appear, that disappear at a disc diameter of about 7 mm. Smooth and irregular radial plicae persist throughout the disc, reaching the ventral margin even in completely adult specimens. Furthermore, the umbonal sculpture comprises fine concentric lamellae (visible in well-preserved specimens only), crossing the irregular radial sculpture. This concentric sculpture reaches further downwards than the radial costae and vanishes just before the central disc.

In the right valve a similar radial sculpture is present in the umbonal area, sometimes better developed on the anterior side than on the middle and posterior sides. No concentric sculpture present, but sometimes the incremental lines are slightly accentuated here. Smooth radial plicae towards the ventral margin, but much weaker developed than in left valve.

The entire disc surface of both valves is covered with a microscopic '*Camptonectes*' sculpture. This sculpture, consisting of numerous obliquely curved, divergent striae (magnification 20 ×), is frequently invisible, as the upper shell layer is easily worn off. But, also in well-preserved specimens, this microsculpture is less developed on the central parts of the disc, sometimes virtually invisible, especially on the left valve. Irregular concentric incremental lines are present throughout the central disc and, more close-set, towards the ventral margins. The sculpture of the posterior auricle is similar to that of the adjacent disc surface, inclusive of the '*Camptonectes*' microsculpture. The anterior auricles demonstrate a lamellose concentric sculpture, more close-set than that on the umbonal area of the left valve. Both posterior and anterior auricles demonstrate some vague radial plicae.

The internal surface of both valves is smooth, neither radial lirae nor any other radial sculpture elements are present. Near the central part of the disc a large adductor insertion is present, situated just behind the vertical mid-line of the shell. A pallial line is not visible. The outer ligament is narrow and straight, without any cardinal crurae. The resilial pit is triangular, with a vertical angle of about 55°. Auricular denticle lines slightly pronounced, without denticles.

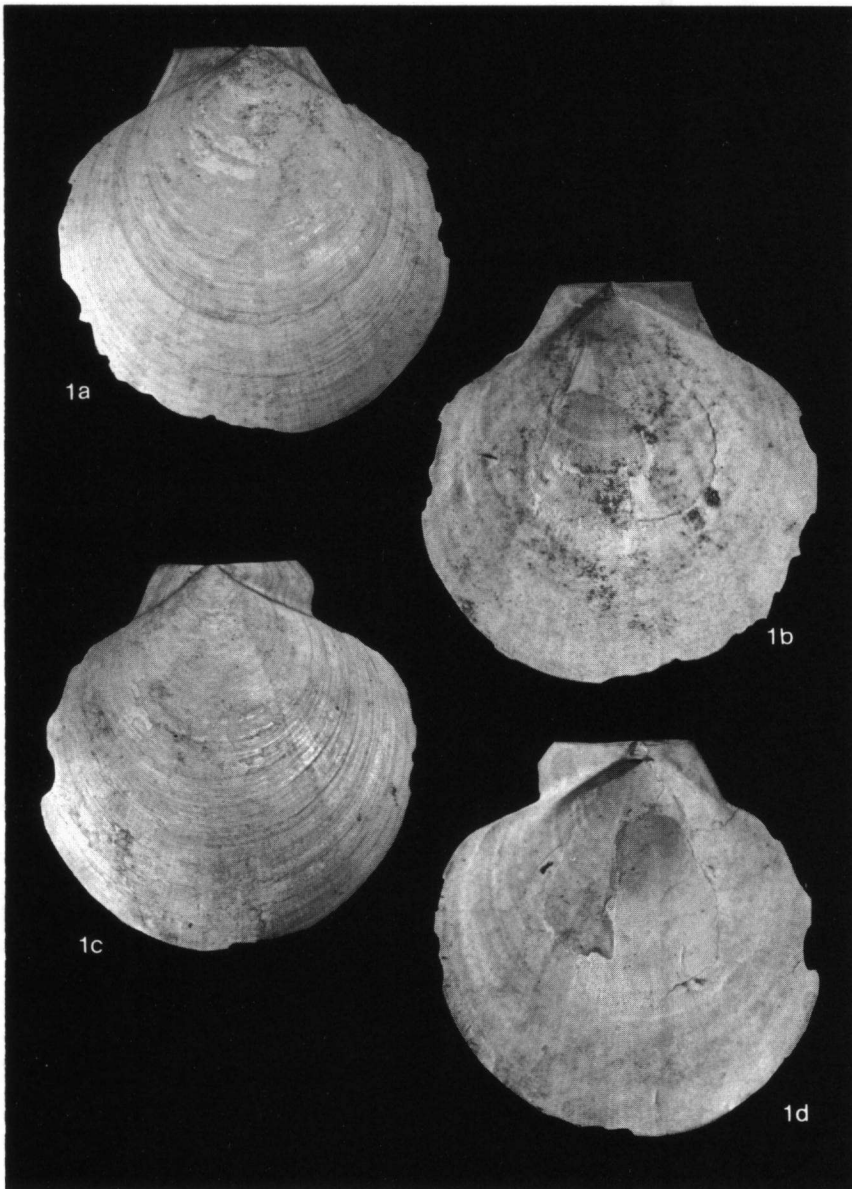
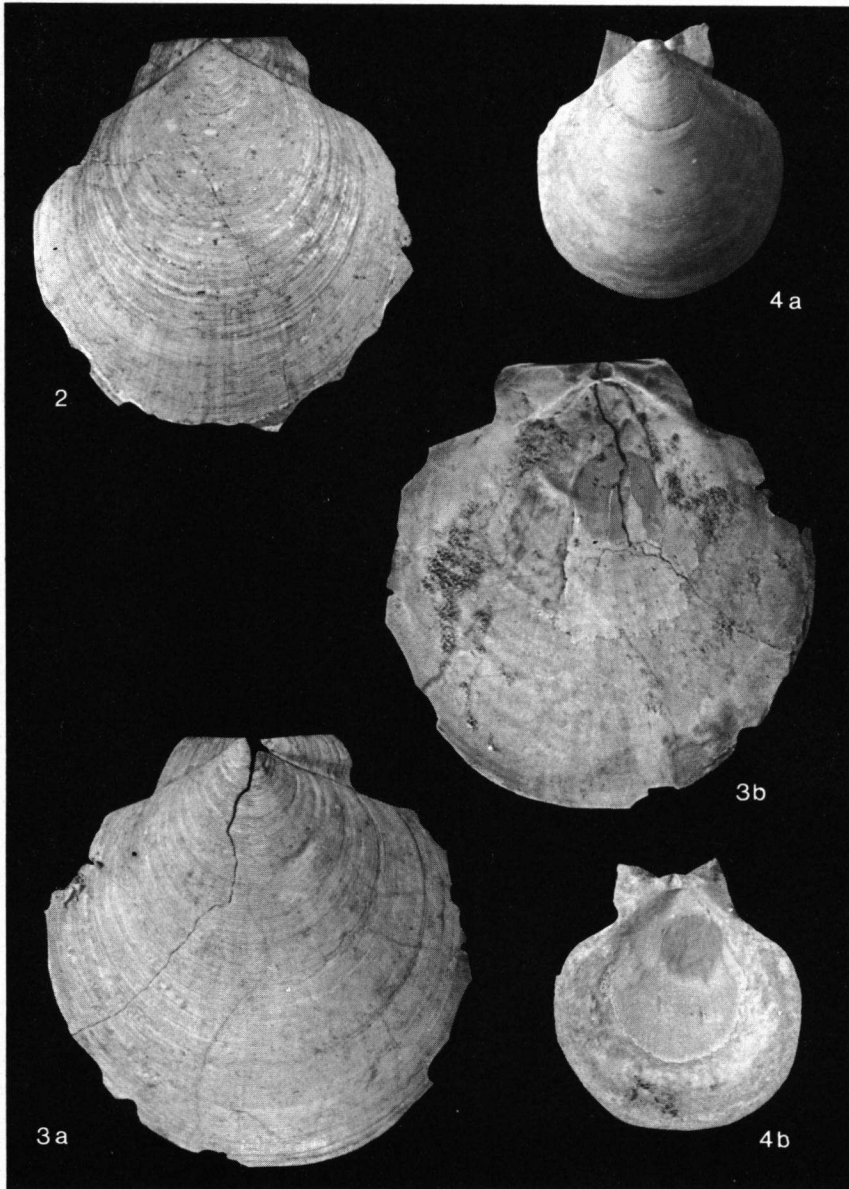


Fig. 1. *Capedopecten anellus* spec. nov., holotype, RGM 229 342, Berchem/Borgerhout, province of Antwerp, Belgium, temporary excavations for E3 'Kleine Ring' motorway; Miocene, Hemmoorian, Oxlundian [Berchem Formation, Antwerp Sands Member, basal bed of layer 17 (Janssen & Van der Mark, 1968), leg. F. J. Janssen. a, left valve, exterior; b, left valve, interior (length 52 mm); c, right valve, exterior; d, right valve, interior (length 50 mm).



Figs. 2-4. Fossil Pectinidae. 2-3, *Capedopecten anellus* spec. nov. 2, paratype, RGM 229 343, origin as indicated for fig. 1; double-valved specimen, showing right valve exterior (length 55 mm). 3, paratype, RGM 229 344, Antwerp, Ploegstraat locality, as described in the text; stratigraphical origin as in fig. 1, leg. D. van der Mark. a, right valve exterior; b, right valve interior (length 68 mm). 4, *Korobkovia woodi* (Nyst, 1861), juvenile, RGM 229 345, origin as indicated in fig. 3. a, right valve exterior; b, right valve interior (length 15.7 mm).



Fig. 5. *Capedopecten anellus* spec. nov., paratype, RGM 229 343 (same specimen as fig. 2). a, right valve umbonal region; b, left valve umbonal region (length of straight upper auricle margins about 19 mm).



Derivatio nominis.—*anellus* (Latin) = little ring, after the name of the 'Kleine Ring' motorway around Antwerp city centre, on which the type locality of this species is situated.

Locus typicus.—Berchem/Borgerhout, province of Antwerp, Belgium; temporary excavations for E3 'Kleine Ring' motorway, as described above.

Stratum typicum.—Basal bed of layer no. 17 (Janssen & Van der Mark, 1968), Antwerp Sands, Berchem Formation (Miocene, Hemmoorian, Oxlundian).

Holotype—Figs. 1a-d, RGM 229 342. Paratypes—From the type locality the following paratypes are available: 1/1 specimen, slightly defective, leg. F. J. Janssen, RGM 229 343 (figs. 2,5); 2/2 specimens, leg. A. W. Janssen, NMR no. 6182; 1/2 specimen, leg./coll. J. Gunst; 2/2 specimens, leg. A. Haandrikman, coll. J. Gunst; 2/2 specimens, leg./coll. F. A. D. van Nieulande; 1/2 specimen, leg./coll. M. Vervoenen. From the recent excavation of the Borgerhout exit, as described above: 1/2 specimen, leg./coll. R. Pouwer no. 708. From the Antwerp, Ploegstraat, locality, as described above: 1/1 defective specimen and 1 right valve, 1 right valve (fig. 3), leg. D. van der Mark, RGM 229 344 and 229 350 respectively; 1 defective left valve, leg. F. J. Janssen, RGM 229 348; 3 defective left valves, 1 fragment, leg. R. E. Hamstra, RGM 229 367; 1 defective right valve, leg. M. van den Bosch, RGM 229 368; 2/2 specimens, leg. A. W. Janssen, NMR no. 5967; 2 left and 3 right valves, more or less defective, leg. A. W. Janssen, NMR no. 5812; 4/2 specimens, leg./coll. H. P. J. Keukelaar.

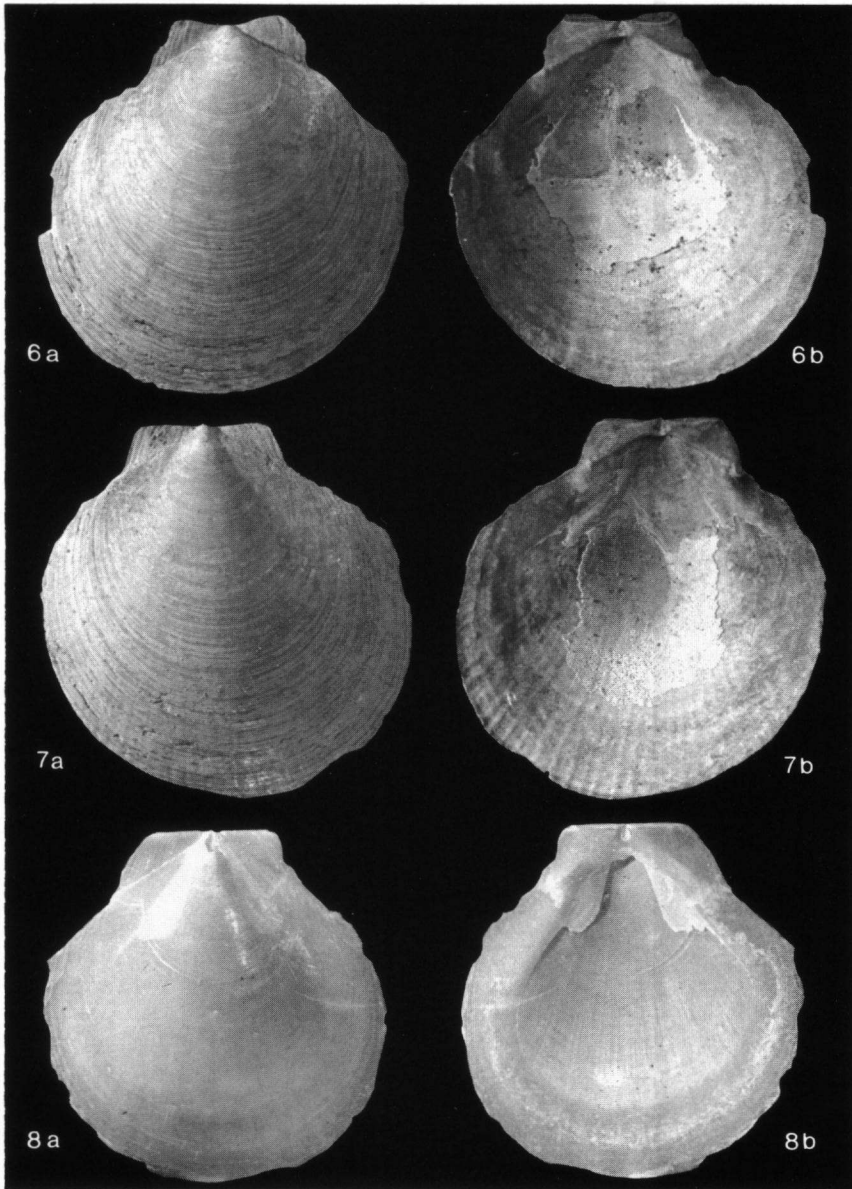
Remarks.—*Capedopecten anellus* resembles the associated species *Korobkovia woodi*, which apparently has a much wider geographical and stratigraphical distribution. A detailed comparison is given below, but the main differences between these two taxa are the presence of a complicated macro- and microstructure on the external surface of both valves in *C. anellus*, whereas in *K. woodi* the shell surface is smooth, without any significant ornamentation.

The new species reaches considerably larger dimensions and is slightly more solid (better: less fragile) than *K. woodi*. In the new species the internal surface of the shell is smooth, without any radial sculpture elements. In *K. woodi* the inside of the left valve has radial sculpture, which, by the way, is considered typical for the genus *Korobkovia*.

The hinge line of the new species is straight, with the dorsal auricle margins of both valves in line, whereas in *K. woodi* the hinge line of the right valve is curved, with the dorsal auricle margins enclosing a distinct angle (most distinctly observed in juvenile specimens). Auricle denticles are absent in *C. anellus*, whereas such denticles are strongly developed on both valves of *K. woodi*. An inactive ctenolium is present in the new species, but absent in *K. woodi*.

One of the most striking and, to the present day, unexplained features of the new species is the fact, that juvenile specimens (with a length of less than about 50 mm) have never been found. Among the much larger samples of *K. woodi*, including hundreds of juvenile specimens, not one juvenile valve of *C. anellus* could be isolated.

As far as we know, the new species has a very restricted distribution pattern, both in geographical and in stratigraphical respects. The species has only been observed in the base of layer 17 of the Antwerp Sands in the Antwerp city area. *K. woodi*, on the other hand, has a stratigraphical range including the Vierlandian, the Hemmoorian and the Reinbekian (Early to Middle Miocene), and is widely distributed all over the North Sea Basin.



Figs. 6-8. Fossil Pectinidae. 6-7, *Korobkovia woodi* (Nyst, 1861), double-valved specimen, RGM 229 346, origin as indicated in fig. 3. 6a, right valve exterior, b, right valve interior (length 41 mm); 7a, left valve exterior; b, left valve interior (length 41 mm). 8. *Lentipecten corneus* (Sowerby, 1818), RGM 229 347, Meldert, province of West-Vlaanderen, Belgium; Eocene, Lutetian (Lede Formation, Lede Sand Member), leg. A. W. Janssen. a, left valve exterior; b, left valve interior (length 27 mm).

COMPARISON BETWEEN CAPEDOPECTEN ANELLUS  
AND KOROBKOVIA WOODI

<i>Korobkovia woodi</i>	<i>Capedopecten anellus</i>
— Shell extremely thin and fragile	— Shell very thin and fragile
— Both valves about equally convex	— Left valve about twice as convex as right valve
— Length up to c. 45 mm	— Length up to c. 70 mm
— Anterior and posterior auricle about equally long (in right valve with length 45 mm, 9 and 9 mm respectively; in left valve with length 48 mm, 7 and 7 mm respectively)	— Anterior auricles distinctly longer than posterior ones (in right valve with length 51 mm, 7 and 11 mm respectively; in left valve with length 52 mm, 7 and 10.5 mm respectively)
— Shell surface almost completely smooth, with only very little radial sculpture on left valve	— Shell surface with a combination of radial and concentric sculpture on the umbonal area of the left valve, and radial sculpture on the umbonal area of the right valve
— Sculpture of auricle not significantly differing from that on the disc; no radial sculpture on auricles	— Sculpture of posterior auricles identical to that on the adjacent disc region, but anterior auricles with distinct and close-set concentric lamellae; both auricles with weak radial plicae
— 'Camptonectes' microsculpture absent	— 'Camptonectes' microsculpture present on the entire surface of both valves (but frequently worn away)
— Dorsal margins of posterior and anterior right valve auricles enclosing an angle of c. 125°; those of the left valve in line with each other	— Dorsal margins of posterior and anterior auricles of both valves in line with each other
— Ctenolium absent	— Inactive ctenolium (Waller, 1984) present
— Inside of disc with radial sculpture elements in left valve, sometimes also present near the extreme margin of the right valve	— Inside of disc in both valves without radial sculpture elements
— Outer ligament cavities distinctly widening abaxially	— Outer ligament cavities hardly or not widening abaxially

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## SAMENVATTING

In de omgeving van de stad Antwerpen waren in de jaren zestig grote ontsluitingen in vooral Miocene mariene afzettingen, zoals bv. bij de aanleg van de 'Kleine Ring', een autosnelweg rond de stad Antwerpen, en een bouwput voor een ondergrondse parkeergarage bij de Ploegstraat. Uit de grote hoeveelheden bij die gelegenheden verzamelde molluskenmateriaal wordt in dit artikel *Capedopecten anellus* gen. nov. spec. nov. beschreven. De nieuwe soort lijkt in eerste instantie sterk op de veel algemenere soort *Korobkovia woodi*, maar wordt aanzienlijk groter en vertoont duidelijke verschillen, vooral ook in de sculptuur van het umbonale veld. De belangrijkste verschillen zijn hieronder in tabelvorm weergegeven.

<i>Korobkovia woodi</i>	<i>Capedopecten anellus</i>
— Schelp uiterst dun en breekbaar	— Schelp zeer dun en breekbaar
— Beide kleppen ongeveer even bol	— Linkerklep ongeveer tweemaal zo bol als de rechterklep
— Lengte tot ongeveer 45 mm	— Lengte tot ongeveer 70 mm
— Voorste en achterste oortje ongeveer even lang (in een rechterklep van 45 mm lengte: resp. 9 en 9 mm; in een linkerklep van 48 mm: resp. 7 en 7 mm)	— Voorste oortje duidelijk langer dan het achterste (in een rechterklep van 51 mm lengte: resp. 7 en 11 mm; in een linkerklep van 52 mm: resp. 7 en 10, 5 mm)
— Buitenzijde van de schelp vrijwel geheel glad, met slechts een geringe aanduiding van radiale sculptuur op de linkerklep	— Buitenzijde van de schelp met een combinatie van radiale en concentrische sculptuur op het topgedeelte van de linkerklep, en met radiale sculptuur op het topgedeelte van de rechterklep
— Sculptuur van de oortjes niet wezenlijk verschillend van die op het centrale schelpgedeelte; geen radiale sculptuur op de oortjes	— Sculptuur van het achterste oortje gelijk aan die van het aangrenzende centrale schelpgedeelte; voorste oortje met duidelijke en dicht openstaande concentrische lamellen; beide oortjes met zwakke radiale sculptuur
— 'Camptonectes'-microsculptuur afwezig	— 'Camptonectes'-microsculptuur aanwezig op het gehele oppervlak van beide kleppen (maar door slijtage snel verdwenen)
— De bovenranden van het voorste en achterste oortje van de rechterklep maken samen een hoek van ongeveer 125°; die van de linkerklep staan in elkaars verlengde	— De bovenranden van het voorste en achterste oortje liggen in beide kleppen in elkaars verlengde
— Ctenolium afwezig	— Inactief ctenolium (Waller, 1984) aanwezig
— Binnenzijde van de linkerklep met radiale sculptuurelementen; soms ook enige radiale sculptuur nabij de marginale rand van de rechterklep	— Binnenzijde van beide kleppen zonder radiale sculptuurelementen
— Holten voor het uitwendig ligament naar buiten toe duidelijk breder wordend	— Holten voor het uitwendige ligament naar buiten toe niet of nauwelijks verbreed