

A study of some Neogene European species of Seilinae (Cerithiopsidae, Gastropoda)

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Abstract

The species of the subfamily Seilinae, occurring in Neogene deposits of the North Sea basin and in Aquitaine, Touraine and Brittany (France) are revised. Their shells with protoconchs are described and figured. Four new taxa are named: *Seila* (*Hebeseila*) *suttonensis* n. sp., *S.* (*Hebeseila*) *sancticlemanti* n. sp., *S.* (*Cinctella*) *trilineata andagavensis* n. subsp. and *S.* (*Seila*) *selsoifensis* n. sp. Their attribution to subgenera and genera is discussed. Other Neogene European Seilinae are discussed and described, if material with protoconchs has become available.

Key-words: Gastropoda, *Seila*, Neogene, Europe.

Résumé

Les espèces de la sous-famille des Seilinae, présentes dans des formations néogènes du bassin de la Mer du Nord, d'Aquitaine, de Touraine et de Bretagne (France) sont révisées. Leur coquilles avec protoconques sont décrites et figurées. Quatre nouveaux taxons sont nommés: *Seila* (*Hebeseila*) *suttonensis* n. sp., *S.* (*Hebeseila*) *sancticlemanti* n. sp., *S.* (*Cinctella*) *trilineata andagavensis* n. subsp. et *S.* (*Seila*) *selsoifensis* n. sp. Leur attribution aux genres et aux sous-genres est discutée. D'autres espèces de Seilinae du Néogène européen sont discutées et décrites, si du matériel avec protoconque est disponible.

Mots-clés: Gastéropodes, *Seila*, Néogène, Europe.

Introduction

The Recent species *Seila trilineata* (PHILIPPI, 1836) has previously been recorded from Oligocene to Pleistocene strata in the North Sea basin, along the Atlantic coast of France, in the Parathetys and in the Mediterranean. TEMBROCK (1964), R. JANSSEN (1978a, b) and GRÜNDEL (1980) showed that the Oligocene material of *S. trilineata* auctorum should be divided into several species; the true *S. trilineata* does not occur in Oligocene deposits. SACCO (1895) and COSSMANN & PEYROT (1921) similarly demonstrated that the species previously recorded as *S. trilineata* from the Miocene of Italy and Aquitaine (France), represented various species. Protoconchs of the Neogene species, however, remained unknown. These would allow further distinction between species, which show only very slight differences in teleoconch sculpture

and shell shape. All Seilinae are indeed very uniform in teleoconch morphology and the differences in sculpture and shape, on which species were formerly based, are often too insignificant or too variable to be used in distinguishing between taxa. The protoconchs of a number of Neogene species are still unknown. Their status and their attribution to subgenera are considered as uncertain. These species are only briefly mentioned here because no further data can be added to their original descriptions; often they are known only from their holotypes. The list of synonyms, of the species discussed, are deliberately kept short, such as to include only identifications verified by the author. Therefore, the stratigraphic and geographic ranges of most species remain undetermined. The localities mentioned in the text are indicated on Text-Fig. 1.

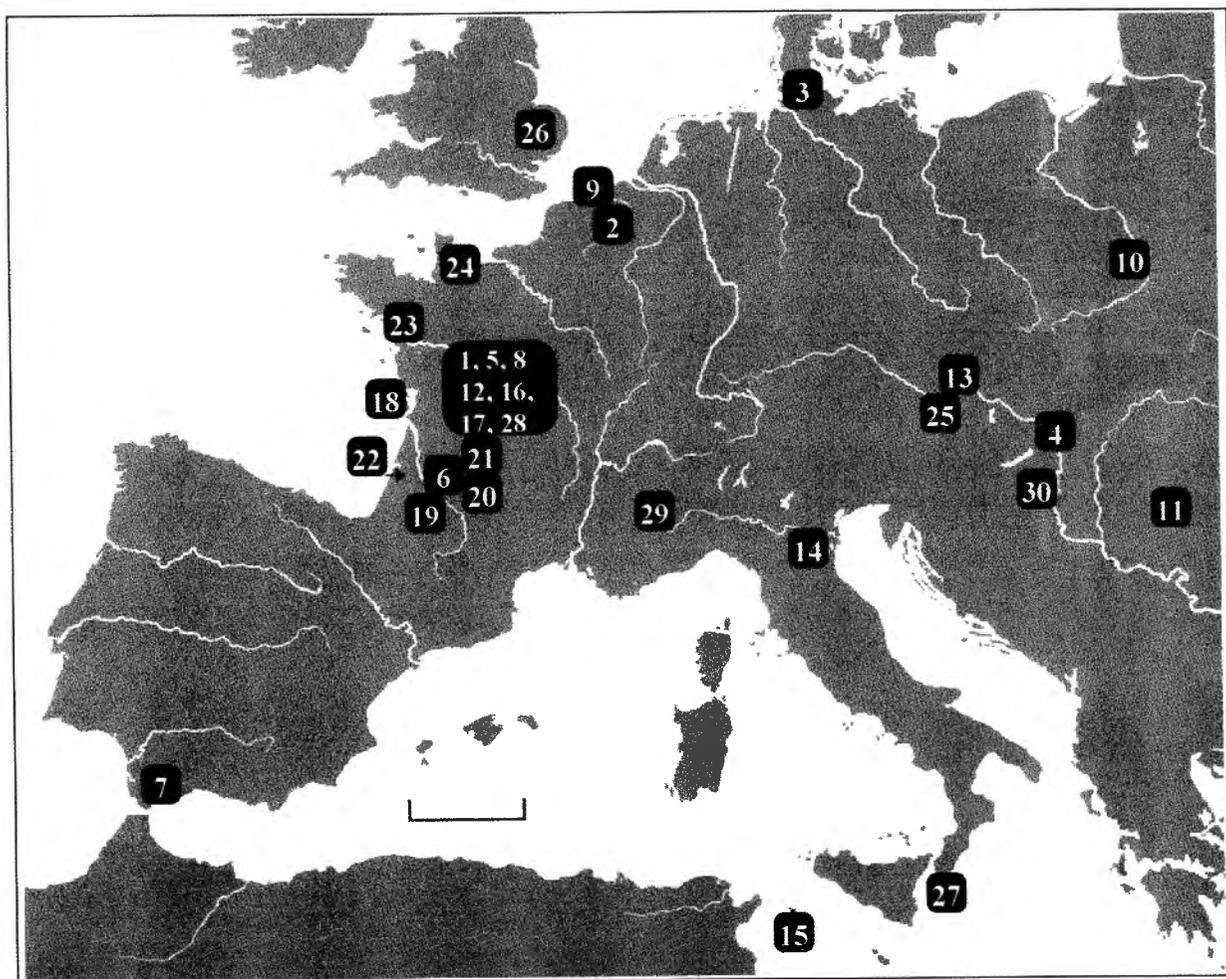
Taxonomy

Phylum Mollusca
Class Gastropoda CUVIER, 1797
Superorder Caenogastropoda COX, 1960
Order Neotaenioglossa HALLER, 1882
Suborder Ptenoglossa GRAY, 1853
Superfamily Cerithiopsacea H. & A. ADAMS, 1854
Family Cerithiopsidae H. & A. ADAMS, 1854
Subfamily Seilinae GOLIKOV & STAROBOGATOV, 1975
Genus and subgenus *Seila* A. ADAMS, 1861

Type species of genus by original designation: *Triphoris dextroversa* A. ADAMS & REEVE, 1850.

The genus *Seila* is characterised by MARSHALL (1978) as follows (only shell characteristics). "Shell medium sized to very small, narrowly conical, subcylindrical, or (rarely) ovate. Sutures weakly impressed. Protoconch of planktotrophic, lecithotrophic, or (apparently) secondarily planktotrophic type, of 1 3/4 - 5 convex whorls. Whorls narrowly or broadly conical or subcylindrical, smooth or axially and/or spirally ribbed, sometimes with a peripheral carina. Teleoconch whorls flat, shallowly convex, or (rarely) shallowly concave. Sculpture highly distinctive, consisting of 3 or more smooth, narrow, spiral cords and fine, numerous, close, interstitial axial lamellae. Anterior canal not or slightly produced, widely open, notched below".

The definition of *Seila* is here enlarged to species which lack axial teleoconch ornament, such as *Seila*



Text-Fig. 1 — Map of Europe with indication of the localities mentioned in the text. 1 cm = 150 km, line = 300 km. 1 - Amberre, France, 2 - Antwerp, Belgium, 3 - Behrendorf, Germany, 4 - Borsodbóta, Hungary, 5 - Bossée, France, 6 - Cabanac, France, 7 - Estepona, Spain, 8 - Ferrière-Larçon, France, 9 - Kallo, Belgium, 10 - Korytnica, Poland, 11 - Kostej (now Costei), Romania, 12 - Manthelan, France, 13 - Mikulov, Czech Republic, 14 - Montegibbio, Italy, 15 - Pantelleria, Italy, 16 - Pauvreley, France, 17 - Sainte-Cathérine-de-Fierbois, France, 18 - Saint-Clément-de-la-Place, France, 19 - Saint-Martin-d'Onney, France, 20 - Saint-Morillon, France, 21 - Saucats, France, 22 - Saubrigues, France, 23 - Sceaux-d'Anjou, France, 24 - Selsoif, France, 25 - Steinabrunn, Austria, 26 - Sutton, United Kingdom, 27 - Siracusa, Italy, 28 - Thenay, France, 29 - Torino, Italy, 30 - Várpalota, Hungary.

(*Hebeseila*) *sancticlementi* n. sp. Furthermore, the number of protoconch whorls is considered here as important in the definition of species, but not of higher systematic units.

The subgenus *Seila* s. s. can be distinguished, according to MARSHALL (1978), by having one of the teleoconch spirals weaker than both others; the protoconch of its type species, however, remains unknown. Only one species in the European Neogene shows this characteristic.

Seila (*S.*) *selsoifensis* n. sp.

Plate 2, Fig. 5, 6

Type material: Holotype in IRScNB IST 6383; paratype in IRScNB IST 6384.

Type locality: Selsoif (quarry in Marais de la Sensurière), nr. Saint-Sauveur-le-Vicomte, dept. Manche, France.

Stratum typicum: Grand-Marais Formation, Tiglian C4, Pleistocene.

Derivatio nominis: after the type locality.

Dimensions: see Table 1.

Material studied: see Table 2.

Generic attribution: This new species belongs to the genus *Seila* because of its general shape and sculpture and to the subgenus *Seila* because of its unequal teleoconch spiral ribs.

Diagnosis: A *Seila* (*Seila*) species with one smooth, very tumid protoconch whorl, three teleoconch spirals, the apical of which is weaker than the others, deep suture, tumid teleoconch whorls, without additional spirals on the shell base and with numerous, weak, widely spaced axial ribs.

Description: Shell small, turriculate, rather broad, with an apical angle of more than 25°, consisting of eight whorls. Protoconch paucispiral, large (broader than first teleoconch whorl), smooth, very tumid, consisting of only one whorl. Teleoconch whorls tumid for genus.

Sculpture starting with axial ribs and two abapical spirals. Third, adapical spiral starting one whorl later and always remaining weaker than both other spirals. Spiral ribs about as broad as intercostal areas. Axial ribs strong, clearly delimited, about as broad as the intercostal spaces, widely spaced, 24 to 30 in number on the middle whorls. Suture deep. Shell base smooth, convex, without additional spirals; aperture nearly square; siphonal canal rather long for genus.

Discussion: This species clearly differs from *Seila t. trilineata* (PHILIPPI, 1836), *S. t. andagavensis* n. subsp., *S. crassicincta* SACCO, 1895 and *S. turritissima* SACCO, 1895 by its paucispiral protoconch, unequal teleoconch spirals and absence of additional spirals on the shell base. *S. infrapercincta* SACCO, 1895 differs in having a fourth teleoconch spiral, *S. cyrtogyra* (COSSMANN & PEYROT, 1921) has a narrower shell and stronger axial sculpture, *S. cabanacensis* (COSSMANN & PEYROT, 1921) has more densely packed teleoconch axials and very flat whorls. The Recent Atlantic species described and discussed by ROLÁN & FERNAN-

DES (1990): *Seila adamsi* (H. C. LEA, 1845), *S. angolensis* ROLÁN & FERNANDES, 1990, *S. carquejai* ROLÁN & FERNANDES, 1990, *S. inchoata* ROLÁN & FERNANDES, 1990, *S. deaurata* ROLÁN & FERNANDES, 1990, *S. parilis* ROLÁN & FERNANDES, 1990, *S. carinata* (E. A. SMITH, 1871) all have a protoconch with more than one whorl.

Subgenus *Cinctella* MONTEROSATO, 1884

Type species of the subgenus by original designation: *Cerithium trilineatum* PHILIPPI, 1836.

The subgenus *Cinctella* MONTEROSATO, 1884 has more or less equal spiral ribs and a smooth protoconch. The presence of two to three protoconch whorls is also considered by MARSHALL (1978) a character of this subgenus, but the Neogene fossils studied show that a number of species existed strongly resembling the type species of *Cinctella*, but with a higher number of protoconch whorls and lacking protoconch sculpture of *Seila trilineata* (PHILIPPI, 1836), with which they were often confused.

Table 1 — Dimensions of the types and figured specimens

Specimen	Height (mm)	Diameter (mm)	Number of whorls	Protoconch height (mm)
<i>Seila selsoifensis</i> n. sp.				
IST 6383	3.8	1.5	8	0.3
IST 6384	2.6	1.1	5 1/2	0.3
<i>S. t. trilineata</i> (PHILIPPI, 1836) IST 6374	2.3	1.2	7	0.5
<i>S. trilineata andagavensis</i> n. subsp.				
IST 2519	6.8	1.7	14	incomplete
IST 6375	6.6	1.6	13	0.5
<i>S. turritissima</i> SACCO, 1895				
IST 6382	2.7	1.1	8 (incomplete)	incomplete
<i>S. crassicincta</i> SACCO, 1895				
IST 6380	4.6	1.2	11	0.5
IST 6381	3.1	1.2	9	0.4
<i>S. suttonensis</i> n. sp.				
IST 6373	6.6	1.6	11.5	0.9
IST 6371	3.2	1.1	7.5	0.7
<i>S. sancticlementi</i> n. sp.				
IST 6376	6.3	1.7	10	0.6
IST 6377	3.8	1.4	8	0.5
IST 6378	7.5	1.5	10	0.6
IST 6379	2.2	1.0	5.5	0.8

Seila (Cinctella) trilineata trilineata (PHILIPPI, 1836)

Plate 1, Fig. 1

- * .1836 — *Cerithium trilineatum* - PHILIPPI, p. 195, pl. 2, fig. 13, 13a.
 .1964 — *Seila trilineata* (Philippi, 1836) - TEMBROCK, p. 330, pl. 5, fig. 1.
 .1990 — *S. trilineata* (Philippi, 1836) - ROLÁN & FERNANDES, p. 23, fig. 22.

Type material: lectotype in Museum für Naturkunde, Berlin; figured by TEMBROCK (1964).

Type locality: Isle of Pantelleria, South of Sicily, Italy.

Stratum typicum: Recent.

Dimensions: see Table 1.

Material studied: see Table 2.

Original description: “*C. testa minuta, subulato-turrita, anfractibus planis, cingulis tribus obtusus, laevibus, interstitiis lineolis longitudinalibus tenuissimis sculptis, canali brevissimo*”.

Description: Shell small, turriculate. Whorls strongly flattened, suture marked only by a very weak depression and consequently almost invisible. Oldest whorls quickly increasing in size, younger ones more slowly. Apical angle about 20°. Protoconch consisting of two and a quarter smooth whorls. First and part of second whorl tumid, last part less so. Protoconch and teleoconch not sharply delineated. Teleoconch sculpture beginning with a weak central spiral, closely followed by an abapical spiral. Third adapical spiral appearing last, half a whorl after the middle one. This spiral remains slightly weaker than both abapical ones on the first teleoconch whorl. Spirals become equally strong on teleoconch. Adult sculpture consisting of three equal spiral ribs, one third as wide as the deeply incised intercostal spaces. Two additional spirals present on body whorl; a fourth at the periphery only slightly weaker than the three main spirals; a very weak fifth appears on the shell base. Between the spiral ribs, much weaker but clearly visible opisthocline axial ribs are present, on the middle whorls about 50 in number, continuous on the spiral ribs. Shell base slightly concave and smooth, with exception of the fifth spiral; aperture small, quadrangular; siphonal canal very short.

Discussion: The lectotype of *Seila trilineata* (PHILIPPI, 1836) was figured by TEMBROCK (1964). This specimen is incomplete and lacks the last whorl(s) and protoconch. Consequently, PHILIPPI'S name will always remain uncertain as the protoconch is of primary importance in distinguishing species of this genus. Furthermore the original description can be applied to nearly all species of the genus *Seila*. ROLÁN & FERNANDES (1990) figured a Recent specimen of *S. trilineata* from Sicily with a smooth protoconch with less than three whorls, as observed in the material studied here. Two authors recorded the presence of *S. trilineata* (PHILIPPI, 1836) in Miocene deposits of the North Sea basin. ANDERSON (1960, p. 65) mentioned the existence of Miocene specimens from the Hemmoor Stufe, Middle Miocene from Behrendorf (Schleswig-Holstein, Germany) as “*Seila (Seila) trilineata* (Philippi 1836)”. R. JANSSEN (1978a, p. 63)

described the protoconch of these specimens as high and pointed, with coarse ribs and ascribed them to the genus *Cerithiella* VERRILL, 1882 rather than to *Seila*. The sinistral specimens from the Miocene Antwerp Sand Member from Antwerp (Fort Herentals, Belgium), mentioned by GLIBERT (1952) do not belong to *S. trilineata* as the spiral ribs are unequal in strength and lack axial lines. Both specimens are too fragmentary to describe, but they belong undoubtedly to a species of the family Triphoridae, related to *Inella vandermarki* MARQUET, 1996. Four fragments without protoconchs of a dextral species, related to *Seila* but without axial sculpture from Antwerp (Kennedytunnel), Edegem Sand (Berchem Fm.), Lower Miocene, are present in the NNM collection (no. RGM 182.543, 117.220). They could be related to the Upper Oligocene species *Cerithiella (C.) bitorquata* (PHILIPPI, 1843), described from Germany, in which the axial sculpture fades in the last whorls or to *Seila (Hebeseila) clementi* n. sp., which always lacks axial ribs. Therefore none of the North Sea Basin Miocene records can be attributed to *S. trilineata*.

Mediterranean Miocene records of *S. trilineata* (PHILIPPI, 1836) are doubtful. SACCO (1895) described a number of species and varieties from Italy. No protoconchs belonging to the types of these species are known. *S. (C.) crassicincta* SACCO, 1895 is distinct from *S. trilineata*: having heavier spiral sculpture, a relatively broader shell and finer axial sculpture. *S. turrella* var. *taurotransiens* SACCO, 1895 (pl. 3, fig. 19) and *S. infrapercincta* SACCO, 1895 (pl. 3, fig. 95) differ from *S. trilineata* by having more than three spirals on the middle teleoconch whorls; the first of these species could belong to a genus other than *Seila*.

Paratethys Miocene records seem to belong to *S. turritissima* SACCO, 1895.

Seila (Cinctella) trilineata andagavensis n. subsp

Plate 1, Fig. 2

- * .1949 — *Seila (Seila) trilineata* PHILIPPI, sp. 1836 - GLIBERT, p. 155, pl. 10, fig. 10.

Type material: Holotype in IRScNB IST 6375.

Type locality: Saint-Clément-de-la-Place (Ferme Le Grand-Chauvereau), dept. Maine-et-Loire, Anjou, France.

Stratum typicum: Redonian, Upper Miocene.

Derivatio nominis: after the region of Anjou.

Dimensions: see Table 1.

Material studied: see Table 2.

Diagnosis: A subspecies of *Seila (Cinctella) trilineata* (PHILIPPI, 1836) with nearly three smooth protoconch whorls, first teleoconch spiral starting abapically; three thick spiral ribs and about 40 weak teleoconch axial ribs present on the middle teleoconch whorls; two additional spirals appear on the last whorl.

Description: Shell small, turriculate, slowly and regularly broadening, with 14 whorls in adult specimens. Apical angle 20°. Protoconch consisting of nearly three smooth whorls. Nucleus and first whorl rather tumid, remaining whorls flat. Teleoconch sculpture starting with an abapi-

Table 2 — Material studied. Collections: IRScNB IST: Institut royal des Sciences naturelles de Belgique, Invertébrés du Secondaire et du Tertiaire, Brussels, Belgium; RGM: National Museum of Natural History Naturalis (formerly Rijksmuseum voor Geologie en Mineralogie), Leiden, The Netherlands; AJ: A. Janse; RM: R. Marquet.

Species	Locality, stratigraphy and number of specimens	Collection
<i>Seila selsoifensis</i> n. sp.	Selsoif (quarry in Marais de la Sensurière), dept. Manche, France. Grand -Marais Fm., Tiglian C4, Pleistocene. 2 sp.	IRScNB IST 6383 (holotype), 6384 (paratype)
	Same. 2 sp.	NNM 394.128
	Same. 68 sp.	RM
	Same. 1 sp.	AJ
<i>Seila t. trilineata</i> (PHILIPPI, 1836)	Same. About 300 sp.	NNM
	Siracusa, Sicily, Italy. Recent. 1 sp.	IRScNB IST 6374
<i>Seila trilineata andagavensis</i> n. subsp.	Velerin Antena, Estepona, pr. Málaga, Spain.	RM
	Zanclian, L. Pliocene. 2 sp.	
	St.-Clément-de-la-Place (Ferme le Grand-Chauvère), dept. Maine-et-Loire, Anjou, France.	IRScNB IST 6375 (holotype)
	Redonian, U. Miocene. 1 sp.	
	Same. 16 sp.	RM
	Same. 24 sp.	RGM
	Sceaux-d'Anjou (Ferme La Presselière), dept. Maine-et-Loire, Anjou, France. Redonian, U. Miocene. 10 sp.	RM
	Ferrière-Larçon, dept. Indre-et-Loire, France.	IRScNB IST 2519 (paratype)
	Pontilevian, M. Miocene. 1 sp.	IRScNB
	Same. 16 sp.	RM
	Same (quarry on D66). 4 sp.	RM
	Thenay (Moulin de Charenton), dept. Loire-et-Cher, France. Pontilevian, M. Miocene. 1 sp.	RM
	Thenay (Carrière du Mincé), dept. Loire-et-Cher, France. Pontilevian, M. Miocene. 1 sp.	RM
	Pauvrely, dept. Indre-et-Loire, France. Pontilevian, M. Miocene. 25 sp.	IRScNB
	Same (quarry on D99). 1 sp.	RM
	Amberre (Moulin Pocha), dept. Vienne. Pontilevian, M. Miocene. 1 sp.	RM
	Manthelan, dept. Indre-et-Loire, France.	IRScNB
	Pontilevian, M. Miocene. 14 sp.	
	Pontlevoy, dept. Indre-et-Loire, France. Pontilevian, M. Miocene. 4 sp.	IRScNB
	St.-Catherine-de -Fierbois, dept. Indre-et-Loire, France. Pontilevian, M. Mioc. 90 sp.	IRScNB
	Bossée, dept. Loire-et-Cher, France. Pontilevian, M. Mioc. 12sp.	IRScNB
<i>Seila turritissima</i> SACCO, 1895	Borsodbóta, Borsod-Abay-Zemplon Megye, Hungary. Badenian, M. Miocene. 1 sp.	IRScNB IST 6382
	Same. 5 sp.	RM
	Várpalota (Szabo Banya), Veszprém Megye, Hungary. Badenian, M. (?) Miocene. 6 sp.	RM
	Korytnica (Lysi Gora), Holy Cross Mountains, Poland. Lower Badenian, M. Miocene. 4 sp.	RM
	Mikulov (Kienberk), S. of Brno, Czech Republic. Badenian, M. Miocene. 1 sp.	RM
<i>Seila crassincta</i> SACCO, 1895	St.-Martin -d'Oney (quarry on D365), dept. Landes, France. Falun de St. Avit, Aquitanian Fm. L. Miocene. 2 sp.	IRScNB IST 6380, 6381
	Same. 29 sp.	RM
	Saucats (La Coquillière), dept. Gironde, France. Falun du Pont Pourquey. Burdigalian, L. Miocene. 2 sp.	RM
	Saubrigues (La Faurie sous Bel-Air), dept. Landes, France. Marne de Saubrigues, Burdigalian, L. Miocene. 1 sp.	IRScNB
	<i>Seila suttonensis</i> n. sp.	Sutton, East Anglia, United Kingdom. Coralline Crag, L. Pliocene. 2 sp.
Same. 23 sp.		IRScNB
Kallo (Vrasenedok), Oost-Vlaanderen, Belgium. Kattendijk Fm., L. Pliocene. 1 sp.		IRScNB IST 6275
Doel (Deurganckdok), B. Luchtbal Sand. 3 sp.		RM
<i>Seila sancticlementi</i> n. sp.	St.-Clément-de-la-Place (Ferme le Grand Chauvère), dept. Maine-et-Loire, Anjou, France.	IRScNB IST 6376 (holotype), 6377, 6378, 6379 (paratypes)
	Redonian, U. Miocene. 4 sp.	
	Same. 34 sp.	RGM
	Same. 8 sp.	RM
	Sceaux-d'Anjou (Ferme La Presselière), dept. Maine-et-Loire, Anjou, France. Redonian, U. Miocene. 2 sp.	RM

cal spiral, quickly followed by a middle and an adapical one, which are equally strong from the onset. Axial sculpture appears nearly a whorl later. Adult sculpture consisting of three equally strong spirals on each whorl; on the body whorl a fourth, equally strong spiral is present on the abapical periphery and a much weaker fifth spiral lies on the shell base, very close to the fourth. Spirals as broad or broader than the relatively shallow intercostal areas. Forty fine axial ribs present on the body whorl, extending to the fifth spiral. Shell base convex, smooth; aperture nearly square; siphonal canal very short.

Discussion: *Seila* (*C.*) *trilineata andagavensis* n. subsp. is very similar to *S. (C.) t. trilineata* (PHILIPPI, 1836), but has a slightly larger protoconch. The teleoconch sculpture, however, differs in the new subspecies: the spirals are broader, the axials weaker and the first spiral to appear is the abapical instead of the middle one. *S. (C.) turritissima* SACCO, 1895 from the Paratethys Miocene differs by its narrower spirals and heavier axials; the protoconch consists of five instead of three whorls. *S. (C.) crassincincta* SACCO, 1895, found in the Italian and Aquitanian (SW France) Miocene, has more flattened protoconch whorls, the shell is relatively broader, the spirals are slightly more widely spaced and the axials are much weaker and farther apart than in the new subspecies.

S. infrapercincta SACCO, 1895 (Italian and Aquitanian Miocene) differs in having four middle teleoconch spirals and six on the last whorl. *S. cyrtogyra* (COSSMANN & PEYROT, 1921) (Miocene of Aquitaine) is very narrow, with tumid whorls and equally strong axials and spirals. *S. cabanacensis* (COSSMANN & PEYROT, 1921) (Miocene of Aquitaine) has finer axial sculpture and spirals of unequal strength.

The specimens studied from Touraine (W. France) are all more or less eroded, none having a complete protoconch. The specimen with the best preservation, number IST 2519, was figured by GLIBERT (1949). It has at least two smooth protoconch whorls, but the top whorl(s) is missing. However, the preservation of the Redonian material studied is nearly perfect. Several specimens possess a complete protoconch.

***Seila (Cinctella) turritissima* SACCO, 1895**

Plate 1, Fig. 4

- .1855 — *Cerithium trilineatum* Phil. - HÖRNES, p. 413, pl. 42, fig. 19 (non PHILIPPI).
- * .1895 — *Seila dertotrilineata* Sacc. forma *turritissima* Sacc. - SACCO, p. 73.
- .1955 — *Seila trilineata* Philippi, 1836 - STRAUZ, p. 209, pl. 10, fig. 181 (not 182) (non PHILIPPI).
- .1966 — *Seila trilineata* Philippi, 1836 - STRAUZ, p. 167, pl. 5, fig. 22, 24 (non PHILIPPI).
- .1970 — *Seila trilineata* Philippi - MEZNERICS, p. 21, pl. 3, figs. 28-29 (non PHILIPPI).
- .1975 — *Seila (Seila) trilineata* (Philippi, 1836) - BAŁUK, p. 166, pl. 20, figs. 8-11 (non PHILIPPI).

Type material: Syntypes in the former «Sammlung des k.k. Hof-Mineralien-Cabinet und k.k. Geologischen Reichsanstalt» (Naturhistorisches Museum Wien and Geologische Bundesanstalt Wien, Austria).

Type locality: Steinabrunn, Vienna basin, Austria.

Stratum typicum: Badenian, Miocene.

Dimensions: see Table 1.

Material studied: see Table 2.

Original description: “*C. testa minuta, cylindracea-subulata; anfractibus planis, cingulis tribus, acutis, interstitiis lineolis longitudinalibus tenuissimis sculptis; canali brevissimo*” (HÖRNES, 1855).

Description: Shell small, turriculate with an apical angle of about 20°. Protoconch with five smooth, flattened whorls. Teleoconch sculpture of three closely set spiral ribs from the onset, one third as wide as the deep intercostal areas which have about 40 prominent, closely set, axial ribs, not extending onto the spirals. Shell base with two additional spiral ribs, with a nearly square aperture and a short siphonal canal.

Discussion: SACCO (1895) renamed “*Cerithium trilineatum*” of HÖRNES (1855) as “forma *turritissima*” of his *Seila dertotrilineata*. HÖRNES (1855), however, in characterising the species, almost copied PHILIPPI’S (1836) description of *S. trilineata*: he called the shell shape “*cylindracea*” instead of “*turrita*” and the ribs “*acutis*” instead of “*obtusis*”. SACCO (1895) changed the name, but added nothing to the description. BAŁUK (1975) gave, under the name *Seila trilineata* (PHILIPPI, 1836) an adequate description of the species under discussion; he also figured a specimen with a complete protoconch, not present in our studied material. The differences between *S. trilineata* and *S. turritissima* are small indeed, but the protoconch composed of five smooth whorls forms a clearly distinctive characteristic. Teleoconch differences are small: only the start of the spiral sculpture differs. The teleoconch spirals start nearly together in *S. turritissima*, while the middle one in *S. t. trilineata* and the adapical one in *S. t. andagavensis* start earlier than both other spirals. COSSMANN & PEYROT (1921) cited the narrow apical angle as the most distinctive feature of *S. turritissima*. In the Polish material studied by BAŁUK (1975) and by the present author, narrow as well as broader specimens occur together, with intermediate specimens, invalidating apical angle as a species characteristic. COSSMANN & PEYROT (1921, p. 298, pl. 7, figs. 77-78) mentioned the occurrence of *S. turritissima* in Lower Miocene of the Aquitaine (SW France). However, they based their statement solely on the shell diameter, not on protoconch characteristics. So the occurrence of this species outside the Paratethys remains unproven.

Hungarian specimens from Borsodbóta were figured by MEZNERICS (1970), with reference to HÖRNES (1855). Although no specimen with an intact protoconch was found by MEZNERICS, nor by the present author, they probably belong to *Seila turritissima* SACCO, 1895 as at least three smooth whorls of the protoconch remain and the teleoconch sculpture agrees with the Polish material. The same applies for specimens from Várpalota, figured by STRAUZ (1955, fig. 181). A sinistral shell figured in the same paper, fig. 182, possesses only two protoconch whorls. It belongs, as does GLIBERT’S (1952) Belgian records of sinistral *Seila*, to a species of the Triphoridae.

It is obvious that *S. (C.) turritissima* SACCO, 1895 and *S. (C.) trilineata* (PHILIPPI, 1836) are very closely related, differing mainly in the number of protoconch whorls. Both could form an evolutionary lineage, starting in the Paratethys and spreading later into the Mediterranean and the Atlantic, but not reaching the North Sea basin.

Seila (Cinctella) crassicineta SACCO, 1895

Plate 1, Fig. 3, 5

- * .1895 — *Seila trilineata* var. *crassicineta* - SACCO, p. 73, pl. 3, fig. 94.
- * .1895 — *Seila dertotrilineata* - SACCO, p. 73, pl. 3, fig. 96.
- .1895 — *Seila dertotrilineata* var. *conicina* - SACCO, p. 73, pl. 3, fig. 97.
- .1895 — *Seila dertotrilineata* var. *subacostillata* - SACCO, p. 73, pl. 3, fig. 98.
- .1921 — *Newtoniella (Seila) trilineata* Phil.; var. *crassicineta* Sacco - COSSMANN & PEYROT, p. 300, pl. 7, fig. 57-60, 92.
- .1984 — *Seila dertotrilineata* Sacco, 1895 - FERRERO MORTARA *et al.*, p. 206, pl. 37, fig. 15.

Type material:

Seila crassicineta: Lectotype in Museo Regionale di Scienze Naturali, Torino BS.048.04.001.

S. dertotrilineata: Paralectotype in Museo Regionale di Scienze Naturali, Torino BS.048.04.003.

Type locality: SACCO (1895, p. 73) mentioned Montegibbio, near Modena, Italy as locality for *Seila crassicineta*. The specimen he figured on his pl. 3, fig. 94 however originates from "colli Torinesi" (hills around Torino). Also FERRERO MORTARA *et al.* (1984) quote "colli Torinesi" as type locality.

Stratum typicum: "Helvetian", Miocene (for "colli Torinesi").

Dimensions: see Table 1.

Material studied: see Table 2.

Original diagnosis:

Seila dertotrilineata: "Distinguunt hanc speciem a *S. trilineata* (Phil.) sequentes notae: Testa crassior. Cingula crassiora, latiora, inter se propinquiora; sub quarto cingulo cingulellum depressum circumbasale conspicitur; sulci transversi parvuliores; costicillae longitudinales minus visibiles vel suboblitae".

Seila crassicineta: "Cingula transversa aliquantum crassiora, deinde sulci transversi minus ampli".

Description: Shell small, turriculate, broad for genus with an apical angle of 25°. Whorls gently increasing in size. Suture indistinct. Protoconch often sharply delimited from teleoconch. An outgrowth of protoconch covers part of the teleoconch in some specimens. This outgrowth can also be very thin and inconspicuous. Number of protoconch whorls consequently variable, between 2 and 3 1/4, depending on the extent of the outgrowth. Protoconch whorls rather flattened with deep sutures. Microsculpture of granules can be observed on the nucleus of well preserved specimens. Adult sculpture consists of three rather broad spiral ribs, about half the width of the shallow intercostal spaces. Abapical rib starting slightly earlier than the other two. On the body whorl, two additional ribs are present. Axial sculpture of very fine, widely spaced

lines, starting later than spiral sculpture, consisting of about 30 lines per whorl mid shell. Shell base concave; siphonal canal short; aperture square.

Discussion: *Seila trilineata* var. *crassicineta* SACCO, 1895, *S. dertotrilineata* SACCO, 1895, *S. dertotrilineata* var. *conicina* SACCO, 1895 and *S. dertotrilineata* var. *subacostillata* SACCO, 1895, which occur together in Montegibbio, are barely distinguishable as already commented by SACCO: "l'esagerazione dei caratteri della var. *crassicineta* porta alla *S. dertotrilineata*". Neither could COSSMANN & PEYROT (1921) distinguish between *crassicineta* and *trilineata* in their Aquitaine material.

S. crassicineta clearly differs from *S. trilineata* (PHILIPPI, 1836) by its flat protoconch whorls, which are clearly separated from the teleoconch, relatively broader shell, heavier spiral sculpture, shallower intercostal spaces and much finer and more widely spaced axial ribs. Because of its special ontogeny, *S. crassicineta* is given here full species status. It is unusual to nearly impossible to find in the same gastropod species specimens with different numbers of protoconch whorls (BOUCHET, 1989). In this case however, the variability is caused by an outgrowth of the protoconch sculpture, after the onset of the teleoconch. So it is not a case of poecilogony.

Subgenus *Hebeseila* FINLAY, 1927

Type species by original designation: *Seila bulbosa* SUTER, 1908.

Seila (Hebeseila) suttonensis n. sp.

Plate 1, Fig. 6

- .1848 — *Cerithium trilineatum* Phil. - WOOD, p. 70, pl. 8, fig. 4 (non PHILIPPI).
- .1918 — *Newtoniella (Seila) trilineata* (Philippi) - HARMER, p. 424, pl. 41, fig. 24 (non PHILIPPI).
- v .1948 — *Seila (S.) turritissima* Sacco, 1895 - BEETS, p. 46, pl. 3, fig. 2 (non SACCO).
- v .1958 — *Seila trilineata* Philippi, sp. 1836 - GLIBERT, p. 8 (non PHILIPPI).
- v .1965 — *Seila trilineata* (Philippi, 1836) - VAN REGTEREN ALTENA *et al.*, p. 18, pl. 6, fig. 65 (non PHILIPPI).
- v .1997 — *Seila trilineata* (Philippi, 1836) - MARQUET, p. 83, pl. 5, fig. 3 (non PHILIPPI).
- v .1998 — *Seila trilineata* auct. non Philippi, 1836 - MARQUET, p. 110, text-figs. a-e.

Type material: Holotype in IRScNB IST 6373, paratype IRScNB IST 6371.

Type locality: Sutton, East Anglia, United Kingdom.

Stratum typicum: Coralline Crag, Lower Pliocene.

Derivatio nominis: after the type locality Sutton.

Dimensions: see Table 1.

Material studied: see Table 2.

Generic and subgeneric attribution: *Seila suttonensis* belongs to the genus *Seila* because of its general shape and sculpture. The subgenus *Hebeseila* FINLAY, 1927 is characterised by flat-sided teleoconch whorls, more or less equal spiral ribs, absence of additional spirals before the last whorl and highly sculptured protoconch of lecithrophic embryo. Already MARSHALL (1978) noted the

resemblance between WOOD's (1848) figure of the protoconch of "*Seila trilineata*" (= *S. suttonensis*) and that of the type species of *Hebeseila*.

Diagnosis: A *Seila* (*Hebeseila*) species with a protoconch consisting of two tumid whorls, ornamented with heavy axial ribs; teleoconch with three spirals (four on last whorl) and clear, very fine axial lines between the spirals.

Description: Shell high, turriculate, slowly increasing in diameter with an apical angle 15°. Whorls very slightly convex, nearly flat, suture not depressed and barely distinguishable. Protoconch paucispiral, consisting of two tumid whorls. Nucleus smooth. Protoconch sculpture of fifteen axial ribs, starting after 1/4 whorl, 1/3 as broad as the intercostal areas, much stronger than the teleoconch axial striae. The transition to the teleoconch is gradual, not sharply marked. Two spiral ribs appear adapically on the last protoconch whorl; these spirals gradually turn towards the abapical suture. Axial ribs become weaker so that on 1/4 of a whorl a reticulate sculpture is present with equally strong axials and spirals. At the end of the transition, the axials have disappeared, the two original spirals are lying abapically and a weaker third spiral appears adapically. Adult sculpture consisting of three equally strong spiral ribs, square in cross section, as broad as the intercostal spaces on the older whorls and slightly narrower on the youngest whorl. The adapical spiral lies against the suture, the abapical one at some distance from the lower suture. Axial sculpture of numerous, slightly irregularly oriented lines, much weaker and not continuous over spirals, sometimes divided in two by a very narrow furrow. Axial lines curved between upper and middle spiral and between abapical spiral and suture, orthocline between middle and abapical spiral, extending up to a fourth weaker spiral rib, present on the periphery of the body whorl. Base smooth, convex; aperture oval; siphonal canal short.

Discussion: This species differs from *Seila* (*C.*) *trilineata* (PHILIPPI, 1836) by its protoconch, which is smooth in *S. trilineata*, and by the presence of four instead of five spirals on the last teleoconch whorl in *S. suttonensis*. The same characteristics distinguishes it from other species of the subgenera *Cinctella* and *Seila*. The Recent New Zealand species *S. (Hebeseila) bulbosa* (SUTER, 1908) has a nearly smooth protoconch, *S. (H.) regia* MARSHALL, 1978 has more (2 1/2 to 3) protoconch whorls, with very variable sculpture and a very fine fifth rib appearing on the last teleoconch whorl. None of the Recent Atlantic *Seila* species studied by ROLÁN & FERNANDES (1990) has a protoconch with the typical heavy sculpture of the subgenus *Hebeseila*. WOOD (1848) already figured a well preserved protoconch of this species, but probably lacked comparative material of true *S. trilineata*. His figure is not erratic, as ANDERSON (1960) believed. The species is very rare in the Pliocene of Belgium; only one complete specimen has been found until now, in the Lower Pliocene Luchtbal Sand Member in Doel, near Kallo, Oost Vlaanderen. Even rarer specimens were found in the Kattendijk Formation of Kallo.

Seila (Hebeseila) sancticlementi n. sp.

Plate 1, Fig. 7, Plate 2, Fig. 1

Type material: Holotype in IRScNB IST 6373, paratypes IRScNB IST 6377, 6378, 6379.

Type locality: Saint-Clément-de-la-Place (Ferme le Grand-Chauvureau), dept. Maine-et-Loire, Anjou, France.

Stratum typicum: Redonian, Upper Miocene.

Derivatio nominis: after the type locality Saint-Clément-de-la-Place.

Dimensions: see Table 1.

Material studied: see Table 2.

Generic and subgeneric attribution: This species is an exception within the genus *Seila* in lacking axial lines on the teleoconch. Its other shell characters, however, make an attribution to this genus probable. The definition of the genus should be enlarged to species without axial lines. It has the characteristic lecitrophic protoconch of the other *Hebeseila* species.

Diagnosis: A *Seila* (*Hebeseila*) species with a protoconch consisting of two tumid, carinate whorls, ornamented with strong axial ribs; axial sculpture lacking on the teleoconch.

Description: Shell small, turriculate, slender with two protoconch whorls. Apical angle 12°. Nucleus smooth, small, pointed or flat. Protoconch sculpture of eleven to sixteen strong opisthocline axial ribs, narrower than the intercostal spaces. An adapical carina is present on the first whorl, making this whorl angular. At the end of the first whorl, the carina descends and starts forming a spiral rib at one third below the adapical suture. The second protoconch whorl consequently becomes rounded instead of angular. The spiral rib is soon joined by a second abapically. Some specimens show faint spiral sculpture on the protoconch whorls. Axial ribs become fainter and more widely spaced until they disappear at the end of the protoconch. First teleoconch whorl narrower than preceding protoconch whorl, sculptured with only two spirals. A third spiral starts at the end of this whorl at the adapical suture. Sculpture on the penultimate teleoconch whorl consists of three narrow spiral ribs, square in cross-section and at most half as wide as the intercostal spaces. One additional spiral rib present just below the periphery of the body whorl. No axial sculpture on teleoconch. Suture marked by a narrow but clearly delimited depression. Aperture rounded, with a relatively long, strongly curved siphonal canal.

Discussion: *Seila* (*H.*) *sancticlementi* n. sp. differs clearly from *S. (Cinctella) trilineata* (PHILIPPI, 1836) and the other *Seila* (*Seila*) and *Seila* (*Cinctella*) species by its axially sculptured angular protoconch and the absence of axial ornament on the teleoconch. *S. sancticlementi* n. sp. differs from *S. suttonensis* n. sp. by possessing a carinate protoconch and by the absence of teleoconch axial sculpture. This latter character differentiates it also from *S. (Hebeseila) bulbosa* SUTER, 1908 and *S. (H.) regia* MARSHALL, 1978. The protoconch of *S. sancticlementi* is rather variable in sculpture, but not in the number of

whorls. The number of axial ribs, the development of the carina and the form of the nucleus show a large variability, which falls, however, within the range of that of other Cerithiopsidae, especially that of other *Hebeseila* species as discussed by MARSHALL (1978, p. 101, fig. 19) under *S. (H.) regia*.

Subgenus unknown

***Seila infrapercincta* SACCO, 1895**

- * .1895 — *S. trilineata* var. *infrapercincta* Sacc. - SACCO, p. 73, pl. 3, fig. 95.
 .1919 — *Cerithiopsis (Seila) trilineata* var. *infrapercincta* Sacco - VIGNAL, p. 185, pl. 9, fig. 45.
 .1921 — *Newtoniella (Seila) trilineata* (Phil.); mut. *infrapercincta* Sacco - COSSMANN & PEYROT, p. 300, pl. 5, figs. 84-85.
 .1984 — *Seila trilineata* (Philippi, 1836) var. *infrapercincta* Sacco, 1895 - FERRERO MORTARA *et al.*, p. 206.

Type locality: "Colli torinesi" (hills around Torino), Italy.

Stratum typicum: "Helvetian", Miocene.

Discussion: This species possesses, from about half height onward, a fourth spiral rib, which divides off the adapical spiral. On the body whorl, four normal spirals, one peripheral and one below the periphery are present. Most authors have considered it as simply a variety of *S. trilineata*, but its peculiar sculpture could make it a full species, should more complete material become available.

***Seila cyrtogyra* (COSSMANN & PEYROT, 1921)**

- * .1921 — *Newtoniella (Seila) cyrtogyra* - COSSMANN & PEYROT, p. 301, pl. 7, fig. 3.

Type locality: Saint-Morillon (Le Planta), dept. Landes, Aquitaine basin, France.

Stratum typicum: Aquitanian Stage, Lower Miocene.

Discussion: This is a small species, with an apical angle of 12° to 15°, tumid whorls and heavy axials, which form a reticulate pattern with the equally strong spirals. Only the holotype is known, which lacks a protoconch.

***Seila cabanacensis* (COSSMANN & PEYROT, 1921)**

- * .1921 — *Newtoniella (Seila) cabanacensis* - COSSMANN & PEYROT, p. 302, pl. 7, fig. 88-89.

Type locality: Cabanac (Pouquet), dept. Landes, Aquitaine basin, France.

Stratum typicum: Aquitanian Stage, Lower Miocene.

Discussion: This is a small species, with a slightly broader shell (15° to 18°) and very flat whorls. Sculpture of closely packed, very fine axials and three spiral ribs of differing strength.

Genus ***Paraseila*** LASERON, 1951

Type species by original designation: *Paraseila heronensis* LASERON, 1951.

Paraseila adela (BOETTGER, 1902)

- * .1902 — *Cerithiopsis adela* - BOETTGER, p. 129.
 .1907 — *Cerithiopsis adela* Bttgr. - BOETTGER, p. 146.
 .1934 — *Cerithiopsis adela* Boettger - ZILCH, p. 222, pl. 8, fig. 40.

Type locality: Kostej (Parau ungurului), Banat, Romania.

Stratum typicum: Badenian Stage, Middle Miocene.

Discussion: The typical rounded instead of cylindrical shell shape, the indistinct suture and the closely packed spiral sculpture, with a large number of axial ribs in the intercostal spaces, make it clear that this species belongs to the genus *Paraseila* LASERON, 1951, which was first described from Australian material. The protoconch of BOETTGER's species is still unknown.

Conclusions

The following species of the subfamily Seilinae have been recorded from the European Neogene and are discussed in this paper:

- Seila (S.) selsoifensis* n. sp.; Pleistocene, Atlantic;
S. (Cinctella) trilineata trilineata (PHILIPPI, 1836) - Pliocene to Recent, Mediterranean;
S. (Cinctella) trilineata andagavensis n. subsp. - Upper Miocene, Atlantic;
S. (Cinctella) turritissima SACCO, 1895 - Middle Miocene, Paratethys;
S. (Cinctella) crassincincta SACCO, 1895; Lower and Middle Miocene, Atlantic and Mediterranean;
S. (Hebeseila) suttonensis n. sp. - Lower Pliocene, North Sea basin;
S. (Hebeseila) sancticlementi n. sp. - Upper Miocene, Atlantic;
S. infrapercincta SACCO, 1895 - Lower and Middle Miocene, Atlantic and Mediterranean;
S. cyrtogyra (COSSMANN & PEYROT, 1921) - Lower Miocene, Atlantic;
S. cabanacensis (COSSMANN & PEYROT, 1921) - Lower Miocene, Atlantic.
Paraseila adela (BOETTGER, 1902) - Middle Miocene, Paratethys.

All *Seila* species studied here have a limited geographic and stratigraphic distribution. Their habitats vary considerably. *S. (S.) selsoifensis* n. sp. is found in material dredged from a sand pit, so its exact habitat is unknown. Together with it a number of species seem to be found, which usually point to a rather cold climate, such as *Acila cobboldiae* (J. SOWERBY, 1817). The sediment is gravel, probably deposited near shore, because of the presence of different species and large numbers of Fissurellidae and Patellidae. *S. (C.) t. trilineata* (PHILIPPI, 1836) is found at Velerin Antena in a Lower Pliocene thermophile, very

diverse fauna; at small distances, gravel, coarse sand and clayey sand occur. The few *Seila* specimens collected were found in the clayey sand, lying locally on top of a thick gravel deposit. All localities with *S. (C.) trilineata andagavensis* n. subsp. and *S. (H.) sancticlementi* n. sp. have a fauna, typical for a warm climate, with a shallow water very diverse molluscan fauna in gravel. *S. (C.) turritissima* SACCO, 1895 was collected in shallow warm water deposits, rocky in Borsodbóta and Várpalota (the latter very shallow), clayey in Korytnica, sandy gravel, in Mikulov. *S. (C.) crassicineta* SACCO, 1895 occurred in Saint-Martin-d'Oney in warm water (with reef forming corals), rather shallow and with a gravel substrate, in slightly colder water (without reefs) on sandy soil in Saucats and in deep water with clay deposition in Saubrigues. *S. (H.) suttonensis* n. sp. was found in Kallo in the Kattendijk Formation in deep water, on rather coarse sandy sediment, together with cold/deep water species such as *Trophonopsis barvicensis* (JOHNSTON, 1825). This is the only fauna studied, which was deposited without transport. *S. (H.) suttonensis* continued in larger numbers in the Luchtbal Sand of Doel, which in its deposition features and fauna comes very close to the British Coralline Crag. Both deposits point to a warmer, shallower environment with finer sand than that of the Kattendijk Formation, with large numbers of bryozoa and a very large majority of Bivalve specimens.

Consequently, the general characteristics of the environment, such as climate, substrate and water depth do not seem to limit the distribution of the genus *Seila* nor that of its individual species. Biotic factors and microhabitat however are difficult to assess from the thanatocoenoses studied, because only one of the localities (Kallo) contains material not affected by transport. This locality seemed to be only a marginal habitat for *Seila*, while only one specimen was collected, so it is not very instructive.

The species *Seila (S.) selsoifensis* n. sp., *S. (Hebeseila) suttonensis* n. sp., *S. (H.) sancticlementi* n. sp. and *Paraseila adela* (BOETTGER, 1902), recorded from the European Neogene, are included here in subgenera and genera, originally described from the Pacific. This certainly does not point to a disjunct distribution: the intermediate areas in the Indian Ocean and the Pacific have not been sufficiently sampled to cover the entire micro-molluscan fauna. ROLÁN & FERNANDES (1990) described five new and two already named Recent species of the genus *Seila* from West Africa. All these species, except one, have a smooth protoconch, showing in some cases a sculpture of microgranules; these however erode too easily to compare with fossil forms. *S. dearata* ROLÁN & FERNANDES, 1990 has a smooth, but carinate protoconch, which shows some resemblance to the genus *Lyroseila* FINLAY, 1928. All other West African species have a protoconch, reminiscent of *Cinctella*, which seems to be a mainly European-Atlantic subgenus and could form an evolutionary lineage. The main difference between *Cinctella* and *Notoseila* FINLAY, 1927 is, according to MARSHALL (1978), that *Notoseila* has a planctotrophic instead of a lecithotrophic larval development. This is however by no means a generic or subgeneric character, while the strongly similar Miocene and Pliocene European species of *Cinctella* show a number of whorls between

two and a half and five. *Notoseila* has been recorded from the German Upper Oligocene (Chattian), represented by the species *Seila (Notoseila) koeneni* R. JANSSEN, 1978. This could be the oldest species of the *Cinctella* lineage in Europe, with at least six protoconch whorls, as figured in GRÜNDEL (1980, fig. 18). Therefore a gradual reduction in number of protoconch whorls seems to characterize this lineage. A reduction in the number of protoconch whorls seems to be an evolutionary trend present in several gastropod lineages, such as the Triphoridae and Cerithiopsidae (see MARQUET, 1996, 1998). This could be due in first instance to the isolation of the Pliocene North Sea basin, reducing the dispersion possibility of the species and promoting the evolution of endemic species. These were probably adapted to a narrow niche in the local environmental conditions, building stable ecosystems, in which competition between species was minimal. Their stratigraphic range was mostly short. Species surviving longer were probably not strictly adapted to a local niche and habitat, inhabiting a larger area and with better means of dispersal by the possession of a multispiral protoconch and a relatively long planctotrophic larval stage.

Seila (Hebeseila) suttonensis n. sp. and *S. (H.) sancticlementi* n. sp. show similar protoconch characteristics, strong enough to be closely related. The last species however lacks one of its diagnostic generic characters, the fine axial sculpture. In this way it superficially resembles the Upper Oligocene species *Cerithiella (C.) bitorquata* (PHILIPPI, 1843), as figured in R. JANSSEN (1978 a, b) (= *Cerithiella (C.) tristrepta* R. JANSSEN, 1978b). This species is however extraordinary variable in sculpture, ranging from specimens with heavy axial ribs to forms lacking all axial sculpture after the beginning of the teleoconch. *Seila (H.) sancticlementi* n. sp. is a much more uniform species, lacking always axial teleoconch sculpture. The protoconchs of both species are also clearly different, *C. bitorquata* having, according to R. JANSSEN (1978), a smooth first protoconch whorl and a second one with many closely packed sickle-shaped axial lines. The unusually large variability in teleoconch sculpture and in protoconch shape seems to be a general trend in the genus *Cerithiella* VERRILL, 1882. This can be observed in the illustrations of the type species of the genus, the Recent *C. metula* (LOVÉN, 1846) by BOUCHET & WARÉN (1993, figs. 1295-1310).

From the Italian Miocene and Pliocene, several *Cerithiella* species and varieties have been described by SACCO (1895) and illustrated by FERRERO MORTARA *et al.* (1984), which could form one variable species: *C. genei* (BELLARDI & MICHELOTTI, 1840), with the varieties *latefenestrata*, *graciliturrita*, *spiculina* and *pliotransiens* of SACCO (1895) and *C. paucicineta* SACCO, 1895. The protoconchs of a number of these forms however are still unknown, so their inclusion into one species is uncertain. The variability of *Cerithiella* is linked by R. JANSSEN (1978a, b) to the occurrence of populations in different environments and by BOUCHET & WARÉN (1993) to the existence of local populations with little genetic exchange due to the non-planctotrophic protoconch. Both explanations of course do not exclude each other. It seems that this plasticity in teleoconch sculpture is a genetic charac-

teristic of the genus, at least from Late Oligocene to Recent species. This isolation and genetic differentiation should lead to the formation of different species in due time.

In contrast to this extensive variability, *Seila* species tend to be extremely conservative in teleoconch sculpture, changing little between Oligocene and Recent, so that species are difficult to distinguish on shell characteristics. Evolution in *Seila* shell morphology seems mostly to affect the protoconch, with a diminution in the number of whorls. Consequently, two different modes of

evolution might have occurred in both closely related groups.

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Explanation of Plates

PLATE 1

- Fig. 1 — *Seila (Cinctella) t. trilineata* (PHILIPPI, 1836). Coll. IRScNB IST 6374. Siracusa, Sicily, Italy, Recent. a X 20, b protoconch apertural view, X 60, c protoconch 90° to the right of b X 60, teleoconch microsculpture X 60. All SEM photographs.
- Fig. 2 — *Seila (Cinctella) trilineata andagavensis* n. subsp. Holotype, coll. IRScNB IST 6375. Saint-Clément-de-la-Place (Ferme Le-Grand-Chauvereau), dept. Maine-et-Loire, Anjou, France, Redonian, Upper Miocene. a X 8, b protoconch apertural view, X 40, c protoconch 90° to the right of b, X 40. All SEM photographs.
- Fig. 3 — *Seila (Cinctella) crassincincta* SACCO, 1895. Coll. IRScNB IST 6380. Saint-Martin-d'Oney (quarry on D365), dept. Landes, France, Falun de Saint-Avit, Aquitanian Fm., Lower Miocene. a X 10, b protoconch apertural view, X 60, c protoconch 90° to the left of b, X 80, d protoconch microsculpture, X 280, e apical view, X 55, f teleoconch microsculpture, X 70. All SEM photographs.
- Fig. 4 — *Seila (Cinctella) turrissima* SACCO, 1895. Coll. IRScNB IST 6382. Borsodbóta, Borsod-Abay-Zemplon Megye, Hungary, Badenian, Middle Miocene. X 1.8. SEM photograph.
- Fig. 5 — *Seila (Cinctella) crassincincta* SACCO, 1895. Coll. IRScNB IST 6381. Saint-Martin-d'Oney (quarry on D365), dept. Landes, France, Falun de Saint-Avit, Aquitanian Fm., Lower Miocene. a protoconch 90° before apertural view, X 55, b same, X 110. All SEM photographs.
- Fig. 6 — *Seila (Hebeseila) suttonensis* n. sp. Holotype coll. IRScNB IST 6373. Sutton, East Anglia, United Kingdom, Coralline Crag Fm., Lower Pliocene. a X 8, b protoconch apertural view, X 50, c. protoconch 90° to the right of b, X 50, c protoconch 90° to the right of b, X 50, d teleoconch microsculpture, X 30, e apical view, X 28. All SEM photographs.
- Fig. 7 — *Seila (Hebeseila) sancticlementi* n. sp. Holotype coll. IRScNB IST 6376. Saint-Clément-de-la-Place (Ferme Le-Grand-Chauvereau), dept. Maine-et-Loire, Anjou, France, Redonian, Upper Miocene. a X 8, b protoconch apertural view, X 21, All SEM photographs.



PLATE 1

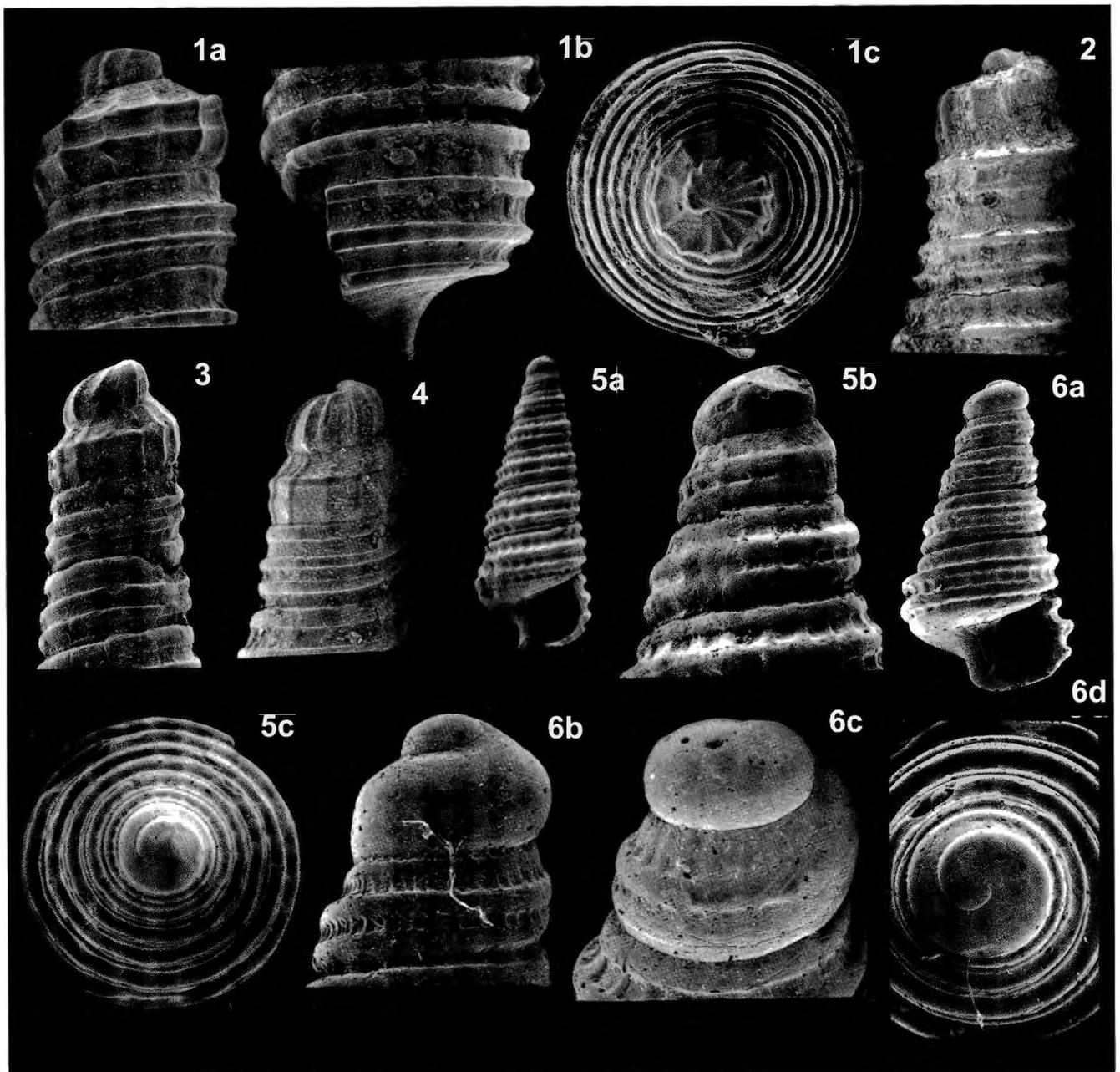


PLATE 2

- Fig. 1 — *Seila (Hebeseila) sancticlementi* n. sp. Holotype coll. IRScNB IST 6376. Saint-Clément-de-la-Place (Ferme Le-Grand-Chauvère), dept. Maine-et-Loire, Anjou, France, Redonian, Upper Miocene. a detail of protoconch 90° to the right of Pl. 1, Fig 7b, X 47, b last teleoconch whorl, X 28, c apical view, X 32. All SEM photographs.
- Fig. 2 — *Seila (Hebeseila) sancticlementi* n. sp. Paratype coll. IRScNB IST 6377. Saint-Clément-de-la-Place (Ferme Le-Grand-Chauvère), dept. Maine-et-Loire, Anjou, France, Redonian, Upper Miocene. Protoconch, X 47. SEM photograph.
- Fig. 3 — *Seila (Hebeseila) sancticlementi* n. sp. Paratype coll. IRScNB IST 6378. Saint-Clément-de-la-Place (Ferme Le-Grand-Chauvère), dept. Maine-et-Loire, Anjou, France, Redonian, Upper Miocene. Protoconch, X 33. SEM photograph.
- Fig. 4 — *Seila (Hebeseila) sancticlementi* n. sp. Paratype coll. IRScNB IST 6379. Saint-Clément-de-la-Place (Ferme Le-Grand-Chauvère), dept. Maine-et-Loire, Anjou, France, Redonian, Upper Miocene. Protoconch, X 33. SEM photograph.
- Fig. 5 — *Seila (S.) selsoifensis* n. sp. Holotype coll. IRScNB IST 6383. Selsoif (quarry in Marais de la Sensurière), near Saint-Sauveur-le-Vicomte, dept. Manche, France, Grand-Marais Formation, Tiglian C4, Pleistocene. a X 13, b protoconch apertural view, X 55, c apical view, X 40. All SEM photographs.
- Fig. 6 — *Seila (S.) selsoifensis* n. sp. Paratype coll. IRScNB IST 6384. Selsoif (quarry in Marais de la Sensurière), near Saint-Sauveur-le-Vicomte, dept. Manche, France, Grand-Marais Formation, Tiglian C4, Pleistocene. a X 21, b apertural view of protoconch, X 66, c protoconch, X 73, d apical view, X 50. All SEM photographs.