The genus Ensis in Europe

by

R. M. VAN URK

c/o Rijksmuseum van Natuurlijke Historie, Leiden

When starting my investigation on *Ensis* some years ago, it was with the vague idea, that something was wrong in the identification of the Netherlands material. The determinations were almost entirely based on the dimensions and the curvature of the shell, but who shall ever delimit a slightly curved species from a more curved one or a small from a larger one?

Originally I intended to study only the Dutch material, but it soon became obvious, that such a study was impossible without a knowledge of other European material, and in the course of time this whole group turned out to be a first rate one as regards its systematical difficulties. The results presented in this paper are as much of a surprise to the author as they may be to others interested in the subject.

I am indebted to many persons and institutions for their help and encouragement and it is a pleasant duty to mention them here. Though the list of acknowledgements may be somewhat long, it may show, that an investigation like this can never be carried out without help from others. This help I have been only too glad to accept.

A few persons may be specially mentioned: Dr. C. O. VAN REGTEREN ALTENA, who allowed me to carry out the work in the Rijksmuseum van Natuurlijke Historie at Leiden and whose continued interest, advice and encouragement have been of great value to me; Dr. T. SOOT-RYEN, Director of the Zoologisk Museum in Oslo, who made the Norwegian material accessible to me; Mr. H. HEIJN of the Rijksmuseum van Natuurlijke Historie at Leiden, who made the excellent drawings [1]); Dr. J. BOWDEN of the University of Glasgow, Scotland, for his correction of the greater part of the English text;

[1]) Fig. 8 on Pl. 2 has been made by Mr. J. H. van Os, of Leiden.

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Besides the extensive material collected by myself during several seasons, mainly at Scheveningen, and the material which a number of persons (among whom several members of the Nederlandse Malacologische Vereniging) were so kind as to put at my disposal, collections have been revised, wholly or partially, of the following institutions: Rijksmuseum van Natuurlijke Historie, Leiden (L.); Comité ter Bestudering van de Nederlandse Mariene Flora en Fauna (F.); Zoölogisch Museum, Amsterdam (A.); Universitetets Zoologiske Museum, Copenhagen (C.); Danmarks Fiskeri- og Havundersøgelser, Charlottenlund; Zoologisk Museum, Oslo (O.); Det Kgl. Norske Videnskabers Selskab Museet, Trondheim (Th.); Tromsø Museum, Norway (Tø); British Museum (Natural History), London; and the Private collection of the author (P.).

I am much indebted to the directors and staffs of the above mentioned institutions for providing me with the material and giving me all kind of other help.

Finally I must mention the excellent material of Mr. A. L. BRANDHORST, who collected some thousands of specimens in the years around 1925 near Scheveningen.

The following abbreviations may still call for an explanation: def. = damaged; ex. = specimen; ½ ex. = an odd valve; fr. = fragment; pl. = pole, or "coast mark".

ENSIS AND SOLEN

Ensis and *Solen* are two well-separated genera, constant differences being found in the hinge:

Ensis has in the left valve 2 vertical teeth and 2 horizontal teeth, the latter being joined along nearly their whole length, with only the tops free and curved upwards. The (external) ligament is situated in a shallow groove and separated from the internal shell by a "ligament ridge", which appears as a rather inconspicuous thickening of the dorsal edge. In the right valve there is only 1 vertical

tooth, which fits between the 2 of the opposite valve, and 1 horizontal tooth. The ligament ridge is here the same as in the left valve.

Solen has only 1 vertical tooth in each valve; in the right valve it is reinforced on its left side by a more or less triangular thickening of the shell, in the left valve this thickening may end in a ridge. Horizontal teeth are wanting. Both valves possess a ligament ridge, which is essentially the same as in *Ensis*.

Fig. 1 shows, that the arrangement of the muscle scars in *Ensis* is also different from that found in *Solen*, in this case in *Solen marginatus*. Part of these differences are undoubtedly generic, but it must be noted that *Solen* is more variable in this respect than the very uniform genus *Ensis*.

The curvature is not a reliable generic character, since both genera comprise straight as well as curved species.

SPECIFIC CHARACTERS

The characters used to differentiate the species can be readily understood by reference to fig. 1 and the descriptions.

The hinge is of little, if any, value and for identification we are almost entirely dependent upon the characters of the muscle scars and the general shape of the shell. Since these are always more or less variable, it is not surprising, that *Ensis* presents more difficulties than e.g. *Spisula*, where constant characters in hinge and sculpture facilitate the identification.

The soft parts must be of very much interest in a genus like *Ensis* (see for instance the papers by BLOOMER and HOLME [1]); if I have not made a special study of them, it is only for the reason that this would have delayed publication of this paper for another one or two years, which did not seem desirable.

[1]) Bloomer, H. H., 1901-1902. The anatomy of the British species of the genus *Solen* Linné. Parts I-III. Journ. Malac. vol. 8, pp. 36-46, 97-100, vol. 9, pp. 18-21. Id., 1903. Classification of the British species of the genus *Solen* Linné. O. c. vol. 10, pp. 41-43. Id., 1905. On the anatomy of certain species of *Siliqua* and *Ensis*. Proc. Malac. Soc. London vol. 6, pp. 193-196, illus. — Holme, N. A., 1951. The identification of the British species of the genus *Ensis* Schumacher (Lamellibranchiata). Journ. Mar. Biol. Ass. U. K. vol. 29, pp. 639-647, illus.

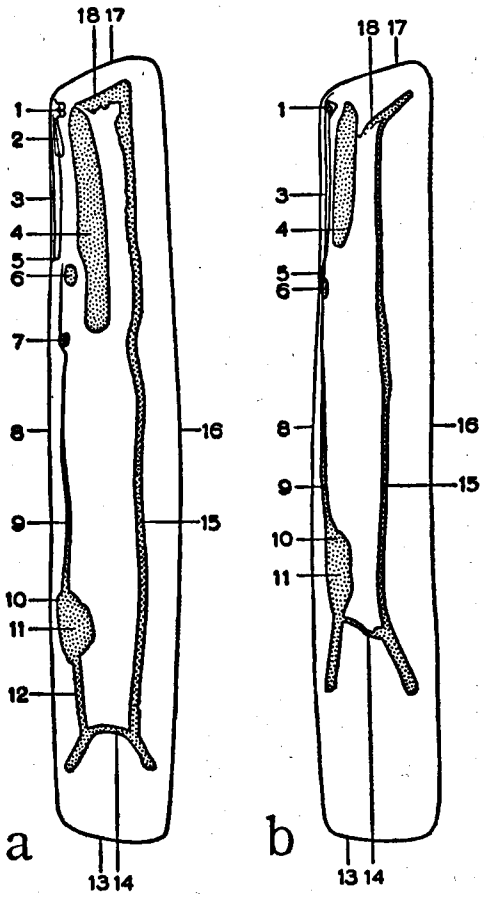


Fig. 1. Diagram of (a) an *Ensis* [*E. minor* (Chenu)] and (b) a *Solen* [*S. marginatus* Penn.]. 1. Vertical teeth. 2. Horizontal teeth. 3. Ligament groove; under it the 'ligament ridge'. 4. Anterior adductor scar. 5. 'Ligament insertion'. 6. 'Anterior insertion of retractor pedis anterior muscle' (Graham); conveniently denoted here as 'foot retractor'. 7. Posterior insertion of idem (Graham). 8. Dorsal edge of the shell. 9. Dorsal pallial scar. 10. 'Insertion of retractor pedis posterior muscle" (Graham). 11. Posterior adductor scar. 12. Dorsal pallial scar. 13. Posterior edge of the shell. 14. Pallial sinus. 15. Ventral pallial scar. 16. Ventral edge of the shell. 17. Anterior edge of the shell. 18. Anterior pallial scar.

VARIABILITY

The European species of *Ensis* are strikingly variable. There are several causes for this variability, but the nature of the habitat — whether littoral or non-littoral — is certainly of much importance.

Thus, while the sub-littoral *E. siliqua* is remarkably constant in its characters, its nearest "ally", *E. minor*, which occurs both littorally and sub-littorally is much more variable. The usually sub-littoral *E. ensis*, though somewhat more variable than *E. siliqua*, cannot compare with the allied *E. phaxoides* in this respect. *E. arcuatus*, which occurs both in deeper water and near coasts, is perhaps the most variable of the European species. In all these cases the variation is mainly confined to the littoral specimens.

There are several characters which appear to be related to the littoral or sublittoral nature of the habitat. On comparing e.g. specimens of *E. minor* from deeper water with those from the shore, a number of interesting differences become apparent. The shells of the first category show a less restricted growth in their length axis, the posterior end being more produced with the growth lines well-separated; the truncate anterior end, however, is much less developed, the shell is relatively less broad (the most slender specimens are always of deeper water origin) and the vertical teeth of the left valve are comparatively slender. By way of contrast, specimens living near the shore show a more restricted growth in their length axis, the posterior end being less produced with, in older specimens, very closely spaced growth lines; the anterior end, however, is well-developed, obliquely truncate, the shell is relatively broader and the vertical teeth in the left valve are comparatively broad.

Several of these differences may also distinguish *E. ensis* from *E. phaxoides*, and littoral specimens of *E. arcuatus* from deeper water specimens. It seems reasonable to assume, that at least part of this variation is caused by the differences in habitat.

Geographical variation plays also an important role in *Ensis*, for which may be referred to the descriptions of *E. arcuatus* var. *norvegica* and the Mediterranean forms of *E. minor* and *E. ensis*.

Another interesting variation is in the length of the horizontal teeth. In North Sea specimens they are about $^1/_3$ the length of the ligament, in Mediterranean specimens up to about $^1/_2$, while in the two tropical species of the genus (*E. goreensis* Cless. and *E. tropicalis* Hertl. & Strong) they reach about $^2/_3$ of this length!

There is even a strong tendency in *E. siliqua* to produce longer horizontal teeth in the Channel (up to about $^2/_5$ the length of the ligament) than in the North Sea.

The above mentioned facts may give some indication as to the conditions under which fossil species have lived.

LIST OF EUROPEAN SPECIES

1. *E. siliqua* (L.)
2. *E. minor* (Chenu)
   2a. *E. minor* var. *subarcuata* n. var.
3. *E. magnus* Schumacher
4. *E. arcuatus* (Jeffreys)
   4a. *E. arcuatus var. ensoides* n. var.
   4b. *E. arcuatus var. norvegica* n. var.
5. *E. ensis* (L.)
6. *E. phaxoides* n. sp.
7. *E. sicula* n. sp.

KEY TO THE EUROPEAN SPECIES OF ENSIS[1])

1a. Anterior end of shell truncated 2
b. Anterior end of shell rounded 12

2a. Anterior pallial scar obviously closer to anterior edge of shell than ventral pallial scar to ventral edge 3
b. Anterior pallial scar at approximately same distance from anterior edge as ventral pallial scar from ventral edge 8

3a. Anterior pallial scar parallel to anterior edge of shell 4
b. Anterior pallial scar diverging from anterior edge of shell . . 7

4a. Anterior pallial scar very close to anterior edge of shell (half, or less than half, the distance between ventral pallial scar and ventral edge). Anterior end of shell often very obliquely truncated. Posterior adductor scar at a distance equal to about its length or more (up to about twice its length in Mediterranean specimens) from pallial sinus . . . . . *E. minor*
b. Anterior pallial scar more distant from anterior edge 5

[1]) For specimens of at least ca. 7 cm length.

5a. Posterior adductor scar at a distance obviously less than its length from pallial sinus . . . . . *E. siliqua*
b. Posterior adductor scar at a distance at least equal to its length from pallial sinus 6

6a. Shell squarely truncated anteriorly, broadening posteriorly. Anterior adductor scar rounded posteriorly . . . . . *E. siliqua*
b. Shell obliquely truncated anteriorly, tapering posteriorly. Anterior adductor scar rounded posteriorly . . . . *E. minor* var. *subarcuata*
c. Shell squarely truncated posteriorly, of about equal breadth at anterior and posterior ends. Anterior adductor scar truncated posteriorly . . . . . *E. arcuatus* s.l.

7a. Posterior adductor scar situated at a distance at least equal to its length from pallial sinus . . . . . *E. arcuatus* s.l.
b. Posterior adductor scar much closer to pallial sinus *E. siliqua* (young)

8a. Posterior adductor scar situated at a distance, often obviously, less than its length from pallial sinus 9
b. Posterior adductor scar situated at a distance at least equal to its length from pallial sinus 11

9a. Ventral edge more strongly curved than dorsal edge. Shell tapering posteriorly . . . . . *E. magnus*
b. Edges parallel. Shell broadening posteriorly or at least as broad here as anteriorly 10

10a. Anterior adductor scar of about same length as ligament (not more than 5 mm longer, except in young specimens). Shell distinctly curved. A North American species . . . . . *E. directus*
b. Anterior adductor scar some 1.3 - 1.4 times as long as ligament. Shell straight. Specimens at least 15 cm long . . . . . *E. siliqua*

11a. Posterior edge of anterior adductor scar rounded. Shell more or less tapering posteriorly. Pallial sinus long (about twice as long as broad) . . . . . *E. sicula*
b. Posterior edge of anterior adductor scar truncated. Shell broadening posteriorly or at least as broad here as anteriorly. Pallial sinus short (of about equal length and breadth) . . . . . *E. arcuatus* s.l.

12a. Edges parallel or nearly so; shells up to about 15 cm, gently tapering towards posterior end. Posterior adductor scar at a distance approximately equal to its own length from pallial sinus. Anterior adductor scar truncated posteriorly . . . . . *E. arcuatus* var. *ensoides*
b. Not so. Anterior adductor scar rounded posteriorly. Shells up to about 10 cm at most and also otherwise different 13

13a. Edges parallel. Shell tapering slightly or not at all towards posterior end. Posterior adductor scar at a distance equal to 1.5 - 2 times its length from pallial sinus. Horizontal teeth ca. 1/3 length ligament (in Mediterranean specimens up to 1/2 length ligament). . . . . *E. ensis*
b. Ventral edge more strongly curved than the dorsal. Shell tapering markedly towards posterior end. Posterior adductor scar at a distance approximately equal to its length, or (often) less, from pallial sinus. Horizontal teeth ca. 1/3 length ligament . . . . *E. phaxoides*

1. *Ensis siliqua* (Linnaeus, 1758)

Pl. 1 Fig. 1

Concha fusca, longissima . . . Lister, 1678, Hist. Anim. Angl., pl. 5 fig. 37, (p. 192).

Solen siliqua Linnaeus, 1758, Syst. Nat., ed. 10 vol. 1, p. 672; Linnaeus, 1767, Syst. Nat., ed. 12 vol. 1, p. 1113; Wood, W., 1835, Gen. Conchol., p. 118, pl. 26 fig. 1; Chenu, 1843, Ill. Conch., *Solen* pl. 3 fig. 1, 1a, 1b, 1c; Forbes & Hanley, 1848, Hist. Brit. Moll., vol. 1, p. 246; Forbes & Hanley, 1848, Hist. Brit. Moll., vol. 4, pl. 14 fig. 3; Hanley, 1855, Ipsa Linn. Conch., p. 29; Jeffreys, 1865, British Conch., vol. 3, p. 18 (p.p.); Jeffreys, 1869, British Conch., vol. 5, pl. 47 fig. 2; Clessin, 1888, in Martini & Chemnitz, Syst. Conch. Cab., ed. 2 vol. 11 pt. 3, p. 10 (No. 11), pl. 3 fig. 3; Dodge, 1952, Bull. Amer. Mus. Nat. Hist., vol. 100, p. 34 (p.p.).

Solen vagina, Reeve, 1874, Conch. Icon., vol. 19, *Solen* sp. 2, pl. 1 fig. 2; not *Solen vagina* L., 1758.

Ensis siliqua, Bucquoy, Dautzenberg & Dollfus, 1895, Moll. mar. Roussillon, vol. 2, p. 506 (p.p.) pl. 74 fig. 1-3; Graham, 1931, Trans. Roy. Soc. Edinburgh, vol. 56, p. 725 (726) (p.p.); van Regteren Altena, 1937, Bijdr. Kennis foss. subfoss. rec. Moll., p. 96 (large form); van Benthem Jutting, 1943, Fauna van Nederland, vol. 12, p. 355 (357) (large form); Holme, 1951, Journ. Mar. Biol. Ass. U.K., vol. 29, p. 639 seq. (p.p.?); Kristensen, 1957, Levende Natuur, vol. 60, p. 93, fig. 1 left (large form); Ziegelmayer, 1957, Muscheln deutsch. Meeresgebiete, p. 20, pl. 12 fig. 4a, b; Entrop, 1959, Schelpen vinden en herkennen, p. 146, fig. 93 (large form); Jaeckel, 1960, Muscheln Schnecken deutsch. Meeresküsten, p. 16, pl. 2 fig. 2.

Ensis (Cyrtodaria) siliqua, Jensen & Spärck, 1934, Danmarks Fauna, vol. 40, p. 153, fig. 141.[1])

Shell. — Very large (up to at least 21.5 cm l. and 3 cm br.); broad; straight, except towards the hinge-region, where it is slightly turned upwards, rarely gently curved throughout its length; edges parallel or nearly so; posterior end broader than, or at least as broad as the anterior end. Anterior end truncate or slightly obliquely truncate, anterior edge nearly straight or only slightly rounded; posterior end obliquely truncate, forming an acute angle with the ventral edge; posterior aperture oval in outline.

Hinge. — Vertical teeth of left valve of about equal size; right tooth D-shaped in outline; left tooth often broadest near the top. Horizontal teeth straight or convex at their base, diverging from the dorsal edge when viewed from above, about 1/3 or rather more than the length of the ligament. Ligament ridge straight or nearly so at its base, diverging from the anterior adductor scar in the direction of the ligament insertion.

[1]) N.B. not *Cyrtodaria* Daudin, type species *Cyrtodaria siliqua* (Spengler).

Muscle scars. — Anterior pallial scar obviously closer to the anterior edge than is the ventral pallial scar to the ventral edge (the ratio is normally about 2 : 3, but in big specimens often nearly 1 : 1), parallel to the anterior edge (somewhat diverging from it in young specimens); ventral pallial scar not concave under the anterior adductor scar. Anterior adductor scar 3-4 times broader at its posterior end than at the top, short (ca. 1.3-1.4 times the length of the ligament), rounded posteriorly, posterior end of its ventral border about equidistant from the dorsal and ventral edges of the shell. Foot retractor immediately behind the ligament insertion. Posterior adductor scar situated at a distance from the pallial sinus which is usually less, or much less, than its own length. Pallial sinus short and broad, often rounded. Dorsal and ventral pallial scars in this part of the shell parallel or nearly so, the latter closer to the ventral edge of the shell than to the dorsal pallial scar.

Variability and specific characters. — An easily recognizable species, which is remarkably constant in its characters. Its differentiation from *E. minor* is dealt with under that species. Young stages may be more difficult to separate from straight *E. arcuatus* than from *E. minor;* in the following short survey the more important differences are given:

	E. siliqua	*E. minor*	*E. arcuatus*
Anterior pallial scar	diverging from anterior end	parallel to anterior end	diverging from or parallel to anterior end
	close to anterior end	close to anterior end	not close to anterior end
	straight	straight	both anterior pallial scar and ventral pallial scar under anterior adductor scar often concave
Anterior adductor scar	broadened posteriorly	not broadened posteriorly	broadened posteriorly
	rounded posteriorly	rounded posteriorly	truncated posteriorly
Posterior adductor scar	at less than own length from pallial sinus	at own length or more from pallial sinus	at own length or more from pallial sinus

Straight *E. arcuatus* var. *norvegica* is easily distinguished from *E. siliqua* of this size by its posterior adductor scar being situated at a distance of 1-1½ time its length from the pallial sinus. Further, it is never quite straight, as is *E. siliqua.*

Nomenclature and typification. — The *Solen siliqua* of LINNAEUS comprises at least two species: *E. siliqua* and *E. minor.* Straight *E. arcuatus* would fit his description well, but there is no indication that this species formed part of his material.

According to HANLEY (1855) and DODGE (1952) there should be a specimen in the Linnean collection marked with the correct Linnean number, HANLEY declaring it identical with the figure in WOOD, Gen. Conch. pl. 26, f 1, which is the *E. siliqua* in the present paper.

Mr. S. P. DANCE of the British Museum (Nat. Hist.), however, writes to me: " I can find no trace of a number on any specimen among those isolated by HANLEY. Therefore I have just taken photo's ..... from those separated out by HANLEY". These photo's clearly represent Mediterranean *E. minor*!

Since it is doubtful on which material LINNAEUS based his *Solen siliqua,* I have selected as lectotype from LINNAEUS' references the specimen figured by LISTER, the type-locality being thus Scarborough, Great Britain. This makes it possible to use the name *minor* (of which it is very clear what it represents) for species no. 2 in the present paper.

Distribution. — Norway-Iberian Peninsula; not in the Mediterranean.

Material. — NORWAY: Munken, near Orland, mouth Trondheims Fjord (Th.); Roaldsanden, near Ålesund (Th.); Kragerö(d) (C.). DENMARK: N. Vorupør, N.W. coast of Jutland (C); Skagerrak, N. of Skagen (C.). NORTH SEA: 'Station 948', 'Station 949', 'Station 991', 'Station 1000' (C.); Dogger Bank (L.); W. of the Dutch Frisian Islands (L.); "Netherlands coast" (L.). GERMANY: see Jaeckel, 1960. NETHERLANDS: Mainly on the northern Frisian Islands: Schiermonnikoog (L., F., Vader), Ameland (L., F.); Terschelling (L., F., Tanis); otherwise rare or very rare and a few specimens only: Vlieland (Mrs. Fehr), Texel (L.); N.W. of Petten 5 miles off coast (L.); Noordwijk (L.); Scheveningen (Mrs. Fehr); Goeree (L.). GREAT BRITAIN: Scotland: Tents Muir, Fife (L.); St. Andrews (v. Haren); Aberlady, near Edinburgh (L.). England: Salcombe, South Devon (sent to me by Mr. N. A. Holme); South Cornwall (sent to me by Mr. N. A. Holme); Eddystone, near Plymouth (L.), Saundersfoot, Pembroke (L.). IRELAND: Bettystown (L.). FRANCE: Penthièvre, Brittany (v. Haren); Roscoff, Finistère, Brittany (L.); Croix de Vie, Vendée (Lacourt). PORTUGAL: "Concha de Sao Martinho do Porto" (L.).

2. *Ensis minor* (Chenu, 1843)

Pl. 1 Fig. 2

Solen siliqua, Poli, 1791. Testac. utr. Sicil., vol. Ordo secundus, p. 9, Index p. V, Pl. X fig. 7, 11-16, Pl. XI fig. 1-13 (non Linnaeus).
Hypogaea crinita Poli, 1791, Testac. utr. Sicil., vol. 1, Ordo secundus p. 12, 18, Index p. XI; 1795, Idem, vol, 2, p. 251 (name of the animal).
Hypogaeoderma siliqua, Poli, 1795, Testac. utr. Sicil., vol. 2, p. 257 (name of the shell)
Solen siliqua minor Chenu, 1843, Ill. Conch. *Solen* pl. 3 fig. 3, 3a.
Ensis siliqua, Bucquoy, Dautzenberg & Dollfus, 1895, Moll. mar. Roussillon, vol. 2, p. 512, pl. 74 fig. 4 (var. ex. forma *minor*): ?Pallary, 1912, Cat. Moll. litt. médit. Egypte, Mém. Inst. Egypt., vol. 7, pt. 3, p. 176; Graham, 1931, Trans. Roy. Soc. Edinburgh, vol. 56, p. 725 (726) (p.p.), pl. 1; van Regteren Altena, 1937, Bijdr. Kennis foss. rec. Moll. p. 96 (small form); van Benthem Jutting, 1943, Fauna van Nederland, vol. 12, p. 357 (small form); Kristensen, 1957, Levende Natuur, vol. 60, p. 93, fig. 1 right (small form); Entrop, 1959, Schelpen vinden en herkennen, p. 146 (small form).

Description of the Atlantic material:

Shell. — Large or very large (largest Scottish specimen ca. 17 cm l. and 2.5 cm br.; in the Netherlands up to ca. 14 cm l. and 2 cm br.), broad or rather broad, straight (including the hinge-region, which is not turned upwards) or slightly curved downwards (as a result of this, the valves when opened, are often diverging posteriorly), more rarely gently curved upwards; edges parallel or nearly so; posterior end of approximately the same breadth as the anterior end. Anterior end (often very) obliquely, or sometimes squarely, truncate; anterior edge straight or slightly rounded; posterior edge often squarely truncate, forming a right angle with the ventral edge; posterior aperture narrow, more or less compressed in outline.

Hinge. — Vertical teeth of left valve (in Dutch specimens) of about equal size; right tooth D-shaped in outline, often, however, becoming triangular in outline and much broader than the left tooth; left tooth often widest in its upper part. In general, there is considerable variation both in the Dutch and other material. Horizontal teeth straight at their base, diverging from the dorsal edge when viewed from above, about 1/3 of the length of the ligament. Ligament ridge straight or slightly convex at its base; parallel or almost parallel to the anterior adductor scar.

Muscle scars. — Anterior pallial scar much closer to the anterior edge than is the ventral pallial scar to the ventral edge (the ratio being about 1 : 2, or the anterior pallial scar still closer to the anterior edge), parallel to the anterior edge (also in very small speci-

mens); ventral pallial scar often concave under the anterior adductor scar, in the material from south of the Channel both the ventral and anterior pallial scars often concave. Anterior adductor scar often scarcely broader at its posterior end than at the top (on average ca. 1½ times as broad, though this may be more in older specimens), short (ca. 1.3-1.5 times the length of the ligament), more or less rounded posteriorly, posterior end of its ventral border much closer to the dorsal than to the ventral edge of the shell. Foot retractor opposite to the ligament insertion. Posterior adductor scar at a distance of about its own length from the pallial sinus. Pallial sinus short and broad. Dorsal and ventral pallial scars in this part of the shell divergent, the latter about equidistant from the ventral edge of the shell and the dorsal pallial scar.

The Mediterranean material may differ in a number of characters from the above description.

In a sample from the Adriatic (Venice, Italy) the shell-form is almost exactly similar to that of *E. siliqua,* while other characters are those of perfect *E. minor.* The following is a short description of it:

Shell. — Moderately large, broad, straight, hinge-region slightly turned upwards, posterior end broadened, anterior squarely truncate, not oblique, posterior end obliquely truncate.

Hinge. — Vertical teeth of left valve about equal in size, both more or less D-shaped in outline, but the right tooth of the same breadth in the middle part and at the base. Horizontal teeth straight at their base, diverging from the dorsal edge when viewed from above, up to ca. ½ of the length of the ligament.

Muscle scars. — Anterior adductor scar much broadened, short in relation to the ligament. Posterior adductor scar at a distance of 1½-2 times its own length from the pallial sinus. Dorsal and ventral pallial scars in this part of the shell parallel, the latter closer to the ventral edge of the shell than to the dorsal pallial scar.

In another sample (Petit Rhône, France) the specimens are intermediate between what may be called here the Venetian and Atlantic forms.

It becomes clear, even from these two samples, that the material from the Mediterranean is not uniform and tends to vary towards the Atlantic form, both good reasons for not using special names in this respect. At least I hesitate to do so, from what I have seen now.

A variation still to be mentioned, is that of the length-breadth ratio, Mediterranean shells becoming much more slender than any I have seen from the Atlantic.

Variability and specific characters. — *E. minor* is closely related to *E. siliqua,* with which it forms a species-pair. Usually it is easily recognizable by its obliquely truncated anterior end, and the pallial scar running parallel and very close to the anterior edge. Several other characters, for which the descriptions should be consulted, separate the two species. It is sufficient here to mention, that the anterior adductor scar is often of about the same breadth at both its ends. This is particularly the case in immature specimens and thus forms a very convenient feature. Actually I have never experienced any serious difficulties in distinguishing the two species and this holds also true for the immature specimens. Where the two are mixed, and this is the case in a number of samples, there seem to be no intermediates at all.

Straight *E. arcuatus* may be distinguished from *E. minor* i.a. by its pallial scar being at the same distance from the anterior and ventral edges, of the shell, by its much broadened, truncated anterior adductor scar and, in the case of typical *E. arcuatus,* by its foot-retractor, which is situated behind the ligament insertion.

For the variability see above, and also the introduction.

Though *E. minor* has never been clearly distinguished from *E. siliqua,* it has nevertheless attracted the attention of Dutch malacologists since about 1920. At that time a straight *Ensis* appeared on the mainland coast of the provincies of Noord-Holland and Zuid-Holland, where previously *E. siliqua* had not been recorded. It rapidly spread and was reported to be quite common already in the years round 1930. As it never reached the dimensions of a well-developed *E. siliqua* — and often remained considerably smaller — it became soon known as the small form of *E. siliqua* and was sometimes indicated as *E. siliqua* var. *minor.* Various explanations have been given for the peculiar distribution and *"minor"*-status, but no one seems to have considered that it might be a distinct species.

In a different way, this species has also attracted attention in Scotland. GRAHAM, on studying *E. siliqua,* found differences in the anatomy which he could not explain. "In certain specimens", he writes, "a fourth (pallial) aperture appears quite distinct . . . . . in others the fourth and pedal apertures are confluent. This character of the soft parts is accompanied by differences in the appearance of the shell; in the former case the shell is of a lighter build, has a lesser development of the periostracum, and the angle made by the anterior dorsal edges of each valve is almost rectangular; in the latter case the shell is of a generally more robust construction, has a thick, dark-brown periostracum, and the angle at the anterior end

apparent . . . . . ". There can be no doubt, that the specimens in question were actually *E. siliqua* mixed with *E. minor.*
is markedly obtuse. The significance of these characters is not at all

Nomenclature and typification. — POLI'S name *crinitus* cannot be used for this species, since it was published in his synonymy of *Solen siliqua* L. CHENU'S *Solen siliqua minor* seems to be the first valid name for this species then. Earlier LAMARCK (1818, An. s. Vert., vol. 5, p. 451-452) had used the terms *major* and *minor* for varieties of several *Solen* species, but these should be regarded as descriptive formulae, since under *Solen ensis* he also mentions a var. *"minor et angustior".*

CHENU'S figure clearly represents a Mediterranean *E. minor.* It is strikingly similar to part of the material I have seen.

Solen novacula Montagu (1803) and *Solen ligula* Turton (1822) are synonyms of either *E. siliqua* or *E. minor.* Since it is almost impossible to decide to which of these two species the original descriptions and figures refer, I consider them to be nomina dubia.

E. minor Dall, 1899, is a quite different American species, which seems in need of a new name.

Distribution. — Norway-Mediterranean.

Material. — Atlantic. NORWAY: Kragerö(d) (C.). NETHERLANDS: Probably along the whole coast. In many collections from a number of localities, often common and in fine condition. Two colonies of living specimens were discovered by Mr. L. de Priester on the coast of the island of Walcheren during very low tide. GREAT BRITAIN: Scotland: Aberlady (L.); England: Studland — Poole, (L.); Shellbay (Studland) (L.); South Cornwall (sent to me by Mr. N. A. Holme). BELGIUM: De Panne (P, leg. A. M. van Wezemael). FRANCE: Penthièvre, Brittany (v. Haren); Asserac, Brittany (v. Haren); Morbihan, Brittany (L.); Fromentine, Vendée (Lacourt), Croix de Vie, Vendée (Lacourt); Arcachon (L.); Oléron (v. Haren, 4 ex. in L.). SPAIN: Gijon, Asturias (Cadee). PORTUGAL: Lisbon (L.). MOROCCO: El Araish, 60 km S. of Tanger (C.).

Mediterranean. SPAIN: Aleudia, Mallorca (L.). FRANCE: St. Maries de la Mer, Camargue (L.); Sète (L., v. Haren); La Crau du Roy, Aigues Mortes, (Pouderoyen); Petit-Rhône (P., leg Mrs. N. van Ophuyzen); Argelès-Plage, Pyr.-Or., 12-9-1962, A. J. M. Leeuwenberg (L.); Collioure, Pyr.-Or., 20-9-1961, A. J. M. Leeuwenberg (L.). ITALY: Naples (C., also sent to me by Mr. N. A. Holme); Torre Gaveta - Cumae, W. of Naples (L.); Messina (C.); Venice (L.). ?EGYPT: Port Said (see Pallary, 1912). Besides a few samples with no further indication than Mediterranean.

The species is apparently widely distributed in the Mediterranean, whereas I have no evidence of *E. siliqua* occurring there. All Mediterranean records of *Ensis* (or *Solen*) *siliqua* (e.g. in WEINKAUFF, 1867, Die Conch. des Mittelm., p. 12, and CARUS, 1889-1893, Prodr. Faunae Medit. vol. 2, p. 140) may, therefore, refer to *E. minor.*

2a. *Ensis minor* (Chenu) var. **subarcuata** n. var.

Pl. 1 Fig. 3

Shell moderately large, in its extreme form somewhat curved, with the ventral edge more strongly curved than the dorsal, tapering posteriorly. Pallial scar not quite as close to the anterior edge as in the typical form (the ratio being about 3 : 4), foot retractor at some distance behind the ligament insertion, anterior adductor scar rather long.

This peculiar form may easily be confused with *E. arcuatus*, especially when it is slightly curved. The characters of the muscle scars and their variation, however, show its relation to *E. minor*. It is linked with the typical form by intermediates.

Typification. — Holotype: Scheveningen, 31-1-1960, ± pl. 100-98, R. M. van Urk in coll. Rijksmuseum van Natuurlijke Historie, Leiden.

Paratypes: Schiermonnikoog, 2 ex., 1961 (Vader). Zandvoort, 1 ex., 31-1-1960, ± pl. 66, v. R. A. (L.); 7 ex., 5-3-1961, pl. 72-69, v. R. A. (L.); 1 ex. (slightly def.), 4-11-1962, W. Bergmans (Bergmans). Noordwijkerhout, 6 ex. (partly def.), 25-9-1960, pl. 72-73, v. R. A. (L.); 1 ex. 26-2-1961, v. R. A. (L.); 3 ex., 5-3-1961, pl. 72-73, v. R. A. (L.); 1 ex. (juv.), 13-5-1962, W. C. G. Gertenaar (Bergmans). Scheveningen, 1 ex., 1-2-1959, pl. 100-98 (P.); 2 ex., 5-3-1960, pl. 99-Meyendell (P.); 8 ex. (4 def.), 31-1-1960, ± pl. 100 - pl. 98 (P.).

Distribution. — The Netherlands, but it may be more widely distributed.

Material. — See Typification.

3. *Ensis magnus* Schumacher, 1817

Pl. 3 Fig. 9

Solen siliqua, ..., *subarcuata*, ... Chemnitz, 1782, Neues Syst. Conch. Cab., ed. 1 vol. 6, p. 44, pl. 4 fig. 29.

Ensis magnus Schumacher, 1817, Essai d'un nouveau Syst. des Habit. des Vers test., p. 143, pl. 14 fig. 1a, b.

Solen ensis major Chenu, 1843, Ill. Conch., *Solen* pl. 3 fig. 2, 2a, 2b, 2e.

Solen ensis (p.p.), Clessin, 1888, in Martini & Chemnitz, Syst. Conch. Cab., ed. 2 vol. 11 pt. 3, p. 13 (No. 14), pl. 3 fig. 7, 8.

Shell. — Very large (up to 20 cm l. and 3 cm br.), broad, slightly curved or occasionally straight; the ventral edge more strongly curved than the dorsal, the latter often being quite straight in its middle part or even somewhat convex there; shell broadest at about $^2/_3$ distance from the anterior end and then markedly tapering posteriorly. Anterior end squarely or slightly obliquely truncate, the anterior edge straight or almost straight. Special features are: a very broad dorsal area, a deeply concave shell and two grooves or lines on the inside of each valve — one running from the dorsal edge of

the pallial sinus to the region of the foot retractor, where it becomes obsolete, the other (which is much less conspicuous) from the ventral border of the pallial sinus to the anterior adductor scar. They correspond with two lines on the outer surface of the shell, one separating the dorsal area from the dorsal region, the other dividing the surface into dorsal and ventral regions.

Hinge. — Vertical teeth of left valve of about equal size, slender. Horizontal teeth convex at their base, diverging from the dorsal edge when viewed from above, ca. 1/3 of the length of the ligament. Ligament ridge straight at its base, almost parallel to the anterior adductor scar.

Muscle scars. — Distance between anterior pallial scar and anterior edge about equal to distance between ventral pallial scar and ventral edge. Anterior pallial scar parallel to the anterior edge, more or less concave; ventral pallial scar not concave under the anterior adductor scar. Anterior adductor scar much (3-4 times) broader at its posterior end than at the top, moderately long (at least 1½ times the length of the ligament), truncated or somewhat rounded posteriorly. Foot retractor opposite to, or immediately behind, the ligament insertion. Posterior adductor scar at a distance of usually much less than its own length from the pallial sinus. Pallial sinus rather long (at least 1½ times as long as broad), more or less rounded. Dorsal and ventral pallial scars in this part of the shell strongly divergent; the latter equidistant from ventral edge and dorsal pallial scar.

Specific characters and variability. — In its typical form *E. magnus* is easily recognized by its general shape (the first paragraph of the description), the position of the foot retractor opposite to the ligament insertion, the rather long pallial sinus, which is more or less rounded, and the posterior adductor scar close to the pallial sinus.

For a discussion of its systematic position, however, see under *E. arcuatus* var. *norvegica*.

Nomenclature and typification — SCHUMACHER's description and figure can be applied as well to the *E. magnus* as to *E. arcuatus* var. *norvegica* or *E. arcuatus* in the present article, the author himself regarding it as identical with the *Solen ensis* of LINNAEUS! Fortunately he also cites *"Solen siliqua* Chem. 6. pag. 44. Tab. 4.", which latter describes and figures without any doubt the characteristic form from the Faroes, for which thus the name of *E. magnus* has been used here. The remark of CHEMNITZ on p. 46 should be quoted here in full: "LINNE belehret uns, diese Muschel werde bey Norwegen gefunden (vid. Faunam Suec.). Die besten und grössesten dieser Art erhalten wir hieselbst von den Ferröischen Eylanden."

This is so exactly my own experience — which thus cannot be regarded as new — that I feel no hesitation in selecting as lectotype the specimen figured by CHEMNITZ, 1782, Neues Syst. Conch.-Cab., Tab. 4, fig. 29 and as type-locality the Faroes.

Though Dr. SOOT-RYEN of Oslo informs me that he has seen the holotype in the Copenhagen collection, I have not been able to find it there, nor could Dr. LEMCHE give me any information about it.

Distribution. — Faeroes, Norway, ? Denmark.

Material. — FAROES: Thorshavn; Sundene-Lysaa; Sörvaag (Vaagö); Ejde; and several samples without further indication of locality (all in C.). NORWAY: Heggdalen, Trondheim, 1 ex., 13-6-1927, C. Dons (Th.); Inntian, Frøya, just outside Trondh. Fjord, 1 ex., 27-5-1937, C. Dons (Th.); Storfosen, mouth Trondh. Fjord, 1 ex., May 1941, C. Dons (Th.). DENMARK: One specimen in Aarhus Nat. Mus. from Frederikshavn, labelled *'Solen ensis* L. f *magna'* may belong to this species or to *E. arcuatus* var. *norvegica,* which I am not able to decide now, not having the specimen here.

4. *Ensis arcuatus* (Jeffreys)

Pl. 2 Fig. 5

Solen siliqua var. *arcuata* Jeffreys, 1865, Brit. Conch., vol. 3, p. 19.

Solen ensis var. *magna,* Forbes & Hanley, 1848, Hist. Brit. Moll., vol. 4, pl. 14 fig. 2 (cf. "Orkney form", see discussion in this paper).

Solen ensis, Reeve, 1874, Conch. Icon., vol. 19, *Solen* sp. 3, pl. 1 fig. 3 (is "Orkney form", see discussion in this paper); Nobre, 1932, Moll. Marin. Portugal, pl. 60 fig. 17; Dodge, 1952, Bull. Amer. Mus. Nat. Hist., vol. 100, p. 34 (p.p.).

Ensis ensis, Bucquoy, Dautzenberg & Dollfus, 1895, Moll. mar. Roussillon, vol. 2, p. 506, pl. 73 fig. 1-3 (var. ex forma *major*); Jensen & Spärck, 1934, Danmarks Fauna, vol. 40, fig. 140 (p. 154); van Benthem Jutting, 1943, Fauna van Nederland, vol. 12, p. 353 (355), with fig. taken from Forbes & Hanley; Ziegelmayer, 1957, Muscheln deutsch. Meeresgebiete, pl. 12 fig. 5a (= var. *ensoides*), b + p. 20 (excl. "jüngeren Tiere"); Arrecgros, 1958, Coq. marins, p. 50, fig. 164.

Ensis arcuatus, Holme, 1951, Journ. Mar. Biol. Ass. U.K., vol. 29 p. 646, pl. 1, fig. 1 No. 2; Entrop, 1959, Schelpen vinden en herkennen p. 145, fig. 92.

Shell. — Large (up to ca. 15 cm l. and 2 cm br.), moderately broad to broad, slightly curved or straight with the hinge-region slightly turned upwards, more rarely the whole shell quite straight; the edges parallel or almost parallel, posterior and anterior ends of about the same breadth. Anterior end squarely or obliquely truncate, anterior edge straight or slightly rounded (markedly rounded in a few adult specimens).

Hinge. — Vertical teeth of left valve rather variable; of about equal breadth or the right tooth broader than the left. Horizontal teeth straight at their base, about 1/3 of the length of the ligament.

Ligament ridge nearly straight at the base, or somewhat convex and more or less diverging from the anterior adductor scar in the direction of the ligament insertion.

Muscle scars. — Distance between anterior pallial scar and anterior edge approximately the same as that between ventral pallial scar and ventral edge; anterior pallial scar parallel to the anterior edge or diverging from it (often quite distinctly), both the anterior pallial scar and the ventral pallial scar under the anterior adductor scar often concave. Anterior adductor scar ca. 3 times broader at its posterior end than at the top, rather long (ca. $1\frac{1}{2}$-$1^2/_3$ times the length of the ligament), obliquely truncated posteriorly, posterior end of ventral border closer to the dorsal than to the ventral edge of the shell. Foot retractor posterior to the ligament insertion. Posterior adductor scar at a distance of about its own length from the pallial sinus (in slender specimens up to ca. $1\frac{1}{2}$ times this distance). Pallial sinus typically rather short, somewhat longer than broad, truncated, but subject to considerable variation. Dorsal and ventral pallial scars in this part of the shell parallel or divergent, the latter about equidistant from ventral edge and dorsal pallial scar, or closer to the ventral edge.

Variability and specific characters. — A very variable species, perhaps the most variable of the whole group. In its typical form it is a large (some 15 cm), broad and slightly curved shell with parallel edges and both ends of about the same breadth, the anterior end being truncated. Other important characters are: the pallial scar located about equidistantly from anterior and ventral edges and often distinctly divergent from the former, the foot retractor behind the ligament insertion, the rather long, broadened and truncated anterior adductor scar and the posterior adductor scar situated at a distance equal to about its own length from the pallial sinus.

Many shells, however, show deviations in one or two characters, without it being possible to regard them more than variations of the typical form.

The material from the Dutch coast and the southern North Sea shows especially variation in the length-breadth ratio and the curvature of the shell. This variation gives rise to broad straight, slender straight, broad curved and (rather) slender curved shells with many, if not every possible gradation. The greater part, however, consists of a few clearly recognizable forms, even if they cannot be sharply delimited, typical *E. arcuatus* (Jeffr.) or shells which come very near to it, being by far the commonest.

Mr. H. VAN HAREN kindly lent me French specimens of *E. arcuatus* from his fine collection. I found them to be broader and more strongly curved than the typical form, the anterior end tended to

be as sharply truncated as is often the case in *Solen,* while in some of the specimens the right cardinal tooth of the left valve was much broader than the left one. Similar shells, however, are also found at Scheveningen.

Nomenclature and typification. — HOLME (1951) found the name *arcuatus* to be the correct one for our species. The photographs of specimens in the JEFFREYS collection (Pl. 4) — which Dr. H. A. REHDER of the U.S. National Museum, Washington, was kind enough to send me — indeed clearly represent the form which is called here *E. arcuatus,* a fact one would not easily guess from the brief description of JEFFREYS.

Solen ensis major is another name often used for *E. arcuatus.* It seems, however, that CHENU was the first to use this name in a nomenclatorally valid way and CHENU's figure clearly represents *Ensis magnus* Schumacher. As to the varietal names *major* and *minor* used by LAMARCK, see the remark in the discussion of the *E. minor.*

If *E. arcuatus* and *E. magnus* should be one species, forming a cline (see under var. *norvegica*), the much older name of SCHUMACHER has, of course, priority.

Type specimen (Pl. 4 Fig. 12) in the JEFFREYS collection, U.S. National Museum, Washington, the left valve labelled *Solen siliqua* var. *arcuata,* Scotland, at the inner surface and marked in ink: 171127; the specimen is 7 inches long.

The second specimen in the JEFFREYS collection (Pl. 4 Fig. 13) is somewhat smaller and also marked 171127 in ink. "We have been unable to find any further information as to date or locality and there are no other specimens in the JEFFREYS collection that can be assigned with any degree of surety to this species" writes Dr. H. A. REHDER, Washington, to whom I am indebted for the above information.

Distribution. — Norway-Portugal; not in the Mediterranean.

Material. — NORWAY: Together with var. *norvegica,* typical *E. arcuatus* being scarce in the material. DENMARK: several fine samples in coll. Copenhagen. GERMANY: see Ziegelmayer, 1957. GREAT BRITAIN, Scotland: "Orkney form", see discussion on p. 35. The species is probably distributed all around the British Isles. NETHERLANDS: All along the coast often washed ashore, the majority of the specimens being not quite fresh, however. FRANCE: Penthièvre, Brittany (v. Haren); Asserac, Brittany (v. Haren); Fromentine, Vendée (Lacourt). PORTUGAL: see Nobre, 1932.

4a. *Ensis arcuatus* (Jeffreys) var. **ensoides** n. var.
Pl. 1 Fig. 6

Ensis ensis, Ziegelmayer, 1957, Muscheln deutsch. Meeresgebiete, pl. 12, fig. 5a.

Shell usually somewhat smaller than typical *arcuatus* (up to ca. 14 cm l. and 2 cm br.), rather slender, moderately to strongly curved, edges parallel, but with a marked taper towards the posterior end; anterior end rounded, anterior pallial scar directed forwards.

In its general appearance this form looks rather different from typical *E. arcuatus*, which it closely resembles, however, in other characters. Still, I had for some time looked upon it as full-grown *E. ensis* (!); until the extensive material of Mr. A. L. BRANDHORST revealed its true status to me. Actually so many intermediates and combinations of characters are present, that the description is only that of extreme specimens. But the name may be applied to every comparatively slender, curved specimen with a rounded anterior end.

Typification. — Holotype in Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands, marked in ink 985a (left valve) and 985b (right valve), A. L. Brandhorst leg., Scheveningen (Holland), summer 1929.

Paratypes in Rijksmuseum van Natuurlijke Historie, Leiden: Locality unknown, ½ ex., F. P. Koumans; 1 ex. (def.), summer 1920, v. Heurn. Netherlands coast, 12 ex., v. Heurn; ½ ex. v. Heurn. North Sea, 1 ex. (monstr.). Terschelling, 2 ex. (1 def.), 29-10-1961, pl. 18-21, A. J. M. Leeuwenberg. Noordwijk, 1 ex., C. A. van der Willigen, Reg. 848; 1 ex. (def.), 5-3-1961, pl. 72-73, v. R. A. Katwijk-Noordwijk, 1 ex. (def.), 5-4-1953, v. R. A., Reg. 1019. Scheveningen, 2 ex. (marked t), 1908, v. Heurn; 9 ex. (3 def.), 1908, v. Heurn; 3½ ex. (2½ def.), 1909, v. Heurn; 6²/₂ ex., v. Heurn; 1 ex. (marked 3r), J. H. Meyer. ? Oostvoorne, 1 ex. (marked 3n), C. A. van der Willigen, Reg. 848. Goeree, 1 ex., summer 1916, P. v. Eijk.

Paratypes in the collection of Mrs. M. C. Fehr-de Wal: Wassenaarse Slag, 1 ex., 1959. Scheveningen, 1 ex., 8-6-1959, Miss. G. van der Baan.

Paratypes from Scheveningen and Scheveningen-Wassenaar in the collection of Mr. A. L. Brandhorst:

½ ex., 14-3-1930, pl. 97-98; ⁴/₂ ex. def., 27-4-1930, pl. 94-90; 2½ ex., 26-5-1930, pl. 95-98; 3²/₂ ex., 14-7-1930, pl. 98-99; and the following numbers: of the 800-series the Nos. 804 a-b, 808 a-b, 828 a-b, 846, 860 a-b, 863 a-b, 876 a-b, 880; of the 900-series the Nos. 936, 986, 986b, 996; of the 1300-series the Nos. 1348, 1355, 1365, 1374; of the 1400-series the Nos. 1411b, 1413b, 1414 a-b.

Paratypes from Scheveningen and Scheveningen-Wassenaar in my own collection:

½ ex., 19-11-1956, pl. 100; 1½ ex. 8-10-1957, pl. 100-97; 1½ ex., 9-10-1957, ± pl. 99; 1 ex., 28-9-1958, pl. 99-94; 1½ ex., 11-10-1958, pl. 99-98; 3 ex. (1 def.), 7-12-1958, pl. 98-97; 1½ ex., 21-12-1958, pl. 99-±97; 1 ex., 18-1-1959, pl. 100/99-97; ½ ex., 8-2-1959, pl. 100-99/98; ½ ex., 15-2-1959, pl. 100/99-±98; ½ ex. (with fr. of left valve), 8-3-1959; ½ ex. 8-11-1959, pl. 100/99-±97; ½ ex., 22-11-1959, pl. 101/100-±97; 1²/₂ ex., (½ (with fr. of left valve), 6-12-1959, pl. 101/100-±97; ½ ex., 24-1-1960, ± pl. 100-±97; 1 ex. (def.). 5-3-1960, pl. 99-96; ½ ex., 19-11-1960, ± pl. 100; ½ ex., 29-12-1960, ± pl. 100; ½ ex., 17-1-1961, ± pl. 100; ⁵/₂ ex. (part. def.), 8-2-1961, pl. 101-100; 1 ex., 11-2-1962, pl. 101-100.

Distribution. — Netherlands, not uncommon. Three other specimens also show more or less resemblance to this variety: ½ ex. (young, right valve) in coll. LACOURT, Croix de Vie, Vendée, France, June 1962; 1 ex., left valve marked Moltk. 24, no. loc. or date (C); 1 ex., Sondré Sandó, Hvaler, Ostfold, Norway, 0-15 m.o.h., i stor mengde (in great quantity), as *Solen siliqua* (one may wonder if the label was not originally that of another sample), Laer LOUISE ANDERSEN leg. (Th.).

Material. — See under Typification and Distribution.

4b. *Ensis arcuatus* (Jeffreys) var. **norvegica** n. var.

Pl. 3 Fig. 10

In the northern North Sea and Atlantic a large, broad, curved form occurs, which has usually been referred to as *Solen ensis* var. or f. *magna*. Because of its interesting systematic position it may be more fully described:

Shell. — Very large (up to 17.5 cm l. and 2.7 cm br.), broad, moderately or strongly curved, the ventral edge somewhat more strongly than the dorsal, with slight taper towards the posterior end, sometimes with the edges parallel and no taper at all; anterior end squarely or slightly obliquely truncate. As to the "special features" mentioned in *E. magnus*, it differs from *E. magnus* in its much narrower dorsal areas, in its — especially towards the posterior end — rather flat shell, and in the two grooves being much less distinct.

Hinge. — Vertical teeth of left valve of about the same size, broad. Horizontal teeth straight or slightly convex at their base, strongly divergent from the dorsal edge when viewed from above, ca. 1/3 of length of the ligament. Ligament ridge broad straight or slightly convex at its base, parallel to the anterior adductor scar or somewhat diverging from it towards the ligament insertion.

Muscle scars. — Distance between anterior pallial scar and anterior edge approximately the same as between ventral pallial scar and ventral edge; anterior pallial scar parallel to the anterior edge; both the anterior pallial scar and the ventral pallial scar under the anterior adductor scar straight. Anterior adductor scar much (ca. 3 times) broader at its posterior end than at the top, short (ca. 1.3-1.4 times the length of the ligament), truncated posteriorly. Foot retractor opposite to the ligament insertion. Posterior adductor scar at a distance of at least its own length from the pallial sinus. Pallial sinus rather short (its length scarcely, if at all, exceeding its breadth), truncated.

Discussion. — The var. *norvegica* is intermediate between the typical form of *E. arcuatus* and *E. magnus*. In the collections from Trondheim and Tromsø I have seen many fine samples of this form, which at first I thought to be a distinct species. Since there are variations, however, both in the direction of *E. arcuatus* (many) and *E. magnus* (very few) it seems impossible to maintain this opinion.

A short survey of the differentiating characters in relation to *E. arcuatus* and *E. magnus*, together with the North-American *E. directus* may be given here.

	E. arcuatus	*E. a.* var. *norvegica*	*E. magnus*	*E. directus*
Curvature	slight	moderate to marked	slight	moderate to marked
Convexity	moderate	slight-moderate	marked	flat
Edges	parallel	ventral edge rather more strongly curved than dorsal	ventral edge much more strongly curved than dorsal	parallel
Taper	slight or absent	slight or absent	marked	absent or slight
Anterior adductor scar	rather long (1.5-1.6 times length of ligament)	short (1.3-1-4 times length of ligament)	rather long (at least 1½ times length of ligament)	very short, (scarcely longer than ligament)
Foot retractor	posterior to ligament insertion	opposite ligament insertion	opposite ligament insertion	opposite ligament insertion
Posterior adductor scar	at 1-1½ times own length from pallial sinus	at 1 or more	at less than 1	at less than 1

In general I find it much more difficult to separate *E. a.* var. *norvegica* from *E. arcuatus* than from *E. magnus*, though this too is not always easy. I strongly suspect that the whole group forms, in fact, a cline, the two last-mentioned forms being the extremes. If this is the case, the name *E. arcuatus* must be replaced by the much older

E. magnus of SCHUMACHER. Further work on the group is obviously required, and until more evidence is forthcoming I prefer to allow the name to stand.

Finally one or two samples may be briefly discussed to illustrate the intermediate position of *E. a.* var. *norvegica.*

In a sample from Great Britain (Orkneys, specimens of different size, coll. L.) the largest specimen resembles var. *norvegica* in its general appearance, but the internal characters are almost entirely those of typical *E. arcuatus.* The illustration in REEVE could have been drawn from this specimen and this makes me think, that it must be more commonly distributed in Scottish waters. The smaller specimens in the sample can hardly be distinguished from full-grown *E. arcuatus.*

Three specimens from the Faroes (Skaulafjord, coll. C.) have given me some doubt as to their identity. I have labelled the smallest specimen *E. magnus* and the other two *E. a.* var. *norvegica.*

Though in several cases young specimens may be recognized at a glance (i.a. on account of their breadth), in a mixed collection such as from Trondheim it is often a matter of judgment to distinguish these stages of *E. a.* var. *norvegica* from *E. arcuatus.*

Typification. — Holotype in Det Kgl. Norske Videnskabers Selskab Museet, Trondheim, Norway; Lyngholmfjaera ("fjaera" = shore), Storfosen, mouth Trondh. Fjord, Ørland, S.T., 20/4-1942. No collector indicated on the label.

Paratypes: NORWAY: Beiarn, Ørland, S.T., 2 ex., 12-5-1933, C. Dons (Th.); Bekkvik, Fjellvaerøy near Fillan on Hitra, S.T., mouth Trondh. Fjord, 1 ex., 11-8-1938, shore, C. Dons (Th.); Outside Fosenvågen (Fosnavåg), mouth Trondh. Fjord, 1 ex., 13-8-1926, 10-20 m., C. Dons, M/S "Gunnerus" (Th.); Grandestorfluen, Ørland, S. T., 1 ex. (def.), 10-20 m, E. Sivertsen (Th.); Husøy, Tarva, just outside Trondh. Fjord, S.T., 1 ex., 11-5-1933, C. Dons (Th.); Kristiansund, near Trondheim, 1 ex., C. Dons (Th.); Leka, N. of Trondheim, N.T., 1 ex., 3-8-1927, shore (Th.); id., 1 ex., 3-8-1937, shore, C. Dons (Th.); Lensvik, Trondh. Fjord, S.T., 1 ex., 21-8-1929, shore (Th.); id., 8 + 6 ex., 24-3-1939, shore, C. Dons (Th.); Munken, Ørland, S. T., 2 2/2 ex., C. Dons (Th.); Sistranda, Nord-Frøya, S.T., 1 ex., 25-3-1943, shore (Th.); Storfosen, mouth Trondh. Fjord, Ørland, S.T., 1 ex., Febr. 1934, J. Lind (Th.); id., 1 ex., 1940, shore, C. Dons (Th.); id., 4 ex., 1 Oct. 1940, C. Dons (Th.); id., 3 ex., 15-4-1942, shore, C. Dons (Th.); Sundnes, Inderøy, inner Trondh. Fjord, N.T., 1 ex. (def.), (Th.); Tautra, central Trondh. Fjord, N. of Trondheim, 2 ex., 16-8-1935, shore, C. Dons (Th.).

Distribution. — Norway, ?Faroes.

Material. — See under Typification.

Ensis directus auctorum (nec Conrad?)

Shell large, broad, flat, moderately to strongly curved, edges parallel or nearly so; posterior end as broad as or somewhat broader than the anterior end, hardly, if at all, tapering; anterior end obliquely truncate.

Hinge. — Vertical teeth of left valve unequal in size; the right tooth broadly triangular in outline, the left one decidedly narrower and about D-shaped in outline. Horizontal teeth straight at their base, about 1/3 of the length of the ligament. Ligament ridge convex at its base, diverging from the anterior muscle scar in the direction of the ligament insertion.

Muscle scars. — Distance between anterior pallial scar and anterior edge about the same as that between ventral pallial scar and ventral edge. Anterior pallial scar diverging from the anterior edge, more or less concave. Anterior adductor scar much broader at its posterior end than at the top (some 3 or 4 times as broad), very short (in full-grown specimens often hardly longer than the ligament), rounded or somewhat truncated. Foot retractor opposite to the ligament insertion. Posterior adductor scar close to the pallial sinus (at a distance much less than its own length). Pallial sinus short and broad, truncated or with an undulation. Dorsal and pallial scars in this part of the shell parallel or somewhat diverging; the latter much closer to the ventral edge of the shell than to the dorsal pallial scar.

E. directus, an Atlantic North American species, is the only large, curved non-European species of the genus. Since it may show, in certain stages, a more than superficial resemblance to *E. arcuatus* var. *norvegica,* it may be confused with the latter, though it is always separated from any other large, curved form by good, constant characters on the inner surface of the shell. A short survey of these characters is given under *E. arcuatus* var. *norvegica.*

Remark. — The description has mainly been drawn up from a sample in the Rijksmuseum, Leiden, containing 6 5/2 ex. from Corson's Inlet, New Jersey, 1909; Reg. No. 1533.

A note on the nomenclature. — I am in some doubt as to the name *directus* for this species. The original description of CONRAD's Tertiary (Miocene) fossil *Solen directus* is so much in contradiction with our recent shell, that one cannot help thinking the two must be different species. E.g., CONRAD states his shell to be linear and straight (whence the name *"directus"*), anything but that being applicable to the recent species, while his description of the hinge is also quite different from that of the recent material.

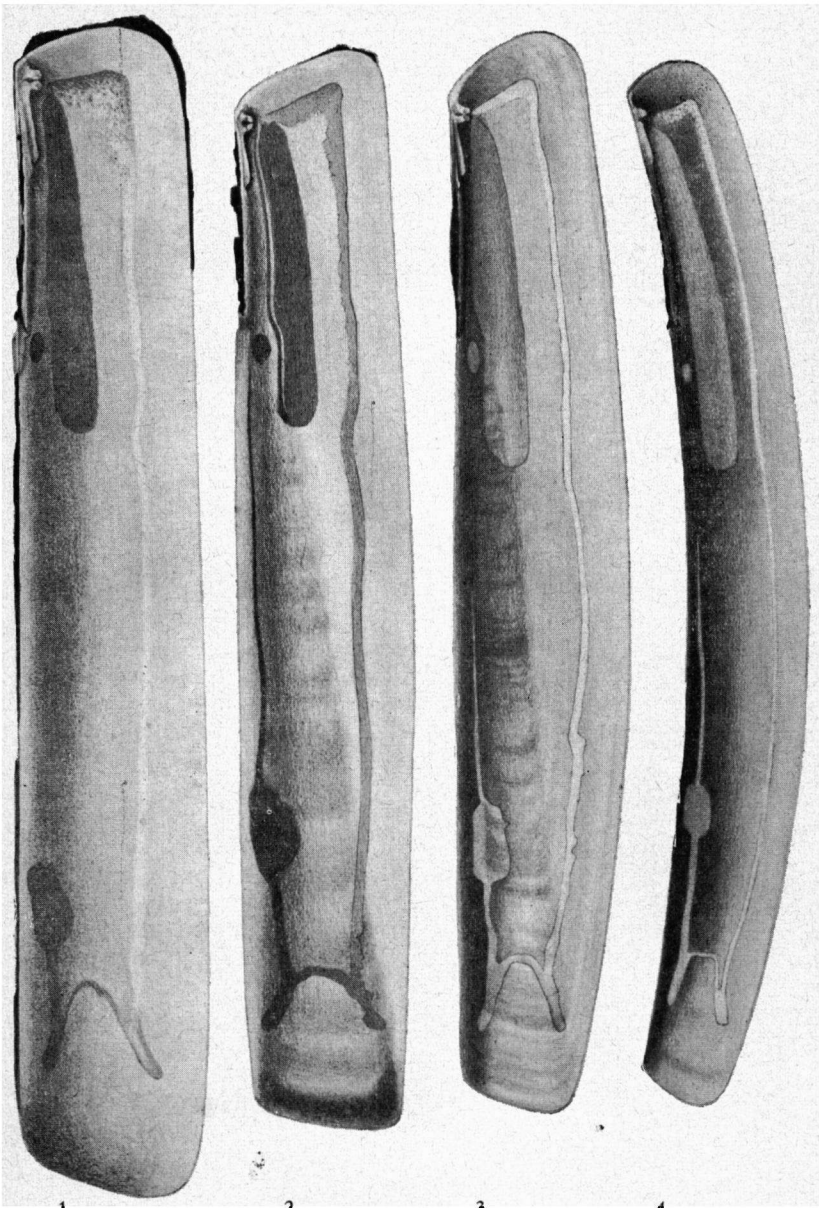
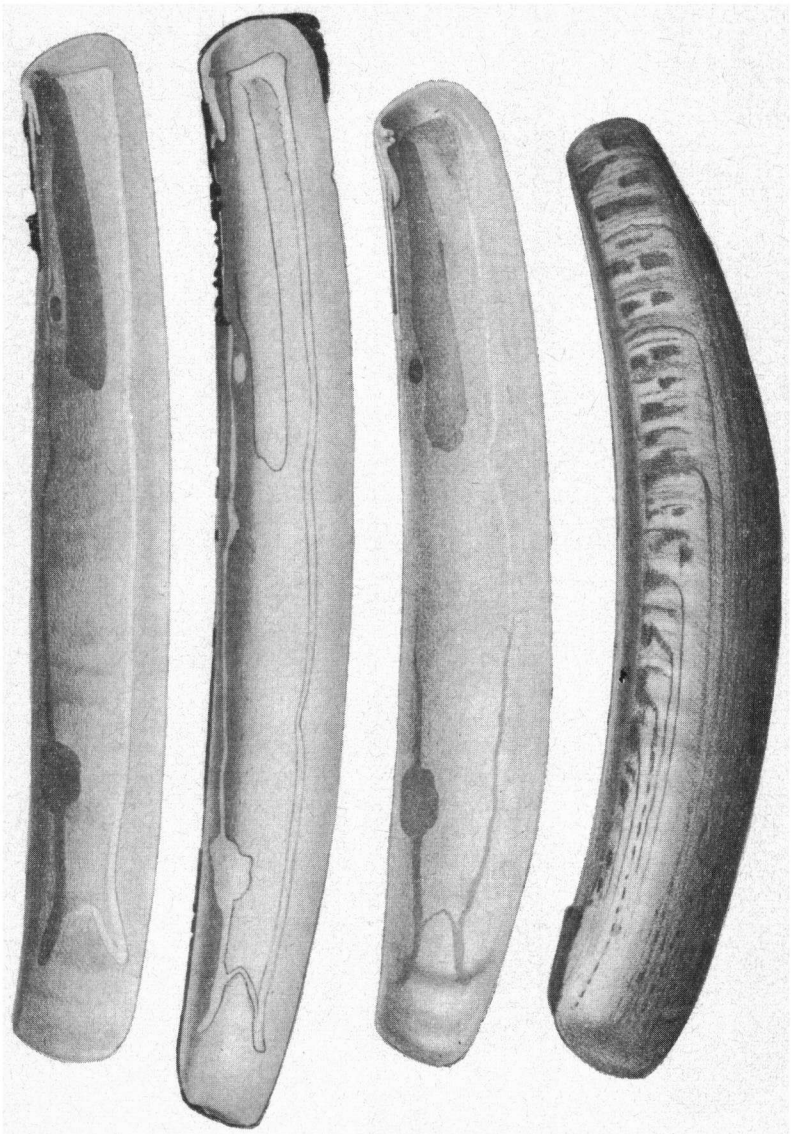


Plate 1. Fig. 1. *Ensis siliqua* (L.), Netherlands, Terschelling (pl. 12-10), 20-8-1940, P. Creutzberg c.s. F., No. 1803), length 18 cm. — Fig. 2. *Ensis minor* (Chenu), Netherlands, De Beer, 2-9-1956, H. van Haren (L., Reg. No. 1726), length 13.4 cm. — Fig. 3. *Ensis minor* (Chenu) var. *subarcuata* n. var., holotype (L.), length 10.7 cm. — Fig. 4. *Ensis ensis* (L.), Denmark (K.). To the sample belong two labels: 1) Lönstrup; 2) Laexis [?] Wolff, Hjörring, 29/6 79. Length 9 cm.



5 6 7 8

Plate 2. Fig. 5. *Ensis arcuatus* (Jeffr.), typical form, drawn from Netherlands material (L.), length 15 cm approximately. — Fig. 6. *Ensis arcuatus* (Jeffr.) var. *ensoides* n. var., holotype, (L.), length 13.2 cm. — Fig. 7. *Ensis phaxoides* n. sp., holotype (L.), length 8.8 cm. — Fig. 8. *Ensis phaxoides* n. sp., drawn from Netherlands material from near the type locality.

DALL writes on the subject: "I began the examination of the fossil material supposing that the Miocene form might be distinct from the recent shell, but after a series of careful comparisons I am unable to find any constant character by which they can be discriminated". Still one wonders what would be the result of a careful examination of the muscle scars, which are so important a feature in *Ensis*.

I have not seen type-material or other fossil *directus*, however, and therefore do not feel justified in making nomenclatural changes. But one remark must still be made. If the recent species is indeed different from the fossil, its name should be *E. americanus* Binney, 1870, not Gould. I owe this information to Dr. LEMCHE of Copenhagen, who wrote to me, that neither the name *americanus* nor the paragraph mentioning its possible differences from *Solen ensis* (= *E. arcuatus*) are found in GOULD, 1841.

Literature. — Conrad, 1843, Proc. Acad. Nat. Sci. Philad. vol. 1, p. 325 *(Solen directus)*; Gould, 1841, Rep. Invertebr. Massachusetts, ed. 1 *(Solen ensis)*; Gould & Binney, 1870. Rep. Invertebr. Massachusetts, ed. 2, edited by Binney, p. 42 *(Solen ensis* var. *Americanus)*; Dall, 1900, Trans. Wagner Free Inst. Sci. Philad., vol. 3, pt. 5, p. 954 *(E. directus)*.

5. *Ensis ensis* (L.)

Pl. 1 Fig. 4

Solen alter curvus minor ..... Lister, 1685, App. ad Hist. Anim. Angl., pl. 2 fig. 9 (p. 44).

Solen ensis Linnaeus, 1758, Syst. Nat., ed. 10. vol. 1, p. 672; Linnaeus, 1767, Syst. Nat., ed. 12, vol. 1, p. 1114; Poli, 1791, Testac. utr. Sicil., vol. 1, Ordo secundus, p. 18, Index, p. V, pl. XI fig. 14; Wood, W., 1835, Gen. Conchol., p. 122, pl. 28 fig. 1,2; Forbes & Hanley, 1848, Hist. Brit. Moll., vol. 1, p. 250; Hanley, 1855, Ipsa Linn. Conch., p. 29; Jeffreys, 1865, British Conch., vol. 3, p. 16; Jeffreys, 1869, British Conch., vol. 5, pl. 47 fig. 1; Dodge, 1952, Bull. Amer. Mus. Nat. Hist., vol. 100, p. 34 (p.p.).

Hypogaea falcata Poli, 1791, Test. utr. Sicil., vol. 1, Ordo secundus, p. 18, Index, p. XI; 1795, Test. utr. Sicil., vol. 2, p. 251 (name of the animal).

Hypogaeoderma ensis, Poli, 1795, Test utr. Sicil., vol. 2, p. 257 (name of the shell).

Solen ensis minor Chenu, 1843, Ill. Conch. *Solen* pl. 3 fig. 5, 6.

Ensis ensis, Bucquoy, Dautzenberg & Dollfus, 1895, Moll. mar. Rousillon, vol. 2, p. 506, pl. 73 fig. 4, 5 (var. ex forma *minor*); Holme, 1951, Journ. Mar. Biol. Ass. U.K., vol. 29, pl. 1 fig. 1, No. 3, p. 639 seq. (p.p.).

Shell. — Small (up to ca. 10 cm l and 1.2 cm br.), slender to very slender, moderately to strongly curved, edges parallel, tapering slightly towards the posterior end (which is ca. 1 mm narrower than the anterior end), anterior end rounded.

Hinge. — Vertical teeth of left valve of about equal size, slender, about D-shaped in outline. Horizontal teeth straight or almost

straight at their base, more or less diverging from the dorsal edge when viewed from above, 1/3 of the length of the ligament. Ligament ridge in its anterior part broad and close to the anterior adductor scar, but diverging from it towards the ligament insertion, where it becomes much narrower (about as broad as the space between it and the anterior muscle scar).

Muscle scars. — Distance between anterior pallial scar and anterior edge about the same as that between ventral pallial scar and ventral edge. Anterior pallial scar more or less parallel to the anterior edge, anterior pallial scar and ventral pallial scar under the anterior adductor scar not concave. Anterior adductor scar slender, its posterior end ca. twice as broad as the top, ca. 1¾ of the length of the ligament, at its posterior end about as broad as the distance to the dorsal pallial scar, posterior end of its ventral border somewhat closer (ca. 1 mm) to the dorsal than to the ventral edge of the shell. Foot retractor posterior to the ligament insertion, at a distance of at least its own breadth. Posterior adductor scar at a distance of ca. 1½ time its own length from the pallial sinus. Pallial sinus usually rather short (its length not much exceeding its breadth, if at all), truncated. Dorsal and ventral pallial scars in this part of the shell parallel or only slightly divergent, the latter (much) closer to the ventral edge of the shell than to the dorsal pallial scar.

Variability and specific characters. — I have drawn up the description from the many North Sea samples in the collections of Copenhagen and Charlottenlund, which are all very uniform, the specimens not attaining, however, a length of more than 8-9 cm.

The Mediterranean form may be somewhat less slender, the posterior and anterior ends being about equally broad; the horizontal teeth are up to about ½ the length of the ligament, and the posterior adductor scar is situated still farther inwards (at a distance of about twice its own length from the pallial sinus). The glossy, violet colour, especially on the inner surface of the valves is in sharp contrast with the sandy-coloured North Sea material.

With *E. ensis* I must also unite a form which occurs in the material from the Netherlands. It is still more slender than the typical North Sea form described above, the anterior pallial scar is directed forwards and the two vertical teeth in the left valve are broad and solid, the right one being the broader. On account of its often brown or inky blue colour I thought at first it was a fossil species, but after a careful examination of some 50 mixed Scheveningen specimens I have been unable to separate it from recent *E. ensis*.

Nomenclature and typification. — According to HANLEY (1855) and DODGE (1952) there should be one specimen in the Linnean

collection, but Mr. DANCE, of the British Museum, has kindly sent me photographs of 3 specimens from that collection. They are not marked with a number and their locality is unknown.

I have, therefore, selected as lectotype the shell figured by LISTER (the only reference in the 10th edition of LINNAEUS' Systema Naturae), which restricts the type-locality to Great-Britain ("M. Angelico"). The figure of LISTER is that of an *E. ensis* from the North Sea, "the delineation though not good being sufficiently characteristic" (HANLEY).

The photographs mentioned above and the figure in WOOD, Gen. Conch., with which HANLEY declares the Linnean specimen identical, very clearly represent the same form.

Distribution. — North Sea-Mediterranean.

The species is absent from the collections from Trondheim and Tromsø, which is surprising, since there are so many fine samples in the Copenhagen and Charlottenlund collections. It is certainly widely distributed in the North Sea, where at least England (Scotland), Denmark, Germany and the Netherlands fall within its range.

In the Netherlands it is washed ashore all along the coast but, with a few exceptions, always as odd, not quite fresh valves. An explanation may be, that *E. ensis* is a non-littoral species living only some distance off the coast.

It is found in many localities in the Mediterranean; see i.a. CARUS and WEINKAUFF, already mentioned under *E. minor*. Records for the Eastern Mediterranean and Black Sea may partly refer to No. 7: *E. sicula*.

According to BUCQUOY c.s. (vol. 2, p. 506) it has been recorded by MIDDENDORFF from the Sea of Okhotsk (!), but I have not been able to find any information about this locality.

6. *Ensis* **phaxoides** n. sp.

Pl. 2 Fig. 7, 8

E. ensis, Holme, 1951, Journ. Mar. Biol. Ass. U.K., vol. 29, p. 644 ("most pronounced taper"); Entrop, 1959, Schelpen vinden en herkennen, p. 144, fig. 91.

E. ensis forma *minor*, Kaas & Ten Broek, 1942, Ned. Zeemollusken, p. 118/119, pl. 8 fig. 9b; Prud'homme van Reine, 1957, Wat vind ik aan het strand, ed. 5, p. 58, pl. 19 fig. 43a?

Shell. — Small (up to ca. 10 cm l. and 1.5 cm br.), moderately slender to rather broad, slightly to moderately curved, ventral edge more strongly curved than the dorsal, the latter being sometimes quite straight in its middle part; in the posterior third of the shell the ventral edge approaches the dorsal, producing a most pronounced taper; anterior end rounded.

Hinge. — Vertical teeth of left valve of about equal size (though sometimes the left tooth may be broader), relatively broad and solid in full-grown specimens, more or less D-shaped in outline. Horizontal teeth somewhat convex or straight at their base, diverging from the dorsal edge when viewed from above, about 1/3 of the length of the ligament. Ligament ridge usually parallel to the anterior adductor scar, narrow in immature specimens, but nearly touching the anterior adductor scar in full-grown ones.

Muscle scars. — Distance between anterior pallial scar and anterior edge about the same as, or slightly less than, that between ventral pallial scar and ventral edge; anterior pallial scar more or less parallel to the anterior edge, anterior pallial scar and ventral pallial scar under the anterior adductor scar not concave. Anterior adductor scar ca. 3 times broader at its posterior end than at the top, ca. 1.5-1.6 times the length of the ligament, rounded posteriorly, with posterior end of ventral border much closer to the dorsal than to the ventral edge of the shell. Foot retractor opposite to, or posterior to the ligament insertion, often at a distance which is not more than its own length. Posterior adductor scar close to the pallial sinus (at a distance of not more than about its own length from it). Pallial sinus variable, but usually about 1½ times as long as wide and markedly narrowed towards the apex, where it is often rounded. Dorsal and ventral pallial scars in this part of the shell more or less divergent, the latter about equidistant from ventral edge and dorsal pallial scar.

Variability and specific characters. — This pretty shell is well-known to Dutch malacologists and present in many collections, but has always passed under the name *E. ensis* or *Solen ensis minor*. It can be distinguished from *E. ensis* by a number of characters, the more important ones being as follows:

	E. phaxoides	*E. ensis* (Atlantic)
Length : breadth ratio	rather broad	very slender
Edges	ventral edge more strongly curved	parallel
Taper	marked	slight or absent
Posterior adductor scar	at about its own length or less from the pallial sinus	at about 1½ times its own length from the pallial sinus
Foot retractor	often immediately posterior to the ligament insertion	posterior to the ligament insertion

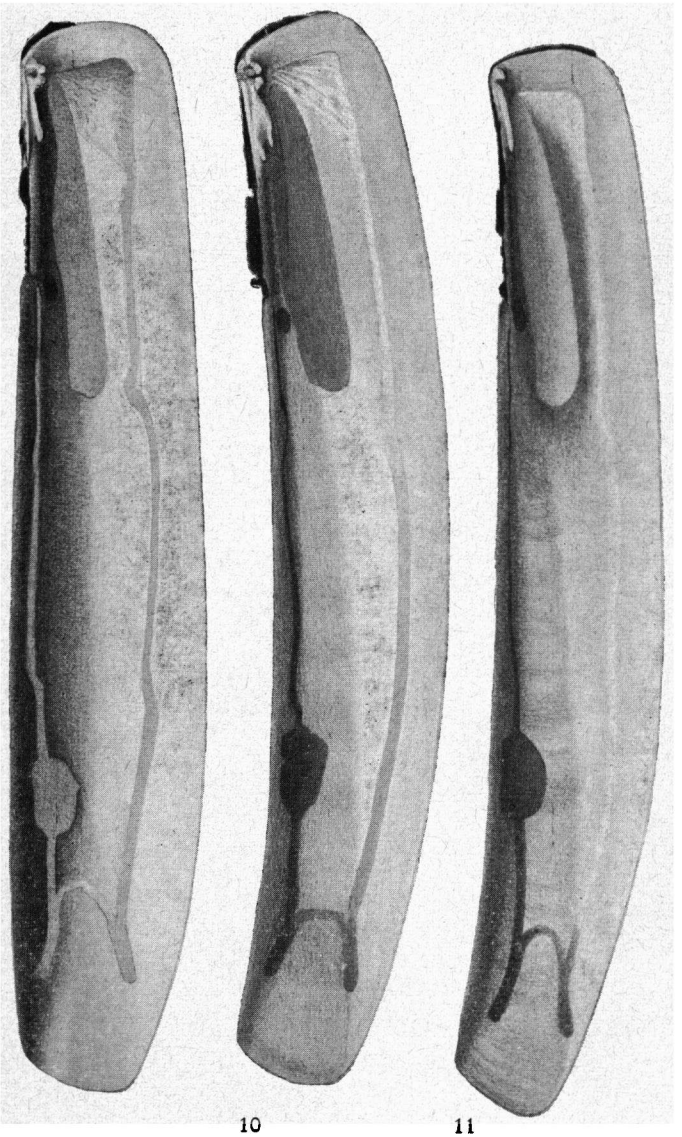


Plate 3. Fig. 9. *Ensis magnus* Schum., Faroes, Thorshavn (K.), length 16,8 cm (a straight specimen of this species, which is more often slightly curved). — Fig. 10. *Ensis arcuatus* (Jeffr.) var. *norvegica* n. var., holotype (Th.), length 17.2 cm. — Fig. 11. *Ensis sicula* n. sp., drawn from the holotype (L.), length of the right valve 8.2 cm.

12 13

Plate 4. Fig. 12. *Ensis arcuatus* (Jeffr.), holotype (U.S.N.M.), length 7 inches. — Fig. 13. *Ensis arcuatus* (Jeffr.), paratype (U.S.N.M.). Photographs by courtesy of the Smithsonian Institution, Washington DC.

E. ensis is a uniform species, but *E. phaxoides* shows considerable variation, especially in its length-breadth ratio and the length of the prodissoconch, and this may cause confusion in identification.

The length-breadth variation gives i.a. rise to slender shells, resembling *E. ensis* in that way, but otherwise still presenting the usual *phaxoides*-characters; they are linked with the more common form by a complete series of intermediates. I have failed, however, to form such a series between *E. ensis* and slender *E. phaxoides*, and this has been one of the reasons for regarding the latter as a distinct species. The variation in length of the prodissoconch, when once recognized, is not likely to present any further difficulties in identification.

Though I have seen hundreds of *E. phaxoides*, all in perfect condition and all, I am certain, correctly identified, I am still unable to fix precisely the limits of the species, more especially as far as the young and immature material is concerned.

Nomenclature and typification. — I find no evidence that this species has ever been recognized as such, since it has commonly been confused with *E. ensis*. The name *phaxoides* ("*Phaxas*-like") has been chosen for two reasons (1) because the young shells are superficially similar to *Phaxas pellucidus*, (2) because of the anterior end, which may be rounded like in a *Phaxas*.

Holotype: Katwijk (Netherlands), 3-10-1954, C. O. van Regteren Altena, in coll. Rijksmuseum van Natuurlijke Historie, Leiden.

Paratypes. — NETHERLANDS: Schiermonnikoog, 22½ ex. (5 def.), 1961 (Vader). Terschelling, 2 ex., 5/8-4-1958, pl. 12-24, No. 5492, J. A. W. Lucas (F.); 20 ²/₂ ex. (3 def.), 16/19-3-1961, pl. 17-21 (Tanis); 2 ex. (def.), 1-11-1960, pl. 18-29, A. J. M. Leeuwenberg (L.); 5³/₂ ex., 30-10-1961, pl. 26, Amelander Gat, A. J. M. Leeuwenberg (L.); 4 ex., 29-12-1961, pl. 18-21, A. J. M. Leeuwenberg (L.). Bergen aan Zee, 1 ex., 4-3-1934, ± pl. 53, v. R. A. (A.); 1 ex., 1/2-1930, v. R. A. (A.). Bakkum aan Zee, pl. 48-49, 3 ex. (2 def.), 22-12-1934 v. R. A. (A.). Wijk aan Zee, 1 ex., 31-3-1934 v. R. A. (A.); 1 ex., 1-6-1935, v. R. A. (A.). Wijk aan Zee-IJmuiden, 2 ex., 5-7-1949, No. 3616, A. Mulder (F.). Bloemendaal aan Zee, 11 ex. (1 monstr.), 8-3-1935, v. R. A. (A.) Zandvoort, 1 ex., 6-1934, marked: 7 (L.); 18 ex., 31-1-1960, ± pl. 66, v. R. A. (L.); 4 ex., 17-10-1960, pl. 67-69, v. R. A. (L.); 15 ex., 24/25-12-1960, pl. 66-69, v. R. A. (L.); 30 ex., 5-3-1961, v. R. A. (L.). Zandvoort-Noordwijk, 1 ex. 11-9-1960, pl. 73-74, v. R. A. (L.). Noordwijkerhout, 4 ex., 25-9-1960, v. R. A. (L.); 6 ex., 26-2-1961, v. R. A. (L.); 3 ex., 13-5-1962, W. C. G. Gertenaar (Bergmans). Noordwijk, 5 ex. (1 def.), 17-3-1951, pl. 82-77, Ph. van Hooven (L.); 20 ex., 24-7-1960, pl. 72-73, v. R. A. (L.); 60 ex., 5-3-1961, pl. 72-73, v. R. A. (L.); 3 ex., 29-6-1961 (Miss Duyfjes). Katwijk-Noordwijk, 1 ex., 5-4-1953, v. R. A., Reg. No. 1019 (L.); 2 ex., 26-10-1958, v. R. A., Reg., No. 1480 (L.); 2½ ex., 19-7-1959 (Lacourt); 2 ex., IX-1959, v. R. A. (L.). Katwijk, 1 ex. 25-9-1934, marked: 9 (L.); 9 ex., 9-1934 (Lacourt); 1 ex., 25-3-1935 (Lacourt); 1 ex., 6-8-1949, Ph. van Hooven (L.); 4 ex. (1 def.), 23-1-1949, No. 1360, W. Vervoort (L.); 3 ex., 9-5-

1954, Reg. 1117, v. R. A. (L.); 11½ ex., 3-10-1954, Reg. 1152, v. R. A. (L.); ½ ex., 8-1961, E. Bergmans (Bergmans); 11 ex., date?, (Lacourt). Wassenaar, 7 ex., 10-1-1937, Reg. No. 618, J. Bremer (L.); 2 ex., 17-8-1951, Wassenaarse Slag, Reg. No. 1652, Miss M. J. de Graag (L.); 1 ex., one of the finest specimens in the material mentioned here, 28-10-1951. Wassenaarse Slag — pl. 93, No. 1019 (Boerman). Scheveningen, 1½ ex., date?, nr. 1359 a + b and nr. 1362 (Brandhorst); 4 ex., 7-1935, marked: 10 (L.); 2 ex., 11-4-1947, pl. 99, No. 2363, J. A. W. Lucas (F.); 1 ex., 17-8-1951, pl. 97-98, No. 1138 (Boerman); 11 ex., 1953, after the storm of February (v. Haren); 8½ ex., 10-1954, No. 891 (Mrs. Fehr-de Wal); 5 ex., 7-12-1958, pl. 98-97 (P.); 1 ex., 21-12-1958, pl. 99-±97 (P.); 1 ex., 8-2-1959, pl. 100-99/98 (P.); 4 ex., 15-2-1959, pl. 100/99-98/97 (P.); 3 ex., 1-3-1959 (P.); 1 ex., 20-6-1959, pl. 99-98 (P.); 2 ex., 18-11-1959 (Mrs. Fehr-de Wal); 1 ex., 6-12-1959, pl. 101/100-± 97 (P.); 37½ ex., 1959 (Mrs. Fehr-de Wal); 2 ex. (1 with fr. left valve), 24-1-1960, ± pl. 100-±97 (P.); 14 ex., 31-1-1960, ± pl. 100-± pl. 98 (P., but 1 def. in L., Reg. No. 1559); 1 ex., 2-1960 (Mrs. Fehr-de Wal); 9 ex. (1 slightly def.) 5-3-1960, pl. 99-Meyendell (P.); 12 ex. (1 with fr. of left valve), 5-3-1960, pl. 101 (P.); 1 ex. 8-2-1961, pl. 101-100 (P.). Terheyde-Hoek van Holland, 6 ex., 2-1937/10-1937, No. 1809, H. Odé (F.). Hoek van Holland, 9 ex., 14-4-1936, v. R. A. (A.). De Beer, 1 ex. (def.), 6-11-1938, J. Bremer (L.). De Beer-Noordwijk, 10 ex. (1 def.), 1937-1942, No. 1808, A. Bloklander, P. H. Creutzberg (F.). Voorne, 15½ ex. (3 def.), 19-4-1936, NW. and W. coast, shore, v. R. A. (A).

BELGIUM La Panne, 1 ex., Aug. 1963, W. Fasseaux (a beautiful specimen of 10.4 cm l., 1.4 cm br.).

Besides 5 ex. sent to me by Mr. N. A. Holme from Plymouth, without further information about date or locality.

Distribution. — Very imperfectly known. NETHERLANDS: all along the coast fine specimens are often cast ashore, sometimes even with the animal still alive. BELGIUM: See under paratypes. GREAT BRITAIN: 1 ex. (somewhat more slender than usual) from Saunderfoot. Pembroke, S. W. Wales, 1947, in coll. L. Besides 5 ex. sent to me by Mr. N. A. HOLME, Plymouth, mentioned under the paratypes.

Material.— See Typification.

7. *E.* **sicula** n. sp.

Pl. 3 Fig. 11

Description of the holotype:

Shell. — Small (length somewhat more than 8 cm, breadth about 1.2 cm in the broadest part), slightly curved, the ventral edge more strongly than the dorsal; anterior end truncate, anterior edge slightly rounded. Posterior end damaged.

Hinge. — Vertical teeth of left valve broken off, the portions remaining suggest, however, that the right tooth was broader than the left. Horizontal teeth slightly convex at their base, parallel to

the dorsal edge when viewed from above, at their posterior end somewhat broader than near the vertical teeth, about 1/3 of the length of the ligament. Ligament ridge straight at its base, decidedly broader than the distance between it and the anterior adductor scar, mainly parallel to the latter but diverging slightly from it near the ligament insertion.

Muscle scars. — Distance between anterior pallial scar and anterior edge less than between ventral pallial scar and ventral edge, anterior pallial scar parallel to the anterior edge, anterior and ventral pallial scar under the anterior adductor scar not concave. Anterior adductor scar ca. 3 times broader at its posterior end than at the top, rather short (7 mm behind the ligament insertion, 16 mm in front of it), rounded posteriorly, posterior end of its ventral border somewhat closer to the dorsal than to the ventral edge of the shell (the difference being about 1 mm), posterior end of the dorsal border diverging from the dorsal edge of the shell. Foot retractor opposite to the ligament insertion. Posterior adductor scar at a distance of rather more than its own length from the pallial sinus. Pallial sinus about twice as long as broad. Dorsal and ventral pallial scars in this part of the shell divergent.

Specific characters. — *E. sicula* is quite unlike any other species of the genus I have seen. The only forms with which it might be confused are (young) *E. arcuatus* and *E. a.* var. *norvegica* (!). There are a number of features, however, which distinguish it from either or both of these, the more important being: (1) the ventral edge, which is more strongly curved than the dorsal, (2) the anterior adductor scar, which is obviously longer and rounded posteriorly, (3) the long pallial sinus, (4) the anterior pallial scar and the ventral pallial scar under the anterior adductor scar, which are not "concave", (5) the dorsal and ventral pallial scars which are divergent between the pallial sinus and the posterior adductor scar. Further the descriptions should be consulted. It must still be mentioned, that neither *E. arcuatus* nor its var. *norvegica* have ever been recorded from the Mediterranean.

Confusion between *E. ensis* and *E. sicula* is only possible, if every small, more or less curved species is looked upon as *E. ensis*.

Nomenclature and typification. — I find no indication, that this species has ever been recognized. If it has ever been found, it has probably been regarded as *E. ensis*. See also under the distribution of that species.

The only known sample is preserved in the Rijksmuseum van Natuurlijke Historie at Leiden, Netherlands, and contains the holotype and $3^3/_2$ paratypes, all more or less damaged. The label gives the

following information (in Dutch): Turkey Expedition 1959. Reg. No. 1583. (C. Swennen — Coll. Nr. 9). Turkey, Sea of Marmora; beach near Florya, ca. 15 km W. of Istanbul, April 2, 1959.

Distribution. — See Nomenclature and typification.

Material. — See Nomenclature and typification.

SUMMARY

In the present paper a study has been made of the genus *Ensis* in Europe. Seven species and three varieties are recognized (see p. 18), the following of them being described as new: *E. minor* (Chenu) var. *subarcuata* (p. 27), *E. arcuatus* (Jeffr.) var. *ensoides* (p. 31) and var. *norvegica* (p. 33), *E. phaxoides* (p. 39) and *E. sicula* (p. 42).

Though *E. magnus* Schum. has been separated here from *E. arcuatus* (Jeffr.) as specifically distinct, it may actually form a cline with the latter.

As to the related Atlantic North American species of the genus it is pointed out, that the species commonly called *E. directus* Conrad should probably be named *E. americanus* Binney, while *E. minor* Dall (1899) seems in need of a new name, since it is unfortunately antedated by *E. minor* (CHENU, 1843).

MEDEDELING VOOR NEDERLANDSE LEZERS

In een van de volgende nummers van Basteria zal een overzicht verschijnen van de Nederlandse *Ensis*-soorten, voorzien van illustraties en tabel.