Cah. Biol. Mar. (1992), **33** : 515-518
Roscoff

Note on the identification of *Ensis directus* (Conrad, 1843).

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Abstract : *Ensis directus* occured for first time in high number in the French part of the North Sea in spring 1991. Identification of specimens smaller than 15 mm is difficult because of easy confusion with *Ensis arcuatus*. For longer animals, a length/height ratio of 6:1 is a reliable criterion of identification for *Ensis directus* after the three other constants and reliable characters described by de Boer (1984).

Résumé : Un important recrutement d'*Ensis directus* a été observé au printemps 1991 sur les côtes françaises de la Mer du Nord. L'identification des individus plus petits que 15 mm est très difficile, car il est alors impossible de différencier *Ensis directus* d'*Ensis arcuatus*. Pour de plus grandes tailles, le rapport longueur/hauteur de 6:1 est un critère d'identification fiable pour *Ensis directus*, il complète les trois autres caractères constants et fiables de la diagnose proposée par de Boer (1984).

INTRODUCTION

Recruitment of a high quantity of post larvae of the Solenidae *Ensis directus* (Conrad, 1843) in the French part of the North Sea in june 1991 (Luczak *et al.*, in press) allowed us to examine the identification of this species.

Measurement of shell breadth and length were made following Holme (1951).

Young recruits (mean length : 3 mm) were first identified as *Ensis arcuatus* (Jeffreys, 1865) (Luczak, 1991). Examination of the oldest specimens from september 1991 (mean length : 35 mm) revealed characters of *Ensis directus* following previous descriptions (von Cosel *et al.*, 1982 ; de Boer, 1984 ; van Urk, 1987) (Fig. 1). Three major characters presented by De Boer (1984) are constant and reliable : anterior adductor scar as long as the ligament or slightly longer only, foot-retractor scar opposite to the insertion marking the end of the ligament and posterior adductor scar very close to the pallial sinus, nearly bordering it.

However, the identification of specimens of *Ensis directus* smaller than 15 mm resulted very difficult. Shell characters which serve to distinguish *Ensis directus* from *Ensis arcuatus* are not very marked, and length/height ratio is not constant under 15-20 mm. For larger specimens, this ratio is about 6:1 (Fig. 2). Essink & Visser (1988) found the same relation for specimens from the Wadden sea.

Ford (1921) found that in *Ensis arcuatus* ranging from 7.5 to 21.0 mm in length, the mean ratio was 5.08. Holme (1951) found for specimens from British Isles a mean ratio of 7.18 for all sizes (N = 112) between 0 and 16 cm. Entrop (1965), De Boer (1984) and van Urk (1987) found a ratio of 8:1 for adults of *Ensis arcuatus*. Von Cosel *et al.* (1982) found a ratio from 5 to 7 for *Ensis directus*, and from 7.5 to 8 for *Ensis arcuatus*.

	Ensis directus	*Ensis arcuatus*	corresponding number on the figure
a.	Anterior adductor scar as long as the ligament or slightly longer only	Anterior adductor scar more than 1.5 x the ligament (var. *norvegica.* ± 1.5 x the ligament)	1 : anterior adductor scar
b.	Foot-retractor scar opposite to the insertion marking the end of the ligament	Foot-retractor scar posterior to the ligament insertion (var. *norvegica.* opposite to it)	2 : ligament insertion (end of the ligament) 3 : foot-retractor scar
c.	Posterior adductor scar very close to the pallial sinus, nearly bordering it	Posterior adductor scar at about its own length from the pallial sinus	4 : posterior adductor scar
d.	Pallial sinus (often) pointing to posterior adductor scar	Not so pointing	5 : pallial sinus
e.	Young specimens : anterior pallial scar markedly closer to the anterior shell margin than the adjacent ventral pallial scar to the ventral shell margin	Both at about the same distance, or the anterior pallial scar only slightly closer to the anterior shell margin	6 : ventral pallial scar 7 : anterior pallial scar
f.	length/height ratio 6:1	length/height ratio about 8:1	
g.	Colour greyish violet with olive green periostracum	Colour fleshy pink with brown periostracum	
h.	Anterior adductor scar (usually) narrowly pointed anteriorly, more or less directed downwards posteriorly	Anterior adductor scar moderately narrowed anteriorly, slightly directed downwards or almost parallel to the dorsal shell margin	

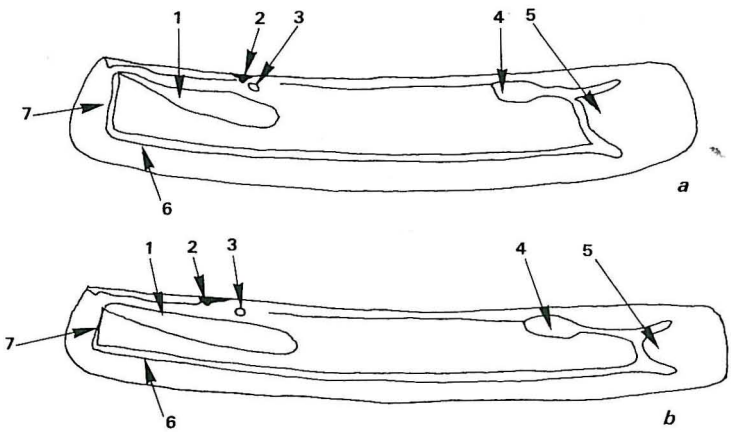

Fig. 1 : Interior of the right shell valve of
a. Ensis directus (Conrad, 1843)
b. Ensis arcuatus (Jeffreys, 1865)
a, b & c are major and reliable characters revealing the identity of the species (modified from De Boer, 1984).

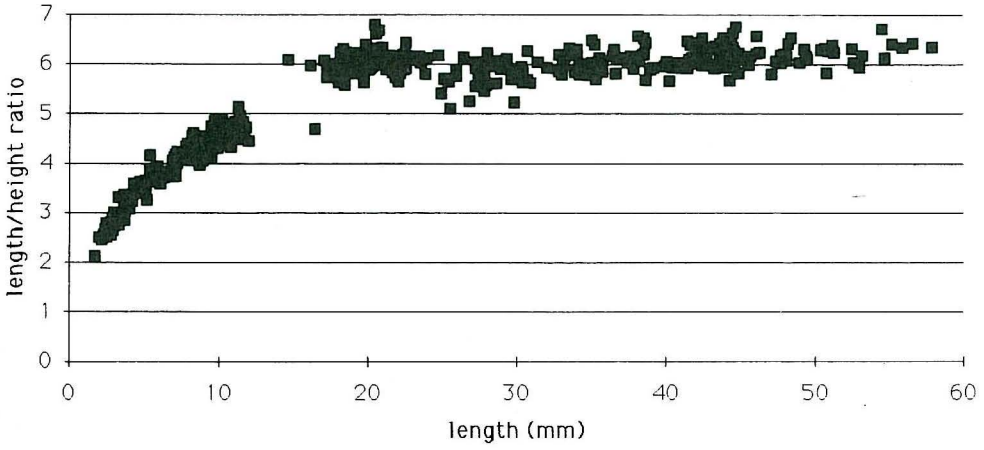

Fig. 2 : Relationship between length and length/height ratio of the shell of *Ensis directus* (specimens from june 1991 to december 1991) (N = 513).

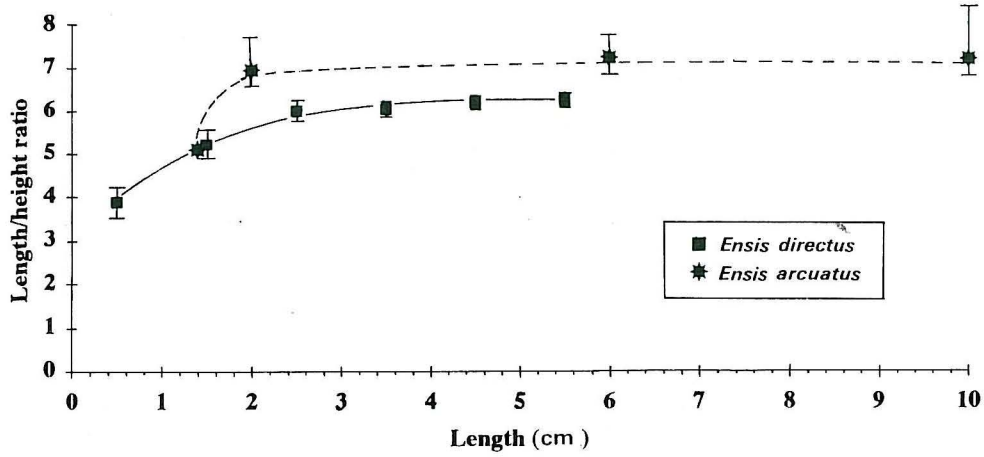

Fig. 3 : Comparison of the relationship between length and length/height ratio of the shell of *Ensis arcuatus* (Holme & Ford's data) and *Ensis directus*. S.D. is represented for *Ensis directus*, min. and max. for *Ensis arcuatus*.

Results of Ford (1925) and Holme (1951) for *Ensis arcuatus* are resumed on a graph with those of the present study for *Ensis directus* (Fig. 3). Data of *Ensis directus* are represented as the mean ratio of 10 mm length class. No standard deviation is available for Ford's data, only maxima and minima are known for Holme's data. No statistical analysis is then possible to compare both curves. However, between 15 and 25 mm, the ratio tends toward stability for both species (Fig. 3).

These results completed with Essink & Visser's results show clearly a difference of length/height ratio between *Ensis directus* and *Ensis arcuatus* for specimens larger than 15 mm.

So, for these specimens, the length/height ratio of 6:1 (versus 7-8:1 in *Ensis arcuatus*) seems to be a good criterion of identification of *Ensis directus*, and it can be considered as the fourth major character to distinguish *Ensis directus* from *Ensis arcuatus*. However, below 15 mm a proper distinction between *Ensis directus* and *Ensis arcuatus* is impossible.

ACKNOWLEDGEMENTS

This note is based on data obtained within the RENORA project (REcrutement en Mer du NORd dans le peuplement à *Abra alba)* funded by the French PNDR (Programme National sur le Déterminisme du Recrutement). The authors are grateful to K. Essink who confirmed the first identification of *Ensis directus*.

REFERENCES

BOER, Th.W. DE, 1984. The American jack knife clam *Ensis directus* (Conrad, 1843) in Europe. *Bolletino Malacologico*, 20 : 258-262.

COSEL, R. VON, J. DÖRJES, & U. MÜHLENHARDT-SIEGEL, 1982. Die Amerikanische Schwertmuschel *Ensis directus* (Conrad) in der Deutschen Bucht. I. Zoogeographie und Taxonomie im Vergleich mit einheimischen Schwertmuschel-Arten. *Senckenbergiana* maritima, 14 : 147-173.

ENTROP, B., 1965. Schelpen vinden en herkennen. *N.V.W.J. Thieme & Cie*, Zutphen, 320 p.

ESSINK, K. & W.VISSER, 1988. *Ensis directus* (syn. *E. Americanus* (Binney)) in de "Landaanwinningswerken" in de Waddenzee. *Het Zeepard*, 48 : 99-101.

FORD, E., 1925. On the growth of some Lamellibranchs in relation to the food-supply of fishes. *J. Mar. Biol. Assoc. U.K.*, 13 : 531-559.

HOLME, N.A., 1951. The identification of British species of the genus *Ensis* Schumacher (Lamellibranchiata). *J. Mar. Biol. Assoc. U.K*, 21 : 639-647.

LUCZAK, C., 1991. Étude du recrutement benthique d'*Ensis arcuatus* dans le peuplement à *Abra alba* (Baie sud de la Mer du Nord) Variabilité spatio-temporelle et étude des premiers stades benthiques. DEA Universités Lille 1, Paris 6, Perpignan & Brest, 37 p.

LUCZAK, C., DEWARUMEZ, J.-M. & K. ESSINK, 1993. First record of the american jack knife *Ensis directus* on the French coast of the North Sea. *J. Mar. Biol. Assoc. U.K*, 73, in press.

URK, R.M. <AN, 1987. *Ensis americanus* (Binney) (syn. *E. directus* auct. non. Conrad) a recent introduction from Atlantic North America. *Journal of conchology*, 32 : 329-333.