

**Fiches d'identification  
des oeufs et larves de  
poissons  
Fiche No 2**

**AMMODYTIDAE**  
(BY C. T. MACER)  
**1967**

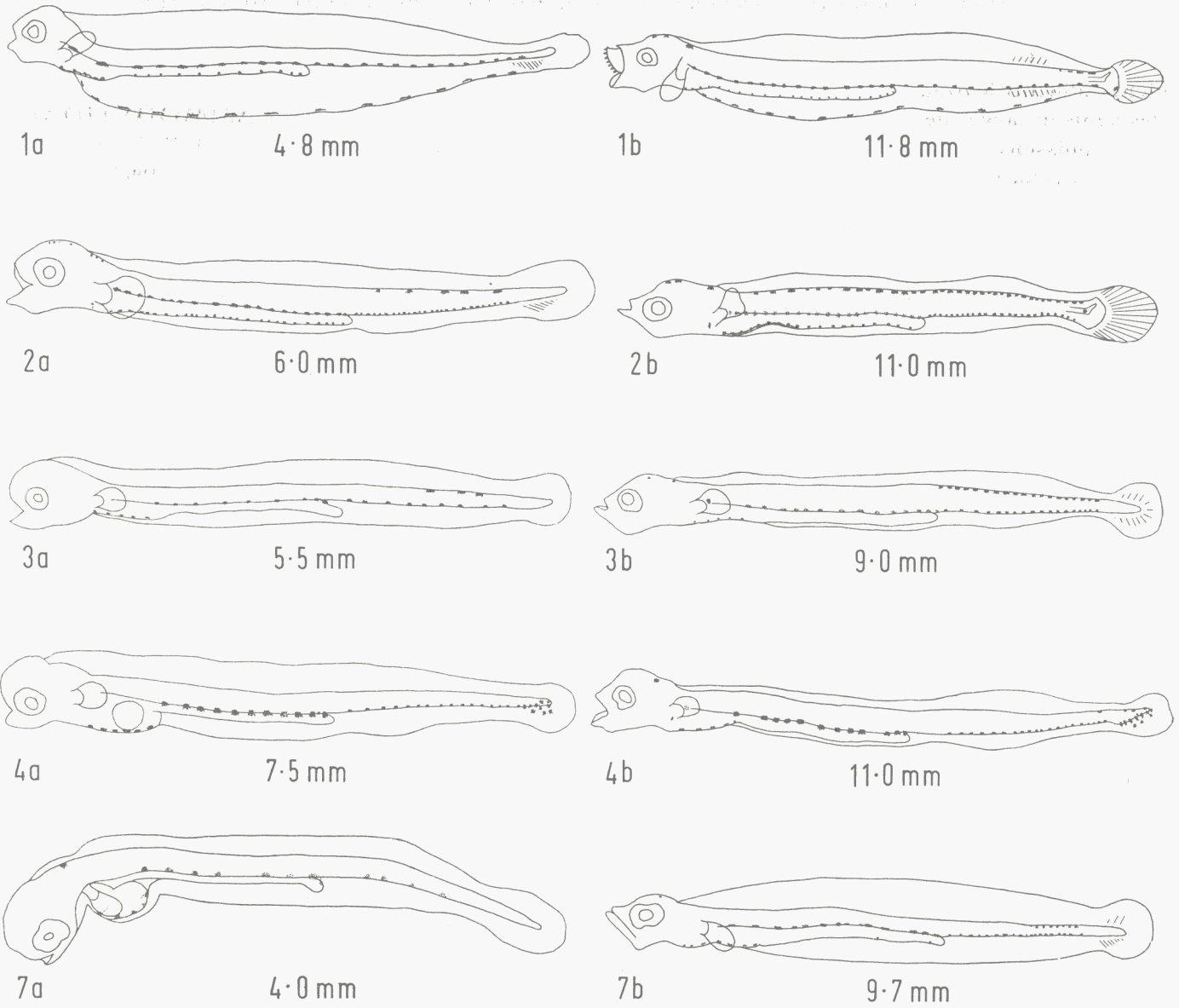


Figure 1 a-d. *G. semisquamatus*

Figure 2 a-d. *A. lanceolatus*

Figure 3 a-d. *A. immaculatus*

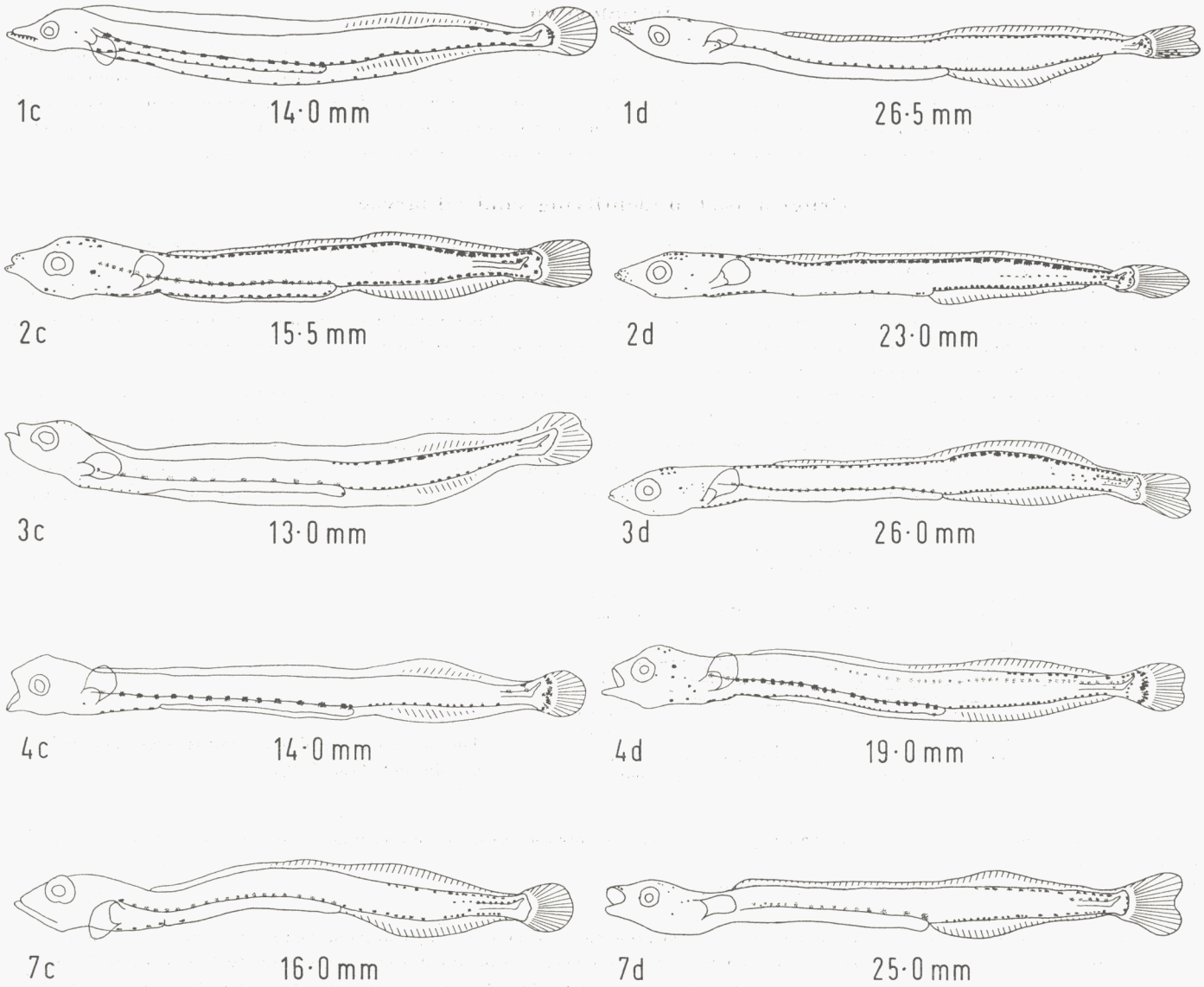


Figure 4 a-d. *A. marinus*; (Nos. 5 and 6, *A. dubius* and *A. hexapterus*, are identical to *A. marinus* in pigmentation and are therefore not illustrated).

Figure 7 a-d. *A. lancea*

## Introduction

North Atlantic sand eels may be divided into three groups: greater [*Ammodytes* (= *Hyperoplus*) *lanceolatus*, *A. immaculatus*]; lesser [*A. marinus*, *A. lancea* (= *tobianus*), *A. dubius*, *A. hexapterus*]; and smooth [*Gymnammodytes semisquamatus*, *G. cicereus*]. There has been much confusion with respect to: (a) nomenclature, (b) the relationships between sand eel 'species', and (c) the identity of the larvae. Difficulties in (c) have largely been resolved, at least in European waters, but those in (a) and (b) remain. The present sheet is concerned only with (c) but it is as well to bear (a) and (b) in mind since there are almost certain to be changes in the future, particularly in the 'lesser' group.

### Criteria used in identifying sand eel larvae

The following factors are the principal ones used in identification: – (a) Presence or absence of two 'teeth' in the upper jaw at the anterior margin of the vomer (present in *A. lanceolatus*, *A. immaculatus* and *G. semisquamatus* of certain lengths). (b) Presence or absence of a row of numerous small 'denticles' on the upper lip (pre-maxilla) (found only in *G. semisquamatus* of certain lengths). (c) The pattern of pigmentation. The melanophores occur mainly in definite longitudinal rows, the nomenclature of which is given in Figure A. Most of the rows are double, one on either side of the mid-line, but the stomach, sub-dorsal and ventral fin membrane pigments are usually in single rows. The double nature of the rows is often not so apparent in the smaller larvae.

The melanophores occur superficially in all rows except the sub-dorsal and pre-anal ventral body pigment. The former overlies the notochord and the latter lies on the peritoneum of the dorsal wall of the abdominal cavity above the gut, so that both these rows tend to become increasingly obscured by body tissue as the larvae grow. In *A. marinus*, however, the pre-anal ventral body pigment lies more superficially and is very conspicuous, this being an important diagnostic feature. There is a general increase in pigmentation as the larvae grow, especially in the dorsal pigment which first appears near the tail and then extends anteriorly. Its degree of development is another important feature.

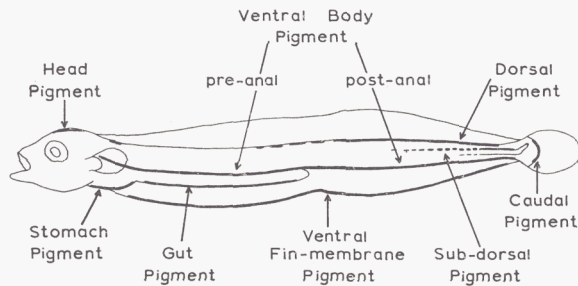


Figure A.

The nomenclature of the pigment rows (modified from Corbin and Vati, 1949).

(d) The number of myotomes or vertebrae (Table 1). Alizarin is commonly used to stain the vertebrae but is not successful in larvae smaller than about 15 mm.

(e) Protrusibility of upper jaw, mainly in the larger larvae.

(f) Time of occurrence (Table 2).

The drawings are semi-diagrammatic and are designed principally to show the pigmentation. The fin rays (pectorals omitted) are portrayed to show the extent of development rather than the correct number; their proximal parts have been omitted so as not to obscure the pigmentation. The notochord tip has been shown only if it is upturned. The drawings have been taken from the following published accounts as well as from the author's own specimens and notes: – CORBIN and VATI (1949), EINARSSON (1951 and 1955), CAMERON (1959). Four sizes of larvae are shown, roughly corresponding to the lengths 5, 10, 15 and > 20 mm. These are shown across the page so that similar sizes of different species can be compared by reading down each column.

## Diagnoses of Species

The lengths given indicate the approximate sizes of larvae to which the stated character applies.

### 1. *G. semisquamatus* (Jourdain) (Figure 1a-d)

The only species to possess ventral fin-membrane pigment (from hatching – 20 mm; may not be visible in damaged specimens) and 'denticles' on pre-maxilla (7–25 mm). Two pointed 'teeth' present, one at each antero-lateral extremity of the vomer, which itself comes to a slight point at its anterior margin (for diagram, see EINARSSON 1951). These vomerine 'teeth' are a larval character only, appearing in larvae of 12–15 mm and disappearing in larvae of about 40–50 mm. Both *A. lanceolatus* and *A. immaculatus* also have vomerine 'teeth', but in these species the teeth (and the vomer) have a different structure (see EINARSSON 1951); also, they appear later and persist in the adult.

A comparatively lightly pigmented form, the dorsal pigment only rarely extends forward to pass beyond the level of the anus. Like *A. marinus*, *A. dubius* and *A. hexapterus*, *G. semisquamatus* may show caudal pigment from about 6 mm but this is never as marked as in those species. From about 10 mm the upper jaw becomes increasingly protrusible, a feature not shared by *A. lanceolatus* and *A. immaculatus*.

2. **A. lanceolatus** Lesauvage (Figure 2a-d)

This species is characterized by very heavy pigmentation, especially in the dorsal row, which usually extends from tail to anus level at 8–10 mm and to the head at 11–16 mm or even smaller lengths. Stomach and gut pigment strong. Caudal pigment absent until about 15 mm. Vomerine teeth visible at 20–25 mm; they are more rounded than in *G. semisquamatus* and the vomer itself has a notch anteriorly instead of a point (EINARSSON 1951). Upper jaw non-protrusible. Fin rays develop earlier than in 'lesser' and 'smooth' species and the ratio of body length to depth is less, so that the body looks stouter.

3. **A. immaculatus** Corbin (= "A. Species IV" in CORBIN and VATI, 1949) (Figure 3a-d).

Very similar to *A. lanceolatus* except for (a) absence of gut pigment; (b) dorsal pigment reaches the anus level at about 9 mm, but does not reach head until about 25 mm; (c) meristic characters (see Table 1).

4. **A. marinus** Raitt, 5. **A. dubius** Reinhardt, 6. **A. hexapterus** Pallas (Figure 4 a-d).

These larvae are characterized by the post-anal ventral body pigment continuing to the tip of the notochord as the caudal pigment, even in the smallest larvae. When dorsal pigment develops, it also does so from the notochord tip, whereas in other species (except *G. semisquamatus*) the larval tail lobe is bare. Dorsal pigment lighter and later in development than in 'greater' species.

At the time of writing, the only methods of distinguishing between these three forms are by meristic characters (Table 1) and geographical distribution (Table 3), since pigmentation is identical. They may be subspecies only.

7. **A. lancea** Cuvier (= **A. tobianus** L.) (Figure 7 a-d).

Similar to *A. marinus* except for (a) no caudal pigment till about 15 mm; (b) pre-anal ventral body pigment quickly obscured by body wall; (c) dorsal pigment does not commence at notochord tip.

8. **G. cicereus** (Rafinesque), a Mediterranean species, has not been included, despite an Atlantic record of the larvae off Portugal (PAGE 1918) because of doubts expressed by CORBIN and VATI (1949). Drawings of *G. cicereus* larvae are given by PAGE.

I am grateful to P. G. CORBIN for helpful suggestions.

### SELECTED BIBLIOGRAPHY

*Taxonomic review*: RICHARDS et al. (1963).

*Review of larval identification*: MACER (1965).

*Descriptions of larvae*: 8 – PAGE (1918): 1, 2, 4 – KÄNDLER (1941) – his '*A. lanceolatus*' = *G. semisquamatus*; his '*A. tobianus*' darkly pigmented form = *A. lanceolatus*: 1, 2, 3, 4 – CORBIN and VATI (1949) – their '*A. tobianus*' = *A. lanceolatus*; their '*A. lanceolatus*' = *G. semisquamatus*; '*A. species IV*' = *A. immaculatus*:

2, 4 – EINARSSON (1951, 1955): 1 – CAMERON (1959):

5, 6 – RICHARDS (1965).

*Larval distributions*: KÄNDLER (1941) – note species corrections as above; CORBIN and VATI (1949) – note species corrections as above; EINARSSON (1951); MACER (1965).

*Vertebral counts*: EINARSSON (1951); RICHARDS et al. (1963).

Table 1

Species	Number of Vertebrae (including Urostyle)
1. <i>G. semisquamatus</i>	64 – 72 (68)
2. <i>A. lanceolatus</i>	64 – 70 (66 – 68)
3. <i>A. immaculatus</i>	70 – 74 (72)
4. <i>A. marinus</i>	65 – 75 (68 – 71)
5. <i>A. dubius</i>	73 – 80 (75)
7. <i>A. lancea</i>	60 – 68 (63 – 64)

The range of vertebral numbers in North Atlantic Ammodytidae. (Numbers in parentheses show most usual values. For data on *A. dubius* and *A. hexapterus* from N.E. America, see RICHARDS et al. 1963)

Table 2

	J	F	M	A	M	J	J	A	S	O	N	D
1. <i>G. semisquamatus</i>		+	+	+	+	+	+	+	+	+	+	+
2. <i>A. lanceolatus</i>				+	+	+	+	+	+	+	+	+
3. <i>A. immaculatus</i>	+	+	+	+	+						?	
4. <i>A. marinus</i>	+	+	+	+	+							
5. <i>A. dubius</i>				?	+	+	+					
7. <i>A. lancea</i>	+	+	+	+	+	+			+	?	+	+

Time of occurrence of larval Ammodytidae (excluding those from N.E. American coast and *A. hexapterus*, due to inadequate data)

Table 3

<i>Distribution</i>	<i>Species</i>
Gulf of Bothnia.....	(2), 7
Gulf of Finland.....	2, 7
Baltic proper.....	(1), 2, 4, 7
Belt Sea.....	(1), 2, 4, 7
Kattegat.....	(1), 2, 4, 7
Skagerrak.....	1, 2, 4, 7
Northern North Sea.....	1, 2, 4, 7
Southern North Sea.....	1, 2, (3), 4, 7
English Channel (E).....	1, 2, 4, 7
English Channel (W).....	1, 2, 3, 4, 7
Bristol Channel and Irish Sea.....	1, 2, 3, 4, 7
South and West Ireland and Atlantic	1, 2, 3, 4, 7
Biscay.....	1, 2
Portugal.....	1, 2
Faroe - Shetland area.....	1 (not Faroe), 2, 4, 7
Faroe - Iceland area.....	2, 4, 7
Norwegian Sea.....	1, 2, 4, 7
Barents Sea.....	(2), 4, (7)
N.E. America.....	5, 6
Greenland.....	4, 5, ?6

(Species in parentheses occur only occasionally)

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