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ON THE POST-LARVAL STAGES OF
AMMODYTES LANCEA CUVIER

BY

HERMANN EINARSSON
FISHERIES RESEARCH INSTITUTE, REYKJAVÍK

WITH 1 PLATE

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ON THE POST-LARVAL STAGES OF AMMODYTES LANCEA CUVIER

In a previous paper in this series (Einarsson 1951) an account was given of the post-larval stages of sandeels (*Ammodytidae*) in Faroe, Iceland and W-Greenland waters. Two types of post-larvae of sandeels were found to occur in Icelandic waters, one being referable to *Ammodytes lanceolatus* Lesauvage and the other to *Ammodytes marinus* Raitt. These types were described and drawn (l. c., pp. 10—11 and Plate I and II) and the indentifications verified by countings of vertebrae which were compared with vertebral numbers of adult individuals. Previously a third species, *Ammodytes lancea* Cuvier, closely related to *A. marinus*, had been found in Icelandic waters (Bruun 1941).

The most characteristic feature distinguishing the older post-larval stages of the "lancea-group" (*A. marinus* and *A. lancea*) from those of *A. lanceolatus* was found to be the arrangement of the dorsal chromatophores. In *A. lanceolatus* these extend from the base of the caudal fin to the head or almost to the head when the post-larva is about 10 mm in length, whereas in the post-larval stages of the "lancea-group" they are confined to the dorsal area behind the anus until the post-larvae have grown to 30—40 mm in length.

Post-larval stages of the "lancea-group" were sorted out according to this character. However, vertebral countings on older post-larvae (> 20 mm in length) revealed that this group comprises two forms: the *A. marinus* type, with number of vertebrae between 68 and 75, and the *A. lancea* type, with number of vertebrae between 60 and 64 (vide Einarsson 1951, p. 14 and fig. 2). The *A. lancea* type proved to be rather scarce and as the material available had been stained, a closer study of this type was postponed until fresh material could be procured, because the staining process sometimes weakens or obliterates the pigment.

More recent collections of post-larval fish in Icelandic waters have provided an opportunity to reconsider this question. By sorting the new collections according to the same principle as previously employed, it was found that some of the specimens differed from the *A. marinus* type in the arrangement of the body pigment. By counting vertebrae it became evident that these specimens belong to *A. lancea*. In table I a survey is given of vertebral count data of post-larval stages (> 20 mm) and adults of the three species of *Ammodytes* which occur in Icelandic waters.

TABLE I
A survey of vertebral numbers of post-larval stages of
A. lancea, *A. marinus* and *A. lanceolatus* in Icelandic waters.

Species	No. of vertebrae inclusive of the urostyle																Num- ber	Av. no. of V.S.	Author	
	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75				76
<i>A. lancea</i>																				
Adults	1	5	19	19	7	1												52	62.56	Bruun 1941
Post-larvae	1	2	13	30	10	1												57	63.03	Einarsson 1951
—			3	16	14	9	2											44	62.80	Pres. records
<i>A. marinus</i>																				
Adults									2	2	11	28	36	18				97	71.53	Bruun 1941
—										2	10	6	8	5				30	71.13	Kändler 1941
Post-larvae									4	13	42	51	40	16	1			167	71.97	Einarsson 1951
—									5	14	49	56	45	11	2	1		183	71.92	Pres. records
<i>A. lanceolatus</i>																				
Adults						1	7	35	51	13								107	67.64	Einarsson 1951
Post-larvae						2	18	27	4									51	67.65	Einarsson 1951
—						5	14	10	5	1								35	67.52	Pres. records

It will be seen that the figures are consistent throughout. Having established the differences between *A. lancea* and *A. marinus*, which are mainly in the arrangement of the body pigment, it now proved possible to follow the developmental series of *A. lancea* from about 20 mm size to the youngest post-larval stages just hatched. This series is illustrated on Plate I.

The characterizing features of the *A. lancea* post-larvae, compared with the corresponding stages of *A. marinus* and *A. lanceolatus* (vide Einarsson 1951, Pl. I and II), are the following:

LENGTH 4—6 MM.

Post-anal pigment:

A. lancea: Does not extend to the posterior tip of notochord.

A. marinus: Extends to the posterior tip of notochord.

A. lanceolatus: Does not extend to the posterior tip of notochord.

Dorsal pigment:

A. lancea: Absent or 1—3 chromatophores placed above the end of post-anal row.

A. marinus: Absent or 1—3 chromatophores placed above the posterior end of notochord.

A. lanceolatus: 2—5 chromatophores placed above posterior part of post-anal row.

Ventral body pigment:

A. lancea: Median rows of stellate chromatophores.

A. marinus: Medio-lateral rows of large stellate chromatophores that stretch to the sides of the intestine.

A. lanceolatus: Median rows of small chromatophores.

Body form and size:

A. lanceolatus is of a heavier build and larger at hatching than *A. lancea* and *A. marinus*.

LENGTH 7—15 MM.

Caudal pigment:

A. lancea: Absent.

A. marinus: A marked row develops quickly.

A. lanceolatus: Absent.

Dorsal pigment:

A. lancea: Several chromatophores.

A. marinus: A few chromatophores at posterior end of body.

A. lanceolatus: Chromatophores extending forwards beyond anus.

Ventral body pigment:

As in preceding stages.

LENGTH 16—30 MM.

Caudal pigment:

A. lancea: Absent or a few irregular chromatophores.

A. marinus: A very marked row of chromatophores.

A. lanceolatus: Absent or a few irregular chromatophores.

Dorsal pigment:

A. lancea: Extending to anus or slightly beyond anus.

A. marinus: Not extending beyond anus.

A. lanceolatus: Extending to head.

Ventral body pigment:

As in preceding stages. In *A. marinus* the chromatophores are very distinct in side view, but in *A. lancea* and *A. lanceolatus* they are indistinct or invisible as they are confined to median rows above the intestine.

To sum up: *A. marinus* can be distinguished from *A. lancea* and *A. lanceolatus* by an extension of the post-anal pigment to the tip of the notochord, and subsequently by a marked caudal row of chromatophores and a lateral extension of the ventral body pigment.

A. lancea can be distinguished from *A. lanceolatus* by a more slender build, smaller size at hatching and a later development of the dorsal pigment (in this respect it resembles *A. marinus*).

The characteristic features of *A. lanceolatus* are the heavy build of the youngest stages and subsequently the extension of dorsal pigment forwards beyond anus.

When the specimens have reached the size of 20 mm they can be stained with alizarine and the indentifications verified by counting vertebrae (see table I).

With reference to my earlier remarks on the species problem of *Ammodytes* (vide Einarsson 1951, pp. 17—18), I should like to add the following:

Since the specific characters of the post-larvel stages of *A. lancea* have been established, there seems to be no reason to link this form with *A. marinus* in a common group, viz. to retain the view that *A. lancea* and *A. marinus* are only subspecifically distinct as advocated by Jensen (1941). *A. lancea* and *A. marinus* are species of their own with specific larval and post-larval features and with vertebral numbers, which do not overlap inside the same area. Other meristic characters, e. g. number of dorsal and anal fin rays, overlap to a very slight degree (vide Bruun 1941, pp. 331—333, and Jensen 1941, p. 26, table 5). However, it has not hitherto proved possible to show that the different meristic characters are accompanied by other morphological differences in the adult individuals.

On the other hand, there is nothing to be added at present to my remarks on the relationship of *A. marinus* and *A. dubius* Reinhardt, which were thought to be conspecific. It is hoped that an examination of recent collections from W-Greenland waters may contribute to the solution of this problem.

The question of nomenclature has been dealt with at length by Jensen (1941, pp. 3—6). I fully endorse his view that the name *tobianus* (for *lancea*) should be dropped to avoid further confusion, but several authors still use this name without having discussed Jensen's arguments.

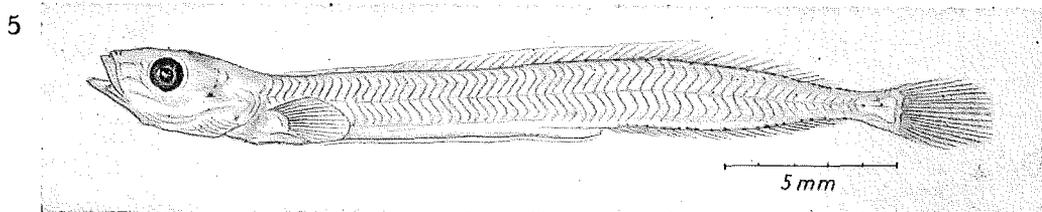
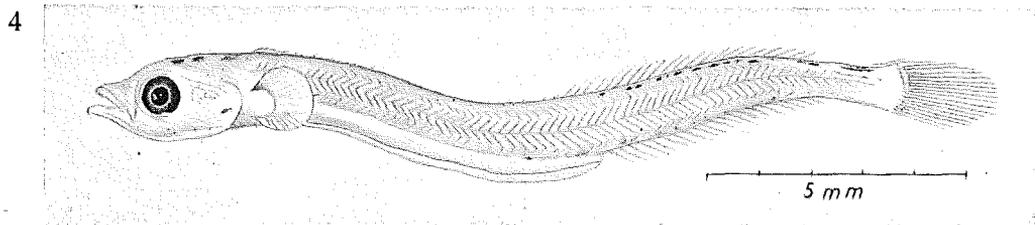
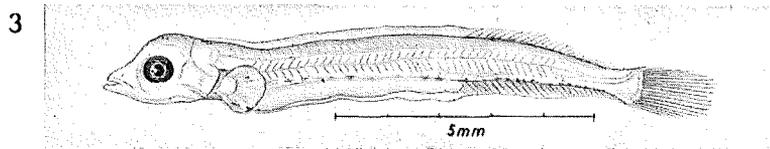
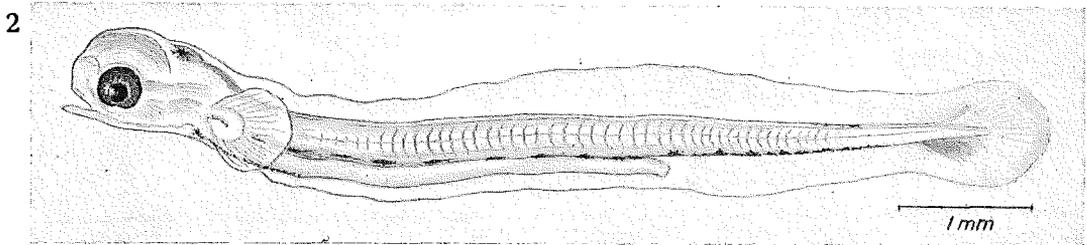
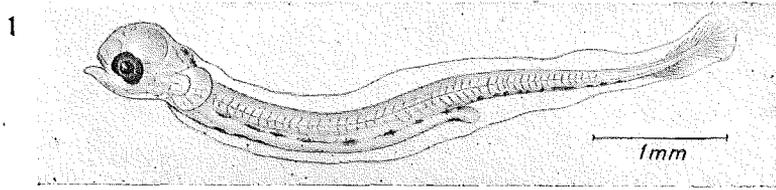
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PLATE I

Ammodytes lancea Cuvier

1. Post-larva, 5 mm, Stat. 499, ¹⁸/₁₀₀ 1948.
2. Post-larva, 7.5 mm, Stat. 491, ¹⁷/₁₀₀ 1948.
3. Post-larva, 12.0 mm, Stat. 602, ¹⁷/₁₀₀ 1948.
4. Post-larva, 18.0 mm, Stat. 602, ¹⁷/₁₀₀ 1948.
5. Post-larva, 26.5 mm, Stat. 612, ⁴/₁₀₀ 1948.



Poul M. Winther del.