

Morphological Description of Leptocephali of *Anguilla japonica*  
Found in the Eastern Waters of the Luzon Islands

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**ABSTRACT** Two specimens, 55.2 mm and 56.6 mm in total length, of the developing stage of the genus *Anguilla* were collected in the eastern and northeastern waters of the Luzon Islands in January, 1975. These specimens were characterized by having 114-115 total myomeres, 66-67 predorsal myomeres, 75-76 preanal myomeres and 9 ano-dorsal myomeres, three major blood vessels lying at myomeres 14-15, 38 and 43, 18-19 pectoral rays, 9 caudal rays and a translucent color with pigment restricted to the chorioid of the eye. The specimens were referred to the Japanese eel, *Anguilla japonica* T. et S., based on the meristic characters, especially preanal myomeres. Station 23-2 in this cruise where one of these leptocephali was collected is the southernmost locality for the Japanese eel.

## 1. INTRODUCTION

Between January and February, 1975, the R/V Hakuho-Maru of the Ocean Research Institute of the University of Tokyo, made the third cruise for the study on spawning grounds and ecology of the pelagic eggs and larvae of the Japanese eel in the Ryukyu Deep and its adjacent waters. In this cruise, ORI, KH-75-1, about 1800 leptocephali of apodal fishes and other material were collected at various depths from the surface to about 2000 m with larva nets of 4 m diameter, 1.6 m diameter and an ORI net. After detailed sorting, two developed leptocephali belonging to the genus *Anguilla* were found. These two leptocephali were identified with *A. japonica*. A total of 55 leptocephali of this species were obtained during three cruises on the spawning ground of the Japanese eel carried out by the R/V Hakuho-Maru started in 1972. In the present paper, a detailed description of these two specimens collected in the last cruise is given together with evidence identifying leptocephali to the species level (Fig. 1).

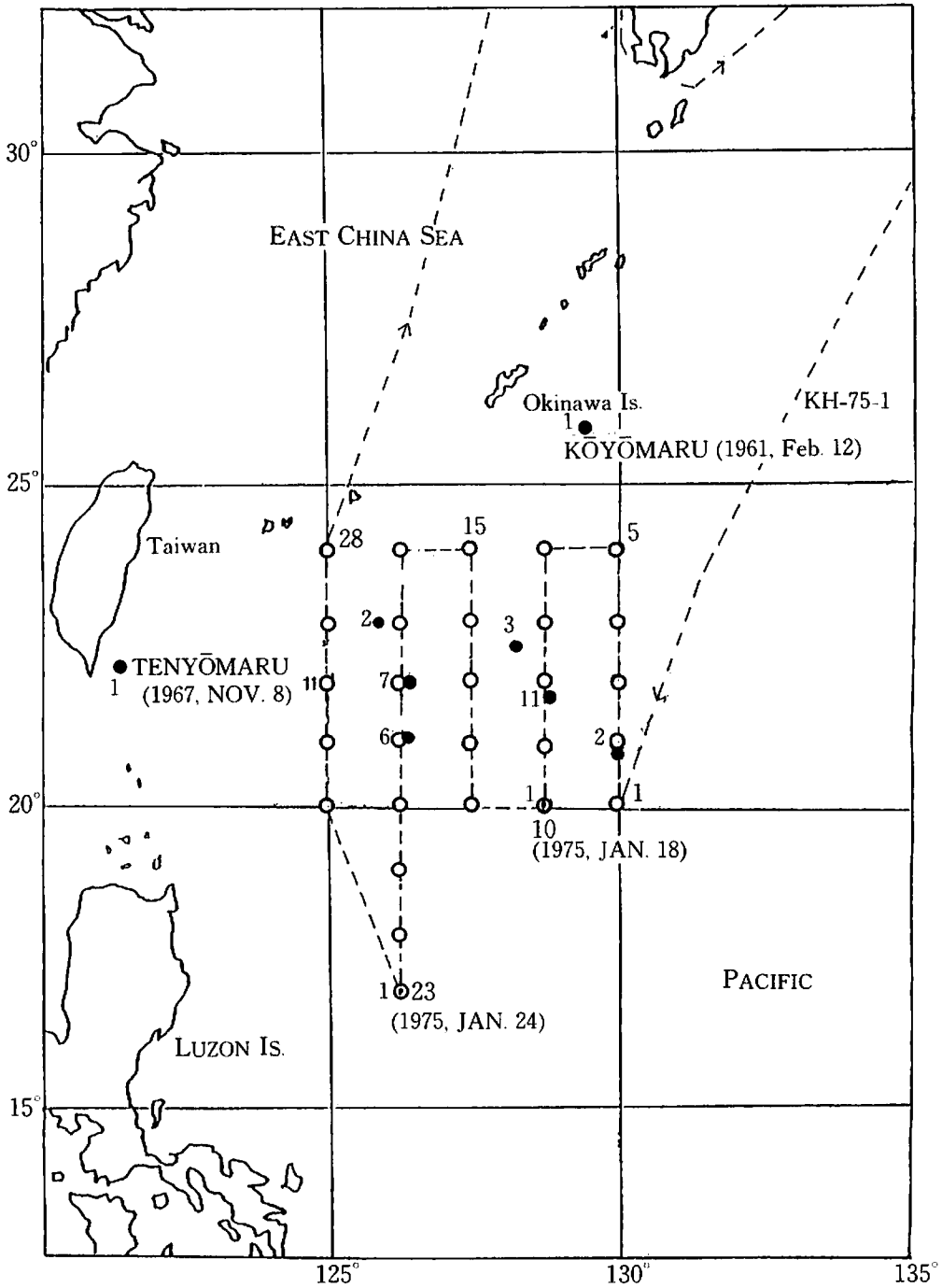


Fig. 1. Cruising course and sampling station (large figures) of R/V Hakuho-maru in 1975 (KH-75-1) to collect *Anguilla japonica* leptocephali. Small figures attached with circles were number of leptocephali of *Anguilla japonica* collected in preceding warks.

Table 1. Detaild description of collected *Anguilla Japonica* leptocephali.

Station number	ORI, KH-75-1, St. 10-2	ORI, KH-75-1, St. 23-2
Locality (Lat., Long.)	19° 57. 5'N 128° 44. 6'E	17° 00. 9'N 126° 16. 3'E
Date	Jan. 18, 1975	Jan. 24, 1975
Time	20:00-20:30	03:41-04:11
Towing-net		
Larva net	4 m diameter, 5 mm mesh size (cot end)	1. 6 m diameter, 5 mm mesh size
Towing	surface, horizontal tow	surface, horizontal tow
Wire payed	75 m	75 m
Wire angle	75°	72°
Ship speed	1. 5 knot	1. 5 knot

## 2. MATERIALS AND METHODS

First specimen, 55. 2 mm in total length; ORI, KH-75-1, St. 10-2 19° 57. 8'N, 128° 44. 6'E, January 18, 1975, 20 : 00-20 : 30; horizontal tow in 75 m wire out with wire

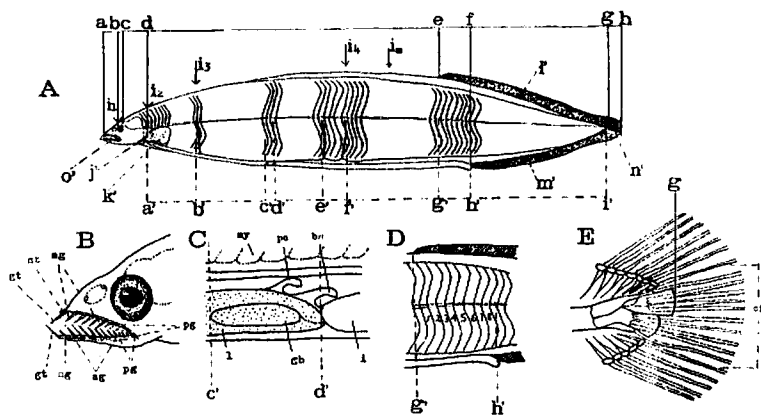


Fig. 2. Drawing showing measurements and counts of *Anguilla japonica* leptocephali. A: a-b, snout; a-d, head; a-e, pre-dorsal; e-f, ano-dorsal; a-f, preanal; a-g, body; a-h, total; a'-i', myomeres; b'-h', location of organs at level of myomeres; Iv, Ist vertical blood vessel; 2nd vertical blood vessel; 3rd vertical blood vessel (renal portal vein); o', teeth; j', branchiostegals; k', pectoral rays; l, dorsal fin rays; m', anal rays; n', caudal rays; i'-i<sub>m</sub>, body depths; B: ag, anterior group teeth; gp, grasping teeth; pg, posterior teeth; st, slender tooth; C: gh, gall-bladder; bs, blind sac; is, intestine; pc, pyloric coeca; li, liver. D: ano-dorsal myomeres. E: cf, caudal fin rays.

angle 75°; water temperature at 75 m layer, 24.2°C; ship speed 1.5 knots; larva net of 4 m diameter with 5 mm mesh size in cod end.

Second specimen, 56.6 mm in total length; ORI, KH-75-1, St. 23-2; 17° 00.9'N, 126° 16.3'E, January 24, 1975, 03:41-04:11; horizontal tow in 75 m wire out with wire angle 72°; water temperature at 75 m layer, 26.1°C; ship speed 1.5 knots; larva net of 1.6 m diameter with 5 mm mesh size in cod end. These specimens were preserved in 10% neutralized formalin and examined by means of a profile projector and photoelectric digit micrometer. The measurements and counts of body parts were made in accordance with the method used by Jespersen<sup>1)</sup> and Castle<sup>2)</sup>(Fig.2).

### 3. DESCRIPTION

Measurements in mm: total length 56.6, 55.2; head 4.2, 4.1; snout 1.1, 1.0; eye 1.2, 1.0; upper jaw 2.1, 1.8; postorbital 1.9, 2.1; pectoral 1.6, 1.5; predorsal 37.2, 34.6; preanal 41.9, 39.4; depth just before eye 2.0, 1.7; depth at pectoral base 3.5, 2.8; depth at anal origin 9.7, 7.3.

Counts: branchiostegal rays 9, not obvious; pectoral rays 19, 18; dorsal rays 243, damaged; anal rays 119, damaged; caudal rays 1+2+2+2+2, damaged.

Teeth: 1+1+VI+12/1+X+4, 1+1+VI+14/1+IX+5.

Myomeres: total 114, 115; predorsal 67, 66; ano-dorsal 9, 9; preanal 76, 75; postanal 38, 39.

Blood-vessel: first vertical vessel at 15th myomere, and at 14th myomere; second vertical vessel at 38th in both specimens; third vertical vessel at 43rd in both specimens.

Anterior margin of gall-bladder at level of 26th myomere in both specimens. A flexion of intestine at level of 30th myomere and at level of 29th myomere.

Body elongate, olive leaf-like, compressed, not very deep and tapering a little more gradually in anterior half and posterior half. Head short, about one-thirteenth of total length; head region clearly differentiated from trunk; snout short, equal to about a quarter of head length; nasal organ developed, anterior and posterior nares separated; eye oval, with its greatest diameter vertical and a little more than one-third of head length.

Mouth cleft oblique, extending to level of midpoint of eye; teeth conspicuous, projecting outside, distributed as follows: first tooth minute, directed forwards and

placed on tip of snout above second tooth which is much larger grasping tooth; these two teeth are followed by a second series of large, six needle-like fangs; a third series of fourteen smaller teeth along border of upper jaw; in lower jaw, first grasping tooth very acute, projected upwards and anteriorly and followed by ten needle-like fangs which become progressively smaller; this second series followed by four noticeably smaller teeth; teeth on lower jaw similar in size and grouping to those on upper jaw.

Branchiostegal rays slightly developed and curving across space in front of pectoral fin with nine fiber-like rays. Pectoral fin relatively large, rounded, base of fin fleshy with nineteen rays. Dorsal fin developed, rays and radials obvious, countable. Anal fin similar. Caudal fin well differentiated from dorsal and anal fins. Brain developed with three parts. Heart located in posterior region of head and its posterior margin is placed almost directly under gill-opening. Gill-opening comparatively large, and placed a little anterior to base of pectoral fin.

Intestine straight and not festooned or swollen, but made a flexion and 30th myomere; two tubercles, projecting from intestine just before flexion. Liver extending from level of 10th myomere to flexed portion, covering intestine. Gall-bladder located from level of 26th to 29th myomeres before flexion. Anus contacted with origin of anal fin.

Color in preservative translucent with pigments restricted to chorioid of eye.



Fig. 3. *Anguilla japonica leptocephalus* in developing stage, Cat. ORI, KH-75-1, No. 23-2, 56.5 mm in total length.

#### 4. DISCUSSION

The present developing larvae are characterized by the following characters: an olive-leaf shaped body, depth not very deep, about one-sixth of total length; pectoral fin large, rays 9; caudal fin developed, rays 10; intestine straight, except for a flexion on middle part, and not festooned or swollen; three major vertical blood vessels lying at segments 14-15, 38 and 43; total myomeres 114 and 115; ano-dorsal myomeres 9; color in preservative translucent with black pigments restricted to the chorioid of the eye.

These characters in the developing stage agree quite well with the mutual characteristics of the species belonging to the genus *Anguilla*, described by the previous investigators<sup>1-4)</sup>. Ege<sup>5)</sup> and Jespersen<sup>11)</sup> recognized four species distributed in the Western North Pacific; *A. bicolor pacifica*, *A. celebesensis*, *A. marmorata* and *A. japonica*. The first three species are clearly distinguished from *A. japonica* in having the vertebral counts less than 111<sup>11)</sup>.

The numerical counts and proportional measurements for all larval characteristics of either of the present two specimens were within the variations shown in the preceding reports on *A. japonica*.<sup>6-8)</sup>

On the other hand, *A. japonica* is very similar to the European eel, *A. anguilla* in many characters of the developing and first metamorphic stages. However, the morphological difference between them is only found in the counts of preanal and postanal myomeres. *A. japonica* has 70-80 ( $76.8 \pm 1.724$ ) preanal myomeres and 35-42 ( $38.6 \pm 1.704$ ) postanal myomeres<sup>6,9)</sup>, while *A. anguilla* has 58-71 ( $64.9 \pm 4.097$ ) preanal myomeres and 44-55 ( $48.1 \pm 2.911$ ) postanal myomeres,<sup>3)</sup> respectively.

Although the range of preanal myomeres in these two species overlaps slightly, there is scarcely any difficulty to distinguish them. This is supported by the significant differences of the mean values of these characters.

In 1975 the elvers of *A. japonica* were collected from the River Cagayan running in the northern part of the Luzon Island.<sup>8)</sup> Moreover, one of the present localities was situated in the far south of the supposed southern extremity. These facts show that the geographical range of *A. japonica* is likely to be more widespread southward than of the previous knowledge.

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