

Leptocephalae of the Eel *Anguilla japonica* found in the Waters of Ryukyu Deep*

By
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Introduction

Despite intensive investigations (SCHMIDT, 1925; UCHIDA, 1935; JESPERSEN, 1942; MATSUI, 1957) which have carried out the collection of the anguillid eel larvae from the nearby waters of Japan, many riddles still exist in our knowledge of their life-histories. The authors have made a great many researches bearing with the anguillid eel larvae in the southern waters of Japan Current based on a hypothesis assumed by MATSUI in 1957. We firstly found a larva apparently identified as *Anguilla japonica* in many leptocephalae collected in the northern region of the Bashi strait (MATSUI and others, 1968). Recently, in the continuous work of eel larva we have examined 23 specimens which were collected on the waters of the Ryukyu deep in February, 1956. They were identified as *Anguilla japonica* by the morphological examinations.

In this paper, we described in detail the measurements, counts and other characters in each specimen, and we had a assumption of the larval life to the Japanese eel, *Anguilla japonica*, together with the results of the early collection.

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Materials and methods

All specimens used in the present work were caught in the station (Lat. 24°32'N, Long. 128°57'E), which was shown in Fig. 1, during from 11:00 to 11:30 p. m., February 12, 1956. This is one point among the stations along the course of the fishing and oceanographic survey in the waters of the Ryukyu Deep which was made by the training ship, Koyo Maru of the Shimonoseki University of Fisheries. The specimens were

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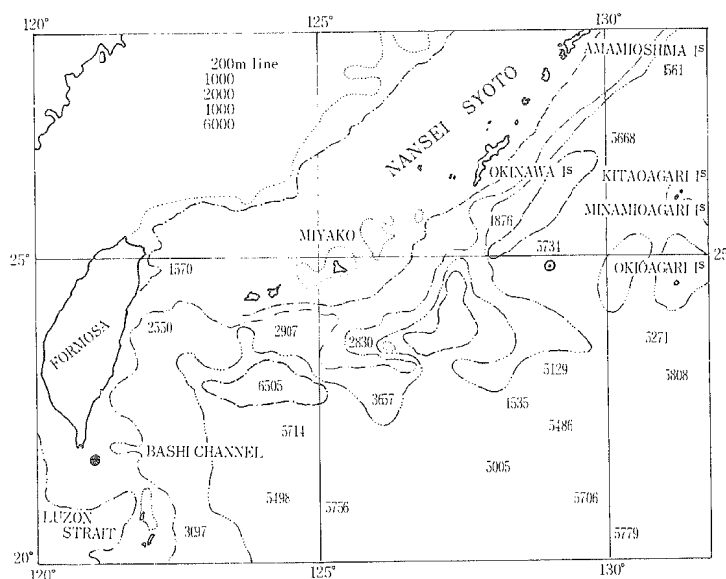


Fig. 1. Map showing station (⊙) where leptcephali of *Anguilla japonica* were collected in the Ryukyu deep and adjacent waters. Dot shows collected station of the first sample of *A. japonica* in our work.

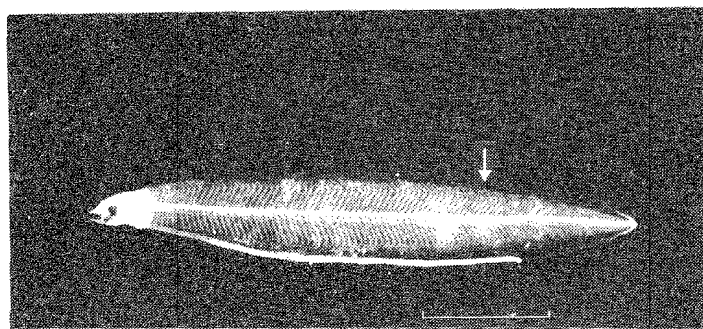


Fig. 2. Photograph of the leptcephalus of *Anguilla japonica*, Allow, origin of dorsal fin; scale in 5mm.

collected by the MATSUI's larva net, measuring 4 m in mouth diameter which was towed about 1.5-2.0 meter per second under the surface.

Description

Eighteen specimens: Measurements in mm: total length 12.2-23.0, head 1.1-1.7, snout 0.4-0.9, eye diameter 0.3-0.5, upper jaw 0.7-1.2, depth just before eye 1.0-1.6, body height (depth at midpoint between pectoral and vent) 1.6-3.9, pectoral 0.3-0.9, preanal 10.8-18.0, predorsal 9.3-16.5, anodorsal space 0.4-1.5, snout-dorsal distance 9.3-16.5, dorsal base 2.9-6.4, anal base 2.1-4.9. Counts: caudal rays 2+2+2+2+1 or 2+2+2+2+2, other fin rays not obvious, but dorsal and anal elements visible only near tip of caudal. Branchiostegal ray not obvious. Teeth (specimen, No. M21001) $\frac{1+1+V+O}{1+IV+O}$. Myomeres 113-116 (73+43=116,

specimen No. M2001), a-d=7-8, preanal 69-74. Disposition of organs at level of myomere: anterior margin of gall bladder at myomere 29-35, first vertical blood vessel at myomere 17-19, last vertical blood vessel at myomere 44-47.

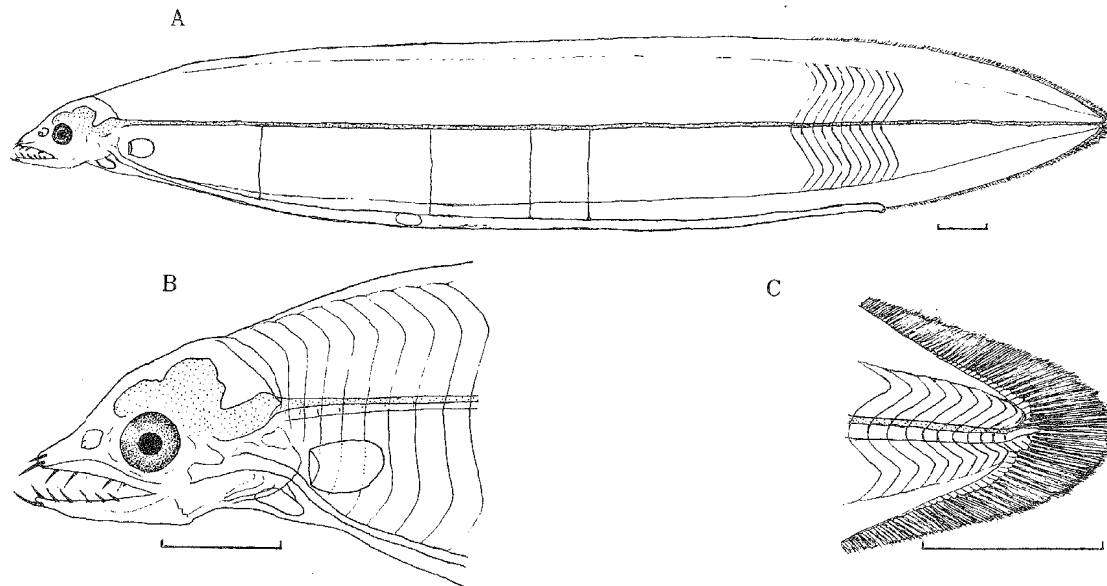


Fig. 3. *Anguilla japonica*, 23.0mm, total length. A-Lateral view, to show distribution of major vertical blood-vessel, intestine and myomeres at level of vent. B-Lateral view of head. C-Lateral view of caudal region. Scale in 1mm.

Table 1. External measurements of anguillid eel larvae, *Anguilla japonica*. Abbreviation: TL, total length; HL, head length; AL, anal length; BH, body height; SL, snout length; ED, eye diameter; a-d, ano-dorsal space; PFL, pectoral fin length; SD, snout-dorsal distance; DBL, dorsal fin base length; ABL, anal fin base length. Measurement in mm.

Specimen	TL	HL	AL	BH	SL	ED	a—d	PFL	SD	DBL	ABL
M 21001	23.0	1.5	18.0	3.90	0.67	0.50	1.50	0.80	16.5	6.4C	4.90
M 21002	19.0	1.7	15.6	3.66	0.66	0.46	1.20	0.33	14.4	5.53	4.33
M 21003	14.0	1.2	11.0	2.80	0.52	0.32	0.48	0.40	10.5	3.48	3.00
M 21004	17.7	1.3	13.5	3.32	0.68	0.48	1.12	0.40	12.4	4.4C	3.28
M 21005	21.5	1.7	11.2	2.46	0.66	0.53	1.00	0.80	10.2	5.86	4.86
M 21007	17.5	1.4	14.4	3.20	0.52	0.40	1.20	0.68	13.2	4.12	2.92
M 21009	17.8	1.5	14.4	3.44	0.67	0.40	1.00	0.40	13.4	4.12	3.12
M 21010	20.3	1.7	15.7	3.68	0.60	0.48	1.00	0.40	14.7	5.20	4.20
M 21011	14.9	1.4	11.3	2.68	—	—	1.20	0.52	10.1	4.28	3.08
M 21013	16.7	1.2	12.5	2.88	0.48	0.44	0.60	0.68	11.9	3.92	3.32
M 21014	12.3	1.3	12.0	2.68	0.60	0.40	0.40	0.48	11.6	2.68	2.28
M 21015	16.2	1.5	12.5	2.96	0.52	0.40	0.52	0.33	11.9	3.68	3.16
M 21016	15.2	1.4	12.4	3.12	0.68	0.40	0.92	0.72	11.8	3.52	2.60
M 21017	12.7	1.1	10.9	2.36	0.44	0.36	0.88	0.72	9.9	3.20	2.32
M 21018	15.2	1.3	12.0	2.60	0.48	0.44	0.88	—	11.1	3.56	2.68
M 21020	12.2	1.2	11.0	2.52	0.52	0.40	—	0.32	9.3	—	2.08
M 21021	14.6	1.3	11.9	2.72	0.48	0.36	0.72	0.40	11.2	3.20	2.48
M 21022	13.7	1.1	11.7	1.60	0.48	0.32	0.60	0.60	11.1	2.92	2.32

Table 2. Showing the meristic characteristics of leptocephalus of *Anguilla japonica*. Abbreviation: TM, total myomeres; PAM, preanal myomeres; a-d, ano-dorsal myomeres; GB, gall bladder at level of myomere; BV, vertical blood vessel.

Specimen	TM	PAM	a—d	GB	BV		
					1st	2nd or 3rd	Last
M 21001	116	73	7	29	19	(32) 40	46
M 21002	115	71	8	31	18	41	46
M 21003	114	69	8	29	18	40	44
M 21004	115	69	8	33	18	39	44
M 21005	114	70	7	35	18	40	46
M 21007	114	74	7	34	17	40	45
M 21009	113	72	7	32	18	—	46
M 21010	113	70	7	34	18	39	46
M 21011	115	71	8	34	18	38	45
M 21012	—	71	8	31	18	36	45
M 21013	116	70	7	30	18	40	47
M 21014	115	72	7	35	—	—	—
M 21015	115	71	7	33	18	—	44
M 21016	115	71	8	33	18	38	45
M 21017	115	72	8	33	18	—	—
M 21018	114	70	8	34	19	41	46
M 21020	115	72	—	33	18	40	45
M 21021	113	72	7	33	18	41	45
M 21022	114	73	8	33	18	40	46
Mean	114.5±0.60	71.2±0.80	7.5±0.67	32.5±1.23	18.1±0.68	39.7±0.68	45.4±0.57

Body short, but not excessively so, deep, in the form of an olive leaf, with the proportions depth in total length 4.6-5.9. Head relatively short, about one-fifteenth of total, slightly swollen in front of pectoral, distinct from trunk; snout not beak-like, short, about one-second of total, its dorsal profile relatively concave; posterior nostril not obvious, eye moderate, oval, with its greatest diameter vertical, eye diameter about equal to length of snout; cleft of mouth relatively oblique, extending to below of middle of pupil, teeth conspicuous, very acute, 7 in upper jaw, first tooth minute, needle-like, directed forward and placed on the antero-dorsal surface of the snout, second tooth is large grasping tooth, these two are followed by an anterior group small; 7 in lower jaw, first tooth is large grasping tooth, needle-like frang.

Branchiostegal ray not obvious. Pectoral fin relatively large, larger than vertical diameter of eye, rounded, base of fin fleshy, but with the rays not obvious. Dorsal and anal fin low, with the ray and radials poorly developed.

Caudal fin not differentiated from dorsal and anal fins. Colours in preservative

translucent, with black pigment restricted to the chorioid of the eye.

Discussion

The morphological and meristic characteristics of the eighteen larvae described above conformed essentially with those of the 53.5 mm larva of *Anguilla japonica* from the Bashi Strait, described in the previous report by MATSUI and others (1968). Of these specific characteristics, the most important ones are pointed out to be the total sum of myomeres in the body parts, the dispositions of major vertical blood vessel and gall bladder at level of myomere, and pectoral fin-rays. That is, the present specimens are characterized by having 113-116 myomeres in total sum, 69-75 myomeres in preanal portion, 7-8 myomeres in the ano-dorsal space between the origin of dorsal and anal fins (long-finned type).

They have the first, the second and the last vertical blood vessels running from the aorta and these lie off myomeres Nos. 17-19, 36-41, and 44-47 respectively. And, the situations of anterior margin of gall bladder are at the level of myomeres Nos. 29-35. Pectoral fin is well developed, but the fin-rays are not yet visible. Finally, it is concluded that the present specimens should be clearly identified as *Anguilla japonica* on the basis of the total myomeres, 113-116 in total sum, though only two long-finned species, *Anguilla japonica* and *Anguilla marmorata*, are found in the Japan and its adjacent waters.

MATSUI (1952) assumed that the spawning ground of *Anguilla japonica* may be within the waters lying between Lat. 20°N to 30°N and Long. 120°E to 140°E, and that also the larva spends the pelagic life during the period of about ten months at least. But, at the present time, sufficient larvae available can not be found in the above region, to allow any conclusions to be drawn.

Especially, in a lot of surveys on the pelagic life worked during from April to September between 1961 and 1967, based on MATSUI's assumption, it is suggested that anguillid eel larvae should not be very plentiful in above waters. In other words, from only two cases on the first specimen (55.4 mm) collected in November and on the present specimens (14.0-31.8) in February, it is difficult to infer that the larva of *A. japonica* have the pelagic life for about one year, as confirmed by JESPERSEN (1942) in *A. rostrata*.

SCHMIDT (1932) maintains that *A. marmorata* of the eastern Indian Ocean attains to the metamorphosing stage over 55 mm, and to the elver stage over 50 mm; it is well known that leptocephalus stage is comparatively short. Moreover, JESPERSEN (1942) pays his attention to the fact that long-finned type is divided into two groups by the mode of the body length, and that short-finned type, *A. bicolor bicolor* is divided into three ones, on the basis of samples collected from the Indo-Pacific Oceans between September and October. The above noted fact will lead to the result that no anguillid eels spawn a short term of a certain season in a year. Therefore, it could not be fully understood that the leptocephalus in *A. japonica* seems to spend the pelagic life during about ten months at least, as assumed by MATSUI (1952).

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