本邦南岸域における浮游性稚魚の生態

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Some Ecological Aspects of Larval Fishes in Waters off Central Japan

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More than 400 towings of surface and sub-surface layers were carried out to obtain informations on the distributional features of larval fish in the waters off central Japan. The results obtained are as follows:

(1) More than 72000 individuals of larval fish were collected. Abundance in both number of species and individuals was high during spring to summer and most of these samples were represented by *Engraulis japonica, Scomber japonicus, Trachurus japonicus, Myctophum asperum, Thunnus thynnus* and *Sebastes inermis,* given in the order of abundance.

(2) Larval forms are classified into the following three types from their vertical distributions; (i) species appearing only at surface layers, (ii) species appearing at layers far below the surface and (iii) species appearing from surface to the depth of some several ten meters. There is an inverse correlation between the depth of distribution of larvae and the degree of development of chromatophores.

(3) Larvae of the dominent species are distributed at layers from surface to sub-surface layers and their zones of distribution move up with their growth. The remarkable diurnal changes of distribution of *Engraulis japonica* at surface layers are caused by vertical migration of larger sized larvae.

Many works have been carried out on the ecology of larval fish, especially commercially important species viz. *Engraulis japonica, Scomber* spp. and *Thunnus* spp.[1–5]. Most of these deal with aspects of both vertical and horizontal distribution in relation to abundance. And there are some works describing the vertical distribution with respect to their developmental stages[6–8]. However, most of these studies are based on collections extended over wide geographical area and some period. Continuous observation on the same population seems to be needed.

The distributional features of the commercially exploitable stages of anchovy have been fairly well clarified[2,3] and the horizontal distribution and vertical migration of some fishes have also been reported after studies using the so-called Maruchi-type larva nets. But the ecology of early developmental stages, especially the pre-exploited stages, is not sufficiently known. In the previous paper[9] the author suggested the inadequacy of the use of nets made from two different fabrics for quantitative analysis of larval fish. In this paper, the vertical distribution of some species are dealt with to get information on a simple sampling method, using a fine meshed larva net. In addition to this, the relationship between floating seaweed and fish larvae is also discussed.

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Materials and Methods

Materials and sampling methods are almost identical with those mentioned in the previous paper[9]. The main gears used were two types of larva net, both of 113 cm mouth opening and meshes of 1.0 mm and 0.5 mm respectively. Though the sampling area covered was from the sea off central Japan to that of southern Japan, the bulk of fish samples collected were from Sagami Bay and Kumano Nada where systematic samplings were carried out during both 1966 and 1967. The vessel used was the R/V Tansei Maru of the Ocean Research Institute of the University of Tokyo.

Results

General features of fish larvae found in surface layers: Over 72,000 individuals were collected during the past three years and the details are shown in Table 1. As can be seen in the Table, up to about 90% of the individuals were identified to species and about 3% to their genera while the rest were unidentified. Most of these samples are represented by the following species in order of abundance; *Engraulis japonica, Scomber japonicus, Trachurus japonicus, Myctophum asperum, Thunnus thynnus* and *Sebastes inermis*. All species, except *Engraulis japonica* that appears in most seasons, appear in a particular season; *Sebastes inermis* from winter to spring and *Scomber japonicus* and *Trachurus japonicus* from spring to summer.

Based on their vertical distributions, the fishes were classified into the following three groups: (1) those collected only from the surface layers viz. *Girella punctata, Seriola quinqueradiata, Lobotes surinamensis, Cololabis saira, Hemiramphus* spp., Exocoetidae spp., *Macrorhamphosus scolopax, Mugil* spp., Mullidae spp., *Coryphaena hippurus, Myctophum asperum, Symbolophorus evermanni,* and *Centrobranchus brevirostris*; (2) those collected from both surface and sub-surface layers: *Engraulis japonica, Stephanolepis cirrhifer, Scomber japonicus, Sebastes inermis, Trachurus japonicus, Callyonimus* spp., *Sillago sihama,* Labridae spp. and Leptocephalus larvae; (3) those collected from the deeper layers, usually deeper than 30 m, even at night: *Diaphus coeruleus, Gonostoma gracile, Vinciguerria* sp. and Berycida spp. As for frequency of appearance, fishes of group (2) viz. *Engraulis japonica, Scomber japonicus* and *Trachurus japonicus* were most dominant. Individuals in group (3) appeared in relatively small numbers.

Abundance, both in number of species and number of individuals was high during spring to summer and very low in winter.

The vertical distribution of dominant species viz. *Engraulis japonica, Scomber japonicus, Trachurus japonicus* and *Sebastes inermis* are shown in Fig. 1. As can be seen in the figure most individuals of the *Scomber japonicus* were caught from the surface layers, tapering off with the depth. In *T. japonicus,* the center of distribution was observed at 20 m depth with their abundance slightly reduced in the upper layers but with sharp reduction in the deeper layers. As intermediate type to these two distributional patterns, having two peaks in their vertical distribution, *E. japonica* and *S. inermis* are represented. In the latter, it is noted that this species has a very restricted vertical range and no individual has been collected from more than 50 m depth.

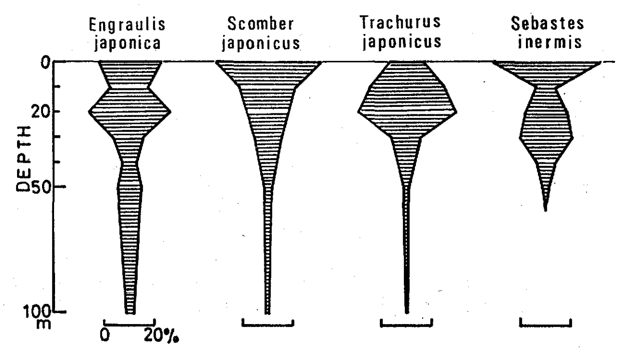

Fig. 1. Vertical distribution of larvae of four major fish species collected in 1966 and 1967.

Diurnal changes in the amount of fish in different layers: Diurnal changes in the density of two species, *Engraulis japonica* and *Scomber japonicus* were investigated by means of serial towings that were carried out at Sagami Bay and Kumano Nada for more than 24 hours.

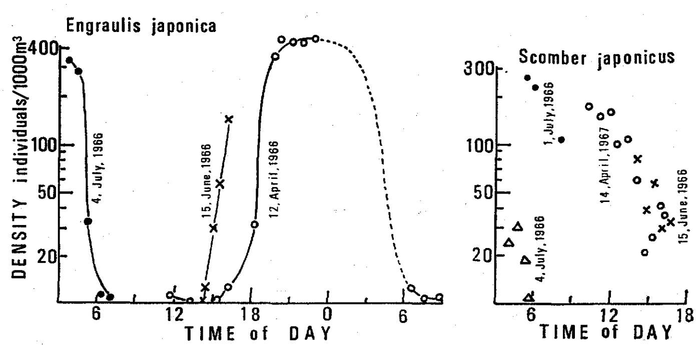

Fig. 2. Diurnal change in the distribution of *Engraulis japonica* and *Scomber japonicus* in surface layers.

The diurnal changes found in surface layers are shown in Fig. 2. As can be made out from the figure, in the case of *E. japonica* an apparent increase in the number of fish taken was observed during twilight hours but at day time, the distribution was practically nil at the surface. On the contrary, there was no remarkable diurnal change in the quantity of *S. japonicus.*

Table 1. Details of number of fish larvae collected during the period of experiment.

species	1965 April	June	Aug.	Oct.	Dec.	1966 April	June	July	Oct.	1967 March	April	Aug.	Total
Englaulis japonica (HOUTTUYN)	1432	25160	6033	22	12	6567	1115	3742	134	8	863	60	45148
Gonorhynchus abbreviatus (T. & S)				14	5					4			23
Maurolicus muelleri GMELIN						7	65						72
Cyclothone spp.					1	47					3		51
Vinciguerria spp.						47	191						238
Centrobranchus brevirostris BECKER		13					32	7				13	65
Myctophum asperum RICHARDSON		182	33				1101						1316
Symbolophorus evermanni (GILBERT)		119					271	235					626
Diaphus coeruleus KLUNZINGER						275	140				27		442
Lampanyctus spp.	23					74	284						381
other Myctophidae spp.					2	2173	988					41	3204
Anguillida Leptocephalus larvae						19	11	5	4		7	26	72
Cololabis saira (BREVOORT)	11					54				23	3		91
Exocoetidae spp.		4	2				182	27					215
Macrorhamphosus scolopax (LINNE)	1				16	97					14	14	142
Syngnathus schlegeli KAUP		9		1								1	11
Sphyraena spp.		18	17				9						44
Atherinidae spp.					23					15			38
Mugil cephalus LINNE							15						15
Trachipterus capellei T. & S.		4		1		5	2				1		13
other Lamprida spp.			6	1		7				28		22	64
Thunnus thynnus (LINNE)							1075						1075
Auxis thazard (LACEPEDE)							55						55
Scomber japonicus HOUTTUYN	619	89				606	508	1237		15	1666		4740
other Thunninae spp.												16	16
Trachurus japonicus (T. & S.)	3	716	65	1		45	637	301	2	8	2	16	1796
Seriola quinqueradiata T. & S.	12					21							33
Coryphaena hippurus LINNE							84				4	6	94

Mullidae spp.		1	17	12			3				4		37
Girella punctata GRAY	20	69		104	38	195			38	7	51		522
Kyphosus cinerascens (FORSKAL)		2						2			3	9	16
Sillago sihama (FORSKAL)		183	252				5						440
Lutjanus spp.			1									12	13
Sparidae spp.			9					1				37	47
Oplegnathus fasciatus T. & S.		1	17				6						24
Callionymus spp.		178	218	32	1	4	244	12			3		692
Blennius yatabei (J. & S.)		143	242				49					3	437
Dasson trossulus (J.& S.)									5	5	3		13
other Blenniidae spp.				3		1			89		1		94
Thallasoma sp.			12	31									33
other Labridae spp.			12	11	6	1			228			24	282
Abudefduf vaigiensis Q. & G.				4		1		3	43			1	52
Stephanolepis cirrhifer (T. & S.)		105	61	2			6	2	5				181
Rudarius ercodes JORDAN & FOWLER		50					8						58
other Aluteridae sp.												11	11
Fugu spp.	1					6				5	2	2	16
Sebastes inermis C. & V.	9				40	4				571	292		916
Sebastiscus marmoratus (C. & V.)	4					3					20		27
Pterois spp.		3	3	2		7			2				17
other Scorpaenidae spp.					4	1	1			104	12	56	178
Tarphops oligolepis (BLEEKER)		2	3		1	2							8
other Pleuronectina spp.							32		1		5	7	45
Pterophryne histrio (LINNE)		2									5		7
other Lophida spp.							26			1		1	28
other spp. and unidentified spp.	139	199	1105	96	45	3338	1569	583	73	146	53	590	7936
Total	2274	27252	8075	370	192	11436	9899	7144	625	940	3044	968	72219

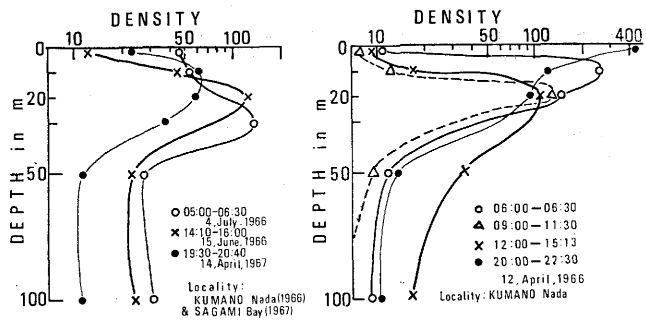

Fig. 3. Diurnal change in vertical distribution of *Engraulis japonica*. Density is expressed as the number of individuals per 1000 m³ of water.

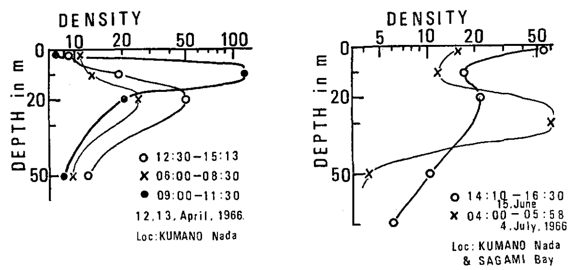

Fig. 4. Diurnal change in vertical distribution of *Scomber japonicus*. Density is expressed as the number of individuals per 1000 m³ of water.

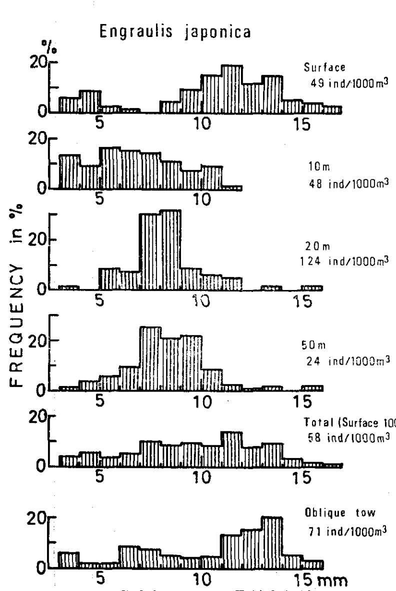

Fig. 5. Size composition of *Engraulis japonica* at different depth. Fish were collected 14:00–16:30, 15th June 1966.

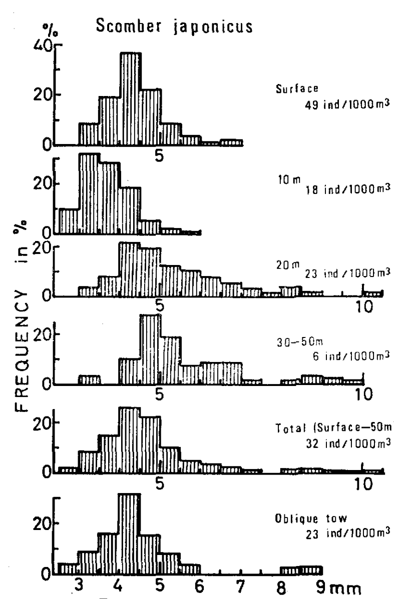

Fig. 6. Size composition of *Scomber japonicus* at different depth. Fish were collected 14:00–16:30, 15th, June, 1966.

The diurnal changes in the amount of fish in sub-surface layers are shown in Figs. 3. and 4. In the case of *E. japonica,* there were marked changes in the amount of fish larvae in shallow layers while there were relatively small changes in the depths of 20 and 30 m.

Size composition of fish at different layers: Size composition of *Engraulis japonica* and *Scomber japonicus* collected from different depths is shown in Figs. 5 and 6. As can be seen in the figure, individuals of small sized larvae of *E. japonica* appear in the upper layers to a depth of 10 m and those of medium sized larvae appear dominantly at 10 m depth. But individuals of larger sizes are observed abundantly at the surface waters and scarcely at depths more than 20 m.

In *S. japonicus,* as in the case of the former species, smaller sized individuals appear in greater abundance at 10 m depth and medium sized ones are dominant in surface layers or at depths of more than 20 m. However, larger sized larvae are found only in layers deeper than 20 m.

Thus smaller individuals of both species did not appear in layers deeper than 20 m and medium sized ones dominated layers between 20 to 50 m and larger one appeared at surface waters.

For both species the mean size composition of their whole range of vertical distribution and the size composition of the collection from oblique towing are shown in the last two columns of each figure. It must be noted here that size composition of collection from oblique towing shows a wide range and resembles the shape of the mean size composition and also the mean density of collection from surface to the deepest layer.

Diurnal change in size composition at surface: Changes of size composition of *Engraulis japonica* and *Scomber japonicus* in day time are showin in Fig. 7. In this case it was cloudy all through the day and very few individuals of both species were collected from the

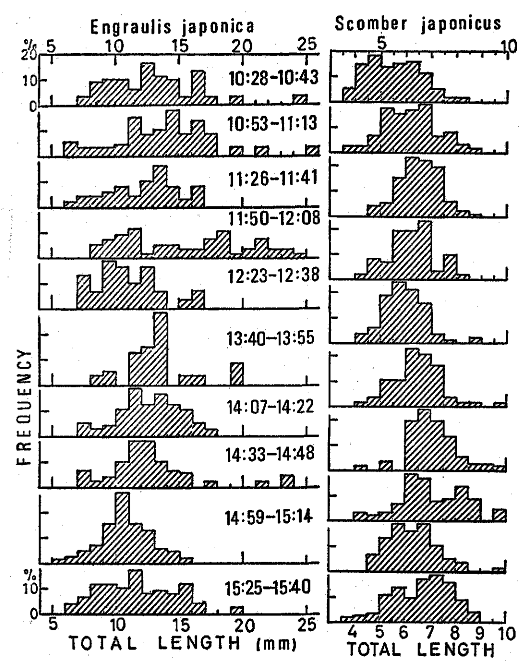

Fig. 7. Diurnal change of size composition of *Engraulis japonica* and *Scomber japonicus* from surface tow. Figures are showing towing duration.
14, April, 1967; locality: Kumano Nada

Table 2. Relationship between density of larval fish and floating seaweed.

Species	Catch from surface layers	Density in the surface layers	Density near the floating seaweed		Density away from the float. seaweed	Catch from the deeper layers	Density at the deeper layers	Range of total length (mm)
Sebastes inermis	625	14.0	16.5	>	11.0	334	19.6	3.1–14.1
Girella punctata	472	8.0	11.6	>	5.5	2	1.0	4.1–18.0
Seriola quinqueradiata	23	1.4	1.6	>	1.3	1	1.0	6.3–17.9
Abudefduf vaigiensis	60	3.2	2.5	<	3.2*	0	0	6.0–10.9
Kyphosus cinerascens	16	2.7	2.7	>	0	0	0	9.1–17.0
Stephanolepis cirrhifer	170	10.6	22.1*	>	1.7	20	2.2	1.9–22.9
Syngnathus schlegeli	11	3.7	3.7	>	0	0	0	43.5–95.6
Coryphaena hippurus	80	10.0	1.7	<	15.0*	0	0	3.7– 9.2
Oplegnathus fasciatus	24	4.8	3.0	<	6.0	0	0	4.4– 7.0
Exocoetidae spp.	215	7.9	4.5	<	9.4	0	0	6.2–45.0
Cololabis saira	46	2.2	2.2	=	2.2	0	0	6.8–14.2
Mullidae spp.	33	5.5	6.7	>	4.3	0	0	6.8–30.9
Macrorhamphosus scolopax	111	3.7	5.5	>	2.4	0	0	6.1–26.5
Mugil cephalus	15	3.8	4.0	≒	3.7	0	0	4.9–11.0
Blennius yatabei	543	41.8	64.3	>	28.3	0	0	3.5–17.3
Engraulis japonica	37638	361.9	227.9	<	421.5	15010	164.9	2.4–31.0
Trachurus japonicus	127	8.5	10.7	>	6.5	1564	39.1	2.4–32.5
Scomber japonicus	3393	52.2	63.2	>	45.3	712	19.8	2.6–15.5
Sphyraena spp.	32	6.4	8.0	>	5.3	0	0	3.9–11.5
Sillago sihama	573	52.1	59.2	>	46.1	18	6.0	3.5–10.9
Callionymus spp.	252	12.0	12.4	≒	11.5	714	32.5	2.4–21.2

Density is expressed as individuals/1000 m^3
* Showing the significant difference at 95% level.

layers deeper than 10 m. As it can be seen in the figure there was no marked change in size composition for both species.

Relationship between larval fish and floating seaweed: Relationship between fish larvae collected from surface and subsurface layers and floating seaweeds that play the role of shelters for larval fish[10-12], has been analyzed from the following data; (1) collections including any fragments of seaweed from surface layer, (2) collections from surface layer without any seaweed and (3) collections from sub-surface layers. The results are shown in Table 2. It is evident from this table that species of *Sebastes inermis*, *Trachurus japonicus* and *Callionymus* spp., show high density at sub-surface layers whereas all the other species are found to be denser in their distribution at surface layers. On classifying the density at surface into density near floating seaweeds and that irrespective of any fragments of seaweed, the density for the species of *Abudefduf vaigiensis, Coryphaena hippurus, Opelegnathus faciatus* and *Engraulis japonica* are high in the areas devoid of floating seaweeds but in other species the density near floating seaweeds was not less than that of the former.

Discussion

Distribution of larval forms is divided into three types based on the ranges of collection depths. As mentioned earlier, it must be noted here that most of these species show distinct color adaptation that may be suitable for their surface life. For example, fishes gathering around floating seaweeds such as *Seriola guinqueradiata, Oplegnathus fasciatus, Stephanolepis cirrhifer* are colored yellow[13], while a silvery coloration is found in fishes belonging to Exocoetidae, *Macrorhamphosus scolopax* and *Mugil cephalus* (even the smallest individual of *Macrorhamphosus scolopax,* 6.1 mm in total length or just hatched Exocoetidae individuals of 6.2 mm show a silver coloration), and a blueish coloration is found in *Cololabis saira* and *Hemiramphus sajori* (hatched individuals of these species exhibit a fully developed coloration). The relationship between coloration of fishes and their association is also reported by some workers and silvery colored fishes usually do not show affinity to floating objects[14]. But when preserved in formalin their blight color changes into dark brown or black. On the contrary, in *Engraulis japonica* individuals ranging from 20 to 30 mm in total length are transparent and bear no chromatophore anywhere except in the visceral region and brains and individuals of this species make wide vertical diurnal migration as compared with *Scomber japonicus* or *Sebastes inermis*. Fishes of *Trachurus japonicus* and *Scomber japonicus* occupy an intermediate type between the two groups above mentioned with regard to coloration and distributional pattern. And this distributional pattern of larval forms with respect to the development of chromatophore has been reported by many authors and well reviewed by BREDER[15].

Vertical migration and distribution of mesopelagic fishes are usually analysed using data of collections from tows of successive depths[16]. Using this method, KAWAGUCHI[17] classified some mesopelagic fishes into three groups viz. sub-surface migrant, midwater migrant, and non-migrant with respect to their mode of vertical migration. And the net avoidance of these fishes must be carefully taken into consideration in the studies of distribution. Though the night-time increase of collection from near the surface layers is well known fact for these fishes, in most myctophids according to PEARCY[18], it is attributable to the reduced net avoidance. In the present case juveniles of some mesopelagic fish are collected and their mode of vertical migration is considered. The sub-surface migrants viz. *Myctophum asperum, Symbolophorus evermanni* and *Centrobranchus brevirostris* are absent completely from the collections at depths from 100 to 150 m, immediately after day break. This fact suggests that their downward migration occurs quickly and widely, because they never appeared at the intermediate depths at any of the sampling times, even at the lowest sampling depths at daytime. A similar tendency was observed for species of *Diaphus coeruleus* and *Vinciguerria* sp. though in these species, the upper limits of migration appeared to be restricted to about 30 m depth even at midnight. And these findings are in accordance with the former workers[16,17].

Usually researches on larval fishes are based mainly on the results of horizontal net towings. And geographical distribution, seasonal change and dispersion of larvae of some dominant species in the waters of Japan are fairly clarified[6]. Recently early life history of *Scomber japonicus* in relation to the fluctuation of population is reported[8]. Most of larvae of these fishes are distributed in the depths of upper several ten meters. But it is not fully discussed that collections from what depth represents the appropriate or the best estimate of density and size composition. So comparison of the data from successive depth towings is made.

Comparing the size and amount of collected individuals from different depths for *Scomber japonicus* and *Engraulis japonica,* the ratio of the maximum collection to the minimum attains to more than a hundred within a day at the surface, but the ratio at 10 to 30 m depth is three for *E. japonica* (max. 260 ind./1000 m^3, min. 95) and five for *S. japonicus* (max. 120, min. 23). For the size composition at sub-surface layers, it must be noted here that the medium sized groups were collected from layers about 20 m depths in both cases. Judging from the stable distribution and moderate size composition, individuals distributed in these layers, 10 to 30 m depths, must be taken for consideration for quantitative analysis of these species. On the whole, the oblique tow, designed to tow large volume of water of these layers, seems suitable for its indication of density and size composition close to the mean and also for its simplicity in operation.

As mentioned before, net avoidance must be carefully taken into consideration for agile larvae. But it does not seem that the avoidance differs within individuals of *Engraulis japonica* smaller than 20 mm in total length and *Scomber japonicus* smaller than 10 mm and also within the depths from surface to several ten meters. If it is so, the size composition shown in Figs. 5 and 6 does not differ largely from the actual distribution. In that case medium sized larvae of *E. japonica* (5 to 10 mm) and larger sized larvae of *S. japonicus* (more than 6 mm) did not appear at surface but dominated at layers of 10 to 30 m depths. But in the case of cloudy condition (Fig. 7) these size groups of both species appeared at surface. From these results, it may be said that night-time increase in surface is caused by migration of these size groups.

Larvae of *E. japonica* larger than 20 mm in total length scarcely collected in the present case. According KONDO[2] group of this size are caught in great abundance near the beaches of central Japan. Lack of larvae of this species larger than 20 mm seems attributable to the shore-ward migration and also net avoidance.

MOTODA[19] has reported that eggs of *Scomber japonicus* in the prehatching stage are distributed mainly in depths of 7 to 15 m and similar findings are reported by other workers[8,20]. And in the present case, it has been noted that larvae of *S. japonicus* at 3 to 4 mm in total length dominated to 10 to 20 m deep layers. Thus the present results are in accord with the findings of former workers. On the whole, it may be said that hatched individuals of both species stay at the hatched layers for some period and then migrate to a depth of 20 to 30 m whereas more developed individuals move to the surface, though the vertical range of distribution of *E. japonica* is wider than that of *S. japonicus*.

Fishes that spawn adhesive or entangling eggs such as *Hemiramphus sajori*[21], *Cololabis saira*[22] and species of Exocoetidae[23] as well as those living in *Zostera* or *Sargassum* belts such as *Syngnathus schlegeli, Stephanolepis cirrhifer, Sebastes inermis*[24] and *Dasson trossulus*[25] spawn their eggs or larvae on floating objects, seaweeds or in its proximity. In these belonids and other fishes the density of larvae near floating seaweeds is assumed to be higher than that of areas lacking such objects. On the other hand, fishes such as *Seriola quinqueradiata* and *Oplegnathus fasciatus* spend their young stages in the vicinity of floating seaweeds but the eggs are pelagic and independent of floating substances[26,27]. Moreover, most of the pomacentrids lay eggs on rock crevices[28,29] and it may be fitted to *Abudefduf vaigiensis*. So it is assumed that in the early stages, this species shows no relationship to floating seaweesd.

Comparing the density of *Cololabis saira* and Exocoetidae fishes near floating seaweeds with that of areas lacking such objects only slight differences were noted, that is, a little higher in the latter case. The eggs of *C. saira* and some exocoetids laid on floating seaweeds are frequently observed in the areas off the coast of central Japan in early summer. Observations on board show no affinity to the floating seaweed (no hiding responses were observed). From these facts it may be said that the floating seaweeds are important as the sites for spawning, however, they become less important for hatched out individuals of these belonids.

As mentioned above, hatched out larvae of *Cololabis saira* swim freely from the floating seaweeds. The size range of this species obtained in this study is 6.8 to 14.2 mm in total length, suggesting that there is little time difference between hatching and collecting. Thus the density near floating seaweeds does not show any remarkable difference. But in the case of exocoetid fishes, size ranges from 6.2 to 45.0 mm and most of the collections are dominated by individuals of more than 30 mm showing longer time lapse between hatching and collecting so as to change their habitat to freely swimming areas. And this observation supports the findings mentioned above.

As mentioned above, it is assumed that fishes having no affinity to floating seaweeds during spawning, spend their early stages freely from the floating seaweeds before gathering around floating objects. In *Seriola quinqueradiata,* individuals of 6.3 to 17.9 mm in total length were caught by larva nets out of which those of 6.6 to 8.4 mm were caught and in the same towings seaweeds were also found, so it may be said that some of the individuals at these stages do live with floating seaweeds and some are free living. In case of *Abudefduf vaigiensis,* fewer individuals were caught along with floating seaweeds and these individuals were mainly larger than 8 mm. On the contrary most of the individuals of *Girella punctata* ranging from 9 to 12 mm were caught along with floating seaweeds and as far as these species are concerned, it appeared that the gathering around floating seaweeds occurs at a range of about 7 to 10 mm.

None of the individuals of *Kyphosus cinerascens* were caught without any fragments of seaweed. It suggests that there was much time lag and change of space between spawning and collecting, since all of them had already started lives with floating seaweeds.

Individuals of *Sebastes inermis* less than 4 mm in total length are found in great abundance at layers of 20 to 30 m depth and larger larvae appear near the surface (Fig. 1). Individuals larger than 20 mm are collected along with floating seaweeds. In this case the size of larvae collected from surface layer ranges from 3.7 to 14.1 mm and their density near floating seaweeds is higher than that at any other places. However, larvae of the same stage are found commonly in coastal area[24] showing that a certain fraction of the population completes its life in the restricted areas and that the stage with floating seaweeds are not always essential for this species.

Individuals of Mullidae spp., *Blennius yatabei, Scomber japonicus,* and *Sillago sihama* are found to be having higher density near floating seaweeds than in any other areas but none of the more advanced larvae of these species were collected along with floating seaweeds. So for these species it is considered that the differences in the density are apparent and caused by some conditions. And no special relationship between these fish and floating seaweeds can be considered.

On the whole, most of larval fishes listed in the Table 2 are found to be of higher density near floating seaweeds than in any other areas. However, in most cases the differences observed in the density are not significant, suggesting that some of the larvae of these stages spend their early lives free from floating seaweeds. And more advanced individuals of the species of *Seriola quinqueradiata, Abudefduf vaigiensis, Sebastes inermis* and *Stephanolepis cirrhifer* were never collected without the presence of floating seaweeds. So the existence and also the abundance of such larval populations that are free from any floating objects need further study. And especially, *Abudefduf vaigeinsis* is showing the widest distribution in the western Pacific comparing with other fishes of Pomacentridae and none of other pomacentrids does not show affinity to the floating objects. Adding to this, BRIGGS[30] listed 53 species of trans-Pacific shore fishes and out of which six species are having some affinities to the floating seaweeds. From these fact, it may be said that the floating seaweed is not always essential for the life of individuals of any species gathering around floating seaweed, but is playing an important role for the dispersal of the population in their larval stages.

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