

## On the Occurrence of Young Stages of Caligidæ on Pelagic Young Fish in the Plymouth Area.

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DURING my researches on the vertical and seasonal distribution of young fishes I soon noticed that occasionally a specimen was found to which a Caligid copepod in an early chalimus stage was attached. As every fish caught was examined under the lens while being measured, I kept a look out for these young stages of the parasites and all occurrences were recorded. The results of this examination are given in Table I which shows also the lengths in millimetres of all the fish thus parasitised found in the collections made during 1925 and 1926 (see 1, 2, 3 and 4).

The most striking result is that out of the 57 species of fish which pass under our notice during the year the young Caligids appeared only on 7 species, namely *Gadus merlangus* (Whiting), *Ammodytes lanceolatus* (Sand-eel), *Onos* sp. (Rockling), *Clupea* sp. (probably Pilchard), *Trigla* sp. (Gurnard), *Caranx trachurus* (Horse-Mackerel), and *Rhombus* sp. (Turbot or Brill). Furthermore, of these 7 species the whiting and the sand-eel were the only two parasitised regularly.

In Table I it will be seen that no parasites were found on the whiting except on specimens of about 11 mm. in length and over. Now it is at about this length that the young whiting starts its association with the jellyfish *Cyanea*, living under and around the umbrella surface. It seems possible that this apparent preference for the early stages of Caligids to attack the young whiting may be indirectly due to this fish's habit of associating with *Cyanea*. It is at any rate curious that no parasites were found on such closely related Gadoids as the pollack and the poor-cod (*G. minutus*). It may be that the early stages of Caligids are responsive to a passing shadow, thus enabling them to find their future hosts. Under such circumstances they might tend to congregate under the *Cyanea* and thus find the small whiting sheltering there. It is interesting that of the other species of young fish recorded as having parasites, the rockling have the habit of sheltering under drift weed, and the horse-mackerel also associate with large medusæ as do the whiting. The young sand-eels might also be more liable than other fish to pick up the parasites on account of their habit of swimming in dense shoals.

Little is apparently known of the early life-history of the Caligids. Wilson (6) says of *Caligus rapax* that at the right seasons the chalimus stages of development may be found attached to the fins and scales of flounder and cod. I have myself seen chalimus stages fixed in large numbers to the fins of mullet (5), though this was admittedly under crowded circumstances. It would however be rather expected that the normal hosts for the early chalimus stages are the larger and adult fish on which the parent Caligids live. In that case the attachment of young stages on the pelagic young fish would rather be of chance occurrence, and this is upheld by the few recorded instances among the many thousands of fish that I have examined.

The chalimus stages were almost always found fixed either on the head itself or somewhere near it, and usually the former. Occasionally young fish were found with more than one parasite attached, the greatest number being five on a specimen of *G. merlangus*, 26 mm. long, on July 1st, 1925, and four on an *A. lanceolatus*, 30½ mm. long, on the same date. The number of fish infested compared with those available for attack was however on the whole low. For instance, I have counted up all the whiting of 11 mm. and over caught, and they amounted to 231 in 1925, and to 389 in 1926; of the former 22 were parasitised and of the latter only 13.

#### REFERENCES.

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TABLE I.

## OCCURRENCE OF CHALIMUS STAGES OF CALIGIDS ON YOUNG FISHES.

Length in Millimetres of Fish carrying parasites.

Date.	Depth in metres.	<i>Gadus merlangus.</i>	<i>Ammodytes lanceolatus.</i>	Onos sp.	Clupea sp.	Trigla sp.	<i>Caranx trachurus.</i>	Rhombus sp.
29.iv.25	12.5	-	20	-	-	-	-	-
19.v.25 L4	9.9	-	18½	-	-	-	-	-
"	20.8	13½ : 11	12	-	-	-	-	-
"	32.6	-	18	-	-	-	-	-
17.vi.25 (i)	29.8	19	-	-	-	-	-	-
"		10 : 16 : 19½	-	-	-	-	-	-
18.vi.25 (iv)	26.8	30	-	-	-	-	-	-
18.vi.25 (vi)	19.4	11½	-	-	-	-	-	-
19.vi.25 (vii)	16.6	-	33	-	-	-	-	-
"	25.8	10½	-	-	-	-	-	-
19.vi.25 (viii)	S.	23½	-	-	-	-	-	-
"	3.6	33	33	-	-	-	-	-
"	13.9	26 : 33 : 24½ : 26½	-	-	-	-	-	-
1.vii.25 A.	2	-	30½ <sup>(4)</sup>	-	-	-	-	-
"	19.8	26 <sup>(5)</sup>	-	-	-	-	-	-
"	23.1	12 <sup>(2)</sup>	-	-	-	-	-	-
1.vii.25 L4	3.5	-	21	-	-	-	-	-
"	21.3	16 <sup>(2)</sup> : 27½ <sup>(3)</sup>	-	-	-	14 : 12	-	-
"	27.1	15	-	-	-	-	-	-
"	36.7	-	16	-	19	-	-	-
16.vii.25	16.5	18	16½	-	-	-	-	-
"	22.2	-	18 : 15	-	-	-	-	-
"	32.3	-	19	-	-	-	-	-
16.vii.25 m.n.	25.8	-	18 : 15	-	-	-	-	-
29.vii.25	25.8	42	21	-	-	-	-	-
26.iv.26	20.8	21½	-	-	-	-	-	-
6.v.26	20.4	25 : 29 : 15 : 24	-	-	-	-	-	-
"	37.1	-	-	7½	-	-	-	-
19.v.26	17.6	-	18	-	-	-	-	-
3.vi.26 (ii)	4.4	25 : 39 : 25	-	-	-	-	-	-
4.vi.26 (iv)	4	24½ : 20½	-	-	-	-	-	-
4.vi.26 (v)	10	15 : 35	-	-	-	-	-	-
4.viii.26	S.	-	-	-	-	-	-	10
"	3.5	50	-	-	-	-	-	-
"	9.5	-	-	-	-	-	-	14
"	22.2	-	-	-	-	-	-	13

NOTE.—The small figures in brackets indicate the number of parasites present on the fish in question when more than one.

