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PORTUGUESE RESEARCH REPORT, 1955Contribution to the Study of *Clavella uncinata* (O.F. Müller), Parasite on Cod (*Gadus callarias* L.) in Greenland and Newfoundland Waters

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In 1955 Dr. M. Ruivo carried out systematic collections of parasites on fishes caught during the cod campaign in Newfoundland and West Greenland waters. Special attention was paid to the parasitic Copepods, in particular those from the cod, *Gadus callarias* L. This was done as these parasites may constitute an additional help in characterizing the cod populations of the various areas of the fishery.

This paper presents the preliminary results of a study of the comprehensive material of *Clavella uncinata* (O.F. Müller) (Copepoda Lernaepodidae) collected from *Gadus callarias* L.

The fact that the regions of fixation of the parasite on the host have been noted very conscientiously for each collection has permitted us to make a comparative study of the various forms in which *Clavella uncinata* (O.F. Müller) can be divided. This problem has at various times been considered by previous authors and the discussion of it is still kept open.

The density of parasites in the numerous samples of cod was also determined to get an idea of the greater or lesser abundance and frequency of the parasite on cod on the various fishing grounds.

1. *Clavella uncinata* (O.F. Müller) is one of the species of the family Lernaepodidae which has been most discussed. It has been reported from numerous species of fish, often of fish very remote from one another in systematic position.

We do not occupy ourselves here with a discussion of the validity of the identification in these earlier reports. The heterogeneity of hosts can quite well be fictitious and can be explained perhaps by the variability of forms and dimensions which this parasite shows even in one and the same host, e.g. the cod.

Based on this variability and its co-relation with the region of fixation of the parasite, Leigh-Sharpe (1925) proposed to substitute for *Clavella uncinata* two new species - *Clavella sciatherica* Leigh-Sharpe, 1918, and *Clavella iadda* Leigh-Sharpe, 1920.

E. Poulsen (1939), based upon a great material collected on cod from Danish waters, came to the conclusion that the two species set up by Leigh-Sharpe are only phenotypic variations of *Clavella uncinata* (O.F. Müller), which species he therefore gives validity again.

A thorough revision of this species from a taxonomic point of view was recently given by R. Ph. Dollfus (1953).

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2. The present study is based on observations from more than 200 specimens of Clavella uncinata collected on cod in Greenland and Newfoundland waters.

In this note only the variability of the soft parts of the body will be considered. The following measurements were made on each individual: the dimensions of the cephalothorax, the maximum length and width of the genital segment, of the abdominal appendix and of the egg sacs. All measurements were made through the microscope using an ocular micrometer (in mm.).

Only the adult individuals of each sample were considered, including those in which the egg sacs had been lost either through hatching or accidentally.

The specimens from the buccal cavity (gill filaments and gill arcs, the buccal-pharyngeal cavity), from the fins, and from the anus were grouped in separate series; the data obtained for the two subareas are summarized in Tables 1 and 2 (Newfoundland - T.N.) and 3 and 4 (Greenland - G.).

3. A comparison of the mean values for the different series of observations shows:

- (a) The figures for the cephalothorax of specimens from the buccal cavity (T.N. = 4.27; G. = 4.78) are clearly higher than those of specimens from the fins (T.N. = 3.28; G. = 3.76).
- (b) The genital segment, in the individuals from the anal region, is broader (T.N. = 2.62) than long (T.N. = 2.20), contrary to what is the case for individuals from the other regions of fixation. In the specimens from the fins the genital segment is as a rule more elongated than in specimens from the buccal and pharyngeal cavities.

These differences are particularly evident in the ratios: cephalothorax/lengths of genital segment and lengths of genital segment/breadth of genital segment (Tables 2 and 4).

- (c) The abdominal appendix is decidedly larger in the specimens from the buccal cavity (T.N. = 0.63; G. = 0.66) than in those from the region of the anus (T.N. = 0.43). In specimens from the fins it is extremely reduced (T.N. = 0.27; G. = 0.33).
- (d) These morphological characteristics are found both for specimens from Newfoundland and in specimens from Greenland.
- (e) The individuals from Greenland are in general larger than those from Newfoundland (Tables 1 and 3, Figure 1).

4. Conclusions.

The results show the existence of constant morphological types characteristic of each region of fixation on the host. These various types can be identified by simple observations (Figure 1).

The differences are completely independent of age and physiological state of the individual.

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As the Lernaopodidae have a phase of free life after the hatching of the eggs, however extremely short, it is possible that the bio-ecological factors related to the different regions of fixation influence the form of the individual already from the first larval stages during which they are fixed on the host, causing morphological and physiological changes.

In admitting that the three types of parasitic Clavella found on the cod correspond to one and the same species - Clavella uncinata (O.F. Müller), we think that these types are true biological forms. A trinomial nomenclature would be the proper one for each of these three types.

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TABLE 1 - NEWFOUNDLAND

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Region of fixation	Date of sample	No. of Parasites	Length of Cephalothorax (aver.)	Max. length of genital segment (aver.)	Max. breadth of genital segment (aver.)	Length of abd. appendix (aver.)
Buccal Cavity (gill arcs, gill filaments, mouth and pharynx)	28-IV	13	4.11	2.61	2.15	0.64
	28-IV	4	3.98	2.18	2.25	0.60
	28-IV	22	4.05	2.33	2.04	0.63
	29-IV	5	4.47	3.18	2.40	0.68
	29-IV	4	4.28	2.96	1.77	0.60
	29-IV	12	4.08	2.67	2.30	0.64
	29-IV	8	4.88	2.16	1.46	0.70
	3-V	15	3.92	2.52	2.12	0.56
	3-V	5	4.47	3.12	2.43	0.63
	18-V	11	4.26	2.88	2.28	0.63
	21-V	48	4.43	2.72	2.27	0.66
	MEAN			4.27	2.67	2.13
Fins	2-V	1	3.60	2.85	2.25	0.30
	2-V	1	3.00	2.85	2.40	0.23
	3-V	6	3.00	2.57	1.65	0.30
	12-V	9	3.60	2.88	2.22	0.30
	17-V	3	3.20	2.70	2.00	0.25
	MEAN			3.28	2.77	2.10
Anus	2-V	1	3.30	2.25	2.25	0.45
	2-V	1	3.45	1.95	2.40	0.38
	2-V	1	3.45	2.25	3.00	0.45
	3-V	11	3.41	2.03	2.25	0.37
	12-V	1	4.05	2.70	3.00	0.45
	15-V	2	3.53	2.03	2.85	0.45
MEAN			3.53	2.20	2.62	0.43

TABLE 2 - NEWFOUNDLAND

Region of fixation	Date of sample	No. of Parasites	Cephal./Length of gen. segm. (aver.)	Length gen. segm./breadth gen. segm. (aver.)
Buccal Cavity	28-IV	13	1.63	1.24
	28-IV	4	1.60	0.97
	28-IV	22	1.79	1.06
	29-IV	5	1.50	1.32
	29-IV	4	1.45	1.32
	29-IV	12	1.54	1.16
	29-IV	8	1.52	1.49
	3-V	15	1.59	1.23
	3-V	5	1.48	1.32
	18-V	11	1.51	1.27
	21-V	48	1.64	1.27
	MEAN			1.57
Fins	2-V	1	1.26	1.26
	2-V	1	1.05	1.18
	3-V	6	1.16	1.56
	12-V	9	1.26	1.30
	17-V	3	1.16	1.36
	MEAN			1.18
Anus	2-V	1	1.76	0.81
	2-V	1	1.46	1.00
	2-V	1	1.53	0.75
	3-V	11	1.68	0.93
	12-V	1	1.50	0.90
	15-V	2	1.80	0.75
MEAN			1.62	0.86

TABLE 3 - GREENLAND

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Region of fixation	Date of sample	No. of Parasites	Length of Cephalothorax (aver.)	Max. length of genital segment (aver.)	Max. breadth of genital segment (aver.)	Length of abd. appendix (aver.)
Buccal Cavity (gill arcs, gill filaments, mouth and pharynx)	19-VII	5	5.10	3.20	2.03	0.66
	19-VII	9	4.32	2.84	2.01	0.60
	27-VII	27	5.22	3.42	2.57	0.67
	2-VIII	16	4.56	2.89	2.15	0.67
	8-VIII	4	5.40	3.75	1.70	0.79
	7-X	8	4.40	2.90	2.45	0.61
	7-X	19	4.38	3.00	2.30	0.62
	4-XI	12	4.89	3.03	2.58	0.66
MEAN			4.78	3.13	2.22	0.66
Fins	2-VIII	8	3.71	2.96	2.36	0.30
	2-VIII	5	3.78	3.33	2.34	0.30
	2-VIII	3	3.75	3.15	2.49	0.44
	28-VIII	2	3.83	3.38	2.10	0.26
MEAN			3.76	3.20	2.32	0.33

TABLE 4 - GREENLAND

Region of fixation	Date of sample	No. of Parasites	Cephal./Length of gen. segm. (aver.)	Length gen. segm./breadth gen. segm. (aver.)
Buccal Cavity	19-VII	4	1.62	1.60
	19-VII	9	1.51	1.44
	27-VII	27	1.54	1.37
	2-VIII	16	1.61	1.32
	8-VIII	4	1.45	1.47
	7-X	8	1.47	1.25
	7-X	19	1.46	1.27
	4-XI	12	1.60	1.18
MEAN			1.53	1.36
Fins	2-VIII	8	1.27	1.27
	2-VIII	5	1.14	1.48
	2-VIII	3	1.20	1.26
	28-VIII	2	1.15	1.60
MEAN			1.19	1.40

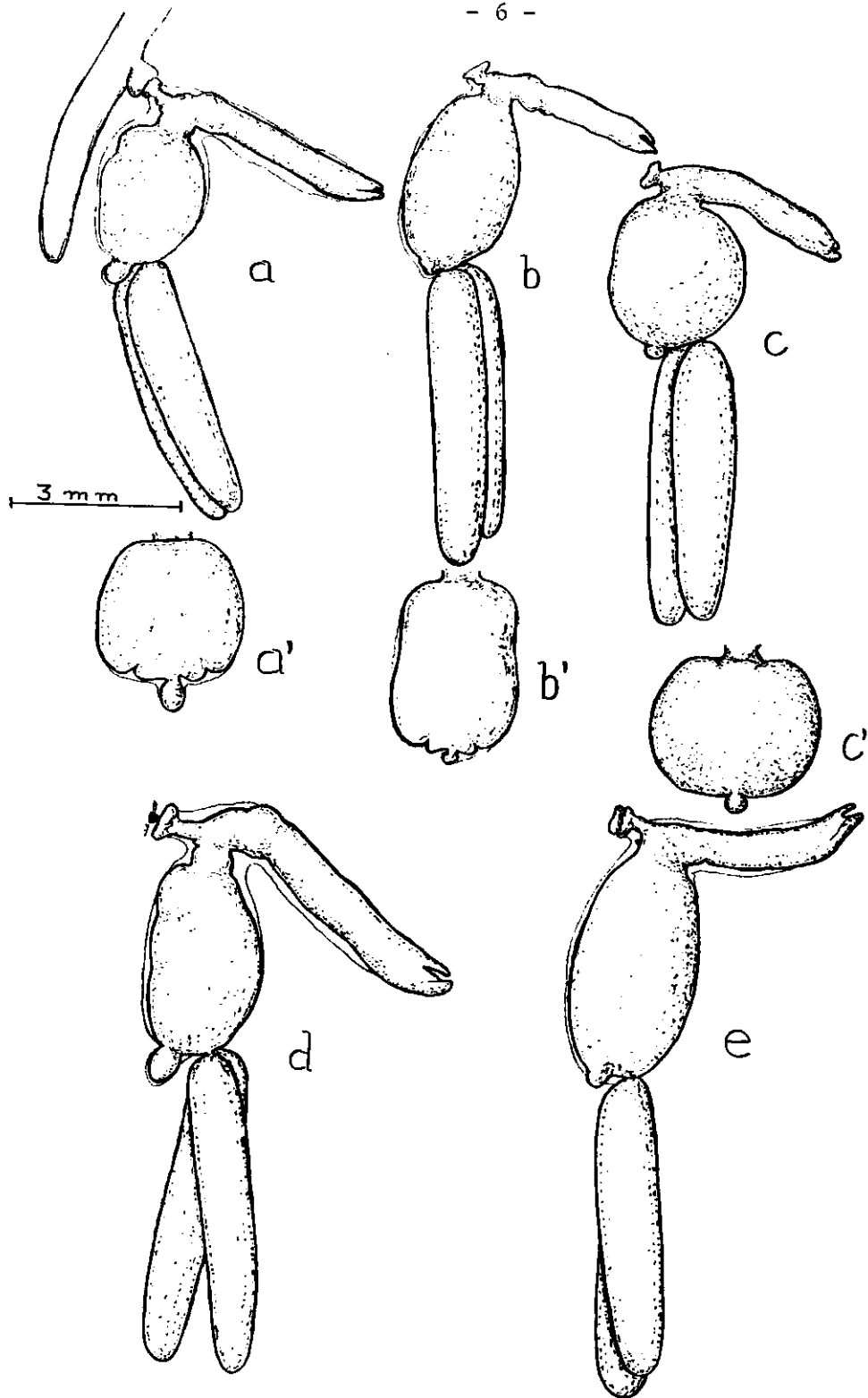


Figure 1. Outlines of the three biological types of *Clavella uncinata* (O.F. Müller) from *Cadus callaries* L. Individuals from Newfoundland: a - from buccal cavity, a¹- genital segment of same ind.; b - from the fins, b¹- genital segment of same ind.; c - from anus, c¹- genital segment of same ind. Individuals from Greenland: d - from buccal cavity, e - from fins.