1904

DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION FOR IRELAND.

RECORD OF THE COPEPODA TAKEN ON THE MACKEREL FISHING GROUNDS OFF CLEGGAN, IN 1901.

BY

G. P. FARRAN, B.A.

(Appendix No. VII. to Part II. of the Report on the Sea and Inland Fisheries of Ireland for the Year 1901.)

APPENDIX, No. VII.

RECORD OF THE COPEPODA TAKEN ON THE MACKEREL FISHING GROUNDS OFF CLEGGAN, CO. GALWAY, IN 1901.

BY

G. P. FARRAN, B.A.

PLATES XVI AND XVII.

i. Table of Distribution and Relative Abundance.

ii. List of the Copepods taken, with Notes.

iii. Description of New Species.

iv. Copepods as Fish Food.

i.—TABLE OF DISTRIBUTION AND RELATIVE ABUNDANCE.

The symbols used in the table to express the relative abundance of copepods are :—A. = abundant = *ca.* 60 %; C. = common = *ca.* 30 %; M.= moderate = *ca.* 20 %; F. = few = *ca.* 10 %; V.F.= very few = *ca.* 4%. The figure (1) indicates that only one specimen was met with. The total bulk of the catch, and the quantity of copepods taken are expressed in cubic centimetres, and in some cases the actual number of copepods is given in brackets.

TABLE OF DISTRIBUTION AND

DATE.	FEBRUARY.			MARCH.								
	26th.			11th.		14th.			19th.		
STATION NO	XIII. M L			XIV. M L		XV. M L			XVI. M L		
	A	B	C	A	B	A	B	C	A	B	C
Hour,	6.50 pm.			6.20 p.m.		4.0 a.m.			6.30 p.m.		
Time fishing,	10 min.			10 min.		—			10 min.		
Distance from mainland,	10 miles.			½ mile.		8 miles.			6½ miles.		
Depth of water,	42 f.			14 f.		37 f.			36 f.		
Depth of net,	1	20	40	1	14	1	18	36	1	17	35
Total catch in cc.,	·4	·75	·75	-	1·25	1	2·25	4·5	·5	1·5	2·75
Catch of Copepods,	(82)	(317)	(600)	(35)	(160)	(214)	(1113)	(3700) = 3 cc	(256)	(1260) = 1 cc	(2130) =2·3cc
Calanus finmarchicus,	-	VF	VF	C	A	C	A	A	A	C	C
Eucalanus elongatus,	-	-	-	-	-	-	-	-	-	-	-
Paracal. parvus,	VF	F	F	F	F	M	F	VF	M	M	M
Calocal. styliremis,	-	-	-	-	-	-	-	-	-	-	-
Clausocal. arcuicornis,	(1)	-	-	-	-	-	VF	(1)	-	-	-
Ctenocal. vanus,	-	-	-	-	-	-	-	-	-	-	-
Pseudocal. elongatus,	(1)	F	C	M	M	F	C	M	C	C	C
Bradyidius armatus,	-	-	(1)	-	-	-	-	-	-	-	-
Scolecithrix pygmæa,	-	-	-	-	-	-	-	-	-	-	-
Centropages typicus,	-	-	-	-	-	(1)	-	(1)	(1)	-	-
Centropages hamatus,	-	-	-	F	VF	-	-	-	-	-	-
Isias clavipes,	-	-	-	F	VF	-	-	VF	-	-	VF
Temora longicornis,	-	(1)	-	-	-	(1)	(1)	VF	-	(1)	VF
Metridia lucens,	A	A	C	-	-	F	VF	F	VF	F	M
Candacia pectinata,	-	-	-	-	-	-	-	-	-	-	-
Anomalocera patersoni.	-	-	-	-	-	-	-	-	-	-	-
Parapontella brevicornis,	-	-	-	VF	VF	-	-	-	-	-	-
Acartia clausi,	-	VF	VF	(1)	F	VF	VF	VF	VF	VF	VF
Acartia discaudata,	-	-	-	-	-	-	-	-	-	(1)	-
Oithona similis,	VF	F	VF	F	F	M	VF	VF	F	VF	VF
Oithona plumifera,	-	-	(1)	-	-	-	-	VF	-	-	-
Oithona nana,	-	-	-	-	-	-	-	-	-	-	-
Oncæa conifera,	-	-	-	-	-	-	-	-	-	-	-
Oncæa media,	-	-	-	-	-	-	-	-	-	-	-
Corycæus anglicus,	-	-	-	-	-	-	-	-	-	-	-
Longipedia coronata,	-	-	-	-	(1)	-	-	-	-	-	-
Dactylopus stromii,	-	-	-	-	-	-	-	-	-	-	-
Dactylopus tisboides,	-	-	-	-	-	-	-	-	-	-	-
Alteutha crenulata,	-	-	-	-	-	-	-	-	-	-	-
Diosaccus tenuicornis,	-	-	-	-	-	-	-	-	-	-	-
Thalestris clausii,	-	-	-	-	-	-	-	-	-	-	-
Thalestris rufocincta,	-	-	-	-	-	-	-	-	-	-	-
Thalestris heligolandica,	-	-	-	-	-	-	-	-	-	-	-
Thalestris harpactoides,	-	-	-	-	-	-	-	-	-	-	-
Thalestris longimana,	-	-	-	(1)	-	-	-	-	-	-	-
Idya furcata,	-	-	-	-	-	-	-	-	-	-	-
Harpacticus { chelifer, + gracilis, }	-	-	-	-	-	-	-	-		-	.
Caligus,	-	-	-	-	-	-	-	-	-	-	-

Relative Abundance.

April.											Date. 1901.
1st.			12th.			17th.		19th.			
XXI. M L			XXIII. M L			XXIV. M L		XXV. M L			Station No.
A	B	C	A	B	C	A	B	A	B	C	
6.30 p.m.			5.40 p.m.			5.50 p.m.		10.0 p.m.			Hour.
5 min.			10 min.			5 min.		—			Time fishing.
3½ miles.			9½ miles.			1½ miles.		1? miles.			Distance from mainland.
45 f.			50 f.			14 f.		48 f.			Depth of water.
1	20	40	1	25	48	1	14	1	24	47	Depth of net.
2·75	13	30	25	31	35	6·5	11	4·5	5·5	17	Total catch in cc..
2·5	11	20	25	30	33	6	10	4	5	11	Catch of Copepods.
A	A	A	A	A	C	A	A	A	A	A	Calanus finmarchicus.
–	–	–	–	–	–	–	–	–	–	–	Eucalanus elongatus.
VF	VF	VF	VF	VF	VF	F	F	VF	VF	F	Paracal. parvus.
–	–	–	–	–	–	–	–	–	–	–	Calocal. styliremis.
–	–	–	–	VF	–	–	–	–	–	–	Clausocal. arcuicornis.
–	–	–	–	–	–	–	–	–	–	–	Ctenocal. vanus.
F	F	M	VF	VF	A	M	C	M	M	M	Pseudocal. elongatus.
–	–	–	–	–	–	–	–	–	–	–	Bradyidius armatus.
–	–	–	–	–	–	–	(1)	–	–	–	Scolecithrix pygmæa.
–	VF	VF	–	VF	VF	VF	VF	VF	–	VF	Centropages typicus.
–	VF	VF	–	–	–	(1)	–	–	–	(1)	Centropages hamatus.
–	(1)	–	–	–	–	(1)	VF	(1)	–	–	Isias clavipes.
–	VF	VF	(1)	(1)	VF	VF	VF	–	VF	VF	Temora longicornis.
(1)	–	VF	–	VF	VF	VF	VF	VF	VF	F	Metridia lucens.
–	–	–	–	–	–	–	–	–	–	–	Candacia pectinata.
–	–	(1)	–	(1)	–	–	–	–	–	–	Anomalocera patersoni.
–	–	–	–	(1)	–	(1)	–	–	–	–	Parapontella brevicornis.
VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	Acartia clausi.
–	(1)	–	–	–	–	–	(1)	–	–	–	Acartia discaudata.
VF	VF	VF	(1)	VF	VF	VF	VF	VF	VF	VF	Oithona similis.
–	–	VF	–	–	–	–	(1)	–	–	–	Oithona plumifera.
–	–	–	–	–	–	–	–	–	–	–	Oithona nana.
–	–	–	–	–	–	–	–	–	–	–	Oncæa conifera.
–	–	–	–	–	–	–	–	–	–	–	Oncæa media.
–	–	(1)	–	–	–	–	–	–	–	–	Corycæus anglicus.
–	–	(1)	–	–	–	–	–	–	–	–	Longipedia coronata.
–	–	–	–	–	–	–	–	–	–	–	Dactylopus stromii.
–	–	–	–	–	–	–	–	–	–	–	Dactylopus tisboides.
–	–	–	–	–	–	–	–	–	–	–	Alteutha crenulata.
–	–	–	–	–	–	–	–	–	–	–	Diosaccus tenuicornis.
–	–	–	–	–	–	–	–	–	–	–	Thalestris clausii.
–	–	–	–	–	–	–	–	–	–	–	Thalestris rufocincta.
–	–	–	–	–	–	–	–	–	–	–	Thalestris helgolandica.
–	–	–	–	–	–	–	–	–	–	–	Thalestris harpactoides.
–	–	–	–	–	–	–	–	–	–	–	Thalestris longimana.
–	–	–	–	–	–	–	–	–	–	–	Idya furcata.
–	–	–	–	–	–	–	–	–	–	–	Harpacticus { chelifer, + gracilis.
–	–	–	–	–	–	–	–	–	–	–	Caligus.

TABLE OF DISTRIBUTION AND

DATE.	APRIL.								MAY.		
	23rd.			29th.	30th.				8th.		
STATION NO.	XXVIII. M L			XXIX.	XXX. M L.				XXXI. M L		
	A	B	C	M L	A	B	C		A	B	C
Hour,	11.30 p.m.			6 p.m.	9.35 p.m.				11.0 p.m.		
Time fishing,	—			10 min.	10 min.				—		
Distance from mainland,	8½ miles.			1 m.	10 miles.				6½ miles.		
Depth of water,	63 f.			14 f.	56 f.				60 f.		
Depth of net,	1	30	60	0	1	27	55		1	30	58
Total catch in cc.,	3	12	5	210	4	11	13		1	4	17
Catch of Copepods,	2·5	9	4·5	210	3·5	10	12		·75	3·5	3
Calanus finmarchicus,	A	C	A	A	A	A	F		–	–	M
Eucalanus elongatus,	–	–	–	–	–	–	–		–	–	–
Paracal. parvus,	VF	VF	VF	VF	VF	VF	F		–	–	F
Calocal. styliremis,	–	–	–	–	–	–	–		–	–	–
Clausocal. arcuicornis,	–	–	–	–	–	–	–		–	–	–
Ctenocal. vanus,	–	–	–	–	–	–	–		–	–	–
Pseudocal. elongatus,	M	A	M	VF	M	C	M		–	–	M
Bradyidius armatus,	–	–	–	–	–	–	–		–	–	–
Scolecithrix pygmæa,	–	–	–	–	–	–	–		–		–
Centropages typicus,	VF	VF	VF	VF	VF	VF	VF		–	–	VF
Centropages hamatus,	–	(1)	–	VF	–	–	–		–	–	VF
Isias clavipes,	–	–	–	VF	–	–	–		–	–	–
Temora longicornis,	(1)	VF	(1)	VF	–	(1)	VF		–	–	VF
Metridia lucens,	M	M	M	–	M	C	A		–	–	A
Candacia pectinata,	–		–	–	–	–	–		–	–	–
Anomalocera patersoni,	–	–	–	VF	–	–	–		–	–	–
Parapontella brevicornis,	–	–	–	VF	–	–	–		–	–	–
Acartia clausi,	VF	VF	VF	VF	VF	VF	VF		–	–	VF
Acartia discaudata,	–	–	–	–	–	–	–		–	–	–
Oithona similis,	VF	VF	VF	–	VF	VF	VF		–	–	VF
Oithona plumifera,	–	–	–	–	–	–	–		–	–	(1)
Oithona nana,	–	–	–	–	–	–	–		–	–	–
Oncæa conifera,	–	–	–	–	–	–	VF		–	–	–
Oncæa media,	–	–	–	–	–	–	–		–	–	–
Corycæus anglicus,	–	–	–	–	–	–	–		–	–	–
Longipedia coronata,	–	–	–	–	–	–	–		–	–	–
Dactylopus stromii,	–	–	–	–	–	–	VF		–	–	–
Dactylopus tisboides,	–	–	–	–	–	–	–		–	–	–
Alteutha crenulata,	–	–	–	–	–	–	–		–	–	–
Diosaccus tenuicornis,	–	–	–	–	–	–	–		–	–	–
Thalestris clausii,	–	–	–	–	–	–	–		–	–	–
Thalestris rufocincta,	–	–	–	–	–	–	–		–	–	–
Thalestris helgolandica,	–	–	–	–	–	–	–		–	–	–
Thalestris harpactoides,	–	–	–	–	–	–	–		–	–	–
Thalestris longimana,	–	–	–	–	(1)	(1)	–		–	–	–
Idya furcata,	–	–	–	–	–	–	–		–	–	–
Harpacticus { chelifer, + gracilis, }	–	–	–	VF	–	(1)	–		–	–	–
Caligus,	–	–	–	–	–	–	–		–	–	–

RELATIVE ABUNDANCE—*continued.*

MAY.									JUNE.			DATE. 1901.
13th.			22nd.			30th.			3rd.			
XXXIV. M L			XXXVIII. M L			XXXIX. M L			XL. M L			STATION NO.
A	B	C	A	B	C	A	B	C	A	B	C	
12.30 a.m.			10.10 p.m.			10.0 p.m.			10.20 p.m.			Hour.
10 min.			10 min.			30 min.			10 min.			Time fishing.
10½ miles.			8½ miles.			9 miles.			12 miles.			Distance from mainland.
59 f.			59 f.			49 f.			50 f.			Depth of water.
1	30	8	1	30	58	1	25	48	1	25	49	Depth of net.
3	–	11	2	10	14	·5	1·5	19	1	4	14	Total catch in cc.
	—			—		(109)	(200)	–		—		Catch of Copepods.
M	–	C	C	C	C	A	A	A	C	F	M	Calanus finmarchicus.
–	–	–	–	–	–	–	–	–	–	–	–	Eucalanus elongatus.
VF	–	VF	VF	F	F	F	F	VF	VF	VF	VF	Paracal. parvus.
–	–	–	–	(1)	–	–	–	–	–	–	–	Calocal. styliremis.
–	–	–	–	–	–	–	–	–	–	–	–	Clausocal. arcuicornis.
–	–	–	–	–	–	–	–	–	–	–	–	Ctenocal. vanus.
C	–	C	M	F	C	VF	F	VF	C	M	M	Pseudocal. elongatus.
–	–	–	–	–	–	–	–		–	–	–	Bradyidius armatus.
–	–	–	–	–	–	–	–	–	–	–	–	Scolecithrix pygmæa.
VF	–	VF	(1)	VF	VF	–	VF	VF	VF	VF	VF	Centropages typicus.
–	–	–	–	–	–	–	VF	(1)	–	VF	VF	Centropages hamatus.
–	–	–	–	–	–	–	–	(1)	(1)	VF	VF	Isias clavipes.
–	–	VF	–	1	VF	2	–	VF	VF	VF	VF	Temora longicornis
C	–	C	C	C	C	VF	M	C	A	A	A	Metridia lucens.
–	–	–	–	–	–		–	–	–	–	–	Candacia pectinata.
–	–	–	–	–	–	–	–	–	–	–	–	Anomalocera patersoni.
–	–	–	–	–	–	–	–	–	–	(1)	–	Parapontella brevicornis.
VF	–	VF	F	VF	VF	F	VF	VF	F	F	F	Acartia clausi.
–	–	–	–	–	–	–	–	–	–	–	–	Acartia discaudata.
VF	–	VF	VF	VF	VF	M	VF	VF	VF	VF	VF	Oithona similis.
–	–	–	–	(1)	(1)	–	–	–	–	–	(1)	Oithona plumifera.
–	–	–	–	–	–	–	–	–	–	–	–	Oithona nana.
–	–	(1)	–	–	VF	–	–	–	–	–	–	Oncæa conifera.
–	–	–	–	–	–	–	–	–	–	–	–	Oncæa media.
–	–	–	–	–	–	–	–	–	–	–	–	Corycæus anglicus.
–	–	–	–	–	–	–	–	–	–	–	–	Longipedia coronata.
–	–	–	–	–		–	–	–	–	–	–	Dactylopus stromii.
–	–	–	–	–	–	–	–	–	–	–	–	Dactylopus tisboides.
–	–	–	–	–	–	–	–	–	–	–	–	Alteutha crenulata.
–	–	–	–	–	–	–	–	–	–	–	–	Diosaccus tenuicornis.
–	–	–	–	–	–	–	–	–	–	–	–	Thalestris clausii.
–	–	–	–	–	–	–	–	–	–	–	–	Thalestris rufocincta.
–	–	–	–	–	–	–	–	–	–	–	–	Thalestris heligolandica.
–	–	–	–	–	–	–	–	–	–	–	–	Thalestris harpactoides.
–	–	–	–	–	–	–	–	–	–	–	–	Thalestris longimana.
–	–	–	–	–	–	–	–	–	–	–	–	Idya furcata.
–	–	–	–	–	–	–	–	–	–	–	–	Harpacticus { chelifer. + gracilis.
–	–	–	–	–	–	–	–	–	–	–	–	Caligus.

TABLE OF DISTRIBUTION AND

DATE.	JUNE.									JULY.		
	11th.			18th.			25th.			3rd.		
STATION NO.	XLII. M L			XLIII. M L			XLV. M L			XLVIII. M L		
	A	B	C	A	B	C	A	B	C	A	B	C
Hour,	6.20 p.m.			10.30 p.m.			10.0 p.m.			10.20 p.m		
Time fishing,	10 min.			30 min.			10 min.			—		
Distance from mainland,	6½ miles.			10 miles.			4 miles.			5 miles.		
Depth of water,	30 f.			50 f.			52 f.			50 f.		
Depth of net,	1	12	25	1	25	49	1	25	51	1	24	48
Total catch in cc.,	1	7	13	2·75	5	13	·5	2	2·5	1·5	5	3
Catch of Copepods,	–	–	–		—		(115)	–	–	(147)	–	–
Calanus finmarchicus,	VF	M	M	M	C	C	A	M	C	A	C	C
Eucalanus elongatus,	–	–	–	–	–	–	–	–	–	–	–	–
Paracal. parvus,	F	F	VF	VF	VF	VF	–	F	F	VF	VF	VF
Calocal. styliremis,	–	–	–	–	–	–	–	–	–	–	–	–
Clausocal arcuicornis,	–	–	–	–	–	–	–	–	–	–	–	–
Ctenocal. vanus,	–	–	–	–	–	(1)	–	–	–	–	–	–
Pseudocal. elongatus,	(1)	VF	C	M	F	M	VF	C	C	M	C	C
Bradyidius armatus,	–	–	–	–	–	–	–	–	–	–	–	–
Scolecithrix pygmæa,	–	–	–	–	–	–	–	–	–	–	–	–
Centropages typicus,	–	F	M	VF	–	VF	VF	(1)	(1)	(1)	–	VF
Centropages hamatus,	(1)	F	VF	–	–	VF	VF	VF	VF	–	VF	VF
Isias clavipes,	–	VF	VF	(1)	–	VF	–	VF	VF	(1)	–	–
Temora longicornis,	C	A	A	VF	M	M	(1)	F	VF	–	F	VF
Metridia lucens,	(1)	–	F	A	A	C	F	C	A	M	C	C
Candacia pectinata,	–	–	–	–	–	–	–	–	–	–	–	–
Anomalocera patersoni,	–	–	–	–	–	–	–	–	–	–	–	–
Parapontella brevicornis,	–	–	–	–	–	–	–	–	–	–	–	–
Acartia clausi,	A	M	M	F	VF	F	F	F	F	F	VF	VF
Acartia discaudata,	–	–	–	–	–	–	–	–	–	–	–	–
Oithona similis,	F	VF	F	VF	VF	VF	–	VF	F	M	VF	F
Oithona plumifera,	–	–	–	–	–	–	–	–	–	–	–	–
Oithona nana,	–	–	–	–	–	–	–	–	–	–	–	–
Oncæa conifera,	–	–	–	–	–	–	–	–	–	–	–	–
Oncæa media,	–	–	–	–	–	–	–	–	–	–	–	–
Corycæus anglicus,	–	–	–	–	–	–	–	–	–	–	–	–
Longipedia coronata,	–	–	–	–	–	–	–	–	–	–	–	–
Dactylopus stromii,	–	–	–	–	–	–	–	–	–	–	–	–
Dactylopus tisboides,	–	–	–	–	–	–	–	–	–	–	–	–
Alteutha crenulata,	–	–	–	–	–	(1)	–	–	–	–	–	–
Diosaccus tenuicornis,	–	–	–	–	–	–	–	–	–	–	–	–
Thalestris clausii,	–	–	–	–	–	–	–	–	–	–	–	–
Thalestris rufocincta,	–	–	–	–	–	–	–	–	–	–	–	–
Thalestris heligolandica,	–	–	–	–	–	–	–	–	–	–	–	–
Thalestris harpactoides,	–	–	–	–	–	–	–	–	–	–	–	–
Thalestris longimana,	–	–	–	–	–	–	–	–	–	–	–	–
Idya furcata,	–	–	–	–	–	–	–	–	–	–	–	–
Harpacticus {chelifer, + gracilis.}	–	–	–	(1)	–	–	–	–	–	–	–	–
Caligus,	–	–	–	–	–	–	–	–	–	–	–	–

RELATIVE ABUNDANCE—*continued.*

JULY.												DATE. 1901.
9th.			19th.			22nd.			31st.			
XLIX. M L			LI. M L			LIII. M L			LVIII. M L			STATION NO.
A	B	C	A	B	C	A	B	C	A	B	C	
9.30 p.m.			9.30 p.m.			—			9.0 p.m.			Hour.
30 min.			30 min.			—			30 min.			Time fishing.
7½ miles.			7½ miles.			7½ miles.			6 miles.			Distance from mainland.
57 f.			55 f.			30 f.			61 f.			Depth of water.
1	28	56	1	27	53	1	15	28	1	30	60	Depth of net.
1·5	5	3	1·5	1·5	14	·25	6	1·5	·5	10	6·5	Total catch in cc.
	—		(440)	–	–	(60)	(172)	(160)		—		Catch of Copepods.
–	F	M	F	M	F	F	C	M	–	M	C	Calanus finmarchicus.
–	–	–	–	–	–	–	–	–	–	–	–	Eucalanus elongatus.
–	VF	VF	VF	VF	VF	VF	F	M	–	VF	VF	Paracal. parvus.
–	–	–	–	–	–	–	–	–	–	–	–	Calocal. styliremis.
–	–	–	–	–	–	–	–	–	–	–	–	Clausocal. arcuicornis.
–	–	–	–	–	–	–	–	–	–	–	–	Ctenocal. vanus.
–	VF	M	F	F	F	M	C	C	–	F	M	Pseudocal. elongatus.
–	–	–	–	–	–	–	–	–	–	–	–	Bradyidius armatus.
–	–	–	–	–	–	–	–	–	–	–	–	Scolecithrix pygmæa.
–	–	–	–	–	–	–	(1)	–	–	VF	VF	Centropages typicus.
–	–	–	–	VF	–	–	VF	VF	–	(1)	–	Centropages hamatus.
–	–	(1)	–	–	–	–	–	(1)	–	–	VF	Isias clavipes.
–	(1)	VF	VF	VF	VF	VF	VF	VF	–	VF	VF	Temora longicornis.
–	A	A	A	A	A	VF	M	M	(1)	C	C	Metridia lucens.
–	–	–	–	–	–	–	–	–	–	–	–	Candacia pectinata.
–	–	–	–	–	–	–	–	–	–	–	–	Anomalocera patersoni.
–	–	–	–	–	–	–	–	–	–	–	–	Parapontella brevicornis.
–	–	VF	VF	VF	VF	A	M	M	A	C	F	Acartia clausi.
–	–	–	–	–	–	–	–	–	–	–	–	Acartia discaudata.
–	VF	VF	M	F	VF	–	VF	F	–	VF	M	Oithona similis.
–	–	(1)	–	–	VF	–	–	–	–	–	(1)	Oithona plumifera.
–	–	–	–	–	–	–	–	–	–	–	–	Oithona nana.
–	–	–	–	–	–	–	–	–	–	–	–	Oncæa conifera.
–	–	–	–	–	–	–	–	–	–	–	–	Oncæa media.
–	–	–	–	–	–	–	–	–	–	–	–	Corycæus anglicus.
–	–	–	–	–	–	–	–	–	–	–	–	Longipedia coronata.
–	–	–	–	–	–	–	–	–	–	–	–	Dactylopus stromii.
–	–	–	–	–	–	–	–	–	–	–	–	Dactylopus tisboides.
–	–	–	–	–	–	(1)	–	–	–	–	–	Alteutha crenulata.
–	–	–	–	–	–	–	–	–	–	–	–	Diosaccus tenuicornis.
–	–	(1)	–	–	–	–	–	–	–	–	–	Thalestris clausii.
–	–	–	–	–	–	–	–	–	–	–	–	Thalestris rufocincta.
–	–	–	–	–	–	–	–	–	–	–	–	Thalestris helgolandica.
–	–	–	–	–	–	–	–	–	–	–	–	Thalestris harpactoides.
–	–	–	–	–	–	–	–	–	–	–	–	Thalestris longimana.
–	–	–	–	–	–	–	–	–	–	–	–	Idya furcata.
–	–	–	(1)	–	–	–	–	–	–	–	–	Harpaticus { chelifer, + gracilis.
–	–	–	–	–	–	–	–	–	–	–	–	Caligus.

TABLE OF DISTRIBUTION AND

DATE.	AUGUST.									SEPTEMBER.		
	6th.			12th.			28th.			3rd.		
STATION NO.	LX. ML			LXI. ML			LXVII. ML			LXIX. ML		
	A	B	C	A	B	C	A	B	C	A	B	C
Hour,	9.0 p.m.			10.30 p.m.			7.30 p.m.			7.40 p.m.		
Time fishing,	30 min.			30 min.			10 min.			10 min.		
Distance from mainland,	—			5½ miles.			4½ miles.			7 miles.		
Depth of water,	39 f.			55 f.			30 f.			26 f.		
Depth of net,	1	20	38	1	27	54	1	15	30	1	13	26
Total catch in cc.,	4·5	5	3	1·5	1	13	5	6	6	1	·75	3
Catch of Copepods,		—			—			—			—	
Calanus finmarchicus,	M	C	C	C	A	C	VF	M	VF	VF	VF	F
Eucalanus elongatus,	–	–	–	–	–	–	–	–	–	–	–	–
Paracal. parvus,	VF	–	VF	VF	VF	VF	VF	M	F	M	M	M
Calocal. styliremis,	–	–	–	–	–	–	–	1	–	–	–	–
Clausocal. arcuicornis,	–	–	–	–	–	–	–	–	–	–	–	–
Ctenocal. vanus,	–	–	–	–	–	–	–	–	–	–	–	–
Pseudocal. elongatus,	C	C	C	F	VF	M	–	M	F	M	F	F
Bradyidius armatus,	–	–	–	–	–	–	–	–	–	–	–	–
Scolecithrix pygmæa,	–	–	–	–	–	–	–	–	–	–	–	–
Centropages typicus,	VF	VF	F	VF	VF	VF	F	F	VF	F	F	F
Centropages hamatus,	VF	VF	VF	VF	VF	VF	F	VF	VF	–	VF	VF
Isias clavipes,	VF	VF	F	VF	(1)	VF	–	VF	–	–	–	VF
Temora longicornis,	–	VF	F	VF	(1)	F	VF	F	F	VF	F	M
Metridia lucens.	M	M	C	C	C	A	–	VF	M	VF	VF	C
Candacia pectinata,	–	–	–	–	–	–	–	–		–	–	–
Anomalocera patersoni,	–	–	–	–	–	–	–	–	–	–	–	–
Parapontella brevicornis	–	–	–	–	–	–	–	–	–	–	–	–
Acartia clausi,	A	C	C	C	M	M	A	A	A	A	A	C
Acartia discaudata,	–	–	–	–	–	–	–	–	–	–	–	–
Oithona similis,	VF	F	M	VF	–	VF	F	M	F	VF	F	F
Oithona plumifera,	–	–	VF	–	–	–	–	–	–	–	VF	VF
Oithona nana,	–	–	–	–	–	–	–	–	–	–	–	–
Oncæa conifera,	–	–	–	–	–	–	–	–	–	–	–	–
Oncæa media,	–	–	–	–	–	–	–	–	–	–	–	–
Corycæus anglicus,	–	–	–	–	–	–	–	–	–	–	–	–
Longipedia coronata,	–	–	–	–	–	–	–	–	VF	–	–	–
Dactylopus stromii,	–	–	–	–	–	–	–	–	–	–	–	–
Dactylopus tisboides,	VF	–	–	–	–	–	VF	–	–	–	–	–
Alteutha crenulata,	–	–	–	–	–	–	–	–	–	–	–	–
Diosaccus tenuicornis,	–	–	–	–	–	–	–	–	(1)	–	–	–
Thalestris clausii,	–	–	–	–	–	–	–	–	–	–	–	–
Thalestris rufocincta,	–	–	–	–	–	–	–	–	–	–	–	–
Thalestris heligolandica,	–	–	–	–	–	–	–	–	–	–	–	–
Thalestris harpactoides,	–	–	–	–	–	–	–	–	–	–	–	–
Thalestris longimana,	–	–	–	–	–	–	–	–	–	–	–	–
Idya furcata,	–	–	–	–	–	–	–	–	–	–	–	–
Harpacticus { chelifer, + gracilis, }	(1)	–	–	–	–	–	–	–	–	–	–	–
Caligus.	(1)	–	–	–	–	–	–	–	–	–	–	–

RELATIVE ABUNDANCE—*continued.*

SEPTEMBER.			OCTOBER.						NOVEMBER.			DATE. 1901.
9th.			11th.			21st.			1st.			
LXX. M L			LXXXVI. M L			XCVI. M L			CIII. M L			STATION NO.
A	B	C	A	B	C	A	B	C	A	B	C	
8.0 p.m.			6.0 p.m.			7.0 p.m.			6.0 p.m.			Hour.
30 min.			30 min.			60 min.			40 min.			Time fishing.
8 miles.			1½ miles.			½ mile.			1¾ miles.			Distance from mainland.
42 f.			14 f.			18 f.			17 f.			Depth of water.
1	20	40	1	7	14	1	9	18	1	6	16	Depth of net.
1	·75	2	3	3·5	–	3		1	1	·25	·75	Total catch in cc.
	—		(163)	(123)	–	(25)	–	(42)	(38)	(103)	(150)	Catch of Copepods.
M	F	F	VF	VF	–	F	–	F	F	VF	VF	Calanus finmarchicus.
–	–	(1)	–	–	–	–	–	–	–	–	–	Eucalanus elongatus.
C	F	C	F	F	–	C	–	F	F	M	M	Paracal. parvus.
–	–	–	–	–	–	–	–	–	–	–	–	Calocal. styliremis.
–	–	–	–	–	–	–	–	–		–	–	Clausocal. arcuicornis.
–	–	–	–	–	–	–	–	.	–	–	–	Ctenocal. vanus.
VF	M	C	M	F	–	(1)	–	F	F	–	F	Pseudocal. elongatus.
–	–	–	–	–	–	–	–	–	–	–	–	Bradyidius armatus.
–	–	–	(1)	(1)	–	–	–	–	–	–	–	Scolecithrix pygmæa.
M	F	M	VF	VF	–	F	–	(1)	(1)	(1)	VF	Centropages typicus.
VF	VF	VF	(1)	VF	–	–	–	(1)	(1)	VF	VF	Centropages hamatus.
VF	VF	–	VF	F	–	(1)	–	–	–	–	–	Isias clavipes.
F	F	VF	F	M	–	(1)	–	(1)	VF	VF	VF	Temora longicornis.
VF	F	F	F	VF	–	(1)	–	VF	F	M	F	Metridia lucens.
–	(1)	–	–	–	–	–	–	–	–	–	–	Candacia pectinata.
–	–	–	–	–	–	–	–	–	–	–	–	Anomalocera patersoni.
–	–	–	(1)	–	–	–	–	–	–	–	–	Parapontella brevicornis.
A	A	A	C	C	–	M	–	A	C	F	A	Acartia clausi.
–	–	–	–	–	–	–	–	–	–	–	–	Acartia discaudata.
F	F	F	VF	VF	–	(1)	–	F	(1)	C	F	Oithona similis.
–	–	–	–	–	–	–	–	–	–	–	–	Oithona plumifera.
–	–	–	(1)	(1)	–	–	–	–	–	–	–	Oithona nana.
–	–	–	–	–	–	–	–	–	–	–	–	Oncæa conifera.
–	–	–	–	–	–	–	–	–	–	–	–	Oncæa media.
–	–	–	–	–	–	–	–	–	–	–	–	Corycæus anglicus.
–	–	–	(1)	–	–	–	–	–	–	–	VF	Longipedia coronata.
–	–	–	–	–	–	–	–	–	(1)	–	–	Dactylopus stromii.
–	–	–	(1)	–	–	–	–	–	–	–	–	Dactylopus tisboides.
–	–	–	–	–	–	–	–	–	–	–	–	Alteutha crenulata.
–	–	–	–	–	–	–	–	–	–	–	–	Diosaccus tenuicornis.
–	–	–	(1)	–	–	–	–	–	–	–	–	Thalestris clausii.
–	–	–	–	–	–	–	–	–	(1)	–	–	Thalestris rufocincta.
–	–	–	–	–	–	–	–	–	–	–	–	Thalestris helgolandica.
–	–	–	–	–	–	–	–	–	–	–	–	Thalestris harpactoides.
–	–	–	(1)	–	–	–	–	–	–	–	(1)	Thalestris longimana.
–	–	–	VF	(1)	–	–	–	–	F	–	–	Idya furcata.
(1)	–	–	F	(1)	–	–	–	–	–	–	(1)	Harpacticus { chelifer. + gracilis.
–	–	–	–	–	–	–	–	–	–	–	–	Caligus.

TABLE OF DISTRIBUTION, &c.—*continued.*

1901. DATE.	NOVEMBER.								DEC.	
	8th.			22nd.			29th.		17th.	
STATION NO.	CVI. M L			CVIII. M L			CXIII. M L		CXVI. M L	
	A	B	C	A	B	C	A	B	A	B
Hour,	5.0 p.m.			4.0 p.m.			11.0 a.m.		1.15 p.m.	
Time fishing,	60 min.			40 min.			10 min.		30 min.	
Distance from mainland,	2 miles.			2 miles.			2½ miles		1½ miles.	
Depth of water,	15 f.			18 f.			20 f.		14 f.	
Depth of net,	1	7	14	1	9	17	1	18	1	14
Total catch in cc.,	15	5	25	1	3	4·5	4	4·5	3	2
Catch of Copepods,	–	–	16		—		·75	–	—	
Calanus finmarchicus,	F	M	A	M	C	M		VF	VF	VF
Eucalanus elongatus,	–	–	–	–	–	–	–	–	–	–
Paracal. parvus,	C	M	M	C	F	M	C	VF	VF	VF
Calocal. styliremis,	–	–	–	–	–	–	–	–	–	–
Clausocal. arcuicornis,	–	–	–	–	–	–	–	–	–	–
Ctenocal. vanus,	–	–	–	–	–	–	–	–	–	–
Pseudocal. elongatus,	VF	F	VF	VF	F	M	F	M.	A	A
Bradyidius armatus,	–	–	–	–	–	–	–	–	–	–
Scolecithrix pygmæa,	–	–	–	–	–	–	–	–	–	–
Centropages typicus,	VF	F	VF	VF	VF	VF	–	VF	VF	VF
Centropages hamatus,	VF	–	–	–	–	–	–	–	VF	VF
Isias clavipes,	–	–	VF	–	–	VF	–	–	–	VF
Temora longicornis,	VF	VF	VF	–	VF	VF	–	VF	VF	F
Metridia lucens,	A	A	M	A	A	A	C	A	VF	M
Candacia pectinata,	–	–	–	–	(1)	–	–	(1)	–	–
Anomalocera patersoni,		–	–	–	–	–	–	–	–	–
Parapontella brevicornis,		–	–	–	–	(1)	–	–	–	–
Acartia clausi,	VF	F	VF	VF	F	F	F	VF	C	M
Acartia discaudata,	–	–	–	–	–	–	–	–	(1)	–
Oithona similis,	VF	VF	VF	F	VF	VF	M	VF	VF	(1)
Oithona plumifera,	–	–	–	–	–	–	–	(1)	–	–
Oithona nana,	–	–	–	–	–	–	–	–	VF	–
Oncæa conifera,	–	–	–	–	–	–	–	–	–	–
Oncæa media,	–	–	–	–	–	–	–	–	–	–
Corycæus anglicus,	VF	(1)	VF	VF	(1)	(1)	–	(1)	(1)	(1)
Longipedia coronata,	–	–	–	–	(1)	–	–	–	–	–
Dactylopus stromii,	–	–	–	–	–	–	–	–	–	–
Dactylopus tisboides,	–	–	–	–	–	–	–	–	–	–
Alteutha crenulata,	–	–	–	–	–	–	–	–	–	–
Diosaccus tenuicornis,	–	–	–	–	–	–	–	–	–	–
Thalestris clausii,	–	–	–	–	–	–	–	–	–	–
Thalestris rufocincta,	–	–	–	–	–	(1)	–	–	(1)	–
Thalestris heligolandica,	–	–	–	–	–	–	–	–	–	(1)
Thalestris harpactoides,	–	–	–	–	–	–	–	–	–	–
Thalestris longimana,	–	–	–	–	–	–	–	–	–	–
Idya furcata,	–	–	–	–	–	–	–	–	(1)	–
Harpacticus { chelifer, + gracilis. }	–	–	–	–	–	–	–	–	–	–
Caligus,	–	–	–	–	–	–	–	–	–	–

It may be noted here that the catch of plankton, apart from its actual abundance in the sea, seems to depend on a great variety of circumstances; the time during which the net is fishing having apparently very little effect. The tow-nettings were, in most cases, taken while the "Monica" was drifting with a train of mackerel nets, her rate of movement through the surrounding water, depending on the force of the wind, being usually scarcely enough to bring the surface tow-net out of the vertical. The bottom and middle tow-nets often tailed away considerably from the boat, evidently owing to the existence of a tidal surface current, and thus strained a much larger amount of water than the surface net. This is one factor which must be allowed for in comparing the catches of the surface and bottom nets. Another, and probably a more important one, is the fact that the tow-nets, being of the ordinary open ring pattern, were fishing during the time that they were being hauled. It seems reasonable to suppose that a tow-net hauled rapidly for a distance of, say, 60 fathoms, or 120 yards, should catch as much as one towed very slowly for a longer distance, especially of such active swimmers as copepods. As an instance of this, it may be mentioned that on 25th June, simultaneously with the bottom tow-net, another tow-net was shot, which was hauled again immediately on its reaching bottom. The catch of this net measured 4 c.c., while that of the bottom tow-net, which was towed for ten minutes, was only 2·5 c.c.

The large catch on November 8th was due to the fact that the tow-nets were out while the train of mackerel nets was being hauled, and were thus towed much faster than usual.

ii.—List of the Copepods taken, with Notes.

The following list includes only the species which occurred in 1901, in tow-nettings taken by the "Monica," on the mackerel fishing grounds off Ballinakill. The notes on their distribution and occurrence refer to the same area, except when otherwise stated. The nomenclature followed is that of Giesbrecht, as given in "Das Tierreich," Berlin, 1898.

Calanus finmarchicus (Gunn.).—This is the most abundant species and the most important from an economic point of view. It reaches its maximum in April. A very remarkable haul of this copepod was made on April 29th, about two miles outside the mouth of the Ballinakill Harbour, 210 c.c. being taken in the surface tow-net hauled slowly for ten minutes. The time was 6.0 p.m., the evening being calm and sunny, and the sea smooth. A few days later large numbers were left dying on the shores of the bay by the tide.

Eucalanus elongatus (Dana).—Occurred once, on September 9th.

Paracalanus parvus (Claus.).—Occurred constantly throughout the year in small quantities, becoming more common in winter.

Calocalanus styliremis Giesbr.—One specimen in very bad condition, taken on May 22nd.

Clausocalanus arcuicornis (Dana).—A few specimens, all females, taken in the spring.

Ctenocalanus vanus Giesbr.—A single specimen, ♀, was taken on June 18th. It has possibly been passed over on other occasions, as it has a great resemblance to *Paracalanus parvus*. The features by which it may most easily be distinguished under a low power, or dissecting microscope, are the length of its first antenna, which exceeds that of the whole animal, and a sort of transparency or absence of opaque contents in the upper part of its head, though I cannot say whether the latter characteristic is constant or not.

Pseudocalanus elongatus (Boeck.).—Present throughout the year, but scarce in winter. Next to *Calanus finmarchicus* and *Metridia lucens*, this is the commonest copepod in the district. Very large specimens were met with in spring, the maximum sizes noted for ♂ and ♀ respectively being 1·44 mm. and 1·9 mm. These figures are in excess of the maximum limits given by Giesbrecht (♂ 1·36 mm., ♀ 1·63 mm)

Chiridius armatus (Boeck.).—A single specimen ♀ which appears to belong to this species was taken in the surface mosquito-net tow-net on April 30th. As there appears to be a certain amount of uncertainty connected with the identification of this and closely allied species I have given a detailed description of my specimen below.

Bradyidius armatus (Vanhöffen).—A single specimen, ♀ taken in February.

Scolecithrix minor, Brady.—One specimen, ♀, of a form which agrees with that referred by Prof. Sars to this species (*Crustacea of Norway*, vol. iv., p. 55) was taken in a bottom tow-net on July 31st.

Scolecithrix pygmœa, T. Scott.—Occurred a few times when the tow-nets were taken nearer shore than usual.

Centropages typicus, Kröyer.—Present in most of the tow-nettings, but in small numbers.

C. hamatus (Lillj.).—Occurred all through the year, but was scarcer than the preceding.

Isias clavipes, Boeck.—Taken not infrequently, but in very small numbers.

Temora longicornis (Müll.).—Present in most of the tow-nettings. It is usually found in small numbers, but on one occasion, June 11th, it formed the greater part of the contents of both middle and bottom tow-nets, and on May 8th the mackerel were found to be feeding on it almost exclusively.

Metridia lucens, Boeck.—Forms, with *Calanus finmarchicus*, the main bulk of the tow-net contents, and also of the food of the mackerel in spring and early summer. This species, as its name indicates, is very luminous, giving a brilliant blue-green light when disturbed. It seems during the spring, before the development of the rich summer plankton, to be the principal cause of "fire" in the sea on this coast.

A large number, at least one third, of the males were noticed to have their clasping antenna on the left side, being in other respects identical with the typical *M. lucens* ♂. This fact has also been noted by Dr. Wolfenden with reference to the same species in the Faröe Channel.—(*Journal Marine Biological Association*, N.S., Vol. VI., No. 3, p. 363.)

Candacia pectinata, Brady.—Single specimens occurred a few times in autumn.

Anomalocera patersoni, Templ.—Rarely found in the fine meshed tow-nets, but is taken more often in the large.

Parapontella brevicornis (Lubb.).—Very scarce in the "Monica's" tow-nettings, though it is plentiful close to shore.

Acartia clausi, Giesbr.—Taken all through the year, becoming more common in autumn. Neither *A. longiremis* nor *A. bifilosa* has yet been met with; but they may have been overlooked, as it was impossible to examine minutely more than a small proportion of the specimens of *Acartia*.

Acartia discaudata (Giesbr.).—Only single specimens were taken a few times at sea, though in Ballynakill Harbour this is one of the commonest copepods.

Oithona similis, Claus.—Almost always present, but never plentiful.

O. plumifera, Baird.—Has been taken several times, but usually only single specimens on each occasion. They were all ♀, and while agreeing closely with Giesbrecht's figures (*Flora und Fauna des Golfes von Neapel*, Vol. 19, Pl. 34) of first to fourth foot, differ in that they, or at least any that have been examined, bear four setæ on the inner branch of the mandible.

O. nana, Giesbr.—Found a few times in tow-nettings, taken near shore in autumn and winter. It is not uncommon in the sheltered waters of Ballynakill and Killary Harbours.

Oncœa conifera, Giesbr.—A few specimens were taken in spring.

O. media, Giesbr.—A single specimen, ♀, was taken on September 3rd. It differed in a few points from Giesbrecht's description of the species, the furcal branches being three times as long as broad instead of two and a half times, and the first three joints of first antenna being in the proportion of 4 : 6 : 11, instead of 3 : 6 : 9. The terminal joints of first antennæ were missing on both sides. It agreed, however, in all important particulars, the inner branch of the fourth foot being without a terminal conical projection, the mandible process being toothed only on the end, and the genital openings being close together and in advance of the middle of the genital segment. Its length was ·76 mm., and the head and genital segment were of a reddish orange colour.

Corycœus anglicus, Lubbock.—This species was not met with except in winter, and then occurred in almost every tow-netting, but in small numbers.

Longipedia coronata, Claus.
Diosaccus tenuicornis, Claus.
Dactylopus stromii (Baird).
D. tisboides, Claus.
Thalestris clausii, Norman.
T. rufocincta, Norman.
T. heligolandica, Claus.
T. harpactoides, Claus.
T. longimana, Claus.
Harpacticus chelifer (Müll.).
H. gracilis, Claus.
Alteutha crenulata (Brady).
Idya furcata (Baird).

These are all more or less common shore-haunting species whose occurrence in deep water was accidental.

Of the 39 species noted, most are such as might naturally be expected to occur; eight, however, seem not to have been yet recorded from

British waters, viz. :—*Calocalanus styliremis, Chiridius armatus, Scolecithrix minor, Clausocalanus arcuicornis, Ctenocalanus vanus, Oithona nana, Oncæa conifera,* and *O. media.*

Of these *Calocalanus styliremis* has been recorded from the Mediterranean and the Pacific; *Chiridius armatus* from the coast of Norway; *Scolecithrix minor* from the Atlantic and Indian Oceans; *Clausocalanus arcuicornis* and *Ctenocalanus vanus* from the Mediterranean, Atlantic, and Pacific; *Oithona nana, Oncæa media* from the Mediterranean; and *Oncæa conifera* from the Mediterranean, Pacific, and Atlantic as far north as the mouth of the St. Lawrence, so that the range of some of them has been considerably extended.

The Copepods in the above list, with a few exceptions, seem to fall into three distinct groups, as follows :—

1. Those which are always present in larger or smaller quantities.
2. Copepods which occur in the tow-nettings in small numbers, and which, in this district at least, are found most abundantly in shallow water near shore or in sheltered bays.
3. Copepods whose natural habitat is probably the open ocean, and which extend their range occasionally to near the coast. These usually occur singly in the tow-nettings.

In the first group may be reckoned *Calanus finmarchicus, Paracalanus parvus, Pseudocalanus elongatus, Centropages typicus, Temora longicornis, Metridia lucens, Acartia clausi,* and *Oithona similis.*

The second group includes *Scolecithrix pygmæa, Centropages hamatus, Isias clavipes, Parapontella brevicornis, Acartia discaudata, Oithona nana,* and the Harpacticids. To these may be added, in winter, *Corycæus anglicus.* Two of these species, viz., *Centropages hamatus* and *Acartia discaudata,* have, perhaps, no right to be called shallow-water copepods, as they have been taken in mid-Atlantic by Prof. Herdman in his "Atlantic Traverse" of 1897 (*Trans. Liverpool Biological Soc.*, vol. xii.). The former was recorded from along the whole route, and the latter was met with both going and returning at the same spot between 90 and 120 miles to the westward of the Rockall bank. This latter record is remarkable, as the species in this neighbourhood seems to be confined to sheltered bays, where it abounds, single specimens having been only taken four times in the open sea, as the table shows.

The copepods of the third group comprise *Eucalanus elongatus, Calocalanus styliremis, Clausocalanus arcuicornis, Ctenocalanus vanus, Oithona plumifera, Oncæa conifera,* and *O. media.* These species, with the exception of *Clausocalanus arcuicornis* and *Oncæa media,* have been found in larger or smaller numbers in a set of tow-nettings taken by the Department's steamer "Helga" in the neighbourhood of the Porcupine Bank, and it seems not unlikely that this is the source from which occasional stragglers reach our shores.

It is possible, however, that they are plentiful close to the bottom, where they would easily escape capture unless by a tow-net attached to a trawl. Mr. T. Scott has recorded *E. crassus* and *E. elongatus* from the bottom of Dornoch Firth (*18th Report, Scotch Fishery Board,* Pt. iii., p. 382), taken by this means, which often produces a rich supply of copepods, and Prof. Sars in his account of the Crustacea of Norway mentions a number of forms as having a distinct bottom-haunting habit.

iii.—Descriptions of Species.

Chiridius armatus (Boeck). (Pl. XVI., figs. 1–13).

♀, length = 4 mm. (cephalothorax to end of lateral spines = 3·2 mm. Abdomen, 1·14 mm.). Body moderately robust, the sides of the head slightly tumid. Head fused to 1st th. seg., 4th and 5th th. seg. fused, the junction being faintly indicated. Last th. seg. produced on either side into a strong point reaching to the middle of genital seg.

Abdomen 4-segmented, the proportional lengths of the segments in mm. being ·4, ·25, ·2, ·14. Furcal branches slightly longer than broad, each with four strong feathered terminal setæ, a very slight, apparently smooth, outer edge seta, and a small feathered seta on the under surface. The inner edges of the furca are feathered.

On the genital segment, arising in the middle of the left side towards the ventral surface, is a small spine which reaches backwards as far as the hinder margin of the segment.

The 1st Antennæ (Pl. xvi., fig. 3) are slightly longer than the cephalothorax, and are 24-jointed, the proportional length of the joints in ·01 mm. being as follows :—

No. ...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Length,	30	20	8	8	8	9	9	20	8·5	8·5	9	10	10	12	13	13·5	13·5	19	21	14	16	19	16	4·5

The setæ on joints numbers 13, 17, 20, 23, 24 are longer than the rest, and are rather slender. They exhibit the same "ringing," or, rather, reticulation which is found in *B. armatus*, and which seems to be due to channels or grooves in the thickness of the chitin which forms the seta.

In the 2nd Antennæ (Pl.xvi., fig. 4) the exopodite is about 1½ times as long as the endopodite. The 2nd joint of the exop. bears only a small distal seta, at least no median seta was observed. The 7th joint bears a median seta on the inner side.

Mandible (Pl. xvi., fig. 5) as in *B. armatus*.

Maxilla (Pl. xvi., fig. 8) seems to agree in structure with that of *B. armatus*. The surface of the 1st inner lobe is, however, smooth, and the top of the 3rd inner lobe spinulose.

1st Maxillipede (Pl. xvi., fig. 9) has the inner face of all the lobes, except the 5th, spinulose. The spines on the 5th lobe are only slightly larger than those on the 4th.

2nd Maxillipede (Pl. xvi., fig. 10) 7-jointed, the 2nd joint very long. The feet (Pl. xvi., figs. 7, 11—13) agree with those of *B. armatus* in jointing and number of setæ. They are, however, more slender and less strongly chitinized, and lack the spinules on the outer edge of the basal joints. The 1st foot differs in that the terminal inner edge seta of the 2nd basal joint is not bent across the lobe of the endopodite. This may, however, be an accidental variation in a single specimen.

The distal seta on the inner edge of the 1st joint of endop. is absent in the 1st foot, and in the other is slender and very little longer than the 2nd joint of the endop. 5th feet absent.

A single specimen, ♀, taken on 30th April, 1901, in large surface tow-net of mosquito-net, 5½ miles north-west of Inishark. This is evidently the species which in Sars' Crustacea of Norway (vol. iv., p. 27) is identified with the imperfectly described *Euchaeta armata* of Boeck. Prof. Sars there refers it to the genus Chiridius and states that it is common in the Norwegian Fjords at depths below 100 fathoms.

Gætanus pileatus, n. sp. (?) (Pl. XVII., figs. 1-11).

♀, length 5·93 mm. (cephalothorax 4·93 mm., abdomen 1 mm.). Colour, bright red, extending to all the appendages. Cephalothorax 4-segmented, head being fused with th. 1, and th. 4 with th. 5.

The head is produced into a strong spine, which slopes slightly backwards, instead of inclining forwards, as in *G. miles*. Last th. seg. bears on either side a short spine, arising close to hinder margin, and projecting downwards and outwards.

Abdomen 4-segmented. The genital segment slightly exceeds the combined length of the three succeeding segments, and has a well-marked projection on its ventral surface. The dorsal margins of the abdominal segments are denticulated.

Furcal branches as wide as long, separated by about their own width, and bearing four stout short densely-feathered terminal setæ, one slender very short outer edge seta, and one longer slender seta arising on the ventral surface.

1st Antennæ (Pl. xvii., fig. 2) very long, slender, 23-jointed, exceeding the whole animal by about the last five joints, with long setæ on 13th, 17th, and 20th joints, and perhaps on others also. Proportional length of the joints in ·01 mm.—

2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
36	15	15	18	18	22	39	24	26	28	42	42	46	46	48	48	64	60	49	51	37	36

2nd Antennæ (Pl. xvii., fig. 3).—Outer branch $1\frac{1}{3}$ times as long as inner, 7-jointed. 2nd joint equal to 7th, with small distal seta, but no median seta. Strong setæ on distal edges of 3rd, 4th, 5th, and 6th joints, and a more slender median seta on 7th joint. Inner branch much more slender than outer, 1st joint much thicker at its base than distally.

Mandible (Pl. xvii, fig. 4).—Jointing as in other members of the genus. There is a median seta on the outer edge of the 2nd joint of the basipodite.

Maxilla (Pl. xvii., fig. 5).—The third inner lobe of the basipodite is much broader than the second, and is strongly spinulose on its extremity. The spines on the second lobe are strongly developed.

1st Maxillipede (Pl. xvii., fig. 6).—The inner faces of the second, third, and, to a less extent, the fourth lobe are spinulose.

2nd Maxillipede (Pl. xvii., fig. 7).—The vesicular appendage on the lower edge of the 1st joint resembles somewhat in shape that of *G. miles*, but does not project so far. There is a similar but much smaller appendage, with a pitted surface, at the extremity of the joint, between the terminal lobe and the second joint.

1st foot (Pl. xvii., fig. 8).—As in *G. miles*, with 2-jointed exop., the division of the first joint into two being faintly indicated.

2nd and 3rd feet (Pl. xvii., figs. 9, 10).—As in *G. miles*.i

4th foot (Pl. xvii., fig. 11).—The 1st joint of the bas p. resembles that of *G. armiger*, bearing distally on its inner edge a row of fine bristles, which are continued across the inner face of the joint.

5th feet absent.

A single specimen, ♀, found in the stomach of a mackerel taken off Cleggan, Co. Galway, on 13th of February, 1901.

The above species is certainly distinct from *G. miles*, *G. armiger*, and *G. caudani*. I have, however, been unable to obtain a copy of the description of *G. denticulatus* Aurivillius, with which it possibly may prove to be identical. It approaches most nearly to *G. miles*, from which it differs in its larger size, the different form of the cephalic spine and of the spines on the last thoracic segment, the length and proportional length of joints of the 1st antenna, and the form of the bristles on the basal joint of the 4th foot.

IV.—Copepods as Fish Food.

During the year (1901) a number of mackerel were examined with a view to ascertaining their food at different seasons. The following is a summary of the results as far as they refer to copepods :—

January.—No mackerel available.

February.—Out of forty-five fish examined, copepods formed the principal food of nine, in all cases in small quantities, and occurred in twenty others as a very small fraction of the contents of the stomachs which were mostly full of schizopods (*Thysanöessa*) and fish remains. The most abundant species was *Metridia lucens*, which was found in almost every instance. The following also occurred, the names being given in the order of their relative abundance :—*Pseudocalanus elongatus*, *Paracalanus parvus*, *Oithona similis*, *Acartia clausi*, *Temora longicornis*, and *Calanus finmarchicus* ; the last-named having been only met with twice. A single specimen of a species of *Gætanus*, which appears to be undescribed, was also found, a description of which is given below.

March.—No mackerel were available ; however seventeen herrings were examined, which gave results very similar to those from the February mackerel. The stomachs were all full of *Thysanöessa*, but contained a number of copepods, principally *Metridia lucens* and *Calanus finmarchicus*, the other species met with being as in February.

April.—Thirty-seven mackerel examined, in all of which copepods formed the main food. In most cases the stomachs had little in them, but some were full. The species represented were *Calanus finmarchicus*, which formed the bulk of the contents in every case, *Pseudocalanus elongatus* occurring in thirty-four stomachs, *Metridia lucens* in twenty-three, *Acartia clausi* in sixteen, *Paracalanus parvus* in five, and *Oithona similis* in one.

May.—Out of twenty-five mackerel, copepods occurred in twenty-three, forming the principal diet of twenty, the stomachs in most cases being full. The species represented were *Calanus finmarchicus*, found in twenty-three, abundant in eleven ; *Pseudocalanus elongatus* found in twenty-three, abundant in one ; *Metridia lucens* found in fifteen, abundant in one ; *Temora longicornis* found in ten, to the exclusion of almost everything else ; *Acartia clausi* found in three ; *Paracalanus parvus* found in one ; and *Oithona similis* in one.

June.—The mackerel divided their attention between copepods and sand-eels. Out of fifty-one stomachs examined copepods occurred in thirty-two, forming almost the entire contents of twenty, and distending them in some cases almost to bursting. Of the rest, three were half full of copepods, and nine contained a small proportion. Early in the month *Calanus finmarchicus* and *Metridia lucens* were met with in equal quantities, but later *M. lucens* became the more abundant. *Pseudocalanus elongatus*, *Acartia clausi*, and *Temora longicornis* were also present in small numbers, and *Oncæa conifera* was found once.

July.—Copepods became much scarcer as an article of diet, since out of thirty-seven stomachs of mackerel examined they were only found in nine, forming the main contents of four. The rest were full of sand-eels, or, in a few instances, of *Spirialis* or larval *Galathea*.

Pseudocalanus elongatus was the most abundant copepod, *Metridia lucens* and *Temora longicornis* occurring in very small numbers.

After July the mackerel appeared to give up feeding on copepods altogether, taking instead to an exclusively fish diet. Only one contrary instance was noted, that of a mackerel taken on 13th August, which was half full of copepods.

It will be seen from the above summary that *Calanus finmarchicus* forms the principal part of the mackerel's copepod food, occurring in much greater quantities in the stomachs than any other species, though the actual number of stomachs in which *Metridia lucens* is met with may be greater. The occasional presence of *Pseudocalanus elongatus* and *Temora longicornis* in immense numbers is remarkable (*P. elongatus* on 23rd May, 11th July, and 31st July, and *T. longicornis* on 8th May), and taken with the tabulated results of tow-nettings seems to show that these species occur at times in dense swarms of limited extent. Another point worth noting is the mode of occurrence of the copepods with relation to the other food-stuffs in the stomach. Sometimes the various contents are irregularly mixed together, while at other times they form distinct strata; *e.g.*, the bottom or cæcal end of the stomach may be filled with spirialis, on top of this being a layer of copepods, while the remainder is made up by sand-eels.

The most probable explanation of cases like the last seems to be, not that the mackerel deliberately alters its diet, but that it swims successively through swarms of the various organisms in question

EXPLANATION OF THE PLATES.

The figures were all drawn by means of the *camera lucida*.

Plate XVI.

Chiridius armatus (*Boeck*).

		Diam.
Fig. 1.	—Female, lateral view,	× 19
Fig. 2.	—Female, dorsal view,	× 19
Fig. 3.	—1st Antenna of female,	× 50
Fig. 4.	—2nd Antenna of female,	× 69
Fig. 5.	—Mandible palp of female,	× 69
Fig. 6.	—Cutting edge of mandible,	× 120
Fig. 7.	—1st Foot of female, lower face,	× 69
Fig. 8.	—Maxilla of female (lower lobes omitted),	× 250
Fig. 9.	—1st Maxillipede of female,	× 56
Fig. 10.	—2nd Maxillipede of female,	× 120
Fig. 11.	—2nd Foot of female, upper face,	× 69
Fig. 12.	—3rd Foot of female, upper face,	× 69
Fig. 13.	—4th Foot of female, lower face,	× 69

Plate XVII.

Gaetanus pileatus, n. sp.

Fig. 1.	—Female, lateral view,	× 12·5
Fig. 2.	—1st Antenna of female,	× 17
Fig. 3.	—2nd Antenna of female,	× 50
Fig. 4.	—Cutting edge of mandible of female,	× 120
Fig. 5.	—1st Maxillipede of female,	× 69
Fig. 6.	—Maxilla of female (lower lobes omitted),	× 120
Fig. 7.	—2nd Maxillipede of female,	× 69
Fig. 8.	—1st Foot of female, upper face,	× 50
Fig. 9.	—2nd Foot of female, upper face,	× 50
Fig. 10.	—3rd Foot of female, lower face,	× 50
Fig. 11.	—4th Foot of female, upper face,	× 50

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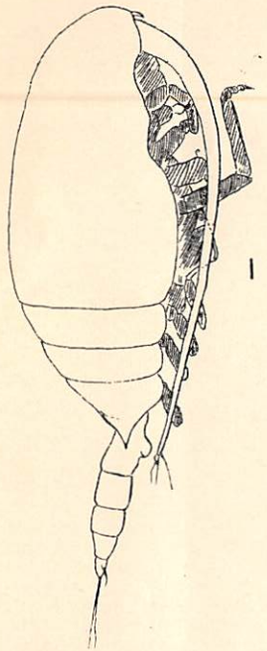
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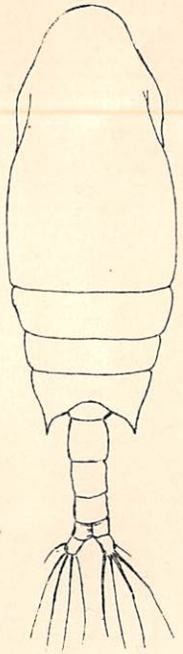
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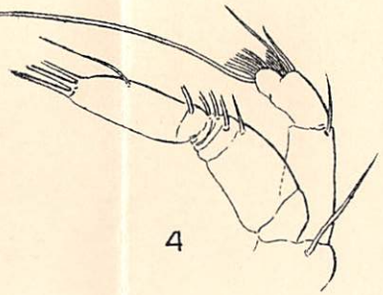
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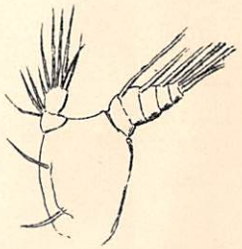
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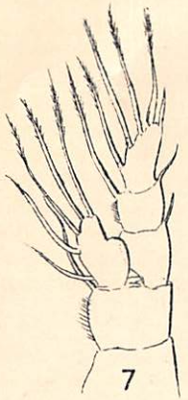
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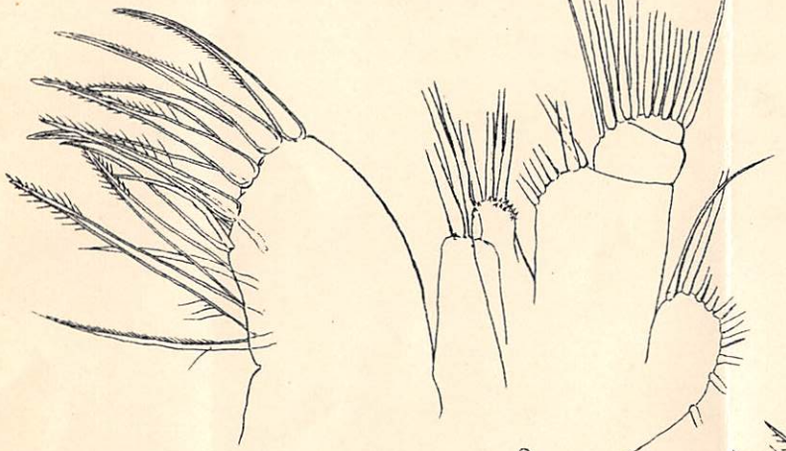
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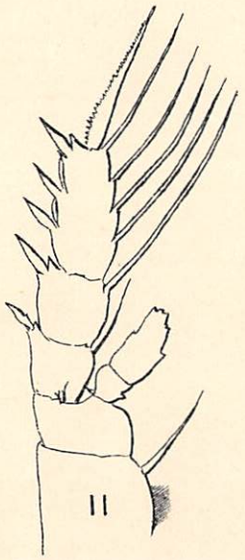
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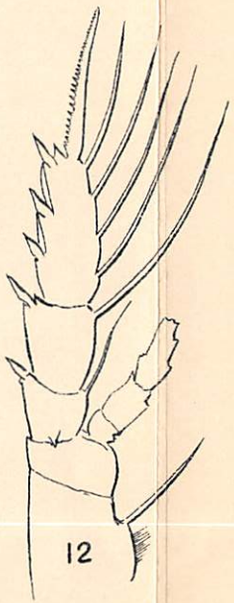
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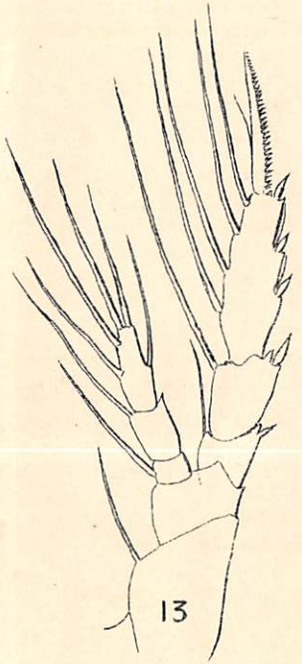
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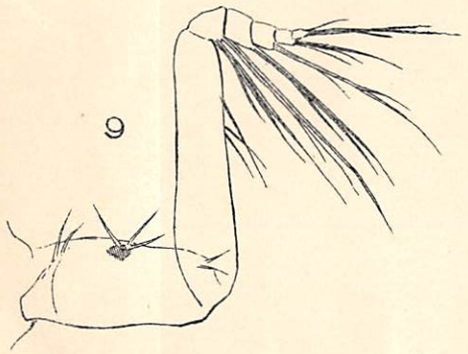
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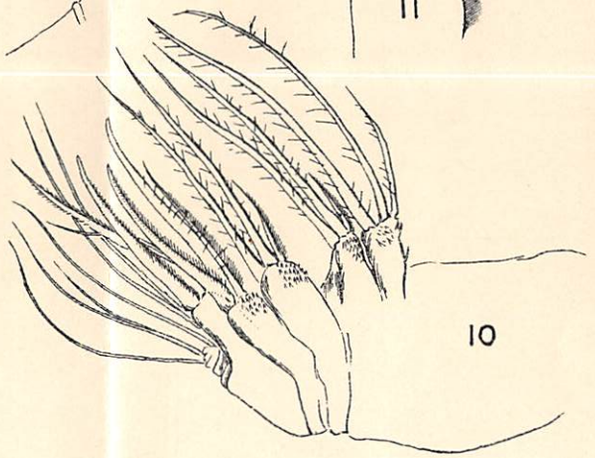
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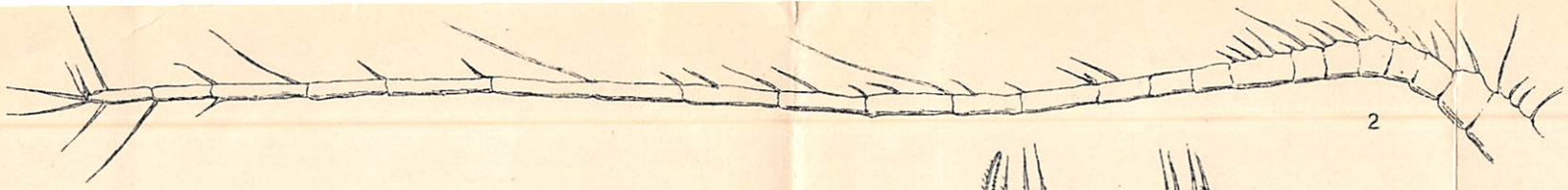
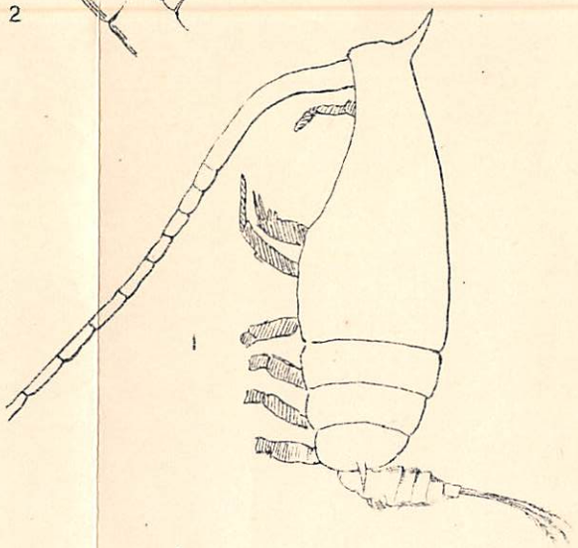
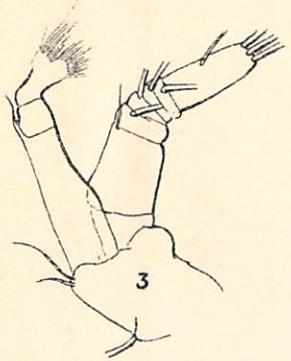
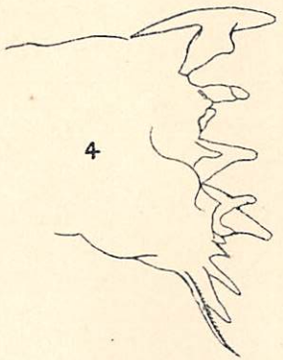
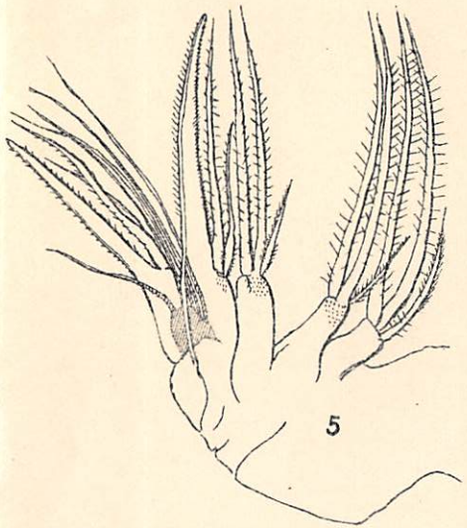
Chiridius armatus, Figs. 1 to 13.











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Cyclopus pileatus. Figs. 1 to 11.