SERIES A (Freshwater) No. 25 1985

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An Roinn Iascaigh agus Foraoiseachta
(Department of Fisheries and Forestry)

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AN IRISH SEA LOUGH

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FEEDING, GROWTH AND PARASITES OF TROUT *SALMO TRUTTA* L. FROM MULROY BAY, AN IRISH SEA LOUGH.

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ABSTRACT

The feeding and gut parasite burden of 354 trout collected between May 1980 and April 1981 from Mulroy Bay on the north coast of Ireland are described and compared with a collection of trout from the Irish Sea. The sea ages of the fish ranged between 0 and 2 sea winters, more than 90% being post-smolt. Males and females were equally represented in the younger, females predominated in the older. The food web was larger than in the Irish Sea, insects and crustaceans being its most numerous constituents but fish making up the greatest volume. Shoal fishes were relatively unimportant. Parasites comprised five species of Digenea, one cestode and a nematode. All occurred at a relatively low incidence and burden. Weights of the Mulroy fish were lower than for trout of equivalent length from the Irish Sea.

INTRODUCTION

Available information on the feeding of trout in the sea suggests there are two patterns in Britain and Ireland: O'Donoghue and Boyd's (1930-34) and Pemberton's (1976) studies concerned sea lochs in which the food web is large and complex. Fahy (1983) examined trout feeding in the Irish Sea where food was apparently abundant, the range of prey organisms narrow and the food chain short. To date all loch studies have been undertaken in Scotland and the purpose of this study is to investigate feeding in such a habitat in Ireland. In addition to considering the diet of trout in a western sea lough, the gut parasite burden, previously examined by O'Donoghue and Boyd (1930-'34) and Fahy (1983) thought not by Pemberton (1976) is described.

MATERIALS AND METHODS

Mulroy Bay, on the north coast of Ireland, is a long narrow marine lough with a diminished tidal range (Fig. 1). Sea water moves along the system, entering the North Water through the Moross Channel. The North Water, in which collection of material took place, is approximately 1km x 3km in extent. Freshwater inflows around its margin are few and small. A survey by Parker and Dunne (1981) shows a variety of invertebrate communities occurring in the North Water. The shore line is for the most part either rocky or stony. There are however occasional patches of sand and it was on one of these that gill netting proved most successful. At other netting places the substratum consisted of mud or clay supporting beds of *Zostera*.

Nine floating gill nets of clear monofilament nylon, each unit 27.4m in length and composed of webbing of either 2.54 or 3.80cm knot to knot, were set in gangs of three (two small meshed and one large) in two areas of the North Water, close inshore (Fig. 1). The nets were set overnight and fished for four nights in each of the eight sampling periods. Weight (to nearest 1g), fork length (to nearest 1cm) and sex of most of the trout captured were recorded and scale samples taken.

The body cavity of each fish was opened and the gut from vent to oesophagus removed. The gut was incised longitudinally and immersed in alcohol-formol-acetic acid, within an hour of recovering the nets. In the laboratory the gut was searched and each pyloric caecum was opened and its contents removed. Food constituents were identified, some to species, most to a higher taxon. The dominant taxon in each stomach was noted on a volumetric basis. Some prey such as fish were counted individually but numbers of the smaller fragmented invertebrates were not. The maximum width (in the vicinity of the dorsal fin) of intact fish prey was measured to the nearest 1mm and the food in the stomach was weighed to the nearest 0.1g. All parasites were identified to species level and counted. Maximum proglottid width and length of each *Eubothrium* were recorded. *Eubothrium* were alive when fixed.

Irish Fisheries Investigations Series A. No. 25 (1985).

RESULTS

Netting success

Netting yield ranged from 0.54 fish per net unit per night in July 1980 to just under 2 fish in February 1981 (Table 1). Mulroy trout ranged in length between 16 and 43 cm; the smallest were wedged in a single mesh and the larger speciments were tangled in the webbing. A by-catch of various species included mullet *Chelon labrosus* (Risso) of 2.7kg or 55-60cm fork length, indicating that the nets might be capable of taking larger trout.

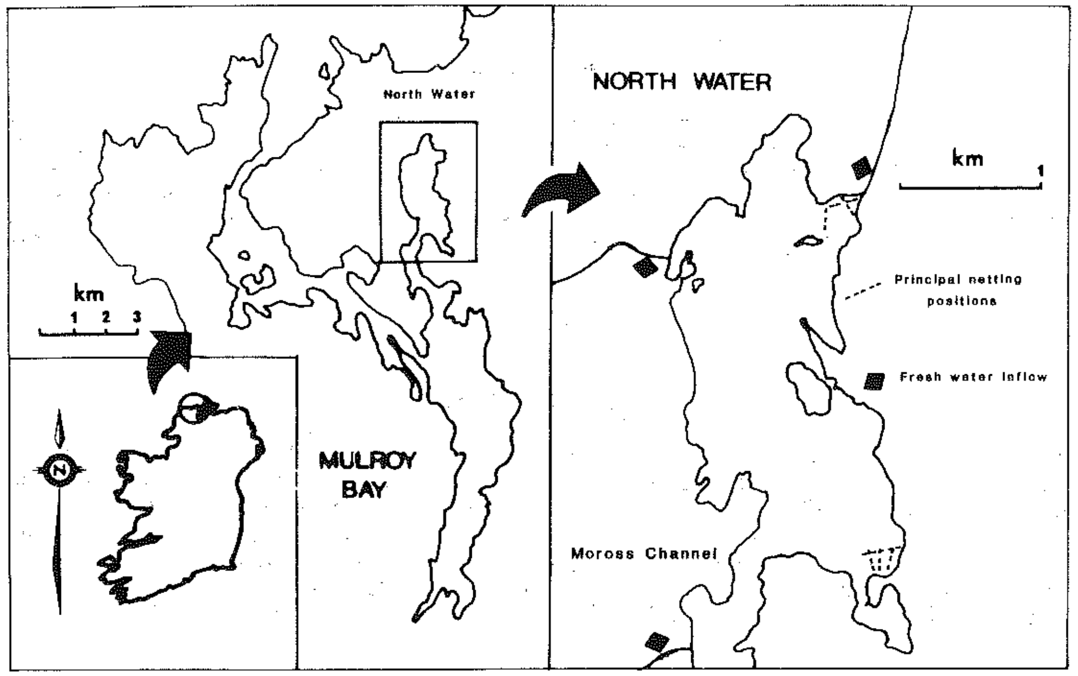

Fig. 1. Map of Mulroy Bay, Co. Donegal showing principal netting positions.

Livery, size and sex ratio

The livery of Mulroy trout varied from that of brown (resident) fish through degrees of silvering to fully silvered fish.

The sex of the trout sampled is expressed in relation to fork length:

Fork length (cm)	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Percent females	50	53	81	93	90	100	100
Numbers	18	157	48	61	39	13	18

Males occurred in equal proportions to females in the smallest length groups; thereafter females became more numerous as the mean length increased. There were no males among fish longer than 40cm.

Age, growth and condition

Assigning Mulroy trout to an age category was difficult, particularly for those specimens which had recently descended to the sea for the first time. In a number of cases B type growth (freshwater growth made in the spring of first descent to the sea) could not be distinguished from late summer growth. Consequently it was not possible to place confidently a large number of the fish in an age group and 17% of the total sampled are labelled indeterminate. The principal age groups were:

Juvenile brown trout/smolt/post-smolt categories (referred to collectively as .0 trout);

Adult fish of either .1 or .2 years. Previous spawners (+ S. M.) were not separately distinguished (Table 1).

Back calculations of fork length at age are presented for two and three freshwater year fish (Table 2). Fish of two freshwater years were significantly ($P < 0.001$) larger at the end of their first parr winter than three freshwater year fish but the latter were marginally larger at first migration to sea, comparison being made between A type fish in each group.

The weight: length relationship was established on data from 96 fish. Log weight (g) was regressed on log fork length (cm) with the following outcome, expressed as a geometric mean functional regression (Ricker, 1973); $b = 2.9570$; $a = -1.9201$; $r = 0.9920$.

Feeding

Indicators of feeding intensity were the percentage of stomachs containing food and the degree of elasticity of the stomach wall (Table 3). The degree of elasticity was rated on a scale of 0 when the stomach was muscular and contracted to 2 when it was expanded and had a parchment like appearance. Intermediate conditions were given the intermediate value 1. A seasonal pattern of feeding was not obvious from the data in Table 3. The presence of food in the stomach did not correlate with elasticity of the stomach wall but fish with muscular and contracted stomachs contained lower quantities of food (expressed as a percentage of the body weight of the fish) (mean weight of food, 0.12% s.d., 0.2006; N, 88) than trout with expanded, parchment like stomachs (mean weight of food, 2.11%; s.d., 1.4286; N, 94).

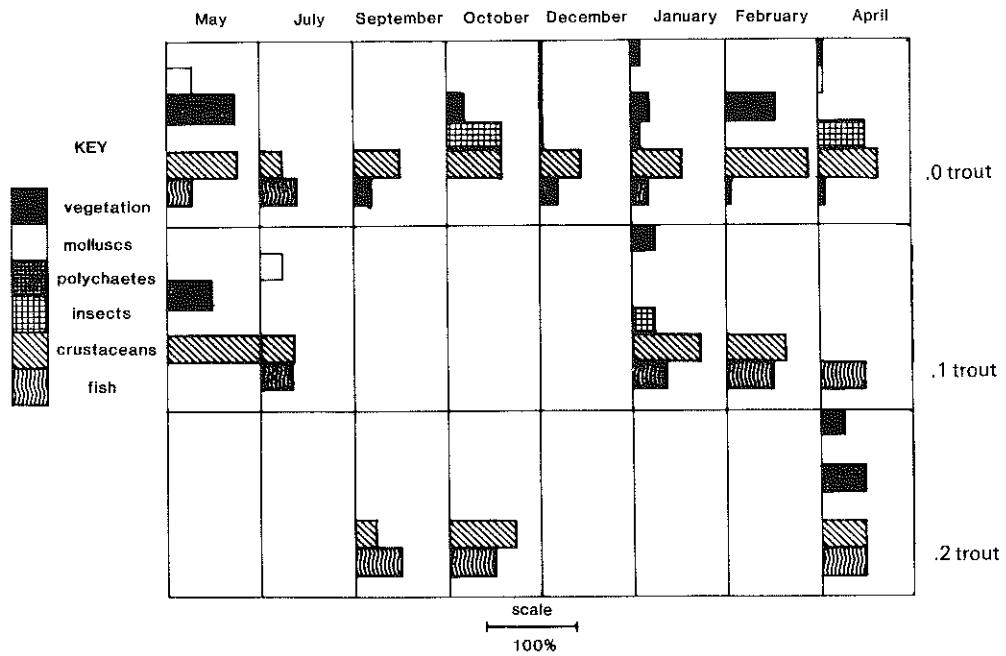

Fig. 2. Percentage frequency of occurrence of the main categories of food in trout of three sea age groups, by month throughout the sampling period.

The seasonal occurrence of the principal prey groupings is given in Table 3 and a list of organisms in Table 4. The insects specified in Table 4 came from two trout stomachs in July and four in October. To Table 3 might be added the occasional occurrence of small stones and coarse sand. Monthly incidence in the main age groupings is shown in Fig. 2. The numbers of trout in each age category are set out in Table 1. The absence of food in an age category reported in Fig. 2 signifies either empty stomachs or the absence of the age category in question from the samples. There was a high incidence of crustaceans in the youngest sea age groups and a progressively greater importance thereafter of fish in the diet. In terms of numbers, insects and crustaceans were the most abundant but fish prey constituted the greatest volume of material. The four most numerous fish prey recorded (of 60 specimens indentified) were: *Atherina,* 19 (31%); *Gasterosteus,* 17 (28%); *Sprattus,* 7 (12%) and *Ammodytes,* 3 (5%).

Predator size and prey selection

In Table 5 the occurrence of the main prey groupings in trout of various fork lengths is shown. Vegetation and molluscs were irregularly distributed though not apparently much favoured. Polychaetes were consumed throughout the size range but crustaceans and insects occurred in greatest incidence in the smaller trout; fish prey were more important in the larger.

A further indication of the relative importance of crustaceans and fish to sea trout of different ages is provided by comparing the weight of the stomach contents in trout containing prey dominated by one or other taxon.

Weight (g) of stomach contents

	Sea age - trout	Number	Mean	Range	s.d.
	.0	66	0.9	0.1 - 2.2	0.9
Crustacea	.1	11	0.8	0.3 - 2.0	1.2
	.2	2	1.0	0.5 - 1.5	—
	.0	2	0.9	0.8 - 1.1	—
Fish	.1	3	1.0	0.7 - 1.2	—
	.2	11	4.3	2.1 - 9.1	3.2

A regression of maximum prey width of 73 intact fish prey on fork length of predator in 60 trout yielded a correlation coefficient of 0.172 ($P > 0.05$).

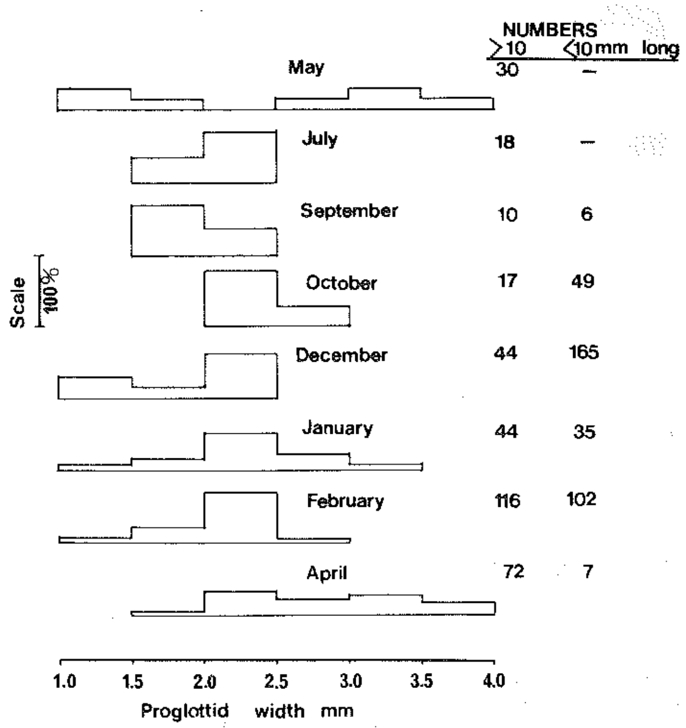

Fig. 3. Percentage maximum proglottid width distribution of *Eubothrium crassum* by month throughout the sampling period together with details of the number of large (> 10mm long) and small (<10mm long) worms.

Parasite burden

Gut parasites occurring in Mulroy trout included the following:
Digenea *Crepidostomum metoecus* (Braun) *Derogenes varicus* (Muller) *Hemiurus communis* (Odhner) *Lecithochirium musculus* (Looss) *Podocotyle (reflexa?)* (Creplin) **Cestoda** *Eubothrium crassum* (Bloch) **Nematoda** *Thynnascaris adunca* (Rud.)

Crepidostomum, a freshwater species, occurred in 5% of trout examined all of which would have descended recently from fresh waters. *Derogenes* and *Hemiurus* are marine and were recorded in 23% and 52% of the total catch. *Lecithochirium* was taken in only seven trout and *Podocotyle* in 15. *Eudothrium* occurred in 75% of the aged catch (82% of the total trout) and *Thynnascaris* in 17% of the aged catch (18% of the total).

The overall occurrence of the most abundant parasites (those occurring in more than 17% of the aged catch) is set out in Table 6. There is little sign of a seasonal pattern for most with the exception of *Hemiurus* which was most abundant in July, September and October. The incidence of parasitic infection rises with the age (Table 6).

Only in the case of the Nematode *Thynnascaris* were fewer of the oldest host age groups than either of the younger infected; 14% of .0 as against 31% of .1 and 10% of .2 trout contained the worm.

The highest incidence of infection, though by relatively low burden (expressed as number of individuals), was by *Eubothrium.* Some details of its occurrence are summarised in Fig. 4 which shows the maximum width frequency of proglottids and the incidence of plerocercoid and small larval worms (<10mm long). Plerocercoids were most abundant in autumn and winter after which they declined. There are indications that growth occurred from December to May and that a considerable fall in the incidence and intensity of infection of *Eubothrium* took place in July and September.

DISCUSSION

The age composition of the sample, none showing more than two sea winters, is typical of a short lived population. This characteristic is typical of western Ireland, Atlantic feeding fish (Fahy, 1978). The freshwater growth of the Mulroy trout is slightly better than that of sea trout from the River Moy (Fahy, 1979).

It is not feasible to state how mesh selectivity influenced the size composition of the trout catch. Peaks in juvenile numbers coinciding with the autumn and spring descents from fresh to salt water did not materialise; nor did an increase in adults, taken in the course of the spawning influx to freshwater, occur. This is wholly attributed to the sampling operations: gill nets are known to be selective (Baranov, 1948) and although the smallest trout which were taken were retained in a single mesh and the larger fish were tangled in the fine webbing, it is likely that some to the smallest first migrants passed through the webbing while a percentage of the largest fish may have glanced off the net without tangling. However fine meshed nets of this kind are capable of taking large sea trout. Juvenile brown trout and smolts are likely to have originated in the fresh waters flowing into Mulroy but the nursery grounds of the larger fish cannot be stated with certainty. Different phases of sea trout are known to occupy different feeding areas (Nall, 1930) and these can be exclusive to a particular age/reproductive state of the fish (Swain and Hartley, 1959).

In numerical terms the most important groups of prey were amphipods and insects; fish constituted the largest prey volume and the other groups listed in the food were relatively infrequently represented. Not all taxa listed in Table 5 can be considered prey of the sea trout. Cypris larvae almost certainly entered the trout as prey of fish on which sea trout were feeding. In the Irish Sea intact sprats and sand eels which were examined after removal from sea trout were observed to be gorged with cirripede larvae, (Fahy, 1983). The copepod *Zygomolgus* is also likely to have entered Mulroy trout inside fodder fish. The insects are a very brief selection which serve to indicate the various sources from which members of this group originated. *Baetis rhodani* nymphs were recorded from the intestine of trout which had recently forsaken fresh water; *Clunio marinus,* a marine orthoclaad, was occasionally consumed in very large numbers in marine conditions but the vast majority of insect taxa had a terrestrial provenance being blown off the land into shallow inshore waters where they were consumed. The utilisation of the leaves and flowering parts of *Zostera* as a fish food had been reported by Petersen (1918) from the Limfjord (Denmark) when in the autumn fragments of the plant became finely divided by mechanical and bacterial action to form the basis of a major food chain. Wyatt (1976) supposed that this food resource is important in tiding a species over when other trophic materials are not available; in the case of Denmark the destruction of large areas of *Zostera* beds did not result in a marked depletion of the inshore fisheries associated with them.

There was no clear pattern of feeding in Mulroy and a high proportion of trout stomachs contained food in all months. However the stomach contents were generally less than in the Irish Sea where trout were recorded containing up to 8 to 10% of total weight as food, averaging 5.3% (s.d. 4.10; N = 122). In Mulroy, trout with expanded stomachs rarely contained more than 3.5% of total body weight as food; the average was 0.9% (s.d. 3.11; N = 203). Furthermore the incidence of "contracted" and "expanded" stomachs in Mulroy seemed to be less seasonally marked. In the Irish Sea the elasticity index was 0.9 in April, 1.8 in May, 1.6 in June and 1.4 in July. It is suggested that "glut" feeding to repletion is less established in Mulroy than in the Irish Sea and that Mulroy fish may be receptive to food over a longer period of the year than in the Irish Sea.

As Mulroy trout increase in fork length their diet tends to include more fish and fewer crustaceans (Table 5). This phenomenon is well known in the Scottish sea lochs (Pemberton, 1976). Pemberton claims that when young smolts first descend to marine conditions they are too small to feed on fish although where suitable small fishes are present (0+ sand eels for example) small post smolt have been observed to feed on them (Fahy, 1983). Wyatt (1976) states that an increase in average size of food organism with increase in predator size is "a general phenomenon supported by data on a wide variety of fish". A correlation between maximum prey width and the fork length of a predator has been described for juvenile trout (Fahy, 1980a) and for larger trout feeding in the Irish Sea (Fahy, 1983). A similar calculation for Mulroy fish proved non-significant. This with the small size of invertebrate food items chosen by the larger fish suggests that a range of size of fodder fishes is not available to Mulroy trout and that large shoals of sand eels, sprats and juvenile herrings, the usual foods of trout in the sea, do not occur there. This interpretation is supported by consideration of the parasite burden.

Polyanski (1961) has identified the diet of marine host fishes as one of the main factors determining the variety of the parasite fauna, its intensity and incidence of infection. The parasitology of the alimentary canal of Mulroy sea trout is therefore considered together with their food.

The digeneans included a freshwater genus *(Crepidostomum* see Kennedy, 1974) and a localised marine species, *Lecithochirium.* Gibson (pers. comm.) reports that the majority of material referred to as *Lecithochirium musculus* comes from Ireland where it has been recorded in, among other hosts, *Anguilla* and *Trisopterus.* The Mulroy material is the first host record for sea trout. The remaining digeneans, *Derogenes, Hemiurus and Podocotyle* are common in inshore fishes (Dawes, 1947; Gibson, 1972). *Lecithaster gibbosus* (Rud.) can be quite abundant in trout but although it occurred in very large numbers in trout from the Irish Sea (Fahy, 1983) it was not recorded at all in Mulroy. *Derogenes, Hemiurus, Eubothrium and Thynnascaris* were the four taxa occurring in gratest numbers in Mulroy fish.

Comparing the incidence and burden of the most common parasites with a substantially similar presentation for trout from the Irish Sea (Fahy, 1983) indicates that although the numbers of parasites in any age category in any month display considerable variation, parasites generally are much fewer in Mulroy. All of the common parasite taxa occur frequently in inshore marine fishes. They could enter sea trout by way of an intermediate invertebrate host or by transfer through another fish host in which they are established when it is consumed by the trout. The intense consumption of fish prey in the Irish Sea where invertebrates constitute a small proportion of the diet is virtually the antithesis of what happens in Mulroy where invertebrates, particularly amphipods, feature prominently in the diet and fish are uncommon.

In the Irish Sea it was feasible to identify distinctive patterns of infestation by *Eubothrium* in sea trout of different age, size and reproductive status (Fahy, 1980b). Fewer *Eubothrium* and a smaller range of host age and size categories in Mulroy obscure easily recognisable patterns here. *Eubothrium* does however display a definite seasonality of occurrence and there are signs of growth at certain times of the year (Fig. 3). Larger *Eubothrium* have been associated with hosts of older sea age in the Irish Sea (Fahy, 1980b) and the relatively low age of the Mulroy trout is an explanation for the narrow proglottid width there.

Sea trout are capable of considerable predatory adaptability and the Atlantic sea lough provides them with an adequate food resource which however they must share with other fish species. Kislalloglu and Gibson (1977) demonstrated that in Scottish sea lochs amphipods formed the bulk of the diet of nearly all predatory fish. Fodder fishes are a more suitable prey for sea trout but these are apparently too infrequent in Mulroy to provide a staple diet.

A consequence of poor feeding is low condition factor. A sample of sea trout feeding in Atlantic waters contains more previous spawners than a sample of similar mean individual weight feeding in the Irish Sea (Fahy, 1978). A possible explanation for this is that members of the two populations have a different shape which could be expressed by condition factor. Details of the weight: length relationship of sea trout from the Irish Sea have been given by Fahy (1981). Details of the log weight regressed on log length expressed as a geometric mean functional regression are: $b = 2.6070$; $a = -1.273$; $r = 0.966$; $N = 114$.

Comparison of the slopes of the Mulroy and Irish Sea regressions and with a slope = 3 by "t" test had the following outcome:

	Mulroy	Irish Sea	Slope = 3
Mulroy		<0.005	< 0.1
Irish Sea	<0.005		<0.005

Comparison of the weight (g) of Mulroy and Irish Sea populations with the standard condition factor (Nall, 1930) at several fork lengths is made hereunder:

	Weight (g)		
Fork Length (cm)	Standard	Mulroy	Irish Sea
20	80	84.5	131.2
40	640	655.7	799.3
60	2160	2174.8	2300.0

Co-variance analysis of the predictive regressions by the methods in Hope (1968) yielded a significant F value (= 117.59). Within the range of lengths of the Mulroy sample the Irish Sea fish have a significantly heavier weight for a given length than the Mulroy fish.

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Practical assistance with the collection of biological material in Mulroy was provided by Tony Fox, Managing Director of Fanad Fisheries and James Carr of Croaghan, Fanad. Determination or confirmation of taxonomic material was made as follows: Drs D. I. Gibson and Alwyn Wheeler of the British Museum (Natural History), dealt with parasites and fish respectively. Dr C. R. Kennedy of the School of Biological Sciences, University of Exeter, advised on *Eubothrium.* J. C. Holmes of the Natural History Section of the National Museum identified most of the crustaceans listed and Dr. M. C. D. Speight (Forest and Wildlife Service, Department of Fisheries and Forestry) identified the insects other than *Clunio* which was determined by Dr. D. A. Murray, Department of Zoology, University College, Dublin. Maura Scannell of the National Botanic Gardens confirmed the identity of *Zostera,* and Ruary Rudd of Westgate, Waterville, Co. Kerry, provided much assistance with the interpretation of condition factor. I remain indebted to my colleagues Dan Minchin and Colm Duggan whose enthusiasm for Mulroy contributed in large part to the work being undertaken there.

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Table 1. Netting success and principal age groupings of trout captured in Mulroy between May 1980 and April 1981.

Month	Number of fish per net unit per night	Age Groupings 2	3	.1	.2	Indet
May	1.75	13	3	15	—	11
July	0.54	6	—	3	—	4
September	1.42	13	—	10	3	8
October	0.55	6	2	—	2	10
December	1.56	33	12	3	3	5
January	1.61	33	6	9	—	10
February	1.94	49	6	9	—	6
April	1.69	40	10	3	2	6
Totals		193	39	52	10	60

Table 2. Freshwater lengths at age

	At	Fork length (cm)	N	S.D.
	1 year	8.19	77	2.75
Trout of	2 years	20.37	77	4.87
2 years	+ (?)	33.18	13	3.83
Trout of	1 year	5.83	35	1.49
3 years	2 years	13.08	35	2.05
	3 years	21.96	35	3.23
	+ (?)	27.69	15	5.96

Table 3. Some feeding characteristics of Mulroy Sea trout (all fish) in 1980 and 1981.

	Stomachs			% frequency of principal prey groups in gut					
Month	Number	% containing food	Elasticity of stomachs	Fish	Insects	Crustaceans	Poly-chaetes	Molluscs	Plants
May 1980	42	76	0.6	16	30	32	11	11	—
July	13	54	0.8	43	14	29	—	14	—
September	34	56	1.3	50	—	25	25	—	—
October	20	100	0.4	9	36	45	9	—	—
December	56	77	0.9	27	8	50	4	8	4
January '81	58	76	0.9	38	4	46	8	—	4
February	70	80	0.8	13	—	56	30	—	—
April	61	53	0.5	26	26	37	3	3	5

Table 4. A list of food constituents in the gut of sea trout taken in Mulroy Bay. Prey organisms are arranged in alphabetical order. Insects are adult except where indicated otherwise.

PISCES

Ammodytes spp.
Atherina presbyter Valenciennes
Gadoid sp. indet.
Percomorph sp. indet.
Pollachius virens L.
Sprattus sprattus L.
Anguilla anguilla (L.)
Clupea harengus L.
Gasterosteus aculeatus L.
Pleuronectes platessa L.
Pomatoschistus minutus (Pallas)
Trisopterus luscus L.

CRUSTACEA

Amphipoda
Amphitoe rubricata (Montagu)
Bathyporeia sp.
Corophium volatator Pallas
Hyale nilssoni (Rathke)
Sunamphitoe pelagica (Milne-Edwards)
Apherusa bispinosa (Bate)
Chaetogammarus marinus Leach
Gammarus zaddachi Sexton
Rivulogammarus duebeni (Lilljeborg)

Copepoda
Zygomolgus tenuifurcatus (G. O. Sars)

Cirripedia
Cypris larvae

Isopoda
Cirolana borealis Lilljeborg
Idotea granulosa Rathke

Leptostracha
Nebalia bipes (Fabricius)

Mysidacea
Praunus flexuosus (O. F. Muller)

INSECTA

Coleoptera
- Chrysomelidae
  - *Lochmaea suturalis* (Thoms)
- Hydrophilidae
  - *Cercyon* sp.
- Scarabaeidae
  - *Aphodius fimetarius* (L.)

Hemiptera

Hymenoptera

Diptera
- Bibionidae
  - *Dilophus* sp.
- Chironomidae
  - *Clunio marinus* Haliday (mainly pupae)
- Tipulidae

Ephemeroptera
- *Baetis rhodani* (Pict.) (nymphs)

POLYCHAETA

Arenicola marina L.
Polyophthalmus pictus (Dujardin)
Nereid sp.
Indet Polychaeta

MOLLUSCA

Gastropoda
Littorina littoralis (L.)
Nassarius sp.
Turritella sp.
L. obtusata (L.)
Planorbis leucostoma Millet
Mollusc eggs (?)

PLANTS

Algae
- Fucoid (fragments)
- *Ulva* (?) (fragments)

Angiospermae
- *Zostera marina* L. (Seeds and fragments)

Table 5. Percentage frequency occurrence of dominant prey categories in the stomachs of all trout of different fork lengths.

Fork Length (cm)	Number	Fish	Insects	Crustaceans	Polychaetes	Molluscs	Vegetation
15-20	18	12	—	50	—	25	12
20-25	157	11	17	49	11	4	1
25-30	48	30	7	30	13	—	3
30-35	61	19	4	42	15	—	—
35-40	39	29	4	17	8	5	—
40-45	13	28	—	16	17	—	—
45-50	18	50	—	12	13	—	12

Table 6. Occurrence by month of four common parasites in three groups of aged sea trout.

A = Percentage incidence of infection. B = Mean burden per infected trout.
C = Range in burden per infected trout.

Parasite		May	July	September	October	December	January	February	April
.0 trout	A	—	83	—	38	16	10	6	—
Derogenes	B	—	4.0	—	1.7	1.9	1.1	1.2	—
	C	—	1-12	—	1-3	1-8	1-2	1-4	—
	A	25	100	100	63	56	51	71	28
Hemiurus	B	2.0	63.1	23.0	36.0	22.1	6.7	10.6	8.5
	C	1-8	32-82	7-39	20-52	2-50	3-10	1-26	1-15
	A	31	50	54	63	78	82	76	88
Eubothrium	B	1.2	1.0	1.0	4.5	3-2	3-5	11-7	2-2
	C	—	—	—	1-9	1-4	1-13	1-17	1-5
	A	25	—	—	88	9	8	20	8
Thynnascaris	B	1.2	—	—	1.0	1.2	1.0	1.7	1.1
	C	1-2	—	—	—	1-2	1-2	1-3	1-2
.1 trout	A	53	—	—	—	—	56	—	66
Derogenes	B	1.1	—	—	—	—	1.0	—	1.0
	C	1-3	—	—	—	—	—	—	—
	A	53	67	—	—	100	67	100	100
Hemiurus	B	3.0	22.5	—	—	18.5	23.0	24.8	30.5
	C	1-3	15-30	—	—	5-28	7-29	3-29	1-61
	A	53	67	100	—	100	44	100	100
Eubothrium	B	20.3	3.0	1.0	—	5.0	1.0	13.2	2.5
	C	20-30	1-5	—	—	2-8	—	3-17	2-4
	A	—	33	—	—	100	100	—	100
Thynnascaris	B	—	2.0	—	—	1.3	1.0	—	1.2
	C	—	1-3	—	—	1-2	—	—	1-3
.2 trout	A	—	—	33	100	100	—	—	100
Derogenes	B	—	—	1.0	1.1	1.1	—	—	2.0
	C	—	—	—	1-3	1-3	—	—	1-3
	A	—	—	100	100	100	—	—	100
Hemiurus	B	—	—	35.5	11.5	58.0	—	—	29.5
	C	—	—	26-45	8-15	48-69	—	—	4-55
	A	—	—	67	100	100	—	—	100
Eubothrium	B	—	—	3.0	26.0	1.0	—	—	4.1
	C	—	—	2-4	20-32	—	—	—	1-7
	A	—	—	—	—	33	—	—	—
Thynnascaris	B	—	—	—	—	1.0	—	—	—
	C	—	—	—	—	—	—	—	—

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