

The Food of Young Fish.

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INTRODUCTION.

THE investigation of the food of larval and post-larval fish from Plymouth Sound and beyond for three years has brought out some interesting facts. For the first two years fresh material from the tow-nets was examined together with old material from the Young Fish Trawl (Lebour, 1918, 1919). During the present year, in addition to the tow-nettings, fresh material from the Young Fish Trawl was also available from July to the end of September, and several fish from outside the Sound examined which had not been obtainable for the last two years. We thus have

a fair number of young Mackerel, Ling, Hake and Gurnard and several others.

The fish were either examined fresh or with the addition of a little formalin, and the food ascertained as soon as possible.

In this way fish newly hatched and post-larval stages, usually not larger than 20 mm., but a few larger adolescent stages were examined, special attention being given to the food fishes.

The food was investigated either by examination of specimens cleared and mounted, or, more usually, and this year entirely, by dissecting out the alimentary canal of the fish.

One finds that certain copepods and other Entomostraca constitute by far the larger part of the food of nearly all the very young fish, and that usually each species of fish selects its own favourite food to which it keeps, indiscriminate feeding seldom or never taking place, and one can usually assign to each fish its own particular food. The diet of the fish, however, depends to some extent on the size of the mouth and gullet, and in a few fish a unicellular diet is the rule up to a considerable size.

Few fish are vegetarians, and it is unusual for any but the youngest fish to eat diatoms. An exceptional occurrence was a piece of a branched alga inside a Wrasse, *Ctenolabrus rupestris*, of 39 mm. in length. Very young Herring and Sprat and a few others often contain green remains which probably belong to some algæ, and occasionally diatoms can be recognized in this, but even before the yolk sac is absorbed the gut may contain larval mollusks and small crustaceans, as in the young Herring.

DIATOMS.

Diatoms very rarely occurred in any quantity, hardly ever more than one individual or one chain of individuals in the same fish. An exception was a young *Ammodytes* of 10 mm. which contained 6 *Rhizosolenia Shrubsolei*, a needle-like diatom with a sharp spine at each end. Fish hatched in the Aquarium and fed on very fine plankton also ate diatoms. A newly hatched Plaice fed on a *Navicula*-like form growing at the bottom of a glass aquarium. Young Gobies only a few days old ate *Asterionella*, *Thalassiosira* and *Chaetoceros* besides *Skeletonema* (the commonest diatom in the plankton).

The following is a list of diatoms found in the young fish :—

<i>Rhizosolenia Shrubsolei</i>	in <i>Ammodytes</i> sp.
<i>Thalassiosira gravida</i>	in <i>Cottus bubalis</i> , <i>Gobius minutus</i> .
<i>Chaetoceros curvisetus</i>	in <i>Gobius minutus</i> .
<i>Skeletonema costatum</i>	in <i>Gobius minutus</i> .
<i>Asterionella japonica</i>	in <i>Gobius minutus</i> .
<i>Biddulphia regia</i>	in <i>Cottus bubalis</i> .

<i>Paralia sulcata</i>	in	<i>Callionymus lyra</i> , <i>Pleuronectes limanda</i> , <i>P. flesus</i> , <i>Scophthalmus norvegicus</i> , <i>Clupea harengus</i> , <i>Lepadogaster bimaculatus</i> , <i>Solea variegata</i> , <i>Arnoglossus</i> sp.
<i>Lauderia borealis</i>		inside a copepod in <i>Solea variegata</i> .
<i>Guinardia flaccida</i>		inside a copepod in <i>Solea variegata</i> .
<i>Coscinodiscus radiatus</i>	in	<i>Cottus bubalis</i> .
„ <i>excentricus</i>	in	<i>Agonus cataphractus</i> , <i>Callionymus lyra</i> , <i>Clupea sprattus</i> .
„ sp.	in	<i>Gobius</i> sp., <i>Pleuronectes limanda</i> , <i>Gadus luscus</i> , <i>Ammodytes tobianus</i> , <i>Caranx trachurus</i> , <i>Clupea harengus</i> , <i>Amphioxus lanceolatus</i> .
„ <i>Grani</i>	in	<i>Gadus merlangus</i> .
<i>Thalassiothrix nitzschioides</i>	in	<i>Clupea sprattus</i> .
<i>Fragillaria</i> sp.	in	<i>Pleuronectes limanda</i> .
<i>Tabellaria</i> sp.	in	<i>Arnoglossus</i> sp.
<i>Melosira</i> sp.	in	<i>Ammodytes tobianus</i> .
<i>Hyalodiscus stelliger</i>	in	<i>Clupea harengus</i> .
<i>Campylodiscus</i> sp.	in	<i>Clupea harengus</i> .

All these are diatoms commonly found in the plankton.

PERIDINIANS.

Peridinians occasionally occurred :—

<i>Dinophysis</i> sp.	in	<i>Gadus minutus</i> , <i>Pleuronectes limanda</i> , <i>Solea variegata</i> .
<i>Prorocentrum micans</i>	in	<i>Labrus</i> (<i>bergylta</i> type), <i>Solea variegata</i> , <i>Pleuronectes limanda</i> , <i>Scophthalmus norvegicus</i> , <i>Clupea harengus</i> .
<i>Diplopsalis lenticula</i>	in	<i>Solea variegata</i> .
<i>Peridinium ovatum</i>	in	<i>Scophthalmus norvegicus</i> , <i>Pleuronectes limanda</i> , <i>Solea variegata</i> .
<i>P. cerasus</i>	in	<i>Solea variegata</i> .
<i>P. pallidum</i>	in	<i>Solea variegata</i> .
<i>P.</i> sp.	in	<i>Labrus</i> (<i>bergylta</i> type), <i>Solea variegata</i> , <i>Pleuronectes microcephalus</i> , <i>Gobius minutus</i> , <i>Clupea harengus</i> .
<i>Goniaulax spinifera</i>	in	<i>Clupea harengus</i> .

Those in the flat fishes were probably inside the copepods they had eaten, but those in the Herring, Bib (*Gadus minutus*), *Gobius* and *Labrus* certainly were taken in the free state.

FLAGELLATA.

The flagellate *Phæocystis* usually appears in enormous quantities in May and June in the Sound, its gelatinous masses clogging the nets and interfering in every way with collecting.

The young Flounder (*Pleuronectes flesus*) before its metamorphosis and its transition to the bottom stage feeds largely on this, its gut sometimes being full of it. Specimens up to 11 mm. kept in a small aquarium were fed on it and devoured it eagerly. *Halosphæra viridis* was occasionally taken by the young Herring, Sprat, Pipe-fish (*Nerophis*) and Scad (*Caranx*).

COCCOSPHÆRALES.

A perfect specimen of a coccosphere (*Coccosphæra* sp.) was found in a Pouting (*Gadus luscus*) of 3 mm.

SILICOFLAGELLATA.

The silicoflagellate (*Distephanus speculum*) occurred in a Dab (*Pleuronectes limanda*) of 6 mm.

FORAMINIFERA.

Foraminifera, chiefly *Polystomella*, are sometimes found in the fish feeding among the *Zostera*, but as these were all fish of a fair size, between 30 and 60 mm., and as the foraminifera nearly always occurred singly, they had probably been taken in accidentally. They occurred in the following fish :—

- Labrus bergylta*, 37 mm.
- Crenilabrus melops*, 35 mm.
- Ctenolabrus rupestris*, 35–37 mm.
- Mullus surmuletus*, 60 mm.
- Gobius minutus*, 49–51 mm.

RADIOLARIA.

The radiolarian *Lithomelissa* occurred in a Wrasse (*Labrus* sp. *bergylta* type) of 6 mm.

INFUSORIA.

The only recognisable Infusoria were Tintinnids :—

- | | |
|----------------------------------|--|
| <i>Tintinnopsis beroidea</i> | in <i>Labrus (bergylta)</i> type). |
| <i>T. ventricosa</i> | in <i>Solea variegata</i> , <i>Pleuronectes limanda</i> , <i>Scophthalmus norvegicus</i> . |
| <i>T. sp.</i> | in <i>Clupea harengus</i> . |
| <i>Cittarocyclus denticulata</i> | in <i>Labrus (bergylta)</i> type). |

Here again those in the flat fish were probably from the copepods, those in the Herring and the Wrasse having probably been taken in free.

It is only occasionally that these unicellular organisms are seen, although it is probable that *Clupea* species and *Ammodytes tobianus* feed principally on these up to about 10 mm. or more. It is much more usual to find in these forms the gut empty or with an occasional larval mollusk, copepod or egg (copepod?).

OVA.

It was found this year that eggs formed a fairly large portion of the food of some of the young fish. It was difficult to identify them, but they appear to be the eggs of copepods. The diameter is about 1.6 mm. or less, and this approximates to the size of the eggs of *Calanus finmarchicus*. As *Calanus* has free eggs it is quite possible that they may form part of the food of the little fish. Some of these eggs were recorded previously as spores. This year they were found in the following fish:—

Gadus merlangus, *Labrus (bergylta type)*, *Labrus mixtus*, *Caranx trachurus*, *Scomber scomber*, *Trachinus vipera*, *Gobius microps*, *Pleuronectes microcephalus*, *Rhombus lævis*, *Scophthalmus norvegicus*, *Ammodytes lanceolatus*.

One *Pleuronectes microcephalus* of 7 mm. contained 72 of these eggs.

ANNELIDA.

A few adolescent stages of *Pleuronectes platessa*, *Gobius pictus* and *Gadus minutus* contained remains of annelids which were not seen in the very small fish.

Certainly the principal food of the young fish is small crustacea, the Cladocera, *Podon* and *Evadne*, *Balanus* larvæ, and, foremost in importance, certain copepods, both adults and larval stages. Decapod larvæ and other crustacean larvæ and also adults are taken by the larger sized fish, but copepods are taken by many of the fish from the newly hatched to the adolescent stages, and, in some cases, to the adult stage.

CLADOCERA.

In the Sound and outside *Podon* and *Evadne* are only available in large quantities in the summer months. When these are in season they are great favourites, and nearly all the small fish will eat them, usually in addition to the copepods on which they feed at other times. Even the almost newly hatched fish, sometimes still with a yolk sac, can eat *Podon* and *Evadne*. Details of the fish eating these will be found under the separate headings.

OSTRACODA.

Crenilabrus melops of 22 mm. contained remains of ostracods.

COPEPODA.

Copepods undoubtedly form the chief food of larval and post-larval fish, and each fish usually keeps to one or more species of copepod, which may be varied as the presence of the copepods varies. The accumulated results show that by far the greater number of the fish eat one or more of the four commonest species of copepod—*Pseudocalanus elongatus*, *Acartia clausi*, *Temora longicornis* and *Calanus finmarchicus*, and each species of fish usually has a favourite amongst these to which it keeps more or less strictly. Thus the favourite food of the Whiting (*Gadus merlangus*) up to about 9 mm. or more is undoubtedly *Pseudocalanus*, but this copepod is not so abundant in the early summer as it is at other times, and then the Whiting will take *Acartia* and *Calanus*, hardly ever *Temora*, although the last may be very common. On the other hand, most of the species of *Solea* and also *Pleuronectes limanda* will take *Temora* and hardly ever *Pseudocalanus*, whilst *Pseudocalanus* and *Acartia* are specially taken by *Scophthalmus norvegicus*. It is to be noted that the Dab takes the same food as the Soles in the very young stages.

These four common copepods occur practically all the year round in the whole area investigated with short periods of disappearance of one or another species, but they are most abundant in spring and summer and commonly breed during this period, when the young fish are at their maxima. Many very small fish eat the nauplii and small copepodid stages, as do also the older fish with small mouths and narrow gullets, while the large-mouthed young forms will take adult copepods when almost newly hatched.

Amongst the other copepods eaten are *Paracalanus parvus*, *Euterpina acutifrons*, *Metridia lucens* and *Oithona similis*, also a few rarer forms, but none of these is eaten so often as the four common species mentioned above. Harpacticids are fairly often eaten by the adolescent stages feeding among the *Zostera*.

CIRRIPEDIA.

Balanus nauplii occur in numbers in winter and early spring and again in July and August. At these times they are eaten a great deal by most of the young fish, particularly those newly hatched. Cypris stages are occasionally taken.

SCHIZOPODA.

Young *Scomber*, *Labrus mixtus*, *Trigla gurnardus* and *Rhombus maximus* contained euphausiid larvæ. Adolescent stages of *Trachinus vipera*,

Arnoglossus laterna and *Gadus minutus* contained mysid remains, but except in these adolescent stages schizopods do not form a large part of the food.

CUMACEA.

The only Cumaceids seen were in adolescent stages of *Pleuronectes limanda* and *P. platessa*.

ISOPODA.

A few adolescent stages contained isopods. A *Crenilabrus* of 33 mm contained isopod remains, and an *Onos mustela* contained a *Gnathia*. Several small fish in captivity ate young isopods.

AMPHIPODA.

Amphipods are eaten by few of the very young fish, but frequently by the adolescent stages. A *Callionymus* of 13 mm. had eaten a young *Apherusa* and a young *Rhombus maximus* of 13 mm. had also eaten an *Apherusa*. The following adolescent stages contained remains of Amphipods: *Crenilabrus melops*, *Centrolabrus rupestris*, *Trachinus vipera*, *Gobius pictus*, *Callionymus lyra*, *Pleuronectes limanda*, *Pleuronectes platessa*, *Arnoglossus laterna*, *Gadus pollachius*. A Whiting of 24 mm. contained a *Hyperia* and small Whiting, Pollack and Gobies in captivity would take young amphipods.

DECAPODA.

Decapods seldom occurred except in the adolescent stages. A Whiting (*Gadus merlangus*) contained a zoëa of *Carcinas mœnas*, a *Trigla gurnardus* of 13.5 mm. contained a crab zoëa and one of 8 mm. contained remains of decapod larvæ. A *Cyclopterus lumpus* of 15 mm. contained a *Eupagurus* larva. Adolescent stages contained the following:—

<i>Pandalus</i> sp.	in <i>Gobius minutus</i> , <i>Callionymus lyra</i> , <i>Arnoglossus laterna</i> , <i>Gadus minutus</i> , <i>Onos</i> sp., <i>Gasterosteus spinachia</i> .
<i>Crangon</i> sp.	in <i>Pleuronectes limanda</i> , <i>Arnoglossus laterna</i> , <i>Gasterosteus spinachia</i> .
<i>Gebia</i> larva	in <i>Pleuronectes limanda</i> .
<i>Hippolyte</i> sp.	in <i>Gadus pollachius</i> , <i>Gadus merlangus</i> .
<i>Eupagurus</i> larva	in <i>Gadus minutus</i> .
<i>Porcellana</i> larva	in <i>Caranx trachurus</i> , <i>Clupea sprattus</i> .
<i>Brachyura</i> zoëæ	in <i>Pleuronectes limanda</i> , <i>Gadus merlangus</i> , <i>Gadus pollachius</i> .
<i>Brachyura</i> megalopæ	in <i>Callionymus lyra</i> , <i>Pleuronectes limanda</i> , <i>Gadus pollachius</i> , <i>Onos</i> sp.

Decapod remains in *Labrus mixtus*, *Ctenolabrus rupestris*, *Mullus surmulatus*, *Trachinus vipera*, *Gobius minutus*, *Gobius pictus*, *Callionymus lyra*, *Gadus merlangus*, *Gadus pollachius*.

In captivity many of the larger young fish ate decapods, thus *Cyclopterus lumpus*, 20–25 mm. ate *Leander* larvæ, *Crangon* and *Gebia* larvæ; *Solea vulgaris* at 30 mm. ate larvæ of *Crangon*, *Gebia* and *Hippolyte* and also *Porcellana* larva; *Solea lascaris* at about 20 mm. ate the smaller decapod larvæ, and *Gadus merlangus*, 22 mm., ate larval *Gebia* and an occasional crab zoëa or megalopa, crab megalopa also being eaten by a Pollack of 26 mm.

Thus as the fish grow decapod larvæ and other crustacea are eaten, but even the larg fisher, 20–30 mm., often seem to prefer copepods.

MOLLUSCA.

Besides crustacea, larval mollusks are almost the only recognisable metazoa eaten by the young fish. These occur occasionally in many species along with crustacea. Young Herring, Brill and Turbot often eat them, and the young Gar-fish *Belone (Rhamphistoma) belone* even up to 36 mm., after the elongation of the lower jaw, seems to eat them habitually. During this year the tow-nets contained enormous numbers of larval mollusks, chiefly gastropods and numerous pteropods of the genus *Limacina*. These latter seem to be very seldom eaten by the fish, and were nearly always refused when given to the young fish in captivity. The larval gastropods were eaten fairly often when they were so numerous. The following small fish from 3.5 to 11 mm. had eaten them: *Labrus (bergylta)* type), *Cottus bubalis*, *Agonus cataphractus*, *Gobius microps*, *Liparis montagui*, *Lepadogaster candolli*, *Gadus merlangus*, *Onos* sp., *Clupea harengus*. Adolescent stages of the following from 27 to 120 mm. had eaten many: *Callionymus lyra*, *Caranx trachurus*, *Gobius Ruthensparri*, *Pleuronectes limanda*, *Gadus pollachius*, and *Ammodytes tobianus*.

Certain of the post-larvæ eat other young fish. Thus the Mackerel at 9 mm. may contain fish remains. One of 13.5 mm. had eaten a Blenny of 7 mm. After 10 mm. fish remains are fairly common in the young Mackerel. The Whiting also eats fish at an early age, and at 22 mm. it has been seen to eat another Whiting of 10 mm., while later they habitually eat fish. The Pollack (*Gadus pollachius*) and the Bib (*Gadus minutus*) in the adolescent stage, 75–115 mm., eat fish which forms the chief food of the Pollack at this size, the Bib more often eating decapods.

Adolescent Brill from about 25 mm. also habitually eat fish, and a Dab (*Pleuronectes limanda*) of 60 mm. contained a young fish of 25 mm. (*Ammodytes*). A Turbot (*Rhombus maximus*) of 98 mm. had eaten a *Callionymus*.

Of the many young fish examined which are of no importance as human food, *Callionymus*, *Trachinus* and *Gobius* are of special abundance, and all these eat the various species of Entomostraca. As much of their food is the same as that taken by most of the young food fishes, it must necessarily follow that they are competitors with these for food, and this may be the cause of the dearth of young food fishes in many parts.

When large numbers of young fish were examined from both shallow and deep waters, from within the Breakwater and from the region bounded by the 30-fathom line, it was found that the diet of each species varied very little; thus the Whiting, wherever it was caught, took *Pseudocalanus* (most often), *Acartia* and *Calanus*, but very seldom *Temora*. *Labrus (bergylta* type) always preferred *Temora*, usually the nauplius. The diet of any species of fish was found to be practically the same, whether it was feeding in the Sound or outside.

The large number of empty guts in some of the young fish, especially the clupeoids, is striking. Green food remains are often found in the very young sprat, but the Herring and Pilchard are more often empty.

A list of the fish from the tow-nets is given at the end of this paper. Those from the Young Fish Trawl and $\frac{1}{2}$ -inch net are recorded in Mr. Clark's paper in the same number of this Journal (pp. 163-164). The numbers of the hauls given here refer to those recorded by him, where all data can be found. For convenience, the following letters are used to designate the various nets used:—

- A Young Fish Trawl.
- B $\frac{1}{2}$ -inch Cotton Trawl.
- C Shrimp Trawl.
- D Tow-net, Cheese-cloth (84 cm.).
- E Tow-net, Mosquito Netting (74 cm.).
- F Muslin Net (84 cm.).

For the various points inside the Sound the plan of the Sound may be referred to. (Lebour, 1917, p. 459.)

The common names of the fish given here are those used by the fishermen in these parts, and do not necessarily correspond with local names in any other area.

Tow-nettings taken regularly from the Sound and outside on the same dates as the hauls, and examined by Miss Webb and partly by the writer, show, much as they did last year, that the four commonest copepods are *Temora*, *Pseudocalanus*, *Calanus* and *Acartia*, and that

these are the commonest food of most of the young fish. In August and September large numbers of larval mollusks and the pteropod *Limacina* were present. The latter seems hardly ever to be eaten by the fish, but the larval mollusks, especially the gastropods, were taken by several (see above). Except for these it seems that the copepods and cladocera (when these latter are present) and *Balanus* larvæ, with larval decapods in the older forms are really the only inhabitants of the plankton that need be taken into account (the few exceptions of the unicellular organisms are given above). Therefore the plankton from the medium and coarse nets is of the most importance with regard to the young fish food.

JANUARY.

With the exception of one *Cottus bubalis* containing a larval bivalve and a *Balanus* nauplius, the only young fish caught in the tow-nets were Herrings. A large proportion of these were empty, but those that had anything inside had eaten chiefly larval gastropods and *Pseudocalanus*; a few *Coryceus* and *Oithona* also being taken, *Tintinnopsis*, *Coscinodiscus* and larval bivalves. All these except *Coryceus* are recorded from the plankton during the month. *Coryceus* is usually present at this time, *Pseudocalanus* being very common.

FEBRUARY.

Herring were not so numerous; Sprat and *Ammodytes tobianus* were common; *Cottus bubalis*, *Gobius* sp. (probably *minutus*), *Agonus cataphractus*, *Gadus luscus*, *Cyclogaster montagui* and *Anguilla vulgaris*, the latter with no food. The Herring were eating *Pseudocalanus*, *Paracalanus*, *Acartia*, *Balanus* nauplii, eggs (copepod?) and larval gastropods. The Sprat and *Ammodytes* contained green food remains, one diatom (*Melosira*) being seen in an *Ammodytes*. *Cottus bubalis* and *Cyclogaster* had eaten larval gastropods, *Agonus* had eaten *Balanus* nauplii, *Temora longicornis* a larval bivalve and an harpacticid. *Gadus luscus* had no food, and *Gobius* green food remains.

The *Balanus* nauplii were common in the plankton, having begun in January. *Temora* nauplii and other copepod nauplii were common. *Pseudocalanus* and *Acartia* were common. *Paracalanus* was the only copepod among the food seen which is not recorded in the plankton, and this was present early in March. *Calanus* was commonly present this month, but was not seen inside any fish.

MARCH.

In March the Herring had disappeared. The young Sprat were very abundant, but those examined contained no food except one with a

Pseudocalanus inside it. *Ammodytes tobianus*, *Agonus cataphractus*, *Pholis gunnellus*, *Callionymus lyra*, *Cottus bubalis*, *Gadus luscus* and *Gobius* sp. present, but few individuals and none containing any food except a *Cottus bubalis* containing a *Balanus* nauplius.

A large number of Sprat eggs were in the tow-nets, and these tow-nets were full of life, *Pseudocalanus* and *Balanus* nauplii being common, so there is nothing there to account for the dearth of food in the little fish.

APRIL.

In April the Sprat were dwindling in numbers, disappearing in the middle of the month and containing no food. *Gadus merlangus* was fairly common and eating almost entirely *Pseudocalanus*, *Gadus luscus* also eating *Pseudocalanus*. *Cottus bubalis* eating *Pseudocalanus* and *Temora*, *Callionymus lyra* also eating *Pseudocalanus*, and *Temora* nauplii. *Ammodytes tobianus* with crustacea remains, *Solea variegata* and *Solea vulgaris* with no food, *Pleuronectes limanda* with a *Temora* nauplius.

In the tow-nets *Pseudocalanus* and *Temora* were the commonest copepods, although *Calanus* was present and *Acartia* common. *Balanus* nauplii were dwindling, *Podon* begins and *Phæocystis* was present at the end of the month.

MAY.

In May there were a few Sprat present with no food. *Gadus merlangus* was the commonest fish, feeding chiefly on *Pseudocalanus*, but also on *Calanus*, *Acartia* and an occasional *Temora* and *Balanus* nauplius. *Gadus minutus* containing *Pseudocalanus* and *Temora*, *Gadus pollachius* containing *Calanus*, *Acartia* and *Podon*. *Callionymus lyra* with *Temora*, *Pseudocalanus* and *Temora* nauplii, *Zeugopterus punctatus* with *Temora* nauplii, *Pleuronectes flesus* eating *Phæocystis*, *Pleuronectes limanda* with *Temora* nauplii, *Onos* sp. with *Temora* and copepod nauplii, *Labrus* (*bergylta* type) with copepod remains and eggs, *Roccus labrax* with copepod remains.

Phæocystis abounded this month, the only fish feeding on it being the Flounder (*Pleuronectes flesus*). *Temora* was very common, also *Acartia*. *Pseudocalanus* not quite so abundant, *Calanus* common. The fish were eating a great deal of *Temora*, and the Whiting was taking *Calanus* and *Temora* as well as *Pseudocalanus*, and also *Podon*. From January the decapod larvæ had been steadily increasing.

JUNE.

In June *Gadus merlangus* was still common and still eating *Pseudocalanus* but also *Acartia* and *Calanus* and an occasional *Temora* and a zoëa of *Carcinus mænas*. A few Sprat with no food, *Pleuronectes limanda*.

with no food, *Solea vulgaris* alive, *Callionymus lyra* with *Pseudocalanus*, *Paracalanus* and *Calanus*. *Onos* sp. with no food, *Labrus (bergylta* type) with copepod nauplii, *Roccus labrax* with no food, *Gobius minutus* with no food, *Blennius* sp. with no food.

Pseudocalanus was not at all common in the tow-nets this month, but *Calanus* abundant and also *Acartia*. *Temora* fairly common, *Podon* and various decapod larvæ abundant.

JULY.

In July the fish from the tow-nets were taken chiefly from outside, some as far as the Eddystone Grounds, but the food still consisted chiefly of *Calanus*, *Temora* and *Pseudocalanus*. Most of the fish, however, came from the Young Fish Trawl.

It was found throughout this investigation that fish of the same species eat much the same food from any locality, and the common copepods in the Sound are also common throughout the area investigated.

Among the fish caught were numerous *Gobius* spp. consisting of *G. elongatus* and *Jeffreysii*, and *Crystallogobius* from the deeper waters, *G. minutus*, *pictus*, *paganellus*, *niger*, *microps* and *Ruthensparri* with occasional *Aphyra* from the more inshore waters. All these eat various small copepods of the commonest kinds, chiefly *Pseudocalanus* and *Acartia*, as does also *Callionymus lyra* (chiefly *Pseudocalanus* and *Temora*). The few Sprat contained no food, Pilchard chiefly were empty, but a few contained eggs (copepod ?), *Pseudocalanus*, *Oithona*, *Acartia* and copepod nauplii (*Calanus* and others). *Labrus (bergylta* type), *L. mixtus* and *Ctenolabrus rupestris* all ate *Temora*, chiefly the nauplii, other copepod nauplii (including *Calanus*) and *Podon*, the *Labrus* species also eating *Pseudocalanus*, eggs (copepod ?), *Paracalanus*, *Acartia* and harpacticids, *Labrus (bergylta* type) also eating larval gastropods and bivalves and *Balanus* nauplii, but by far the commonest of *Labrus (bergylta* type) was *Temora* nauplii. One *Labrus mixtus* had eaten an euphausiid larva. *Gadus merlangus* had eaten *Pseudocalanus* again to a large extent, also *Acartia*, *Calanus* and *Temora* occasionally, an *Oithona*, 2 zoëæ of *Carcinus mænus* and a few eggs (copepod ?). Adolescent stages from Cawsand contained *Calanus*, *Temora* and *Podon*. *Gadus luscus* contained copepod remains; adolescent stages of *G. pollachius* contained chiefly *Calanus* and *Temora*. *Lepadogaster* had eaten *Temora* (young copepodid stages and nauplii), other copepod and *Balanus* nauplii, larval bivalves and harpacticids. *Scomber* chiefly with copepod nauplii (especially *Temora* and *Calanus*), *Podon*, *Evadne*, euphausiid larvæ and eggs (copepod ?). *Molva molva* with *Calanus*, *Pseudocalanus*, *Paracalanus* and *Podon*. *Merluccius merluccius* with *Pseudocalanus*, *Trachinus vipera* chiefly *Temora*, especially the nauplii and young copepodid stages, *Podon*, eggs

(copepod ?) and *Pseudocalanus*. *Trigla gurnardus* chiefly with *Pseudocalanus* and *Paracalanus*, an occasional *Temora*, *Calanus*, *Podon* and copepod nauplii. Decapod larvæ including a crab zoëa occurred twice in *Trigla* and remains of fish once. *Blennius* sp. contained copepod remains, *Podon* and copepod eggs. *Rhombus maximus* with *Podon*, and *Calanus* nauplii, *Rhombus lævis* with young *Temora* and nauplii and other copepod nauplii. *Pleuronectes limanda* with *Temora* and *Pseudocalanus*, adolescent stages from the Cattewater with chiefly *Calanus*, also harpacticids, *Acartia*, larval decapods including *Gebia* and crab zoëæ and once the remains of a fish. One *Pleuronectes flesus* from the Cattewater, 30 mm., contained crustacea remains. *Pleuronectes microcephalus* contained *Temora* nauplii, *Arnoglossus* sp. no food, *Scophthalmus norvegicus* chiefly *Acartia*, a fair number of *Pseudocalanus*, *Oithona*, copepod nauplii (chiefly *Temora* and *Calanus*) an occasional *Paracalanus* and *Metridia*. *Ammodytes laceolatus* contained *Acartia*, *Pseudocalanus*, *Paracalanus* and eggs (copepod ?).

In the tow-nets *Pseudocalanus* was abundant at times, but sometimes not present at all. *Calanus* was common throughout the month, *Temora* and *Acartia* also common, *Paracalanus* not uncommon, *Podon* very common, *Evadne* common at times; *Balanus* nauplii reappeared this month. Decapod larvæ abounded but were only rarely taken by the fish. Mollusk larvæ fairly common.

AUGUST.

In August nearly all the fish were from the Young Fish Trawl. The few Sprat present contained no food, Pilchard chiefly no food but a few copepod nauplii and eggs. Young *Labrus (bergylla* type) were much less abundant and still containing *Temora*, *Pseudocalanus* and *Podon*. Adolescent stages from Cawsand containing harpacticids, and adolescent *L. mixtus* containing remains of decapods and harpacticids. Adolescent *Crenilabrus melops* contained young amphipods and harpacticids. *Ctenolabrus rupestris* contained young *Temora*, *Temora* nauplii and other copepod nauplii, whilst the adolescent stages contained remains of decapods, amphipods and harpacticids. All these adolescent labrids came from Cawsand Bay, where they were feeding on the commonest crustacean food. *Caranx trachurus* were eating chiefly *Temora* nauplii, *Pseudocalanus* and *Podon* with a few *Paracalanus*, *Centropages*, *Coryceus*, *Halosphæra* and *Coscinodiscus*. *Scomber* chiefly with copepod nauplii, especially *Calanus* and *Temora*, and a good many *Podon*, eggs (copepod ?) were also present and some fish remains. *Trachinus vipera* chiefly with *Temora*, but also with *Pseudocalanus*, *Podon* and *Evadne*. Adolescent stages from Cawsand with mysids, *Crangon* and amphipods which abound in the water where they feed. *Trigla gurnardus* chiefly with

Pseudocalanus, also *Calanus* nauplii, *Paracalanus*, euphausiid larvæ and a crab zcæa. The young gobies and *Callionymus* with various copepods, adolescent stages of *Gobius minutus* with harpacticids and larval decapods, of *G. pictus* with amphipods decapod larvæ and annelids, of *G. Ruthensparri* with many larval gastropods and bivalves, *Pseudocalanus* and decapod larvæ, of *Crystallogobius* with *Temora* and other copepods. Adolescent stages of *Callionymus* with small *Pecten opercularis*, *Montacuta* (?), *Nucula*, *Lacuna* and *Modiolaria*, also amphipods, harpacticids and decapod larvæ including crab megalopæ. *Lepadogaster Candolli* with *Pseudocalanus*, *Podon*, *Evadne* and copepod nauplii (*Temora* and others); *L. bimaculatus*, which occurs in the deeper water, almost entirely with *Temora*, *Rhombus maximus* with euphausiid larvæ, *R.* with eggs (copepod?). *Pleuronectes limanda*, adolescent, with harpacticids. *Arnoglossus*—no food except two which contained *Pseudocalanus*. *Scophthalmus norvegicus* with chiefly *Acartia*, also *Pseudocalanus*, *Calanus*, *Paracalanus*, *Podon*, the nauplius of *Temora*, and eggs (copepod?). *Gadus merlangus* with chiefly *Calanus*, also *Pseudocalanus* and *Acartia*, whilst one adolescent stage contained *Calanus*. Adolescent stages of *Gadus pollachius* from Cawsand chiefly with fish remains amongst which were *Gobius Ruthensparri*, which occur there in great numbers, and *Labrus* sp., also decapods. Adolescent stages of *Gadus minutus* from Cawsand chiefly with decapod remains (*Pandalus*, *Leander*, *Crangon*, *Eupagurus*) and copepod remains (*Calanus*, *Temora* and others), also *Podon*. *Merluccius merluccius* with *Calanus* only. *Ammodytes lanceolatus* with *Paracalanus*, *Pseudocalanus* and, once, a *Temora*. *Spinachia vulgaris* from Cawsand with *Pandalus*, *Crangon* and other decapod remains.

The tow-nets contained an enormous number of larval mollusks and the pteropod *Limacina*. The latter was not eaten so far as was observed, but *Gobius Ruthensparri* had eaten a large quantity of larval gastropods, and *Callionymus* had eaten many of the fully formed mollusks. *Calanus* and *Temora* were abundant, *Acartia* very common, *Pseudocalanus* and *Calanus* not so common, *Anomalocera Pattersoni* occurred fairly often and was eaten by *Gadus minutus*. *Podon* was still present in numbers and was eaten by several fish. Larval decapods abounded and formed the food of several of the adolescent fish, the smaller fish still keeping almost entirely to the copepods and *Podon*.

SEPTEMBER.

In September many of the fish were caught in midnight hauls, Sept. 8th and 9th; a good many also were adolescent stages from Cawsand. None of the Pilchards examined contained any food. One adolescent *Labrus bergylla* contained harpacticids; adolescent *Crenilabrus melops* contained amphipods and harpacticids, and adolescent *Ctenolabrus*

rupestris contained amphipods, decapods and copepods. *Mullus surmuletus* with amphipod and harpacticid remains. *Caranx trachurus* with *Centropages typicus*, *Calanus*, *Acartia*, *Pseudocalanus*, *Temora*, *Coryceus*, *Oithona*, *Podon* and eggs (copepod ?), whilst the adolescent stages contained chiefly larval gastropods. Adolescent *Trachinus vipera* with *Crangon*, mysids and amphipods. A *Trigla gurnardus* from a midnight haul, 22 mm., and a *Trigla* sp., 15 mm., both contained *Calanus*. The *Gobius* species and *Crystallogobius* contained various copepods, but these and *Callionymus* were not specially examined. *Rhombus maximus* contained larval gastropods, *Pseudocalanus* and a *Calanus*, one adolescent specimen containing a *Callionymus*. Adolescent stages of *Pleuronectes limanda* with amphipods, cumaceids, larval gastropods and bivalves and harpacticids. *Pleuronectes microcephalus*, midnight haul, with no food. Adolescent stages of *Pleuronectes platessa* with remains of amphipods, annelids, cumaceids and a *Solen*. *Arnoglossus laterna*, adolescent stages, with remains of amphipods, mysids, *Crangon vulgaris* and *trispinosus*, *Leander*, *Pandalus*, *Calanus*, *Centropages* and harpacticids. Smaller specimens of *Arnoglossus* with no food. Adolescent stages of *Gadus merlangus* with *Temora*, *Calanus* and remains of decapod larvæ, of *Gadus luscus* with *Acartia*, *Labidocera Wollastoni* and the larva of *Eupagurus*, of *Gadus minutus* with *Calanus*, *Temora*, *Candacia*, *Pseudocalanus*, *Labidocera*, decapod larvæ including *Leander*, *Crangon*, *Eupagurus* larva and mysids. *Raniceps raninus* with *Calanus*. Adolescent *Ammodytes tobianus* from Whitsand Bay with larval gastropods, larval decapods, *Centropages*, *Acartia*, *Oithona* and other copepods. Post-larval *Ammodytes lanceolatus* with *Pseudocalanus*.

The tow-nets again contained large quantities of larval gastropods and bivalves, and also *Limacina*. The larval gastropods were eaten in numbers by the adolescent *Caranx trachurus* and *Pleuronectes limanda*, also by young *Rhombus maximus*. *Acartia* and *Calanus* were the commonest copepods eaten by many of the fish, *Temora* fairly common, *Pseudocalanus* usually present but not very abundant, *Centropages typicus* fairly common, eaten by *Caranx trachurus* and adolescent *Arnoglossus laterna*; *Oithona similis*, *Candacia armata* and *Podon* occurred sparingly, *Oithona* and *Podon* eaten by *Caranx*, *Candacia* eaten by *Gadus minutus*.

The young fish were not collected after September.

CLUPEIDÆ.

CLUPEA SPRATTUS L. SPRAT.

One hundred and twenty-two specimens, 2-22 mm. in length, were examined from the tow-nets February to June. Towards the end of March the newly hatched Sprats brought in from the tow-nets were too

numerous to count, and a large number of eggs of the same species were also brought in. The first young were seen on February 4th, 2 mm. in length, but these contained no food. Out of 122 specimens 116, ranging from 2 to 22 mm., contained no food; 3 contained green food remains; 1 of 15 mm. contained 18 *Pseudocalanus*; 1 of 22 mm., May 16th, contained 2 *Pseudocalanus*; 1 of 20 mm., May 13th, contained an harpacticid and an egg (copepod?).

Other records are the following:—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	1	2	16-18	No food.
	56	4	19-23	„
C	Cawsand, July 2	1	55	<i>Porcellana</i> larva and copepod remains.

Previous records show many of the very young with green food remains inside, many empty, a few with unicellular organisms and a few with copepods. One of 8 mm. in July contained two *Temora* nauplii, while larger specimens, 27 and 32 mm., contained *Pseudocalanus*, *Balanus* cypris larvæ and larval gastropods. It is evident that the Sprat at an early age eats small copepods in the nauplius stage and adult copepods only a little later.

CLUPEA PILCHARDUS WALB. PILCHARD.

Two hundred and seventy-one Pilchards were examined, chiefly from the Young Fish Trawl, but very few contained any food.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	2	3	15-18	Eggs (copepod?).
		1	18	Copepod remains.
		64	12-25	No food.
	3	2	15-19	<i>Pseudocalanus</i> .
		1	13	Remains of copepod nauplius.
		1	20	Remains of small crustacea, probably copepods.
		8	13-19	No food.
	4	1	20	<i>Calanus</i> nauplius.
		2	14-19	No food.
	13	1	14	Young <i>Acartia</i> .
		1	14	<i>Oithona similis</i> .
		18	13-24	No food.
	31	2	12-19	Copepod nauplii.
		6	11-14	No food.

Net.	Haul.	No. of Individuals.	Length. in mm.	Food.
	38	27	10-23	No food.
	39	11	9-15	"
	40	3	10-21	"
	42	4	13-24	"
	43	4	13-22.5	"
	44	14	11-18	"
	45	10	10-20	"
	46	23	9-24	"
		1	22	Copepod nauplius three eggs (copepod ?).
		1	22	Egg (copepod ?).
	47	21	12-22	No food.
	48	2	14-15	"
	56	3	16-22	"
D	Cawsand Bay, Aug. 20	3	20-23	"
D	Rame Head, N.N.W., Mewstone, E.N.E., Aug. 21	13	19-22	"
F		8	17-21	"
B	7	2	20	"
	Coarse Tow-net, Eddy- stone-Looe, July 14	3	15-21	"
	Coarse Tow-net outside Breakwater, July 22	2	19-20	"
	Coarse Tow-net on Young Fish Trawl, July 21	2	18-22	"
	Coarse Tow-net, Polperro- Looe Is., July 25	1	18	"

Thus out of 271 specimens ranging from 9 to 25 mm. only 13 contained any food. In 3 cases the food consisted of 1 egg each (probably copepod); in 3 cases definite copepods, *Pseudocalanus*, *Acartia* and *Oithona*; in 4 cases copepod nauplii; in 1 case copepod remains not identifiable; and in 1 case crustacea remains, probably copepod.

Previous records show 1 out of 13 to have food inside, and that a copepod. Thus in every case when food occurred it consisted of copepods in some form (taking the eggs to belong to a copepod).

CLUPEA HARENGUS L. HERRING.

One thousand and thirty-two young Herring, 8-15 mm. in length, were examined from the tow-nets from inside and outside the Breakwater in January and February; 725 of these contained no food.

Out of 198, Jan. 13th, 10 (8-11 mm.) contained larval gastropods, 6 also contained larval bivalves, 2 also copepod nauplii, 3 also young copepods, and 2 also *Tintinnopsis* sp.; 6 contained *Pseudocalanus*, 3 contained larval bivalves, 2 contained young *Coryceus*, 1 a *Balanus* nauplius, 1 a copepod nauplius and 1 a *Coscinodiscus* sp.

Out of 358, Jan. 17th, 36 (7-12 mm.) contained larval gastropods and 1 also contained a *Pseudocalanus*; 5 contained only *Pseudocalanus*, 1 a young *Coryceus*, 2 a larval bivalve and 1 an harpacticid.

Out of 25, Jan. 21st, (9-16 mm.), 4 contained larval gastropods, 1 also a *Pseudocalanus* and 2 (10.5-16 mm.) contained only *Pseudocalanus*.

Out of 20, Jan. 24th (9-11 mm.), 1 contained a larval gastropod, 1 (10 mm.) an *Oithona similis*, 1 (9 mm.) a *Pseudocalanus*, and 4 copepod nauplii, and 1 (11 mm.) a *Pseudocalanus* only.

Out of 11, Jan. 27th, 1 (11 mm.) contained copepod remains.

Out of 5, Jan. 29th, 1 (10 mm.) contained a *Pseudocalanus*.

Out of 5, Jan. 31st, 2 (10-11 mm.) contained *Pseudocalanus*.

Out of 16, Feb. 4th, 2 (11 mm.) contained *Pseudocalanus*.

Out of 6, Feb. 6th, 1 (12 mm.) contained a larval gastropod and 1 (12 mm.) a *Paracalanus* and an *Acartia*.

Out of 10, Feb. 7th, 1 (8.5 mm.) contained a *Balanus* nauplius.

Out of 11, Feb. 12th, 4 (11-13 mm.) contained *Pseudocalanus* and 1 contained copepod remains.

Out of 3, Feb. 18th, 1 (11 mm.) contained a *Balanus* nauplius.

Out of 7, Feb. 20th, 1 contained an egg (copepod). None of the others contained food.

Larval gastropods occur most frequently as food of the young Herring, being present in 176 altogether from 8-12 mm. Larval bivalves occur in 10 (7-11 mm.), *Pseudocalanus* occurs in 29 (8.5-16 mm.), *Coryceus* in 2 (9-10.5 mm.), *Paracalanus* in 1. Young copepods occur in 4, copepod nauplii in 2, *Tintinnopsis* sp. in 3, *Coscinodiscus* sp. in 1, *Balanus* nauplii in 1. Therefore larval gastropods are much the commonest, small copepods coming next. The yolk sac was still present in many of the specimens up to 9 mm., but, as before, it was found that food may be taken at 7 mm., even when the yolk sac is present.

Previous records agree in the large number without any food inside, green food remains sometimes being found in the very smallest, with occasional diatoms, afterwards larval gastropods and bivalves, copepod nauplii and small adult copepods, *Balanus* nauplii also being taken fairly frequently. In 1917 some of the young Herring contained sand grains, and some contained various unicellular organisms, diatoms, Peridinians and, probably, *Halosphaera*. As noticed before, our own records agree with those of H. A. Myer (1880) with artificially reared Herring, which

first contained greenish matter; later on larval mollusks, copepods and nauplii, the copepod diet increasing as the fish grew.

Thus all the three common Clupeoids, Herring, Sprat and Pilchard, feed on small copepods when they reach a certain size, the Herring specially liking larval mollusks when very small.

ANGUILLIDÆ.

ANGUILLA VULGARIS L. EEL.

One specimen in a tow-net from the region of the Panther, Feb. 4th, 76 mm. long, contained no food.

GADIDÆ.

GADUS MERLANGUS L. WHITING.

One hundred and eighty-nine Whiting were examined from the tow-nets, from inside and outside the Breakwater, April 3rd to July 1st, 3-17 mm. long. Sixty-six contained no food, 49 contained *Pseudocalanus*, 13 contained indistinguishable copepod remains, 15 contained copepod nauplii, 2 contained green food remains, 2 contained eggs (copepod?), 2 contained larval mollusks, 4 contained *Temora* (all young except 1) and 1 a *Temora* nauplius. Nine contained *Acartia*, 1 contained *Paracalanus*, 1 an harpacticid, 1 a *Centropages typicus*, 1 a *Balanus* nauplius and 1 a zoëa of *Carcinus mœnas* (in the mouth). Sixteen contained *Calanus*, but all but one of these were in the mouth, having probably been taken after capture. The largest (17 mm.) contained *Pseudocalanus*. The Trematode *Derogenes varicus* occurred in 3, and *Pharyngora bacillaris* in 1.

The following records are from the other nets:—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.	
A	1	1	6	2 <i>Temora</i> nauplii.	
		1	8	2 <i>Pseudocalanus</i> , 2 <i>Carcinus mœnas</i> zoëæ (in mouth).	
		1	9	No food.	
	2	1	12	3 <i>Pseudocalanus</i> , 2 eggs (copepod?).	
		1	17	2 <i>Calanus</i> .	
	4		6	8-14	<i>Pseudocalanus</i> .
			2	8-9	<i>Pseudocalanus</i> and copepod nauplii.
		1	7	<i>Pseudocalanus</i> and <i>Calanus</i> nauplii.	
		1	3		

Net.	Haul.	No. of Individuals.	Length. in mm.	Food.
		1	14	<i>Pseudocalanus</i> and <i>Calanus</i> .
		1	17	<i>Pseudocalanus</i> and eggs (copepod ?).
		1	7	Remains of copepod nauplii.
	6	1	8	Copepod remains.
		1	11	No food.
		1	11	<i>Pseudocalanus</i> .
		1	12.5	2 <i>Podon</i> , 2 <i>Oithona</i> , 8 eggs (copepod).
	7	1	11	3 <i>Podon</i> , 3 <i>Acartia</i> , 1 <i>Pseudocalanus</i> .
		1	11	Copepod remains.
	8	2	6.5-9	<i>Pseudocalanus</i> .
		1	7	2 <i>Temora</i> nauplii.
	9	1	9	No food.
		1	7	Copepod remains.
		1	8.5	1 <i>Acartia</i> .
		1	10	1 <i>Calanus</i> .
		1	10	1 <i>Podon</i> , 3 <i>Acartia</i> , remains of young copepods.
		1	10 ca	<i>Pseudocalanus</i> .
		1	11	2 <i>Pseudocalanus</i> , 3 <i>Calanus</i> nauplii.
	11	3	6-7.5	No food.
		3	7-7.5	<i>Pseudocalanus</i> .
		1	9	2 <i>Acartia</i> , 1 egg (copepod ?).
		1	10	Copepod remains.
		2	10.5	<i>Temora</i> nauplii.
		1	11	<i>Calanus</i> (in mouth).
	12	3	5.5-7	No food.
		1	9	4 <i>Pseudocalanus</i> .
		1	5	2 <i>Pseudocalanus</i> , 1 <i>Calanus</i> nauplius.
		1	10.5	3 <i>Paracalanus</i> .
		1	6	Remains of copepod nauplii.
		2	9	Remains of young <i>Temora</i> .
		1	7	2 young <i>Temora</i> , 2 <i>Temora</i> nauplii.
		1	7.5	Copepod remains.
	13	1	7	No food.
		1	6	2 <i>Paracalanus</i> .
		1	9	3 <i>Pseudocalanus</i> .

Net.	Haul.	No. of Individuals.	Length. in mm.	Food.
		1	9	Copepod remains.
		1	10	1 young <i>Temora</i> , 1 <i>Paracalanus</i>
		1	11	2 <i>Acartia</i> , 1 <i>Temora</i> .
		1	13	2 <i>Temora</i> , 2 <i>Paracalanus</i> .
	19	1	13	1 <i>Pseudocalanus</i> , 2 <i>Acartia</i> , 1 <i>Oithona</i> .
	28	1	6	1 <i>Acartia</i> .
		1	7	No food.
		1	8	3 <i>Temora</i> , nauplii, 1 <i>Acartia</i> , 1 young <i>Pseudocalanus</i> .
		1	9	3 <i>Pseudocalanus</i> , 1 young <i>Acartia</i> .
		1	9	5 <i>Pseudocalanus</i> .
	29	1	12	Egg (copepod ?).
	32	1	20	No food.
		4	22-40	<i>Calanus</i> .
	33	1	8	1 <i>Pseudocalanus</i> .
	34	1	7	No food.
	35	2	5-6	"
		1	7	3 <i>Acartia</i> .
		1	7.5	Copepod remains.
		1	13	5 <i>Pseudocalanus</i> , 1 <i>Calanus</i> .
Coarse Tow-net, Rame Head N.E., Mewstone E. $\frac{1}{2}$ S., July 21				
E Rame Head N.N.W. Mewstone E.N.E. bottom, Aug. 21		1	36	9 <i>Calanus</i> .
B	20	1	65	Copepods, chiefly <i>Temora</i> .
	21	1	70	No food.
	24	1	82	Remains of mysids.
	27	2	67	<i>Calanus</i> and remains of deca- pod larvæ.
	31	3	78-80	No food.
C Cawsand, July 2		4	38	Copepod and <i>Podon</i> remains.
		1	45	Remains of <i>Hippolyte</i> (cf. <i>varians</i>), <i>Temora</i> , <i>Calanus</i> , harpacticids.
		1	48	<i>Podon</i> , <i>Calanus</i> .
		1	50	<i>Calanus</i> , <i>Temora</i> , <i>Hippolyte</i> .

One from the Young Fish Trawl, July 7th, 12 mm., contained the Trematode *Derogenes varicus*.

It is thus seen that, as before, the favourite food is copepods, and the copepod most frequently eaten is *Pseudocalanus*. As before noticed, *Calanus* is taken fairly often by those of 9 mm. and upwards, and it is often seized after capture, being in the mouth when examined. It is usually towards the middle of May and after that *Calanus* is taken, a fact coinciding with the usual rarity of *Pseudocalanus* at those times. Experimental feeding has shown that the Whiting prefers *Pseudocalanus* and *Acartia*, which are taken before *Calanus*, *Calanus* in its turn being preferred to *Temora*. Larger specimens, 22-75 mm., have been shown to eat fish.

GADUS LUSCUS L. POUTING.

Fourteen specimens from the tow-nets, from inside and outside the Breakwater were examined, February-May, 2.5-10 mm. Only 2 contained any food (6.5-7 mm.), both containing *Pseudocalanus*. One of 23 mm. caught in a hand net outside Chelson Meadow in the Laira, May 15th, contained remains of crustacea.

The following records are from the other nets :—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	11	1	8	Copepod remains.
	73	1	14	" "
		1	14	2 <i>Pseudocalanus</i> .
		3	11-13	No food.
	B	31	1	15
2			40-43	Copepod remains.
1			33	Many <i>Acartia</i> .
C	Cawsand, July 7	1	37	1 <i>Eupagurus</i> larva, 1 <i>Labidocera Wollastoni</i> .
		1	43	Many <i>Podon</i> , harpacticids, <i>Temora</i> , <i>Calanus</i> .
		1	53	Harpacticids, <i>Calanus</i> , <i>Temora</i> .

Previous records show green food remains, unicellular organisms and copepod nauplii in the smallest specimens. At 4 mm. *Pseudocalanus* is taken, this again being the favourite food, other copepods eaten being *Calanus*, *Acartia* and *Candacia*.

GADUS POLLACHIUS L. POLLACK.

One specimen from the coarse tow-net, near the Breakwater, May 20th, 13 mm., contained 1 young *Calanus*, 2 *Acartia* and 1 *Podon*.

The remainder examined were adolescent stages.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.	
B	4	1	60	53 larval gastropods, indistinguishable food remains.	
		5	2	113-114	No food.
	Cattewater, June 20	5	2	97	Remains of fish and decapods.
			1	76	1 <i>Hippolyte</i> .
			1	95	Decapod remains.
			24	75-115	Fish remains.
			1	91	Remains of <i>Labrus</i> .
			2	105-109	<i>Gobius Ruthensparri</i> .
			1	44	<i>Leander</i> larva, <i>Calanus</i> .
			1	45	<i>Calanus</i> , <i>Temora</i> , <i>Oithona</i> .
Cawsand, July 2	5	1	45	<i>Temora</i> , harpacticids	
		1	45	Crab zoëa, <i>Temora</i> , <i>Calanus</i> , harpacticids.	
		1	45	<i>Temora</i> , <i>Calanus</i> .	
		1	45	Crab megalopa, <i>Calanus</i> , <i>Temora</i> , harpacticids.	
		1	50	<i>Podon</i> , amphipods, crab zoëæ, <i>Temora</i> .	
		1	44	<i>Leander</i> , <i>Calanus</i> .	
		1	45	<i>Calanus</i> , <i>Temora</i> , <i>Oithona</i> .	
		1	45	<i>Temora</i> , harpacticids.	
		1	45	Crab zoëa, <i>Temora</i> , <i>Calanus</i> , harpacticids.	
		1	45	<i>Temora</i> , <i>Calanus</i> .	
1	45	Crab megalopa, <i>Calanus</i> , <i>Temora</i> , harpacticids.			

Previous records show that the young Pollack from 5.5 to 25 mm. eat chiefly copepods, the favourite again being *Pseudocalanus*, *Calanus* coming next. Apparently up to about 25 mm. or more copepods are almost exclusively eaten; between 40 and 70 mm., copepods, larval decapods and larval mollusks; after that fish seem to form the chief food.

GADUS MINUTUS O. F. MÜLLER. BIB (POOR COD).

Four specimens were examined from the tow-nets in May, from inside and outside the Breakwater, 6-13 mm. One contained no food, 2 contained copepod remains and 1, 13 mm., contained a *Pseudocalanus* and a young *Temora*.

The remainder were adolescent stages :—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	56	1	40	<i>Crystallogobius</i> , many <i>Podon</i> , <i>Calanus</i> , <i>Temora</i> , remains of decapod larvæ.
	64	1	75	<i>Temora</i> .
		1	72	<i>Temora</i> , <i>Candacia</i> , decapod larvæ remains.
		1	51	<i>Temora</i> , decapod larvæ re- mains.
	72	1	64	Many <i>Acartia</i> .
		5	83-160	Decapod remains (<i>Leander</i> ?).
	73	5	69-110	<i>Crangon</i> remains.
	81	1	82	Many <i>Eupagurus</i> larvæ, <i>Calanus</i> .
		1	135	1 <i>Labidocera Wollastoni</i> , many <i>Calanus</i> .
		1	143	4 <i>Crystallogobius</i> , mysids, many <i>Calanus</i> .
B		3	97-105	<i>Pandalus Montagui</i> .
		3	90-102	Decapod remains.
		19	73-105	Indistinguishable.
	11	1	60	Crustacea remains.
	15	1	70	<i>Candacia</i> , <i>Temora</i> , decapod larvæ.
		1	78	Copepod remains, decapod larvæ, young amphipods and isopods.
	17	3	80-85	Copepod remains.
		1	80	No food.
		1	75	Many <i>Calanus</i> .
		1	85	<i>Calanus</i> , <i>Pseudocalanus</i> .
		1	95	Copepod and annelid remains.
	26	1	85	Many <i>Calanus</i> , decapod larvæ, <i>Candacia</i> .
	27	1	86	Copepod remains.
		1	92	Many <i>Calanus</i> , decapod larvæ remains.
		1	76	Many <i>Calanus</i> .

Previous records of young Bib from 6-14 mm. show *Pseudocalanus* as the favourite food. It is here shown that the food of the adolescent stages, from 40 to 160 mm., is chiefly crustacea—copepods, especially

Calanus and *Temora*, *Podon*, decapods and their larvæ, and, in a few cases, remains of fish (*Crystallogobius*). Only 2 out of 32 contained fish, crustacea being eaten more by the Bib than by the Pollack at this size.

The interesting fact is apparent that all the *Gadus* species common in this district—Whiting, Pollack, Bib and Pouting, in their young stages, eat *Pseudocalanus* more than anything else, *Acartia* and other small copepods also being taken, probably when *Pseudocalanus* is not so abundant. *Calanus* is taken by the larger but rarely by the smaller fish. Both *Temora* and *Calanus* are taken by the adolescent stages, which also eat the larger decapod larvæ, small amphipod, and other crustacea. So far as has been observed all but the Pouting may eat fish in the adolescent stages. This seems to be habitual in the Pollack, which will also take crustacea along with the fish, common in the Whiting, which can eat fish at 22 mm., but also eats many crustacea, and rare in the Bib, which occasionally eats *Crystallogobius*, but more often has been found to have eaten crustacea.

MOLVA MOLVA L. LING.

Ten specimens from the Young Fish Trawl were examined :—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	4	1	6	6 Copepod nauplii.
		1	ca 12	5 <i>Pseudocalanus</i> . [food.
	8 12	1	15	Kept alive, died in 2 days, no
		1	15	No food. [pod remains.
		1	11.5	2 <i>Pseudocalanus</i> , other cope-
		2	13-17	<i>Calanus</i> .
		1	10	4 <i>Paracalanus</i> .
		1	12	1 <i>Calanus</i> , 1 <i>Paracalanus</i> .
		1	15 ca	<i>Calanus</i> , <i>Podon</i> .

Again *Calanus* and *Pseudocalanus* are eaten and also *Paracalanus*. There are too few specimens to judge which is the favourite.

MERLUCCIUS MERLUCCIUS. HAKE.

Twelve specimens were examined from the Young Fish Trawl :—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	28	1	5.5	<i>Pseudocalanus</i> .
	44	1	5	<i>Calanus</i> nauplii.
	47	1	13	<i>Calanus</i> remains.
	63	1	9.5	„ „
	64	4	8 ca-10	„ „
	66	2	7-8	„ „
		1	11	No food.
	69	1	10	<i>Calanus</i> remains.

From these few observations it seems likely that the young Hake, like the *Gadus* species, begins by taking *Pseudocalanus*, *Calanus* afterwards being frequently eaten.

RANICEPS RANINUS L. LESSER FORKBEARD.

One specimen from the Young Fish Trawl (Haul 67), 12 mm., contained remains of *Calanus*.

ONOS SP. ROCKLING.

These are probably *Onos mustela*, but the identification is not certain. Out of 6 from the tow-nets from inside and outside the Breakwater, May-July, 4-10 mm., 2 contained no food, 1 a young *Temora*, 1 a copepod nauplius, 1 copepod remains and 1 an egg (probably copepod).

The following are other records :—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	2	1	6	Egg (copepod ?).
		1	8	Larval gastropod.
	4	1	5.5	No food.
	13	1	6.5	1 <i>Acartia</i> , 5 copepod nauplii.

Previous records show *Pseudocalanus* and young *Temora* as food, also *Oithona* and other copepods. In captivity the young Rockling ate almost anything and specimens from the Cattewater (12-27 mm.) contained larval gastropods, harpacticids and larval decapods.

BOTHIDÆ.

ARNOGLOSSUS SP.

Very few of the young *Arnoglossus* contained any food :—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	47	2	10-11.5	<i>Pseudocalanus</i> .
		5	7-9.5	No food.
	58	1	15	<i>Pseudocalanus</i> .
		1	14	No food.
	1	2	9-11.5	„
	13	4	8-15	„
	14	1	7.5	„
	29	2	4.5-6	„
	31	7	8-21	„
	32	1	6	„

Net.	Haul.	No. of Individuals.	Length. in mm.	Food.
	33	2	5-5.5	No food.
	34	5	5-13	"
	35	4	5-16	"
	37	11	9-16	"
	38	7	5-9	"
	39	10	5-9	"
	40	1	8	"
	42	3	7-14.5	"
	43	6	7-17	"
	44	9	5-11	"
	46	4	11-19	"
	48	11	5-16	"
	54	1	10	"
	56	9	13-18	"
	57	1	7	"
	63	4	8-17	"
	64	6	6-9	"
	69	5	9-13	"
	70	10	10-19	"
	71	4	9-20	"
B	6	6	7-25	"
	12	6	17-24	"
	*17	4	90-100	Amphipod remains.
		1	96	No food.
		1	95	Remains of <i>Crangon</i> , <i>Leander</i> and amphipods.
		1	98	<i>Crangon</i> remains.
		2	100-105	Remains of amphipods and decapods.
		1	115	Remains of amphipods and mysids.
	21	3	42-105	<i>Crangon</i> remains.
	23	1	44	2 <i>Crangon trispinosus</i> .
	24	1	46	Mysid remains.
	25	1	95	<i>Crangon</i> remains.
	29	1	35	4 <i>Calanus</i> , 2 young amphi pods.
	30	1	92	1 <i>Pandalus</i> , 1 mysid, 2 amphi pods.
	1	1	100	Mysid and amphipod remains.
	31	1	24	Harpacticids.

Net.	Haul.	No. of Individuals.	Length. in mm.	Food.
		1	26	2 <i>Centropages typicus</i> , harpacticids.
		1	28.5	1 <i>Centropages typicus</i> .
		1	44	Mysid and amphipod remains.
		1	104	Young <i>Crangon vulgaris</i> , mysid and amphipod remains.

From * the adolescent stages all belong to *Arnoglossus laterna* and most of the younger forms are probably that species.

Previous records show an enormous number of empty fish, and when food is present it is nearly always *Pseudocalanus* or some other small copepod, or else unicellular organisms. It seems very probable that the usual food up to about 20 mm. or more is chiefly soft and unicellular, the remains of which would not be easily seen. At and after 24 mm. more copepods are eaten, often large species, and over 40 mm. larger crustacea-decapod larvæ, and adult *Crangon*, mysids and amphipods.

RHOMBUS MAXIMUS L. TURBOT.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	28	1	7	4 <i>Podon</i> , 1 <i>Calanus</i> nauplius.
	37	1	6	2 Euphausiid larvæ.
	57	1	8	7 larval gastropods, 1 <i>Pseudocalanus</i> , 1 <i>Calanus</i> nauplius.
B	23	1	98	1 <i>Callionymus lyra</i> .

The few records previously given show copepods (*Temora* and *Centropages*), *Balanus* nauplii and an amphipod *Apherusa* as food.

RHOMBUS LÆVIS RONDEL. BRILL.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	14	2	4-5	<i>Temora</i> nauplii.
		1	5	3 Calanoid nauplii, 1 <i>Temora</i> nauplius.
		1	5	8 Calanoid nauplii.
		1	5	1 young <i>Temora</i> , 3 <i>Temora</i> nauplii.
		1	5	1 egg (copepod?).
	17	1	4	Calanoid nauplii, remains of young copepod.
D	Rame Head, bearing N.N.W., 3 miles, Aug. 21	1	6	6 eggs (copepod?).

Previous records of Brill, 14–18 mm., show various copepods, *Podon*, decapod larvæ and larval mollusks. Those from about 25 mm. had eaten young fish.

SCOPHTHALMUS NORVEGICUS GUNTHER.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.	
A	3	1	9	2 <i>Pseudocalanus</i> 2 <i>Oithona</i> .	
		1	9	2 <i>Acartia</i> .	
	4	3	5.5–9	No food.	
		2	9	<i>Pseudocalanus</i> , <i>Acartia</i> .	
		3	8–9	<i>Pseudocalanus</i> .	
		1	5.5	<i>Calanus</i> nauplius, <i>Temora</i> nauplius.	
		1	5.5	<i>Calanus</i> nauplii.	
		1	6	1 <i>Oithona</i> , 1 <i>Calanus</i> nauplius.	
		1	6	1 <i>Pseudocalanus</i> , 1 <i>Oithona</i> , 1 young <i>Temora</i> , 1 <i>Calanus</i> nauplius.	
		1	7	2 <i>Oithona</i> , 1 young <i>Pseudocalanus</i> , 2 copepod nauplii.	
		1	9	2 copepod eggs.	
		1	9	3 <i>Pseudocalanus</i> , 1 <i>Calanus</i> .	
		1	9	3 <i>Acartia</i> .	
		1	9	1 <i>Calanus</i> , 2 <i>Acartia</i> , 1 <i>Pseudocalanus</i> , 3 young <i>Temora</i> .	
		13	1	4.5	No food.
			2	6.5	<i>Oithona</i> .
			3	6.5–7	Copepod remains.
	24		6.5–11	<i>Acartia</i> .	
	6		6.5–9	<i>Acartia</i> , <i>Oithona</i> .	
	1		6.5	<i>Pseudocalanus</i> , <i>Oithona</i> .	
	2		9–10	<i>Pseudocalanus</i> , <i>Acartia</i> .	
	4		7.5–9	<i>Paracalanus</i> , <i>Acartia</i> .	
	1		7	<i>Paracalanus</i> , <i>Oithona</i> .	
	1		7	5 <i>Acartia</i> , copepod nauplius.	
	1		6.5	1 <i>Oithona</i> , 1 <i>Temora</i> nauplius, 1 Calanoid nauplius.	
	1		7	1 <i>Temora</i> nauplius, 1 <i>Paracalanus</i> .	
	1	7.5	1 <i>Oithona</i> , 1 Calanoid nauplius.		
1	8	2 <i>Acartia</i> , 1 <i>Metridia</i> .			
1	8	7 <i>Acartia</i> , 1 <i>Oithona</i> , 1 egg (copepod ?).			

Net.	Haul.	No. of Individuals.	Length. in mm.	Food.
		1	8	2 <i>Oithona</i> , 1 <i>Acartia</i> , 1 copepod nauplius.
		1	10	1 <i>Calanus</i> , 6 <i>Acartia</i> , 1 <i>Podon</i> .
	28	1	6.5	No food.
	31	3	6-8.5	„
		3	8-9	<i>Acartia</i> .
		1	6	1 <i>Pseudocalanus</i> .
		1	8	1 <i>Pseudocalanus</i> , 1 <i>Temora</i> nauplius.
		1	8	Copepod remains.
	34	1	5	No food.
	47	1	8.5	<i>Pseudocalanus</i> remains, eggs (copepod ?).
Coarse Tow-net attached to dredge Eddystone-Looe, July 14		1	10	<i>Pseudocalanus</i> .
Medium Tow-net Penlee-Breakwater, July 15		1	4	<i>Temora</i> nauplius.

Comparing this with previous records we find much the same sort of food, but whereas from the 1914 material *Pseudocalanus* was the favourite food, *Acartia* is the favourite this year. It is evident that *Scophthalmus* prefers these two, but it is also fond of *Metridia*, which is larger, although it seldom takes *Temora*.

ZEUGOPTERUS PUNCTATUS (BL.).

On April 30th one specimen, 11 mm. long, was brought in alive from near the Breakwater and kept alive for several days. It was almost completely symmetrical and swimming upright, and fed on small copepods, chiefly *Temora* and *Acartia*. Another on May 9th, 6 mm., died the next day and did not feed. One, April 30th, from the Knap, 5 mm., contained one *Temora* nauplius, 3, May 4th and 16th, Penlee and Knap, 4-5 mm., contained no food.

Previous records show that copepods are chiefly eaten, *Temora* being the favourite.

PLEURONECTIDÆ.

PLEURONECTES PLATESSA L. PLAICE.

Two Plaice eggs occurred in the tow-nets, one from near the Breakwater, Feb. 4th, and one from the region of the Knap, Feb. 14th. Both hatched, and lived 14 and 12 days respectively. The second never ate,

but the first hatched on Feb. 6th, and on Feb. 10th the yolk sac was nearly gone and the fish was feeding on diatoms which were growing on the bottom of the jar, chiefly *Navicula* sp. *Nitzschia closterium* was also growing in the jar. After Feb. 11th the Plaice looked ill and died on Feb. 20th.

On March 20th a Plaice 13 mm. long and metamorphosed occurred in the tow-nets from within the Breakwater, but contained no food.

Adolescent stages occurred as follows :—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
B	20	3	105-120	Remains of amphipods and annelids.
		1	114	Remains of amphipods, annelids and harpacticids.
	23	1	111	Amphipod remains.
	24	1	97	Cumaceids, <i>Crangon</i> and amphipod remains.
		1	112	1 <i>Solen</i> , remains of annelids and amphipods.

PLEURONECTES LIMANDA L. DAB.

Sixteen specimens (5-12 mm.) from the tow-nets were examined, from inside and outside the Breakwater, April to June. Only two of these contained food, a *Temora* nauplius in one of 5 mm. and copepod remains in one of 12 mm. Other records are the following :—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	4	1	13	2 <i>Pseudocalanus</i> , 5 <i>Temora</i> .
B	5	4	35-54	Harpacticids with sand and foraminifera.
		18	1	35
	20	2	58-63	Young amphipods.
		1	58	Young amphipods, cumaceid.
	21	1	27	Many young amphipods, larval bivalve, cumaceids, harpacticids.
		1	29	Amphipods, harpacticids, larval bivalves, larval gastropods.
		1	32	Young amphipods, larval gastropods, harpacticids.
1		45	Larval gastropods, eggs (copepod ?).	

Net.	Haul.	No. of Individuals.	Length. in mm.	Food.
		1	48	No food.
		1	48	Amphipods, larval gastropods.
		1	65	Young amphipods.
	24	3	50-68	Young amphipods, cumaceids.
		1	48	3 cumaceids, remains of <i>Cran- gon</i> and amphipods.
		1	48	Young amphipods.
		1	50	Young amphipods, larval mol- lusks.
C	Cattewater, July 2	8	20-30	Harpacticids.
		3	40-45	Harpacticids, <i>Calanus</i> .
		2	40	<i>Calanus</i> , crab zoëa.
		1	40	<i>Calanus</i> , <i>Temora</i> .
		1	40	<i>Calanus</i> .
		1	40	<i>Podon</i> , <i>Calanus</i> , harpacticids, crab zoëa.
		1	40	<i>Podon</i> , <i>Calanus</i> , harpacticids, <i>Acartia</i> .
		1	40	<i>Calanus</i> , harpacticids, crab zoëa.
		1	45	Harpacticids, <i>Temora</i> , <i>Acartia</i> .
		1	60	<i>Gebia</i> larva, crab megalopa, <i>Calanus</i> , <i>Ammodytes</i> .

Previous records show the food of the Dab from 4 to 17 mm. to be *Podon* and various copepods, *Temora* being the commonest, harpacticids, chiefly *Euterpina*, also being very common. It is now shown that in those from 20-60 mm. the food is again very often harpacticids, amphipods, cumaceids, larval decapods (often crab zoëæ), larval mollusks (chiefly *Calanus*) and also fish being taken. Copepods are, however, still the commonest food.

PLEURONECTES FLEUSUS L. FLOUNDER.

From the tow-nets, Panther, May 13th, one of 10 mm. contained no food, 3 of 11 mm. on the same date were kept alive for some time and their feeding was interesting. When brought in there was a great deal of *Phaeocystis* in the jar, which was just at this time flourishing in great abundance in the Sound and interfering considerably with the tow-nets. The little Flounders were feeding on this and still continued to do so in the aquarium. They were perfectly transparent, with the eyes in the process of coming over, but not completely in the adult position. On May 15th as the *Phaeocystis* fouled the water, the water was changed

and fine plankton given to the fish, which continued to eat green stuff, probably *Phæocystis* spores, and ignored the crustacea. On May 17th the colour was changing and the eyes completely turned. The food was still minute green organisms. On May 20th complete metamorphosis had taken place. One copepod (*Temora*?) besides greenstuff was seen inside one specimen. On May 21st one died having a *Calanus* inside. The others were eating copepods, *Temora* and *Acartia*, the metamorphosis thus coinciding with change in diet. They still measure 11 mm. On May 27th some eggs of *Gobius* attached to a valve of *Cardium* were put into the aquarium, and feeding on these were some *Calma*, a nudibranch which eats *Gobius* eggs. The *Calma* had also laid eggs, and the Flounders were full of opaque food which was almost certainly the eggs of *Calma* which they must have eaten. These continued to eat small copepods until June 24th when they were killed.

On May 23rd a young Flounder, 9 mm. long and not yet metamorphosed, was caught in a tow-net in Chelson Meadow and kept alive in water $\frac{2}{3}$ fresh and $\frac{1}{3}$ salt, with some green freshwater weed in the aquarium. This Flounder was full of green food and ate minute food from fine plankton that was given to it. By June 15th it had metamorphosed and was eating small copepods.

In 1917 a Flounder of 10.5 mm. on May 31st was full of *Phæocystis*. Most of the others examined, not yet metamorphosed, contained no food, or else vegetable matter only. In one case diatoms were present (*Paralia* and *Fragillaria*).

Young metamorphosed Flounders occur habitually in large numbers up the rivers, their food being chiefly small crustacea.

It is thus shown that the usual food of the young Flounder up to about 11 mm., and before undergoing metamorphosis, is minute unicellular organisms, chiefly vegetable. After metamorphosis the diet apparently changes to copepods and other small crustacea.

PLEURONECTES MICROCEPHALUS DONOV. LEMON DAB.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	1	1	12	No food.
	4	2	9-11	<i>Temora</i> nauplii.
	15	1	8 ca	No food.
	26	1	11	2 <i>Temora</i> nauplii, 1 egg (copepod?).
	28	1	7	72 eggs (copepod?).
			1	8
	65	1	10	"
B	11	1	19	"

The last specimen contained the Trematode *Derogenes varicus*.

Previous records show many specimens with no food, and what there is consists chiefly of very small crustacea and unicellular organisms. It seems evident that the young *Pleuronectes microcephalus* is incapable of eating any large copepods and that its diet up to the time of metamorphosis consists of very small organisms, its food being more like that of the Flounder than of the Dab and Soles.

SOLEIDÆ.

SOLEA VULGARIS QUENSEL. COMMON SOLE.

From the tow-nets one, 4 mm., April 11th, West Channel, contained no food. Three, 9-11 mm., April 1st to June 1st, from inside and outside the Breakwater were kept alive for some time and ate copepods of various kinds.

Previous records show copepods (*Temora*, *Euterpina*, *Oncaea*) and *Balanus* larvæ as the principal food.

SOLEA VARIEGATA DONOV. THICKBACK.

From the tow-nets, 1 from New Grounds, April 5th, 4.5 mm., contained no food, 3 from Knap and Panther, April 30th, 7-8 mm., were kept alive, feeding on small copepods, but soon died.

Previous records show *Podon*, various harpacticids, *Temora*, *Balanus* larvæ and several other copepods as food of the post-larval Thickback.

SOLEA LASCARIS BONAP. SAND SOLE.

Three live specimens from Panther and Knap, 2 of 7 mm., 1 of 8 mm., put into a small aerated aquarium. These were all quite symmetrical, and fed on small copepods, chiefly *Temora* and *Acartia*, from which they selected the smallest. All died.

It has been shown (Lebour, 1917) that the food of the flat-fishes agrees naturally with the large-mouthed and small-mouthed forms, and that the former take in copepods almost as soon as they are hatched and the latter only take these at a later stage. To the wide-mouthed group belong the Turbot, Brill, species of *Solea*, the Dab and probably the Plaice, *Zeugopterus* and *Scophthalmus*; to the small-mouthed group belong the Flounder, *Arnoglossus* and *Pleuronectes microcephalus*. The Flounder certainly takes unicellular organisms up to about 11 mm., the other two probably do also. When copepods are taken by these they are always small, generally *Pseudocalanus* and *Acartia*, very seldom *Temora*, except in the nauplius or young copepodid stages. *Arnoglossus* has a decided preference for *Pseudocalanus*, even at a length of over 19 mm., and *Pleuronectes microcephalus* also seems to prefer *Pseudocalanus*. The wide-mouthed forms, however, do not all prefer the larger copepods, for whereas all the species of *Solea* examined, the Dab, Turbot, Brill and

Zeugopterus have a decided preference for *Temora*, most of these are also fond of the small harpacticid *Euterpina acutifrons*, and *Scophthalmus*, which can eat an adult copepod almost directly it is hatched, most certainly prefers *Acartia* and *Pseudocalanus* and very rarely takes *Temora*, although it likes *Metridia*.

Nearly all these wide-mouthed forms and also *Pleuronectes microcephalus* will take *Podon*, which seems to be much beloved by most young fish.

SERRANIDÆ.

MORONE LABRAX L.

Two specimens from the region of the Panther Buoy in May and June, 6 mm. One contained copepod remains, the other no food.

CARANGIDÆ.

CARANX TRACHURUS L. SCAD.

Ninety specimens, chiefly from the Young Fish Trawl were examined in August and September, ranging from to 4 to 65 mm. :—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	32	1	6	No food.
		1	8	Remains of <i>Temora</i> nauplius.
	44	7	4-6	No food.
		2	4.5-5	Copepod nauplii.
		1	5	Copepod remains.
		1	5	Egg (copepod ?).
		1	5	1 <i>Pseudecalanus</i> .
	45	2	7	Copepod remains.
	56	1	6	No food.
		3	8-9	<i>Temora</i> .
		6	6-7	Young <i>Temora</i> .
		2	6	Young <i>Temora</i> , eggs (copepod ?).
		1	6	1 young <i>Temora</i> , 1 young <i>Pseudocalanus</i> .
		1	7	3 young <i>Temora</i> , 2 <i>Calanus</i> nauplii
		1	7	1 <i>Temora</i> , 1 <i>Podon</i> , 1 egg (copepod ?).
	59	1	14	Copepod remains, eggs (copepod ?).
		1	24	1 <i>Calanus</i> , 1 <i>Acartia</i> , 1 <i>Podon</i> , eggs (copepod ?).
	60	1	15	No food.

Net.	Haul.	No. of Individuals.	Length. in mm.	Food.
		1	10	Many eggs (copepod ?).
		1	13	1 <i>Centropages typicus</i> , many eggs (copepod ?).
		1	13	1 <i>Centropages typicus</i> , 2 <i>Pseudo-</i> <i>docalanus</i> , many eggs (cope- pod ?).
	61	3	4.5-7	No food.
		1	9.5	3 <i>Acartia</i> .
		1	9.5	1 <i>Centropages typicus</i> , other copepod remains.
		1	25	1 <i>Centropages typicus</i> , 1 <i>Cal-</i> <i>anus</i> , several <i>Temora</i> and <i>Pseudocalanus</i> .
		2	8-11	No food.
	64	1	8	"
	70	1	10	3 <i>Temora</i> , 1 <i>Calanus</i> .
	71	1	35	Many <i>Acartia</i> , 1 <i>Coryceus</i> .
	72	1	11	4 <i>Pseudocalanus</i> .
		1	11.5	Copepod remains.
		1	14	1 <i>Oithona</i> , remains of <i>Pseudo-</i> <i>calanus</i> .
		1	16	Many <i>Acartia</i> .
	73	1	19	Remains of <i>Calanus</i> and <i>Podon</i> .
	74	1	33	No food.
		2	49-60	Larval gastropods.
	78	1	39	No food. [larva.
B	7	1	20	6 <i>Pseudocalanus</i> , 1 decapod
	22	1	35	Copepod and larval decapod remains.
	24	1	33	Larval gastropods.
	25	2	40-55	No food.
		4	47-48	Larval gastropods.
	27	1	45	Many <i>Calanus</i> .
		1	45	Copepod remains.
		1	50	Many <i>Acartia</i> .
F	Rame Head N.N.W., Mewstone E.N.E., Aug. 21	1	8.5	1 <i>Halosphæra viridis</i> , 1 <i>Cos-</i> <i>cinodiscus</i> sp., 2 <i>Paraca-</i> <i>lanus</i> .
		1	13	2 <i>Centropages typicus</i> , 2 <i>Podon</i> .
		1	17	3 <i>Coryceus anglicus</i> , 2 <i>Para-</i> <i>calanus</i> .

Copepods are certainly the commonest food of *Caranx* from the smallest size to the largest examined. A variety of copepods is taken including *Centropages typicus* and *Paracalanus parvus*, besides the commoner *Temora*, *Calanus*, *Pseudocalanus* and *Acartia*. This agrees with the few previous records. No special favourite is apparent, and crab zoëæ, *Porcellana* larvæ, *Podon*, and decapod larvæ are also occasionally taken and sometime larval gastropods in considerable quantities by the adolescent stages which seem to eat either copepods or mollusks. The occurrence of large numbers of larval gastropods in the tow-nets towards the middle of August and September shows that when available in masses they are eaten largely by this fish.

MULLIDÆ.

MULLUS SURMULETUS L. RED MULLET.

From B, haul 20, one of 58 mm. contained amphipod and decapod larvæ. One of 60 mm., haul 27, contained amphipod and harpacticid remains and one *Polystomella*.

AMMODYTIDÆ.

AMMODYTES TOBIANUS L. LESSER SAND EEL.

Sixty-nine specimens were examined from the tow-nets from inside and outside the Breakwater, Feb.-April, ranging from 4 to 9 mm. Fifty contained no food, 8 were kept alive and ate nothing but soon died, 10 contained green food remains and 1 a diatom (*Melosira*). One of 9 mm. contained indistinguishable crustacea remains.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	2	1	13	No food.
	59	1	9	"
B	11	1	120	Larval gastropods.
A	74	4	110-112	Larval gastropods, copepod remains.
		1	110	Larval gastropods, larval decapods, copepod remains.
	75	1	115	Several <i>Centropages typicus</i> , <i>Acartia</i> , <i>Oithona</i> , other copepod remains.
		1	140	Indistinguishable copepod remains.

The last specimen was full of a species of a Trematode, *Hemiurus* sp., occurring along with the food remains.

In previous records nearly all the young *Ammodytes tobianus* contained green food remains, 2 containing diatoms (*Coscinodiscus*) and 1 a copepod nauplius. The larger specimens, 19–21 mm., contained copepod remains, including *Pseudocalanus*.

AMMODYTES LANCEOLATUS LESAUV. LARGER LAUNCE.

Nearly all the specimens were from the Young Fish Trawl :—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	2	5	10–20	No food.
		1	14	Egg (copepod ?).
	3	4	14–15	No food.
		13	19	9–19.5
	6		9–11	Eggs (copepod ?).
	7	11–19	<i>Acartia</i> .	
	3	14–18	<i>Pseudocalanus</i> .	
	1	13	<i>Paracalanus</i> .	
	2	14–15	Copepod remains.	
	15	2	19–21	No food.
	16	2	10.5–14 ca	„
			1	16
	1	16.5	20 eggs (copepod ?).	
	1	17.5	1 <i>Paracalanus</i> .	
	14	18	1 <i>Pseudocalanus</i> , 1 <i>Paracalanus</i> .	
	24	1	7	Several eggs (copepod ?).
	56	13	12–21	Indistinguishable copepod remains.
			9	16–25
	1	24	<i>Pseudocalanus</i> , <i>Paracalanus</i> , <i>Temora</i> .	
	1	23	No food.	
1	20	2 <i>Pseudocalanus</i> , 2 <i>Paracalanus</i> .		
2	18–19	<i>Paracalanus</i> .		
58	3	12–21	Copepod remains.	
		1	18	2 <i>Pseudocalanus</i> .
60	2	14–18	<i>Pseudocalanus</i> .	
B	6	2	11–15	<i>Pseudocalanus</i> .
		1	17	No food.

Coarse Tow-net Rame,
N.W. $\frac{1}{2}$ N., Mewstone,
N.E. by E. $\frac{1}{2}$ E., Aug. 21

The specimens previously recorded as *lanceolatus* and 'probably *lanceolatus*' may have been the 2 species mixed together, as they undoubtedly occur together at times in the summer, although *lanceolatus* is the commoner in that season. As the specimens were not kept, it is difficult to say whether the 2 specimens (8-10 mm.) containing green food remains and *Rhizosolenia* were truly *lanceolatus* (Lebour, 1918, p. 456). As these new records show, eggs and copepods are commoner in the young *lanceolatus*, green food remains in *tobianus*.

CALLIONYMIDÆ.

CALLIONYMUS LYRA L. DRAGONET.

Forty specimens from the tow-nets, inside and outside the Breakwater, March to July, 2.5-8 mm., 11 contained no food, 8 were kept alive and were fed on miscellaneous small plankton, chiefly small copepods. The remainder all contained copepods. Four, 3-5 mm., contained *Pseudocalanus*, 4 contained *Temora* (1 an adult, 2 the young copepodid stages, and 1 a nauplius). One of 6 mm. contained *Calanus*.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	1	1	5	Copepod remains.
		1	9	4 <i>Pseudocalanus</i> , 1 <i>Paracalanus</i> , 3 <i>Podon</i> .
	2	1	5	5 copepod nauplii.
		1	6	1 <i>Acartia</i> .
	3	1	6	No food.
		1	6	1 <i>Temora</i> , 2 young <i>Temora</i> .
	4	8	6-9	No food.
			2	7
		3	6-8	<i>Calanus</i> nauplii.
		1	6	<i>Temora</i> nauplius.
		1	6	4 copepod nauplii, eggs (copepod ?).
		2	6-9	Copepod remains.
		1	3-5	No food.
Tow-nets Rame- stone, July 21	1	4	1 <i>Pseudocalanus</i> , 1 <i>Temora</i> nauplius.	
		1	5	6 <i>Temora</i> nauplii.
		1	5	2 <i>Temora</i> nauplii, 1 young <i>Temora</i> .
Coarse Tow-net, Penlee, July 23	2	8-9	Copepod remains.	
Coarse Tow-net, Rame- Penlee, July 23	1	9	4 <i>Podon</i> .	

A few adolescent and adult stages were examined from the Young Fish Trawl :—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
B	5	1	45	Sand and foraminifera.
		1	50	Harpacticids.
		1	58	2 <i>Pecten opercularis</i> , other shell remains.
		1	68	5 <i>Pecten opercularis</i> (ca 5-6 mm.), 1 <i>Montacuta?</i> 1 <i>Pandalus</i> .
C Cawsand, Aug. 27		1	35	Harpacticids.
		1	65	Amphipod remains, crab megalopa.
		1	68	Amphipod remains, <i>Pecten opercularis</i> , <i>Nucula</i> , <i>Lacuna</i> .
		1	70	Crustacea remains, <i>Modiolaria</i> .
Cawsand, Aug. 18		1	123	Decapod remains, <i>Pecten opercularis</i> .
		1	40	Young amphipods.
		1	40	Young amphipods, sand.
		1	45	Young amphipods, sand, shell remains.
		1	85	Copepod and shell remains.

The above records from the young stages agree with those of previous years, miscellaneous food, chiefly copepods of various kinds, being eaten. The adolescent stages often take mollusks, with amphipods, decapods and copepods.

LABRIDÆ

The food of the young labrids has been investigated for the last two years almost entirely on the form called *Labrus bergylla*, with a few specimens of *Ctenolabrus rupestris*. This year in addition to these the young of *Labrus mixtus* has been examined, and also adolescent stages of all three, and also of *Crenilabrus melops*, which are all common in Cawsand Bay, feeding among the *Zostera*.

LABRUS SP. (BERGYLTA TYPE).

Sixty were examined from the tow-nets, May to August, from the region of the Breakwater, Penlee, Rame, Mewstone and Eddystone, 3.5-12 mm. long. Of these 48 contained copepod nauplii (26 containing *Temora* nauplii clearly identified, most of the others probably being *Temora* and the rest *Calanus*). Thirteen contained young *Temora* and 1 an adult *Temora*; 3 contained *Pseudocalanus* and 1 an *Acartia*, 1 an *Oithona*, 1 harpacticids; 8 contained *Podon*, 2 contained *Balanus* nauplii and 1 a larval gastropod.

Net.	Haul.	No of Individuals.	Length in mm.	Food.	
A	1	1	7	1 <i>Podon</i> .	
		1	7	1 larval gastropod, 3 larval bivalves, 1 <i>Podon</i> , 1 <i>Paracalanus</i> .	
		1	7	2 <i>Podon</i> , 3 harpacticids, 1 larval bivalve.	
		1	7	2 <i>Podon</i> , 3 harpacticids, 1 larval bivalve.	
		3	5	Copepod remains.	
	13	4	2	6	<i>Temora</i> nauplii.
			1	6	No food.
			1	6	2 <i>Temora</i> nauplii, 1 copepod nauplius indet, 1 egg (copepod?).
			1	6.5	2 <i>Temora</i> nauplii, 2 Calanoid nauplii.
			1	8	5 young <i>Temora</i> , 1 <i>Oithona</i> .
B	54	1	8	8 young <i>Temora</i> .	
	5	1	37	Harpacticids, 1 <i>Polystomella</i> .	
	27	1	45	Harpacticids.	

Thus of these 81 specimens from all parts, the majority contained *Temora*, either in the young copepodid stages or as nauplii, chiefly as nauplii. Other small copepods, such as *Oithona* and *Acartia*, are also taken, *Podon*, *Balanus* nauplii and occasional larval mollusks. The investigations of the previous two years show the same preference for copepod nauplii, especially *Temora* and also its other young stages. Twenty-one out of 54 (16 containing no food) in 1918 contained *Temora*, and 20 out of 39 in 1917 contained copepod nauplii, chiefly *Temora*.

LABRUS MIXTUS L.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.		
A	1	1	10	6 <i>Podon</i> , 2 harpacticids.		
		1	10	3 <i>Podon</i> , 1 <i>Pseudocalanus</i> .		
		1	10	2 <i>Podon</i> , 2 <i>Pseudocalanus</i> , 1 <i>Paracalanus</i> .		
		1	11	4 <i>Podon</i> , 1 <i>Temora</i> , 1 <i>Temora</i> nauplius.		
		1	11	1 <i>Podon</i> , 2 <i>Temora</i> .		
		13	2	9-9.5	<i>Acartia</i> . [pod ?].	
			1	8	2 <i>Temora</i> nauplii, 1 egg (copepod nauplii, 1 egg (copepod ?)).	
			1	9	1 young <i>Temora</i> , 2 copepod nauplii, 1 egg (copepod ?).	
			1	9.5	1 copepod nauplius, other copepod remains.	
			1	10	1 <i>Oithona</i> .	
			1	12	1 euphausiid larva.	
			16	1	8	5 eggs (copepod ?).
		B	4	2	39-44	Many harpacticids, decapod remains.
5	1			37	No food.	

Labrus mixtus thus eats copepods, but more of the small adults than the nauplii.

CRENILABRUS MELOPS (L).

These were all adolescent stages.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
B	4	2	25-38	Harpacticids.
		4	30-35	Harpacticids and amphipods.
	5	1	22	Harpacticids and ostracods.
		1	23	No food.
	25	1	27	Young amphipods.
		1	33	Young amphipods, <i>Idotea</i> .
	27	1	33	Harpacticids.
		1	48	Amphipod remains.
		6	33-35	Amphipod and harpacticid remains.
	C Cawsand, Aug. 27		1	33
		1	35	Amphipod and harpacticid remains, <i>Polystomella</i> .

These 18 specimens show the ordinary food of these adolescent stages to be harpacticids and amphipods.

CTENOLABRUS RUPESTRIS (L).

Net.	Haul.	No. of Individuals.	Length in mm.	Food.	
A	2	1	10	2 <i>Podon</i> , 1 <i>Calanus</i> nauplius.	
	13	1	10	Copepod remains.	
		1	10	2 <i>Podon</i> , 4 <i>Temora</i> .	
		1	10	4 <i>Podon</i> , 1 <i>Temora</i> , other copepod remains.	
		2	8	Young <i>Temora</i> .	
	31	1	8	2 Calanoid nauplii, 2 <i>Temora</i> nauplii.	
		1	8	3 copepod nauplii.	
		1	8.5	2 <i>Calanus</i> nauplii.	
		1	9	No food.	
		32	1	7	"
			1	9	Copepod remains.
	43	1	9	Remains of young <i>Temora</i> , <i>Temora</i> nauplii.	
	B	4	6	30-37	Decapod remains (chiefly <i>Crangon</i>).
		5	1	34	Harpacticids. [nifera.
1			34	Decapod remains, forami-	
1			37	Harpacticids, 1 foram.	
2			36-37	Harpacticids.	
24		1	29	Young amphipods and harpacticids.	
		1	37	Remains of decapod larvæ, young amphipods and harpacticids.	
		1	33	Harpacticids.	
		27	1	29	Amphipod and copepod remains.
		1	33	Remains of decapods.	
	1	45	Amphipod remains.		
C Cawsand, Aug. 27	5	32-35	Amphipods.		
	2	31-32	Amphipods, harpacticids and decapod remains.		
	10	33-35	Harpacticids and amphipods.		
	1	32	Amphipods and decapod larvæ.		
	1	39	Amphipods, branched alga.		
	1	35	Remains of harpacticids and amphipods, <i>Polystomella</i> .		

It is thus evident that the food of *Ctenolabrus* consists of small copepods and *Podon* (*Temora* still being the favourite) in the smaller forms. In 1918 4 of 8-9 mm. were examined, 3 of which contained *Temora*. In the adolescent stages the food is amphipods and harpacticids with decapod larvæ.

All these young labrids seem to feed on much the same food: young copepods and *Podon* with occasional larval mollusks up to about 12 mm., *Temora* being the favourite food and *Temora* nauplii being specially frequent. Sizes between 12 and 28 mm. were seldom taken. After 28 mm. they eat chiefly amphipods and harpacticids with, less frequently, some decapod larvæ and isopods, all of which abound where the fish are feeding. An occasional *Polystomella* occurs inside the fish. These foraminifera are very common among the *Zostera* and are probably not taken in intentionally. In only one case a piece of alga was found inside a *Ctenolabrus*.

The food does not materially differ in young specimens from shallow or deeper water, *Temora*, usually in its larval state, being generally the commonest food at any depth where the fish are taken; this agreeing with records in former years.

TRACHINIDÆ.

TRACHINUS VIPERA C. AND V. LESSER WEEVER.

Most of the specimens were from the Young Fish Trawl:—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.		
A	2	1	5	No food.		
		1	5	Copepod remains.		
		1	6	2 <i>Podon</i> .		
	4	1	5	No food.		
		2	5	<i>Calanus</i> nauplii.		
	13	2	2	4.5-6	<i>Temora</i> nauplii.	
			1	4.5	1 <i>Temora</i> nauplius, 1 egg (copepod?).	
		5	5	5-6.5	Young <i>Temora</i> , <i>Temora</i> nau- pli.	
			1	6	Young <i>Temora</i> .	
			1	6	Young <i>Temora</i> , <i>Podon</i> .	
		16	2	2	6-6.5	Remains of copepod nauplii.
				1	7	3 <i>Temora</i> , 1 <i>Pseudocalanus</i> .
	1		1	5.5	1 <i>Podon</i> , 2 copepod nauplii.	
			1	6.5	1 <i>Podon</i> , 6 <i>Temora</i> nauplii, 2 eggs (copepod?).	
	32		2	5.5-7.5	<i>Temora</i> , eggs (copepod?).	
	1	6	No food.			

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
F	Rame N.N.W., Mew- stone E.N.E., Aug. 21	1	7	2 <i>Pseudocalanus</i> , 6 <i>Podon</i> , 1 <i>Evadne</i> .
B	20	1	78	No food.
	22	1	78	Remains of <i>Crangon</i> .
	24	1	63	Mysid remains.
		1	70	Young mysids.
		1	82	Amphipod remains.
		1	88	Copepod remains.
	25	2	68-70	Mysid remains.
		1	70	<i>Crangon</i> remains.
		1	98	<i>Crangon</i> and mysid remains.

In previous years all those examined contained copepods, except 1 larval *Gebia*, those eaten being *Pseudocalanus*, *Temora*, *Oithona*, *Coryceus* and *Anomalocera*, *Temora* being the commonest. *Temora*, both larval and adult stages, is thus shown to be the favourite food of *Trachinus vipera* in its young post-larval stages, other copepods also being taken, and *Podon*, *Evadne* and eggs (copepod?).

In the adolescent stages *Crangon*, amphipods and mysids are also taken besides copepods, *Crangon* and mysids being the commonest.

SCOMBRIDÆ.

SCOMBER SCOMBER L. MACKEREL.

One hundred and sixty-five young Mackerel were examined, all but 2 from the Young Fish Trawl from July 7th to August 13th, 5-13.5 mm. in length.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
	1	1	7	No food.
		1	11	Remains of copepod nauplii.
	4	3	5-6.5	No food.
		10	5-7	Copepod nauplii remains.
		1	7	3 <i>Calanus</i> nauplii.
	7	1	7	No food.
		2	7-8	<i>Podon</i> .
	8	3	5.5 ca-10.5	No food.
		2	8.5-9	<i>Podon</i> . [(copepod?).
		1	8	1 <i>Temora</i> nauplius, 1 egg
		1	9	1 <i>Temora</i> nauplius.
		1	9.5	1 <i>Podon</i> , 1 egg (copepod?).
		1	9.5	1 <i>Podon</i> 1 Calanoid nau- plius, 3 eggs (copepod?).

Net.	Haul.	No. of Individuals.	Length in mm.	Food.	[plii.
	9	7	6.5-8.5	No food.	
		2	6.5	Remains of copepod nau-	
		1	6.5	2 <i>Temora</i> nauplii	
		1	6.5	1 <i>Podon</i> , remains of cope-	
				pod nauplii.	
	10	5	8.5-11	No food.	
		1	7	1 <i>Temora</i> nauplius, 6 eggs	
				(copepod ?).	
		1	7	1 <i>Evadne</i> .	
		1	9	1 <i>Podon</i> .	
	12	11	7-10.5	No food.	
		1	9	1 <i>Podon</i> , 3 eggs (copepod ?).	
		1	9	1 egg (copepod ?).	
		1	9.5	Remains of <i>Gobius</i> .	
	13	2	10	No food.	
		1	8.5	1 <i>Temora</i> nauplius, 1 egg	
				(copepod ?).	
	14	8	9-12	No food.	
		2	8-11	<i>Podon</i> .	
		1	10	1 <i>Podon</i> , 1 egg (copepod ?).	
		1	8.5	Young <i>Temora</i> .	
		1	7.5	1 copepod nauplius, 2 eggs	
				(copepod ?).	
		7	8-10	Eggs (copepod ?).	
	15	2	8.5-9	Eggs (copepod ?).	
		1	10.5	Copepod nauplius.	
		1	10.5	1 <i>Podon</i> , 5 eggs (copepod ?).	
	20	1	10	30 eggs (copepod ?).	
	21	3	7-11	Eggs (copepod ?).	
		2	6.5-7	<i>Evadne</i> , <i>Calanus</i> nauplii.	
		1	7	3 <i>Calanus</i> nauplii, 1 <i>Evadne</i> ,	
				3 eggs (copepod ?).	
		1	7	1 <i>Temora</i> nauplius, 4 eggs	
				(copepod ?).	
		1	7	4 <i>Evadne</i> , 6 eggs (copepod ?).	
		1	7.5	1 calanoid nauplius.	
	22	1	6.5	3 eggs (copepod ?).	
	23	2	6	No food.	
		1	7	2 copepod nauplii, 3 eggs	
				(copepod ?).	
		1	8	1 <i>Podon</i> .	
	24	2	6-8	Eggs (copepod ?).	

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
		1	6	2 <i>Calanus</i> nauplii.
		1	6.5	1 <i>Podon</i> .
		1	7	2 <i>Evadne</i> , 2 eggs (copepod?)
		1	10	1 euphausiid larva.
	25	4	6-10	No food.
		1	8	1 <i>Evadne</i> .
		3	6-8.5	<i>Evadne</i> , eggs (copepod?).
		1	11	1 euphausiid larva.
	28	1	9.5	1 <i>Podon</i> , several eggs (copepod?).
		1	9.5	Young fish. [pod remains.
			10	Remains of small fish, cope-
	29	1	9	No food.
	31	9	7-11	"
	32	1	9	"
	33	1	6.5	"
	35	1	9	"
	37	2	7-8	"
	38	1	7	"
		1	7	1 <i>Calanus</i> nauplius, 1 mite.
		1	8	2 <i>Calanus</i> nauplii, many eggs (copepod?).
		1	9	1 <i>Trachinus vipera</i> .
	39	11	5-9	No food.
		2	5-7	<i>Podon</i> , <i>Calanus</i> nauplii.
		1	8	1 <i>Podon</i> , 1 <i>Temora</i> nauplius, 2 eggs (copepod?).
		1	7	Crustacea remains.
	46	1	6	1 <i>Podon</i> .
		2	9	<i>Podon</i> , eggs (copepod?).
	48	1	7	No food.
		1	7	1 <i>Calanus</i> nauplius, cope- pod remains.
		1	9	1 young <i>Temora</i> , 2 calanoid nauplii, 2 eggs (cope- pod?).
		1	9.5	1 calanoid nauplius.
	51	1	13.5	Young <i>Blennius</i> (7 mm. long).
Coarse Tow-net, Rame N.E., Mewstone E. $\frac{1}{2}$ S., July 21		2	8-10	Copepod remains.

From these notes it is seen that the young Mackerel often contains no food, 75 out of 165 being empty. The food taken by the others is chiefly copepod nauplii and eggs (probably copepod), 38 containing nauplii and 38 containing eggs. The nauplii are chiefly *Calanus* and *Temora*. Nineteen contained *Podon*, 10 contained *Evadne*, 2 contained euphausiid larvæ and 5, from 9 to 13.5 mm., contained young fish.

GOBIIDÆ.

GOBIUS MINUTUS L.

Most of the young specimens from the tow-nets, February to July, 3-7 mm., contained no food, a few containing copepod remains. The usual food seems to be miscellaneous copepods.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	2	5	5-8	No food. [plii.
		10	6-8	Remains of copepod nau-
		4	6-7	<i>Acartia</i> .
B	5	1	45	Remains of <i>Pandalus</i> .
C Cawsand Bay, Aug. 27		3	49-50	Haracticids, sand, <i>Poly-</i> <i>stomella</i> .
		1	51	Larval decapod remains, sand, <i>Polystomella</i> .

Previous records show various copepods to be the chief food.

GOBIUS PICTUS. MALM.

Out of 16 specimens from the tow-nets from outside the Breakwater, 5-8 mm., July 6, 5-6 mm., contained no food, 6, 6-8 mm., contained *Acartia*, 1, 6 mm., a *Pseudocalanus*, 1, 7 mm., a young *Temora*, 2 contained copepod nauplii and 1 a *Balanus* nauplius. Out of 10 from a coarse tow-net scraping the bottom, Penlee, July 4, 6-11 mm., 2 contained no food, 4, 6-11 mm., contained *Balanus* nauplii, 2 an harpacticid and 1, 7 mm., an *Acartia*.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	2	1	8	Copepod remains.
		1	10	1 <i>Oithona</i> .
		1	10	3 young <i>Temora</i> , 2 <i>Calanus</i> nauplii.
C Cawsand, Aug. 27		1	47	Remains of annelids and amphipods.
		1	47	Remains of amphipods.
			48	Decapod remains.
			49	Decapod larvæ remains.

GOBIUS PAGANELLUS L.

Two from tow-nets, outside the Breakwater, July, 10 mm., 1 contained no food, 1 copepod remains.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.	
A	1	4	6-11	No food.	
		1	7	2 <i>Pseudocalanus</i> .	
		1	8	2 <i>Pseudocalanus</i> , 1 harpacticid.	
		1	11	2 <i>Pseudocalanus</i> , 1 <i>Temora</i> nauplius.	
		1	7	1 <i>Acartia</i> .	
		3	7-8	<i>Temora</i> nauplii.	
		1	8	Larval bivalve.	
		2	1	9	3 <i>Calanus</i> nauplii.
			1	11	Copepod remains.

GOBIUS MICROPS KRÖYER.

	Haul.	No. of Individuals.	Length in mm.	Food.
A	1	1	7	Remains of small copepods.
		1	7	2 young <i>Pseudocalanus</i> .
		1	7	Copepod nauplii, eggs (copepod ?).
		1	8	1 <i>Temora</i> nauplius, 1 larval gastropod, 3 <i>Balanus</i> nauplii.

GOBIUS RUTHENSPARRI EUPH.

One from a medium tow-net, Rame-Mewstone, July 21, 9 mm., contained a *Pseudocalanus*. The remainder examined were adolescent stages.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
B	5	3	30-34	Larval gastropods, remains of copepods.
		1	25	1 larval gastropod, 1 larval bivalve, many <i>Pseudocalanus</i> .
		1	31	Larval gastropods, larval bivalves.
		1	35	Many <i>Paracalanus</i> .

Net.	Haul.	No. of Individuals.	Length. in mm.	Food.
C	Cawsand, Aug. 27	1	35	Many larval gastropods harpacticids 1 <i>Pseudo-</i> <i>calanus</i> .
		1	37	Many larval gastropods, 1 crab megalopa.
		1	37	Larval gastropods, larval bivalves, 1 <i>Pseudocala-</i> <i>nus</i> .

APHYA MINUTA (Risso).

Two adult specimens, B, haul 4, 45-48 mm., contained no food.

CRYSTALLOGOBIUS NILSSONI. DUB. AND KOR.

Two adult specimens, A, haul 1, 42-44 mm., contained no food. One of 25 mm. (haul 56) contained 1 *Temora* and other copepod remains.

The gobies are miscellaneous feeders, although copepods form their chief food, with *Podon*, *Balanus* nauplii and occasional decapod larvæ. A specimen of *Gobius microps* reared in a glass jar, now 20 mm. long and seven months old, began by feeding on ulva spores, then fed on nauplii of the harpacticids breeding in the jar and on nauplii given to it in very fine plankton. Afterwards it ate the larger copepods and other small crustacea. It is now feeding on small fresh-water isopods and small crustacea from the plankton. Other gobies very soon after hatching ate diatoms, peridinians and small copepod nauplii.

BLENNIIDÆ.

BLENNIUS SP.

These were probably *Blennius ocellaris*. Six specimens from the tow-nets, from outside the Breakwater, 4-8 mm., contained no food, 2 of 6 mm., contained copepod remains.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	2	5	6-7	No food.
	3	1	7	„
	13	3	5.5-6	„
		1	7	1 <i>Podon</i> .
		1	6.5	Egg (copepod ?).
		1	6.5	2 copepod nauplii.
		1	7	2 calanoid nauplii.
		1	7	1 copepod nauplius, 2 eggs (copepod ?).

TRIGLIDÆ.

TRIGLA GURNARDUS L. GREY GURNARD.

Eighty-three specimens ranging from 6.5–13.5 mm. were examined from the Young Fish Trawl:—

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	4	1	6.5	Remains of <i>Pseudocalanus</i> and <i>Calanus</i> nauplii.
		1	7 ca	Copepod remains.
		1	8	Remains of <i>Pseudocalanus</i> .
		1	8 ca	Remains of <i>Pseudocalanus</i> and copepod nauplii.
	10	3	6	Unrecognisable.
	13	5	6.5–8	No food.
		8	8–12	<i>Paracalanus</i> .
		2	8	<i>Paracalanus</i> , <i>Temora</i> .
		2	9–9.5	<i>Pseudocalanus</i> .
		2	8–9.5	Young <i>Pseudocalanus</i> .
		2	11–12	<i>Pseudocalanus</i> , <i>Paracalanus</i> .
		1	8	Remains of copepod nauplii.
		1	9	1 <i>Temora</i> .
		1	10	<i>Pseudocalanus</i> , remains of copepod nauplii.
		1	12	1 <i>Paracalanus</i> , 1 <i>Pseudocala-</i> <i>nus</i> , 1 larval euphausiid.
		1	13.5	3 <i>Calanus</i> , crab zoëa.
	14	1	8	Remains of decapod larva (mysis stage).
		1	12	Portion of fish's backbone.
	15	2	9.5–10	Crustacea remains.
	16	1	8.5	1 <i>Podon</i> , remains of <i>Calanus</i> .
		1	12	Remains of several <i>Calanus</i> .
	18	1	8	Remains of several <i>Calanus</i> .
		1	11 ca	Remains of euphausiid larvæ, <i>Podon</i> , copepods.
	20	1	7	2 <i>Podon</i> , copepod remains.
	22	1	7	Remains of <i>Calanus</i> nauplii and decapod larvæ.
		1	9	3 euphausiid larvæ.
	24	1	8.5	1 euphausiid larva, 1 egg (copepod ?).

Net.	Haul.	No. Individuals.	Length. in mm.	Food.
	25	3	7-10	Remains of <i>Calanus</i> .
		1	7	Remains of copepods and copepod nauplii, several eggs (copepod ?).
	26	2	11.5-13	Remains of <i>Calanus</i> .
		1	9	3 <i>Calanus</i> , 1 <i>Podon</i> .
	28	1	10	3 <i>Calanus</i> .
		1	11	Remains of euphausiid larvæ.
	30	1	10.5	Remains of <i>Calanus</i> and calanoid nauplii.
	31	1	7	1 <i>Pseudocalanus</i> , several calanoid nauplii.
		1	8	1 euphausiid larva, remains of copepod nauplii.
		1	8.5	Remains of <i>Calanus</i> .
		1	9	Remains of euphausiid larvæ.
	33	1	9.5	Remains of euphausiid larvæ.
		1	12	Remains of <i>Calanus</i> .
	35	1	8	No food.
		1	9.5	Remains of <i>Pseudocalanus</i> .
	41	1	10	Copepod remains.
	42	2	9.5-12	Remains of <i>Pseudocalanus</i> .
	44	1	7	Remains of <i>Pseudocalanus</i> .
		1	8	No food.
	56	8	7.5-9.5	Remains of <i>Pseudocalanus</i> .
		2	9-10.5	Remains of <i>Pseudocalanus</i> and <i>Calanus</i> .
		2	9	Remains of <i>Calanus</i> .
		2	10-11.5	Copepod remains (probably <i>Calanus</i>).
B	10	1	22	Remains of <i>Calanus</i> .
Coarse Tow-net, Cawsand Bay, Aug. 18		1	9	1 <i>Paracalanus</i> , other copepod remains.

It is thus seen that only 10 out of 85 contained no food, or unrecognisable, 66 contained copepods, 25 containing *Pseudocalanus*, 22 *Calanus*, 12 *Paracalanus* and only 3 containing *Temora*. Four contained *Podon*, 7 contained euphausiid larvæ, 1 a decapod larva and 1 part of a fish's backbone. Copepods evidently form the chief food of the post-larval *Trigla gurnardus*, although at 8 mm. they may eat euphausiid and decapod larvæ and at 12 mm. may eat fish. The few records in previous years show copepods and *Podon* to have been eaten.

COTTIDÆ.**COTTUS BUBALIS EUPH. BULLHEAD.**

Twenty-six specimens were examined from the tow-nets from both inside and outside the Breakwater, January to April, from 2.5 to 10 mm., 14, 2.5-5 mm., contained no food, 1 of 7 mm. was kept alive but died in three days containing no food, 1 of 10 mm. contained 1 *Pseudocalanus*, 3, 3.5-4 mm., contained larval gastropods, 3 of 4 mm. contained *Balanus* nauplii and 1 a larval bivalve, and 1 of 7 mm. contained a *Temora*.

Previous years have shown *Cottus bubalis* to take a varied diet, larval mollusks, copepods and cladocera all being eaten, besides occasional diatoms.

AGONIDÆ.**AGONUS CATAPHRACTUS (L). ARMED BULLHEAD.**

Seven specimens were examined from the tow-nets, from inside and outside the Breakwater, February to May, 7-18 mm. Three of these were kept alive, but died in a few days. Two of 12 and 18 mm. lived some time in the aquaria. At first the specimen of 12 mm. (April 22nd) was greenish yellow and black, very light towards the tail, but by April 26th it had become quite dark, and this and the specimen of 18 mm. were like the adult. Both ate copepods from the plankton, chiefly *Temora* and *Pseudocalanus*.

One of 7 mm. contained 2 *Balanus* nauplii, 1 young *Temora*, 1 larval bivalve and 1 harpacticid; the other contained no food.

A specimen of 55 mm., B, haul 24, contained no food.

Two specimens in previous years contained *Balanus* nauplii and a *Coscinodiscus*.

CYCLOPTERIDÆ.**LIPARIS MONTAGUI DONOV.**

One specimen from a medium tow-net, Knap, February 25th, 3 mm. long, contained 2 larval gastropods. Previous records show copepods (*Acartia* and *Temora*) and indistinguishable crustacea remains.

GASTEROSTEIDÆ.**SPINACHIA VULGARIS FLEM. 15-SPINED STICKLEBACK.**

Three specimens (B, haul 4), 61-80 mm., 1 contained no food, 1 decapod remains, and 1 remains of *Pandalus*, *Crangon* and other crustacea. One (B, haul 5), 70 mm., contained no food.

Amphipods and harpacticids are previously recorded as food.

GOBIESOCIDÆ.

LEPADOGASTER CANDOLLI RISSO.

Ten specimens from the tow-nets, inside and outside the Breakwater, July-August, 5-7 mm., 1 contained no food, 3 contained young *Temora* and 1 a *Temora* nauplius, and 2 other copepod nauplii. One contained a *Calanus* nauplius, 1 a *Balanus* nauplius, 3 larval bivalves and an harpacticid. One contained 2 harpacticids, 2 contained *Pseudocalanus* and 1 an *Evadne* and 7 *Podon*.

The same kind of food is recorded for previous years—small copepods (adults and nauplii), cladocera and *Balanus* nauplii being the chief food.

LEPADOGASTER BIMACULATUS DONOV.

One specimen from a coarse tow-net, outside the Breakwater, July 22, 9 mm., contained a young *Temora*.

Net.	Haul.	No. of Individuals.	Length in mm.	Food.
A	56	6	7-10	<i>Temora</i> .
		1	10	2 <i>Temora</i> , <i>Paralia sulcata</i> .
	61	1	7	No food.

One specimen in 1918 contained *Balanus* larvæ and larval mollusks. One, kept alive, ate small copepods, *Podon* and *Balanus* larvæ.

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RECORD OF LARVAL AND POST-LARVAL FISH FROM THE TOW-NETTINGS, 1919.

Date.	Locality.	Fish.	No.	Size in mm.	Food present.
Jan. 13	Knap to Penlee West Channel to Breakwater	Clupea harengus	46	8-11.5	Larval gastropods.
		"	71	8-11	Larval gastropods, <i>Pseudocalanus elongatus</i> .
	Knap to Panther	"	81	8-11	Larval gastropods- <i>Pseudocalanus elongatus</i> , young <i>Coryceus anglicus</i> .]

Date.	Locality.	Fish.	No.	Size in mm.	Food present.
Jan. 15	West Channel to Breakwater	"	151	7-12	Larval gastropods, larval bivalves, <i>Pseudocalanus elongatus</i> , copepod nauplii, <i>Tintinnopsis</i> sp.
	Breakwater to New Grounds	"	200	8-12	Larval gastropods, young <i>Coryceus anglicus</i> , <i>Pseudocalanus elongatus</i> , larval bivalves, copepod nauplii, <i>Balanus</i> nauplii, <i>Tintinnopsis</i> sp., <i>Coscinodiscus</i> sp.
17	Panther.	"	244	8-12	Larval gastropods, larval bivalves, <i>Pseudocalanus elongatus</i> , copepod nauplii.
	West Channel to] Middle Sound	"	84	8-12	Larval gastropods, larval bivalve, <i>Pseudocalanus elongatus</i> , harpacticids.
	Breakwater	"	30	8-12	Larval gastropods.
21	Knap	"	6	10-11	Larval gastropods.
	Middle Sound	"	4	9-11	Larval gastropods, <i>Pseudocalanus elongatus</i> .
	Breakwater	"	13	9-10	Larval gastropods.
	Panther	"	5	8-16	<i>Pseudocalanus elongatus</i> .
24	Knap to Penlee	"	4	10-11.5	<i>Oithona similis</i> , copepod remains.
		<i>Cottus bubalis</i>	1	4	<i>Balanus</i> nauplius, larval bivalve.
	Breakwater	<i>Clupea harengus</i>	6	9-11	Larval gastropod.
	Panther	"	11	8-5-11	<i>Pseudocalanus elongatus</i> , copepod nauplii.
27	Middle Sound to Cattewater	"	10	9-5-13	Copepod remains.
29	Panther	"	2	9	No food.
	Knap	"	4	10-11	<i>Pseudocalanus elongatus</i> .
	Breakwater	"	1	11	No food.
	White Patch	"	3	9-10	"
31	Panther	"	4	10-11	<i>Pseudocalanus elongatus</i> .
	Breakwater	"	1	10	No food.
Feb. 4	Panther	"	11	9-13	<i>Pseudocalanus elongatus</i> .
		<i>Anguilla vulgaris</i>	1	76	No food.
		<i>Ammodytes tobianus</i>	1	5	Green food remains.
	Breakwater	"	1	5	No food.
		<i>Clupea harengus</i>	5	10-12.5	"
	New Grounds to Breakwater	"	1	11	<i>Pseudocalanus elongatus</i> .
		<i>Clupea sprattus</i>	3	2	No food.
		<i>Cottus bubalis</i>	1	3.5	Larval gastropods.
		<i>Ammodytes tobianus</i>	1	5	No food.
6	Breakwater to New Grounds	<i>Gobius</i> (cf. <i>minutus</i>)	1	3.5	Green food remains.

Date.	Locality.	Fish.	No.	Size in mm.	Food present.
6 Feb.	Breakwater to New Grounds	<i>Clupea harengus</i>	6	9-12	Larval gastropod, <i>Paracalanus parvus</i> , <i>Acartia clausi</i> .
	White Patch to Middle Sound	<i>Ammodytes tobianus</i>	1	4.5	Green food remains.
	White Patch	<i>Clupea harengus</i>	2	8.5-11	<i>Balanus nauplius</i> .
	Breakwater to Middle Sound	"	3	8-12	No food.
	Middle Sound	"	7	9-12	"
7	Middle Sound to White Patch	<i>Ammodytes tobianus</i>	1	5	"
	Duke Rock to Breakwater	<i>Clupea sprattus</i>	1	4	"
12	Breakwater to Panther	"	1	4.5	"
		<i>Clupea harengus</i>	2	9-13	<i>Pseudocalanus elongatus</i> .
	Panther to Knap	<i>Ammodytes tobianus</i>	4	4-4.5	Green food remains.
		<i>Clupea harengus</i>	2	11-12	<i>Pseudocalanus elongatus</i> .
	New Grounds to West Channel	"	6	9-13	<i>Pseudocalanus elongatus</i> , copepod remains.
		<i>Cottus bubalis</i>	1	3.5	Larval gastropod.
		<i>Ammodytes tobianus</i>	3	4-7	No food (7 mm. alive)
	White Patch to Middle Sound	"	1	5	Diatom (<i>Melosira</i>).
	White Patch to Breakwater	<i>Clupea harengus</i>	1	9	No food.
14	Penlee to Panther	<i>Cottus bubalis</i>	1	7	Alive.
		<i>Clupea harengus</i>	5	8.5-14	No food.
		<i>Clupea sprattus</i>	3	3.5-4.5	Green food remains.
		<i>Ammodytes tobianus</i>	4	4-5	" " "
	Breakwater	<i>Clupea harengus</i>	1	15	No food.
		<i>Clupea sprattus</i>	8	4-5	Green food remains.
18	Breakwater	<i>Ammodytes tobianus</i>	16	4-6	4 alive, others green food remains.
		<i>Clupea sprattus</i>	6	4.5-5	Green food remains.
	Middle Sound to Breakwater	"	3	4-5	" " "
		<i>Clupea harengus</i>	3	9.5-11	<i>Balanus nauplii</i> .
		<i>Ammodytes tobianus</i>	13	4-6	Green food remains.
	White Patch to Jennycliff	<i>Ammodytes tobianus</i>	3	5-5.5	No food.
20	West Channel to New Grounds	<i>Cottus bubalis</i>	1	5	"
		<i>Clupea harengus</i>	4	9-11	"
		<i>Clupea sprattus</i>	2	4-5	"
		<i>Ammodytes tobianus</i>	3	4.5-6	No food (1 alive).
	Breakwater	<i>Cottus bubalis</i>	1	3	No food.
		<i>Clupea harengus</i>	3	8-11.5	Egg?
		<i>Clupea sprattus</i>	4	4-5	No food.
		<i>Ammodytes tobianus</i>	2	4.5-5	"
	West Channel	"	3	4-6	No food (1 alive).
24	Breakwater	"	1	5	No food.
		<i>Clupea sprattus</i>	5	6	"
	Shagstone	"	2	5	"
		<i>Clupea harengus</i>	3	11-5	"
		<i>Agonus cataphractus</i>	1	7	<i>Balanus nauplii</i> , <i>Te-mora longicornis</i> , juv., larval bivalve, harpacticid.

Date.	Locality.	Fish.	No.	Size in mm.	Food present.
25	Knap	<i>Clupea sprattus</i>	2	7	No food.
		<i>Cyclogaster montagui</i>	1	2	Larval gastropods.
	Panther	<i>Cottus bubalis</i>	1	4	" "
		<i>Gadus luscus</i>	1	2.5	No food.
28	East Knap to Penlee	<i>Agonus cataphractus</i>	1	10	Alive.
	Knap	<i>Clupea sprattus</i>	2	5-6	Green food remains
March					
13	Breakwater	"	1	4	No food.
		<i>Cottus bubalis</i>	1	4	<i>Balanus nauplii</i> .
	Panther to West Channel	<i>Ammodytes tobianus</i>	1	5.5	No food.
14	West end of Breakwater	<i>Clupea sprattus</i>	2	5	"
		<i>Agonus cataphractus</i>	1	8	"
	Panther	<i>Pholis gunnellus</i>	1	7	"
		<i>Clupea sprattus</i>	5	3-15	<i>Pseudocalanus longa-</i> <i>tus.</i>
	Knap	"	2	3	No food.
		<i>Ammodytes tobianus</i>	1	4	"
17	Penlee	<i>Clupea sprattus</i>	4	3-7	"
	Penlee to Panther	"	3	4	"
		<i>Gobius sp.</i>	1	4	"
		<i>Gadus luscus</i>	2	3	"
		<i>Cottus bubalis</i>	1	4	"
	Knap	<i>Clupea sprattus</i>	several	3-6	"
		<i>Callionymus lyra</i>	3	2-5	"
20	Knap	<i>Pholis gunnellus</i>	1	9	"
		<i>Clupea sprattus</i>	1	5	"
		<i>Ammodytes tobianus</i>	1	5	"
	Breakwater to West Channel	<i>Cottus bubalis</i>	2	4	"
		<i>Pleuronectes platessa</i>	1	13	"
21	White Patch	<i>Clupea sprattus</i>	5	3-5	"
	New Grounds	"	3	3	"
		<i>Cottus bubalis</i>	1	4	<i>Balanus nauplii</i> .
		<i>Callionymus lyra</i>	1	3	No food.
	New Grounds to West Channel	<i>Clupea sprattus</i>	2	3-4	"
	Middle Sound	"	2	3-4	"
24	West Channel	<i>Gadus luscus</i>	2	2.5	"
26	West Channel	<i>Clupea sprattus</i>	several	3-6	"
	Knap	"	"	3-6	"
	Knap-Penlee	"	"	3-6	"
31	Knap	"	2	3	"
		<i>Ammodytes tobianus</i>	1	4	"
	Breakwater	<i>Gobius sp.</i>	1	5	"
		<i>Cottus bubalis</i>	1	5	"
		<i>Clupea sprattus</i>	several	3-6	"
		<i>Gadus luscus</i>	3	3	"
		<i>Callionymus lyra</i>	1	3	"
	Panther	<i>Clupea sprattus</i>	several	3-6	"
		<i>Gobius sp.</i>	1	2.5	"
		<i>Callionymus lyra</i>	1	3	"
	Knap-Penlee	<i>Clupea sprattus</i>	several	3-6	"
		<i>Gobius sp.</i>	1	3	"
		<i>Gadus luscus</i>	1	2.5	"
		<i>Cottus bubalis</i>	1	5	"

Date.	Locality.	Fish.	No.	Size in mm.	Food present.
April					
3	Knap	Gadus merlangus	2	7-8.5	<i>Pseudocalanus elongatus</i> .
	Panther	Clupea sprattus	3	3-5	No food.
		Gadus luscus	2	6.5-7	<i>Pseudocalanus elongatus</i> .
	Knap-Panther	Gadus merlangus	2	5-7	" "
		Cottus bubalis	1	6	Copepod remains.
		Gadus merlangus	1	6	Crustacea remains.
		Callionymus lyra	1	3	No food.
	Penlee to Knap	Clupea sprattus	4	4-6	"
		"	5	4-6	"
		Gadus merlangus	1	7	<i>Pseudocalanus elongatus</i> .
		Gadus luscus	1	3	No food.
		Ammodytes tobianus	1	9	Crustacea remains.
5	New Grounds	Clupea sprattus	several	3-6	No food.
		Gadus merlangus	3	3-5	<i>Pseudocalanus elongatus</i> .
		Cottus bubalis	2	3-5	No food.
		Solea variegata	1	4-5	"
7	Knap	Gadus merlangus	3	3-5	Copepod nauplii.
	West Channel	Cottus bubalis	1	2-5	No food.
	Breakwater	"	2	3-4	"
		Gadus merlangus	1	2-5	"
8	New Grounds	Clupea sprattus	2	6-7	"
		Cottus bubalis	1	5	<i>Temora longicornis</i> .
	Panther	"	4	3-4	No food.
		Clupea sprattus	8	4-8	"
		Gadus merlangus	1	3	"
	Breakwater	"	1	3	Green food remains.
11	West Channel	Solea vulgaris	2	4-11	No food (1 alive).
		Cottus bubalis	1	4	No food.
	Breakwater	"	1	4	"
	New Grounds	Agonus cataphractus	1	12	Alive.
17	Panther	Cottus bubalis	1	12	"
22	Knap	Gadus merlangus	3	3-5	<i>Pseudocalanus elongatus</i> .
		Solea vulgaris	2	6-6.5	No food.
	Knap to Penlee	Gadus merlangus	2	5-8	<i>Pseudocalanus elongatus</i> .
		Gobius (probably minutus)	1	6	No food.
23	Panther	Pleuronectes limanda	8	6-12	Alive.
	Penlee	Gadus merlangus	6	5-7	Larval bivalve, copepod remains, copepod nauplii, <i>Pseudocalanus elongatus</i> .
		Pleuronectes limanda	1	12	Alive.
	Knap-Penlee	Cottus bubalis	1	10	<i>Pseudocalanus elongatus</i> .
		Gadus merlangus	1	8	No food.
		Pleuronectes limanda	1	5	"
29	New Grounds	Gadus merlangus	3	5-6	<i>Pseudocalanus elongatus</i> .
		Callionymus lyra	6	5-8	Alive.
	Melampus Buoy to New Grounds	Gobius minutus	1	8	"
		Gadus merlangus	9	5-17	<i>Pseudocalanus elongatus</i> , eggs (copepod).
		Callionymus lyra	1	3	<i>Pseudocalanus elongatus</i> .
30	Panther	"	2	6	Alive.

Date.	Locality.	Fish.	No.	Size in mm.	Food present.	
April.	Panther	<i>Gobius minutus</i>	2	6-7	No food.	
		<i>Solea variegata</i>	1	7	Alive.	
	West Channel to Breakwater	<i>Solea vulgaris</i>	1	9	"	
		<i>Callionymus lyra</i>	4	6	"	
		<i>Gadus merlangus</i>	1	6	"	
		<i>Zeugopterus punctatus</i>	1	11	"	
	Knap	"	1	5	<i>Temora</i> nauplius.	
		<i>Solea variegata</i>	2	7-8	Alive.	
		<i>Pleuronectes limanda</i>	1	5	<i>Temora</i> nauplius.	
		<i>Gadus merlangus</i>	2	5	<i>Pseudocalanus elongatus</i> .	
		<i>Callionymus lyra</i>	1	5	<i>Temora</i> nauplius.	
May.	5 Knap	<i>Zeugopterus punctatus</i>	2	4-5	No food.	
		<i>Gadus merlangus</i>	9	5-11	<i>Pseudocalanus elongatus</i> , copepod nauplius.	
			<i>Callionymus lyra</i>	2	4	<i>Temora longicornis</i> , juv., copepod nauplius.
	Knap-Penlee	"	1	4	Copepod remains.	
		<i>Gadus merlangus</i>	4	7-9	<i>Pseudocalanus elongatus</i> .	
	Panther Breakwater to New Grounds	"	9	4-12	" "	
		<i>Callionymus lyra</i>	2	4-5	" "	
	13 Panther	<i>Gadus merlangus</i>	14	4-20	<i>Pseudocalanus elongatus</i> , copepod remains.	
			4	10-11	3 alive (1 no food).	
			2	15-22	No food.	
			1	6	"	
		Breakwater	<i>Gadus minutus</i>	1	6	"
			<i>Gadus merlangus</i>	13	6-11	<i>Calanus finmarchicus</i> , <i>Temora longicornis</i> , <i>Pseudocalanus elongatus</i> , eggs (copepod?).
		Penlee-Knap	"	10	6-8	Copepod remains.
			<i>Clupea sprattus</i>	1	20	Harpacticid, egg (copepod?).
		Knap	<i>Gadus merlangus</i>	5	6-7	<i>Calanus finmarchicus</i> , <i>Acartia clausi</i> , copepod nauplius.
		14 Middle Sound	<i>Gadus minutus</i>	1	11	Copepod remains.
<i>Gadus merlangus</i>	3		6	Copepod remains, larval mollusk.		
<i>Pleuronectes limanda</i>	1		9	No food.		
<i>Gadus minutus</i>	1		11	Copepod remains.		
White Patch	<i>Callionymus lyra</i>		1	8	Alive.	
East Channel	<i>Gadus merlangus</i>		1	8	<i>Pseudocalanus elongatus</i> , harpacticid.	
16 Panther Penlee to Knap	<i>Gadus luscus</i>	1	10	No food.		
	<i>Clupea sprattus</i>	1	22	"		
	<i>Gadus merlangus</i>	2	7	<i>Temora</i> nauplius.		
	<i>Zeugopterus punctatus</i>	1	4	No food.		
	Knap to Panther	<i>Gadus merlangus</i>	3	7-8	<i>Pseudocalanus elongatus</i> .	
		<i>Onos mustela</i>	1	8	No food.	
	West Channel to Breakwater	<i>Gadus merlangus</i>	1	8	Copepod remains.	
		<i>Callionymus lyra</i>	1	5	" "	

Date.	Locality.	Fish.	No.	Size in mm.	Food present.	
16	Breakwater	Gadus merlangus	4	7	<i>Pseudocalanus elongatus</i> , <i>Temora</i> nauplius.	
		Clupea sprattus	1	22	<i>Pseudocalanus elongatus</i> .	
19	Breakwater	Gadus merlangus	8	7-8	<i>Pseudocalanus elongatus</i> , <i>Acartia clausi</i> , <i>Temora longicornis</i> , juv., <i>Calanus finmarchicus</i> , <i>Balanus</i> nauplius.	
		Labrus (bergylta type)	1	5	Copepod remains, eggs (copepod ?).	
		Zeugopterus punctatus	1	6	Alive.	
		Clupea sprattus	1	22	No food.	
		Labrus (bergylta type)	1	4	"	
		Gadus merlangus	2	5-7	<i>Temora longicornis</i> juv., copepod remains.	
Penlee	Knap-Penlee	Onos sp.	1	10	"	
		Trigla sp.	1	6	Not examined.	
20	Breakwater	Gadus minutus	1	13	<i>Pseudocalanus elongatus</i> , <i>Temora longicornis</i> .	
		Gadus merlangus	2	6	No food.	
		Clupea sprattus	3	9-15	"	
		Gadus merlangus	10	5-10	<i>Pseudocalanus elongatus</i> , <i>Calanus finmarchicus</i> , <i>Temora longicornis</i> , <i>Acartia clausi</i> , harpacticid, copepod nauplii.	
27	Knap	Gadus pollachius	1	13	<i>Podon</i> sp., <i>Calanus finmarchicus</i> , <i>Acartia clausi</i> .	
		Onos sp.	1	6	<i>Temora longicornis</i> , juv.	
		Gadus merlangus	6	8-11	No food.	
		Clupea sprattus	1	24	"	
		Merone labrax	1	6	Copepod remains.	
28	Breakwater	Clupea sprattus	1	18	No food.	
		Gadus merlangus	1	6-5	<i>Acartia clausi</i> , copepod nauplii.	
Panther	New Grounds to Breakwater	"	1	10	<i>Calanus finmarchicus</i> , <i>Centropages typicus</i> , <i>Acartia clausi</i> .	
		Onos sp.	1	4	Copepod nauplius.	
June.	2	Knap to Penlee	Solea vulgaris	1	11	Alive.
			Pleuronectes limanda	1	12	Copepod remains.
	Panther	Breakwater	Gadus merlangus	3	5-10	<i>Calanus finmarchicus</i> , <i>Pseudocalanus elongatus</i> .
			Callionymus lyra	1	5	No food.
			Merone labrax	1	6	"
			Gobius minutus	1	5	"
			Clupea sprattus	1	13	"
			Gadus merlangus	1	9	<i>Carcinus maenas</i> zoëa <i>Calanus finmarchicus</i>
	Panther	Breakwater	Trigla sp.	1	6	Not examined.
			Callionymus lyra	2	4	Copepod remains.
			Clupea sprattus	1	14	No food.

Date.	Locality.	Fish.	No.	Size in mm.	Food present.
June.					
3	Penlee to Knap	<i>Gadus merlangus</i>	10	5-8	<i>Pseudocalanus elongatus</i> , <i>Acartia clausi</i> , copepod nauplii, green food remains.
		<i>Callionymus lyra</i>	1	5	<i>Pseudocalanus elongatus</i> .
		<i>Clupea sprattus</i>	1	9	No food.
	Panther to Knap	"	1	13	"
		<i>Gadus merlangus</i>	1	5	"
6	Knap to Penlee	"	4	4-7	<i>Acartia clausi</i> , copepod nauplii.
		<i>Callionymus lyra</i>	1	5	<i>Paracalanus parvus</i> .
	Breakwater	<i>Gobius minutus</i>	2	6	No food.
	Panther	"	1	5	"
		<i>Gadus merlangus</i>	5	3-7	<i>Pseudocalanus elongatus</i> , copepod remains, copepod nauplii.
		<i>Callionymus lyra</i>	2	4-5	Copepod remains.
		<i>Labrus (bergylta type)</i>	1	3-5	No food.
	Breakwater	<i>Gobius minutus</i>	2	3-5	"
16	Knap to Panther	<i>Gadus merlangus</i>	1	11	"
		<i>Blennius sp.</i>	3	4	"
		<i>Labrus (bergylta type)</i>	1	6	Copepod nauplius.
	Knap	"	2	4-6	No food.
		<i>Gadus merlangus</i>	1	10	<i>Pseudocalanus elongatus</i> .
	Panther to Breakwater	"	12	8.5-15	<i>Pseudocalanus elongatus</i> , <i>Calanus finmarchicus</i> , <i>Temora longicornis</i> .
		<i>Labrus (bergylta type)</i>	3	5	No food.
		<i>Gobius minutus</i>	1	5	"
		<i>Callionymus lyra</i>	1	6	<i>Calanus finmarchicus</i> .
17	West Channel	<i>Gadus merlangus</i>	1	14	<i>Pseudocalanus elongatus</i> , <i>Calanus finmarchicus</i> .
		<i>Onos sp.</i>	1	8	No food.
July.					
1	Knap to Shagstone	<i>Gobius minutus</i>	1	5	"
	Mewstone	<i>Labrus (bergylta type)</i>	2	7	<i>Podon intermedius</i> , <i>Pseudocalanus elongatus</i> , larval gastropods.
		<i>Callionymus lyra</i>	1	4	Harpacticid.
		<i>Gadus merlangus</i>	1	6	Copepod remains.
	Knap-Mewstone	<i>Gobius minutus</i>	3	6-7	No food.
		<i>Blennius sp.</i>	1	7	"
2	Penlee	<i>Gobius pictus</i>	5	5-6	<i>Acartia clausi</i> , <i>Pseudocalanus elongatus</i> .
		<i>Gobius sp.</i>	1	6	No food.
		<i>Callionymus lyra</i>	1	4	<i>Pseudocalanus elongatus</i> .
4	Rame to Penlee	<i>Gobius microps</i>	4	7-8	<i>Pseudocalanus elongatus</i> , juv., <i>Temora</i> nauplius, <i>Balanus</i> nauplius, larval gastropods, eggs (copepod?).
		<i>Blennius sp.</i>	2	6	Copepod remains.
	Scraping bottom	"	1	5	Not examined.
	Penlee Point N.E.				
	Penlee Buoy E.				
	by N.				

Date.	Locality.	Fish.	No.	Size in mm.	Food present.
Scraping bottom					
	Penlee Point N.E.	Gobius pictus	10	6-11	"
	Penlee Buoy E.	Labrus (bergylta type)	2	8	"
	by N.	Lepadogaster candolli	1	7	"
14	Attached to dredge Eddystone S.E. Looe Is. N.E.	Gobius elongatus	2	17.5	"
		Gobius jeffreysii	1	14	"
		Scophthalmus norvegicus	1	10	"
	Eddystone S.E., Looe Is. N. $\frac{1}{2}$ E.	Clupea pilchardus	5	15-21	No food.
		Labrus (bergylta type)	3	5-7	<i>Oithona</i> sp., <i>Calanus</i> and <i>Temora</i> nauplii.
	Rame to Penlee	Onos sp.	1	7	Egg (copepod?).
		Lepadogaster candolli	1	7	No food.
		Labrus (bergylta type)	3	5-7	<i>Temora longicornis</i> and nauplius, <i>Balanus</i> nauplii.
	Eddystone S.E., Looe Is. N.N.E.	Gobius pictus	1	7	<i>Balanus</i> nauplius.
		Labrus (bergylta type)	1	7	Not examined.
15	Mewstone	Clupea pilchardus	1	19	"
		Gobius sp.	2	5-5	No food.
		Gobius pictus	1	7	Copepod remains.
		Gobius paganellus	1	10	" "
		Labrus (bergylta type)	1	5	<i>Temora</i> nauplii.
		Lepadogaster candolli	1	6	<i>Temora</i> , juv., copepod nauplii.
	Penlee to Break- water	Labrus (bergylta type)	4	5	<i>Temora</i> , juv., and nau- plii, copepod nau- plius.
		Scophthalmus norvegicus	1	4	<i>Temora</i> nauplius.
18	Rame N.W., Mew- stone E. $\frac{1}{2}$ N.	Labrus (bergylta type)	2	5	Not examined.
21	Rame Head N.E. Mewstone E.S.E.	Scomber scomber	2	8-10	Copepod remains.
		Gadus merlangus	1	13	<i>Pseudocalanus elonga- tus</i> .
		Labrus (bergylta type)	1	6	<i>Temora</i> nauplii.
		Gobius Ruthensparri	1	9	<i>Pseudocalanus elonga- tus</i> .
		Callionymus lyra	3	4-5	<i>Pseudocalanus elonga- tus</i> , <i>Temora</i> nauplii, young <i>Temora</i> .
	On Young Fish Trawl (Haul 10)	Clupea pilchardus	2	18-22	No food.
22	W. Breakwater	Labrus (bergylta type)	1	5	<i>Temora</i> nauplii.
		Trigla sp.	1	10 ca	Alive.
		Lepadogaster candolli	1	6	Harpacticids.
		Callionymus lyra	1	3-5	No food.
		Labrus (bergylta type)	1	6	Young <i>Temora</i> and nauplii.
	Outside Breakwater	Blennius sp.	1	8	No food.
		Clupea pilchardus	2	19-20	"
		Gobius paganellus	1	10	"
		Labrus (bergylta type)	4	4-7	Young <i>Temora</i> and nauplii, <i>Balanus</i> nau- plii.
		Lepadogaster candolli	2	6-7	Young <i>Temora</i> .
		Lepadogaster bimaculatus	1	9	"

Date.	Locality.	Fish.	No.	Size in mm.	Food present.
23 July.	Rame Head	Callionymus lyra	1	9	<i>Acartia clausi</i> , <i>Temora</i> nauplius.
	Penlee	Gobius pictus	4	6-7	<i>Acartia clausi</i> .
		"	3	5-8	<i>Acartia clausi</i> , young <i>Temora</i> .
		Callionymus lyra	2	8-9	Copepod remains.
		Labrus (bergylta type)	4	5-7	Young <i>Temora</i> and nauplii.
	Rame to Penlee	"	10	4-8	"
		Gobius pictus	2	6-8	<i>Acartia clausi</i> , copepod nauplius.
		Callionymus lyra	1	9	Copepod remains.
25 July.	Rame Head	Labrus (bergylta type)	1	12	<i>Temora</i> nauplii.
	N.N.W., Penlee E.N.E.	Gobius sp.	1	8	Not examined.
	Polperro bearing N. $\frac{1}{2}$ E. to N. $\frac{1}{2}$ W. Looe Is. N.E. $\frac{1}{2}$ N.	Clupea pilchardus	1	18	No food.
		Callionymus lyra	2	5-9	Not examined.
		Solea sp.	1	2.5	"
		Lepadogaster candolli	1	5	"
		Labrus (bergylta type)	5	5-6	<i>Temora</i> and other copepod nauplii.
		Trachinus vipera	1	6	No food.
Aug.					
8	Rame Head N.W., Penlee N. by E. $\frac{1}{2}$ E.	Trigla gurnardus	1	6	Not examined.
		Caranx trachurus	2	2-5	"
		Trachinus draco ?	1	6	"
18	West Channel	Lepadogaster candolli	1	7	<i>Evadne</i> , <i>Podon</i> , <i>Pseudocalanus elongatus</i> .
	Cawsand Bay	Trigla gurnardus	1	9	<i>Paracalanus parvus</i> , other copepod remains.
	Middle Sound to New Grounds]	Gobius minutus	1	8	Not examined.
		Labrus (bergylta type)	1	6.5	<i>Podon</i> , <i>Temora longicornis</i> , <i>Pseudocalanus elongatus</i> .
		Lepadogaster candolli	2	5-6.5	<i>Temora</i> nauplius, <i>Calanus</i> nauplius, <i>Pseudocalanus elongatus</i> .
20	Off White Patch Cawsand Bay	Clupea pilchardus	10	17-23	No food.
		"	38	19-26	"
21	E Rame Head N.N.W. Mewstone, E.N.E., bottom	Gadus merlangus	1	36	<i>Calanus finmarchicus</i>
	E Rame Head N.W. $\frac{1}{2}$ N., Mewstone N.E. by E. $\frac{1}{2}$ E.	Solea lascaris	1	12	Alive.
		Ammodytes tobianus	1	17	No food.
D	Rame Head N.N.W., Mewstone ca. E.N.E., mid-water	Rhombus laevis	1	6	Eggs (probably copepod).

Date.	Aug.	Locality.	Fish.	No.	Size in mm.	Food present.
29	F	Rame Head N.N.W., Mew- stone ca. E.N.E.	Syngnathus rostellatus	1	42	Not examined.
			Caranx trachurus	3	8.5-17	<i>Paracalanus parvus</i> , <i>Centropages typicus</i> , <i>Coryceus anglicus</i> , <i>Podon</i> , <i>Halosphera</i> <i>viridis</i> , <i>Coscinodiscus</i> sp.
			Trachinus vipera	1	7	<i>Podon</i> , <i>Evadne</i> , <i>Pseudocalanus elongatus</i> .
			Trigla gurnardus	1	6	Not examined.
			Clupea pilchardus	8	17-21	No food.
			Arnoglossus sp.	2	14	Not examined.
	F	Rame Head N.N.W., Mew- stone ca. E.N.E.	Ammodytes lanceolatus	1	19	"
			Clupea pilchardus	14	19-22	No food.
29	D	Rame Head E by N. $\frac{1}{4}$ N., Eddystone S.E. $\frac{1}{4}$ S.	Arnoglossus sp.	1	7	Not examined.
			Trigla sp. (B form)	1	7	"
		Coarse Tow-net, bottom, Penlee Point to Rame Head	Trachinus vipera	1	5.5	"