



# IRISH FISHERIES INVESTIGATIONS

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# ESTUARINE AND INSHORE FISHES

## ERRATA

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## NOTES ON SOME IRISH ESTUARINE AND INSHORE FISHES

By

J. Bracken, Ph.D. and M. Kennedy, Ph.D.

(with records of the distribution of shads by Eileen Twomey, M.Sc.)

## INTRODUCTION

This paper brings together data collected in various ways by the authors, over a period of years. Some of the material described is a by-product of investigations, the primary results of which have already been published. Other material is supplementary to data previously published.

The material comprises :

- (a) Collections made in tide-pools and in shallow water along the south shore of Dublin Bay between 1948 and 1950;
- (b) Fishes other than herring taken in sprat weirs and beach-seines during a study of the biology of the herring on the east and south coasts of Ireland (Burd and Bracken, 1965);
- (c) Incidental data on species such as bass, mullet and shads, obtained since available information on the biology of these species was last summarised (Kennedy, 1954);

The species of fish involved may be roughly divided into three categories :—

- (1) Small species (blennies, gobies, etc.) of no direct commercial or angling importance, but of some significance as predators on or competitors with the young of more important species, or which serve as food for more important species;
- (2) Fishes such as bass or mullet, whose biology has not been studied in such detail as that of commercially important food fishes;
- (3) Common food fishes, whose biology has been the subject of much research, and is well known.

This paper adds to existing knowledge of the distribution, food, growth and reproduction of some of the species in the first and second categories above, particularly as regards Ireland. In the case of the third category of fishes, the data given is mainly in relation to the occurrence of young stages inshore along the Irish coast.

## SOURCES OF MATERIAL

**Sprat Weirs.** The sprat weirs from which material was obtained are situated at Passage East and Checkpoint, on the east side of Waterford Harbour (the combined estuary of the Barrow, Nore and Suir); and at Ballynatray, north of Youghal, on the estuary of the Munster Blackwater. These weirs have been described by Went (1959 and 1961). The sprat weir samples were obtained during the months August to March, in 1960, 1961 and 1962.

**Beach Seines.** The beach seine used for the capture of young herrings has been described by Hodgson (1929). It is 12 feet deep in the centre, 36 yds, long, with a mesh size in the centre small enough to

retain fish of a few cm in length. Beach seining was carried out during the months of July, August and September in the years 1960 and 1961.

**Rod Fishing.** The material on adult fishes of angling interest was collected over many seasons, and at various periods of the year, from a number of different areas; chiefly Dublin and Youghal, but also including Bray, Greystones, Kilmichael Point, Kilmore Quay, St. Mullins (Barrow Estuary), Carrick-on-Suir (Suir Estuary), Dungarvan, Ballycotton and Skibbereen. Information collected in this way has been supplemented in some instances by examination of commercial catches.

**Hand Nets.** Were used to capture small fishes in tide-pools and shallow water.

The Dublin Bay tide-pool collections between 1948 and 1950 were made at the following points :—

- (i) Merrion Strand: shallow pools on a wide, flat expanse of inter-tidal muddy sand.
- (ii) Seapoint: wrack-covered rocks, with pools and channels; giving way to flat strand with channels at about the level of low water of neap tides.
- (iii) Sandycove: pools on a rocky plateau beside deep water.

The map, Fig. 1, shows the location of the main stations from which samples of fish were collected.

## THE FISH

### CLUPEIDAE

The following members of the family Clupeidae were taken during sprat-weir and beach seine sampling :—

<i>Clupea harengus</i> , L.*	Herrings
<i>Clupea sprattus</i> , L.	Sprat
<i>Sardina pilchardus</i> , (Walbaum)	Pilchard
<i>Alosa finta</i> , (Cuvier)	Twaite Shad
<i>Engraulis encrasicolus</i> , (L.)	Anchovy

Young herring, sprat and pilchards, collectively known as "White-bait", were taken in most areas and showed a widespread distribution.

Shad, mainly of the O-group (less than one year old), but also some second year fish, occurred in fair numbers on the south coast only. Only one adult specimen of anchovy, which is considered rare in Irish waters, was recorded during these surveys. Since most of the material examined consisted of O-group herrings, sprats, pilchard and sometimes young twaite shad, external characters were not sufficient to separate them. Positive identification in doubtful cases was achieved by vertebral counts as follows:—

	Range of vertebral counts
Herrings (excluding summer spawned)	54-60
Sprat	47-49
Pilchard	50-53

The urostyle was included in all counts, as part of the last vertebra goes to form it. All the O-group herrings examined were of winter-spawned origin and therefore the range of vertebral counts was high.

One external parasitic copepod—*Lernacenicus sprattus* (Sowerby) was recorded from the Clupeidae examined during these investigations. According to Scott (1913) the female parasite is found on sprats and herrings attached to the eyes and other regions of the body anterior to the commencement of the dorsal fin. This parasite has not been found attached to any O-group herrings examined from Irish waters since 1958. It has been recorded frequently in sprats, however, particularly the sprats from the south coast. Its occurrence varied from 1% to 3% per sample in sprats taken in the Blackwater estuary, Co. Cork. The percentage occurrence in Waterford Harbour has been lower—0.5% to 1% per sample.

### *Engraulis encrasicolus*, L. Anchovy

The specimen of anchovy was taken in the beach seine in the Castletown River, Dundalk, Co. Louth. It is the first anchovy recorded from the Irish Sea and the third from Irish waters. The previous two specimens recorded were taken off the south coast, one in Ventry Harbour, Dingle, Co. Kerry, in the Autumn of 1869 and the other in Kinsale Harbour, Co. Cork, in October 1951 (Kennedy 1952).

Details of the Irish Sea specimen are as follows:—

Date of capture	=	21/7/'61
Fork length	=	14.1 cm
Total length	=	15.3 cm
Weight	=	25 g

### *Clupea sprattus*, L. Sprat

With few exceptions, sprats have been taken during the whitebait sampling programme at all south coast beach-seine stations (Fig. 1)

\*Scientific names in accordance with Went (1957)

from Knockadoon Bay, Co. Cork to Rosslare, Co. Wexford. The main concentrations would appear to be in the estuary of the Blackwater, Co. Cork and Waterford Harbour. The occurrence of large numbers of O-group sprats in the Southern Irish Sea from Rosslare, northwards to Clogherhead, Co. Louth, is, however, sporadic. Sprats are again numerous from Clogherhead to Carlingford Lough, Co. Louth.

Monthly larval surveys were carried out by the Cú Feasa using a modified Gulf 111 High Speed Tow Net during the December/April period of 1960/61 and the January/March period of 1962. This survey extended from the Fastnet, Co. Cork to Arklow, Co. Wicklow. In both seasons large numbers of sprat eggs and yolk-sac larvae were taken off the south coast, indicating that a substantial winter spawning had taken place.

Since O-group sprats never exceed 9.0 cm and are usually 7.0 to 7.5 cm in length, it can be concluded from the length analyses that in the majority of samples examined the fish were mainly O-group sprats. Older sprats (11.4—13.4 cm) were taken during the winter/spring period in the sprat weirs at Ballynatray, on the Munster Blackwater and at Passage East in Waterford Harbour, suggesting an inshore movement prior to spawning.

#### *Sardina pilchardus*, (Walbaum) Pilchard

Pilchards were abundant during the 1960/61 and 1962 surveys at the most westerly stations sampled on the south coast, i.e. Whiting Bay and Ballynatray, Co. Cork. Small catches of pilchard were made on the south-east coast and in the Irish Sea. Only small numbers of pilchard eggs and post-larvae appeared in the tin-tow net catches off the Cork coast. As the pilchard post-larvae (with fully formed fins) were taken in January, spawning must have been much earlier than in either the sprat or herring in the same area.

The limited measurements obtained from O-group pilchards showed that they were larger than the other Clupeoids; which is what one would have expected in view of the advanced post-larval stages taken early in the season at a time when the majority of sprat eggs had not yet hatched.

#### *Alosa finta*, (Cuvier) Twaite Shad

This is the common Irish species of shad. It ascends the Barrow, Nore and Suir each year in very large numbers, and also enters the Munster Blackwater in considerable numbers (Went 1953). Reliable information as to its distribution outside these rivers is, surprisingly, scanty. It is not exploited commercially, and it is only recently that anglers have discovered its sporting possibilities. Recent additional Irish records include the following:—Dundalk Bay, River Nanny, Irish Sea (east of Lambay), Slaney Estuary, Ilen Estuary and Dingle Bay. The size range of these specimens was from 28.0 to 43.2 cm.

An apparently land-locked form of twaite shad occurs in the lakes of Killarney. This has been classified as a geographical sub-species, *killarnensis*, (Trewavas 1938). Very little is known about it. Recent records include fish of 16.5 cm and 11.4 cm in 1955 (Gibson 1956) and one of 18.1 cm in June 1957 (all fork length), (Twomey 1958).

In the Barrow, Nore and Suir, shad appear in the upper tidal reaches—at St. Mullins, Inistioge and Carrick-on-Suir respectively—towards the end of April and are present until early June. They come with the tide and a single tide may bring a very large number. They will not, however, run in very large numbers if there is a flood in the river. In this respect they behave quite differently from salmon and sea trout. They occur in shoals over several miles near the head of the tide, tending to concentrate in the pools at low water. In both the Barrow and the Suir there are weirs at the upper limits of the tide over which shad do not pass. In these upper tidal reaches, where the rise of tide is several feet, the water is quite fresh, and the fauna and flora are of freshwater character.

The shad have been described as “rushing about on top of the water in the evenings” at St. Mullins, presumably spawning. In the parts of the river where this activity occurs, the river bed is mostly stones with some big rocks, and with a fair flow at low water.

The specimens obtained at St. Mullins and at Carrick-on-Suir in May were ripening or ripe. No spent fish were taken. They probably drop downstream soon after spawning.

**HABITS:** In Youghal Bay, in the estuary of the Munster Blackwater, in July and August, shoals of twaite shad are not infrequently found associated with mackerel. They can then be caught on spinners as well as in nets.

**FOOD:** Some specimens taken at sea were examined. Where food was present it consisted of fish remains—sprats in some cases; unidentifiable in others.

Seventeen shad from 270 g to 965 g in weight, taken on rod and line at St. Mullins on May 26th, 1960 were examined for food. The stomachs were generally empty except in the very few cases, where vegetable debris was present. This might have been accidentally swallowed when the fish were being played. More than twenty shad of up to 990 g in weight, examined at Carrick-on-Suir in early May 1961, also contained no food. In May 1961, shad at St. Mullins were, however, observed rising at winged *Simulium* spp. and at mayflies (*Ephemera danica*). The stomachs of a number of these shad were examined. While most were empty, one contained several winged *Simulium* and some Grey Flag sedges (*Hydhopsyche* sp.); one contained winged Grey Flag sedges; one contained an *Ephemera* nymph on the point of moulting into a subimago; and one contained a quantity of shad spawn.

GROWTH RATE: Young shad taken in the sprat weir at Passage East in the estuary of the Waterford River during the autumn-winter period appear to comprise two age groups:—

- (1) fork length 6.0 to 8.0 cm; no annulus on scales.
- (2) fork length 12.5 to 14.7 cm; an annulus present, well in from the edge of the scale.

The smaller shad, which may be assumed to be O-group, were present in collections made from late August through to March during the years 1959 to 1961. Shad in the second group, presumably 1 year older, were present only in autumn collections. It would therefore seem that the young shad descend into the strongly saline water of the lower estuary during their first year, and remain there during their first winter and second summer. Migration to the open sea probably takes place during or towards the end of the second winter. The shad do not return to the estuaries until they are mature and ready to spawn.

Judy (1961) found that in the American shad, *Alosa sapidissima*, at spawning time, the age of the fish is the number of growth checks or annuli on its scales plus one i.e. the scale edge corresponds to the location of the current annulus, when it will be formed. The scale edge becomes eroded in the gravid fish during their visit to fresh water. In consequence, the scales of previously-spawned shad bear spawning marks like those seen on the scales of previously-spawned salmon.

A small sample of twaite shad caught on rod and line at St. Mullins at the head of the Barrow estuary on May 26, 1960 was examined. The fish ranged in weight from 270 g to 740 g and all were mature. Their scales were similar to those of the American shad as described by Judy (1961) and the occurrence of spawning marks indicated a first spawning at an age of four to six years. Some twaite shad had multiple spawning marks. None showed a "fresh-water zone" on the scales as described for the American shad, though a few showed a slight false check in the second year of life. Growth rates calculated from fourteen twaite shad are given in Table 1.

Table 1. Calculated fork lengths of twaite shad at formation of of annuli (cm)

	L 1	L 2	L 3	L 4	L 5	L 6	L 7
Mean	7.5	14.1	21.0	25.8	31.7	34.3	35
Range	6.3—8.9	11.5—16.5	16.5—29.2	20.3—31.7	30.5—34.3	29.2—35.5	30.5—41.2

It will be noted that the back-calculated L 1 and L 2 agreed fairly well with the measured length of the autumn-winter juvenile shad taken in the lower estuary, which were deemed to belong to the

O-group and 1+ age group. The sample examined was too small to show if males and females grow at different rates. The oldest shad in the sample was a female aged 9 years, which was only 33.7 cm fork length.

A female shad of 45 cm fork length, weighing 1035 g caught at St. Mullins in May 1960 was 7 years old, and spawning for the third time.

#### *Alosa alosa*, (L.) Allis Shad

The allis shad grows much larger than the twaite shad, attaining a weight of as much as 8 lb. In Continental rivers, it is known to travel upstream, in some cases, as far as salmon and it enters the rivers somewhat earlier than the twaite shad. Its distribution in Ireland is uncertain, and because of the difficulty of distinguishing it from the twaite shad, records of the occurrence of allis shad must be accepted with caution.

Statements by some authors that the allis shad spawns in the Shannon are not correct. Only one authentic record of the occurrence of an allis shad in the Shannon can be traced—a fish taken at Killaloe in the nineteenth century (Mayne, 1861). It may, perhaps, be significant that the Shannon Pollan *Coregonus pollan elegans*, of Lough Derg, which spawn near Killaloe are known locally as "shad". In fact shad of either species are virtually unknown in the Shannon, certainly in the Limerick area, or upstream of it.

Recent definite records of allis shad in Irish waters are given in Table 2.

Except for the Foyle, Ilan and Killarney specimens, all these allis shads were taken at sea. The minimum size at spawning is not known, but some at least of these specimens must have been mature. In 1960, in Dingle Bay, numerous specimens were obtained by trawlers from February to April but only one in May and one in June. However, they became more common in the catches again in July and August. The scarcity of shad specimens in May and June may have been due to the fact that the trawlers did not encounter the shoals. However, the presence of adult allis shad in Dingle Bay, both before and after the spawning period, does suggest that spawning may take place in one of the rivers flowing into the Bay.

The stomachs of many of the allis shad were empty or had unidentifiable contents. Of 20 Dingle Bay specimens, whose stomach contents was noted, 13 contained "plankton" and 7 contained fish. The specimen from Valentia contained small Euphausiids. Seven specimens from Baltimore, Dunmanus and Bantry Bays, which were taken in a *Nephrops* trawl by the research vessel Cú Feasa, all contained Euphausiids.

Table 2. Recent records of the occurrences of allis shad in Ireland

Year	Month	Location	Numbers	Length Range
1953	July	Port Ballintrae, Co. Antrim*		
1956	September	Foyle Est.*		
1956	May	Ilen Est.		35.2 (39.6) cm
1958	June	"		36.1 (41.9) cm
1960	May 12	"		36.0 cm
1960	May 13	"		45.7 cm 1120 g spent
1961	October 4	Baltimore (Mouth of Ilen)	4	34.4; 35.9; 26.9; 36.2 cm
1961	October 5	Dunmanus Bay	2	30.6; 30.2 cm
1951	October 5	Bantry Bay		39.7 cm
1960	Feb. 18-23	Dingle Bay	11	26.0 to 47.3 cm
1960	March 2-29	"	15	30.1 to 41.2 cm
1960	April 8-27	"	10	32.3 to 39.3 cm
1960	May 24	"	1	34.8 cm
1960	June 14	"	1	31.0 cm
1960	July 1-20	"	21	26.1 to 38.2 cm
1960	August 9	"	18	28.0 to 34.2 cm
1961	April 24	Valentia (Dingle Bay)		44.3 cm
1958	February 19	Killarney		44.0 cm Found dead on shore of upper lake
1961	September 15	Galway Bay		36.9 cm

(Total lengths in brackets, otherwise fork lengths).

\*Records by Vickers (1959)

### OSMERIDAE

#### *Osmerus eperlanus*, L. Smelt

The true smelt has so far been recorded only from the estuary of the Shannon and of its tidal tributaries (Kennedy 1948). Large numbers of smelt appear in the upper tidal reaches at Limerick in early spring, chiefly in March. These are adult fish with ripe gonads. Samples of these fish were examined in 1947 and 1948. Spawning smelt were observed in the R. Fergus at Ennis on March 20, 1963.

A small sample of fourteen smelt was obtained from the estuary of the Fergus (tributary of the tidal Shannon) at Clarecastle in early

June 1960. These smelt were recovering spents and maiden fish. Of the fourteen fish examined, four contained no food and the remainder contained one to four specimens each of the common sand shrimp, *Crangon sp.* One held, in addition, a Chironomid larva.

Table 3. Calculated fork lengths of smelt (cm)

Place and date	No.	Age		
		2+	3	3+
Limerick, March, 1948 (R. Shannon)	3	—	17.3 cm (16.0—19.8)	—
Clarecastle, July, 1960 (R. Fergus)	13	15.5 cm (13.2—18.3)	—	19.1 cm (14.0—21.5)

### SYNGNATHIDAE

Irish species of pipefishes belong to four different genera:—*Siphonostoma*, *Entelurus*, *Nerophis* and *Syngnathus*. The first, represented by a single species *Siphonostoma typhle*, does not appear to be common (Went 1957), and no specimens were obtained by either author. The ocean pipefish, *Entelurus aequoreus* appears to live mainly at some distance from the shore. Large examples were found in the stomachs of large pollack from Youghal Bay in June 1954. *Nerophis* is represented by two species, of which one, *Nerophis lumbriciformis*, the worm pipefish, appears to be fairly common in tide pools in some areas. Specimens were obtained by hand net in a pool in the sand at the top of Crookhaven inlet in June 1960. *Nerophis ophidion*, the straight-nosed pipefish, is scarce in Ireland, and no specimens were obtained in the Dublin shore collections or in the herring investigations.

No specimens of *Syngnathus spp.*—nor indeed any pipefishes—were obtained in Dublin Bay shore collections in 1948, 1949 or 1950. However specimens were not infrequently captured in the beach during 1960 and 1961 (see below). There is probably an association between these fishes and weeds of one kind or another, including a possible association with *Zostera* beds.

Couch (1877) and Day (1880-1884) attributed all British and Irish samples of *Syngnathus* to a single species, *S. acus*. Fries, Ekstrom and Sundeval (1893) and Meek (1916) list two species, however, as having a more or less co-extensive range, from Norway to the Bay of Biscay. These two species are the greater pipefish, *Syngnathus acus*, L. and the lesser pipefish, *Syngnathus rostellatus*, Nilsson. Travis Jenkins (1936) states that *S. rostellatus* is plentiful on at least some parts of the British coast. Wheeler (1957) identified two small pipefish, taken by dipnet close inshore at Felistowe, Suffolk, as young specimens of *Syngnathus rostellatus*. Examination by Wheeler of the collection of

pipefishes in the British Museum (Natural History) revealed eighteen additional records for the British coast and one for the Irish coast taken in Blacksod Bay, Co. Mayo. The beach seine catches from the east and south coasts of Ireland included both species.

According to Fries, Ekstrom and Sundeval, *Syngnathus acus* grows to 50 cm, while *S. rostellatus* grows to only 16 cm.

Examples of *Syngnathus spp.* were taken in the beach seine in the following localities:—

- S. acus.*: Wexford Harbour; Passage East. Size range 31.7—41.8 cm
- S. rostellatus.*: Mornington; Howth; Passage East. Size range 13.1—14.5 cm
- Syngnathus spp.*: Passage East, July 1961. Size range 8.1—18.0 cm; not critically examined.

It was noted that the eggs carried by males of *Syngnathus rostellatus* were of much smaller diameter than those carried by males of *S. acus*.

A female *S. acus* cast ashore at Sherkin Island, Co. Cork in March 1962 was 33 cm long and contained ripe eggs 2.5 mm in diameter.

#### BELONIDAE

Young garfish *Belone belone* (L.) were taken in the beach seine as follows:—

Rosslare Strand	August 1960	3 specimens	11.5—15.0 cm
Passage East	July 1961	1 specimen	38.5 cm
Cahore Point	August 1961	4 specimens	average 35.0 cm

#### GADIDAE

Under-yearling cod, *Gadus callarias*, (6.4 to 13.0 cm), coalfish, *G. virens*, (8.5 to 15.9 cm), pollack, *G. pollachius* (6.4 to 14.7 cm) and whiting, *G. merlangus* (5.3 to 16.3 cm) were frequently taken in beach seines. Under-yearling pouting, *G. luscus* (6.5 to 9.5 cm) and poor cod, *G. minutus* were less often taken.

Black spots on body and fins, due to the presence of the metacercariae of the trematode *Cryptocotyle lingua*, were frequently present in young whiting, coalfish and pollack, and less frequently in cod. Samples of gadoids from Dundalk Bay were particularly affected by this parasite.

The five-bearded rockling, *Onus mustelus*, was frequently taken in shore pools at Seapoint in Dublin Bay. The size range was from 9.2 to 15.3 cm. Specimens taken in July were spent, while others

taken in March, April and August were full, which indicates a prolonged spawning period. The pelagic young stages of *O. mustelus* have been described by Cunningham (1896) and McIntosh and Masterman (1897). Small specimens at a later stage of development taken at Seapoint and kept in an aquarium showed the characteristic colour changes from silvery through blue-black to brown and sometimes amber.

#### SERRANIDAE

The bass, *Morone labrax*, is common in Irish waters. It is not taken commercially to any significant extent; but it ranks high as a sport fish. Other species of Serranidae e.g. *Polyprion americanus* and *Epinephelus gigas* are of infrequent or rare occurrence in Irish waters. (Went 1957).

#### *Morone labrax*, (L.) Bass

The bass is a long-lived, slow-growing fish which frequents estuaries, beaches and bays, and also tide-rips over offshore reefs. It is plentiful on many parts of the Irish coast, especially in the south and south west. It spawns in spring and early summer, May probably being the peak spawning month on the Irish coast (Kennedy 1954). The conditions of the gonads in May and June suggests that spawning on our coast may be intermittent and protracted.

Eggs of bass were taken in townets at the Splaugh Rock (Rosslare) and in Youghal Harbour in May and early June 1967, and will be described elsewhere. Later stages obtained by the authors were as follows:—

Rosslare Strand, Co. Wexford	August	1 specimen 2.5 cm (beach seine)
Courtown Harbour, Co. Wexford	August	Numerous specimens, average 2.5 cm, taken in a hand net in brackish water (salinity 3.5 parts per thousand), along with O-group mullet.
Cahore, Co. Wexford	August	1 specimen 3.5 cm (beach seine)

Larger juvenile bass were taken in sprat weirs and beach seines at Passage East (Waterford Estuary); Ballynatray and Youghal (Cork Blackwater estuary); Wexford; and Mornington (Boyne Estuary). In addition, small bass of one to three year old were taken on rod and line in a little tidal creek running into a pill opening off the Cork Blackwater Estuary east of Ferry Point in June 1957. Details are given in Table 4.

Table 4. Juvenile bass (Fork lengths in cm)

Month and Location	Age Group	Average Length	Range
October 1961 Ballynatray	0+	6.6	5.9—7.2
March 1959 Ballynatray	0+	8.57	7.0—9.5
June 1957 Tidal Creek	1	9.0	—
June 1957 Tidal Creek	2	15.5	14.7—16.7
July 1961 Passage East	2+	15.0	—
August 1960 Ballynatray	2+	13.45	13.3—13.6
August 1960 Wexford	2+	16.4	16.0—16.8
August 1961 Youghal	2+	18.0	Numerous specimens
September 1961 Mornington	2+	18.0	" "
September 1960 Ballynatray	2+	14.0	Single specimen
June 1957 Tidal Creek	3	23.8	23.5—24.2

#### CARANGIDAE

Scad, *Trachurus trachurus*, (L.) of the O-group were occasionally taken in beach seines at Youghal, Ardmore, Passage East and Dunbrattin, Co. Waterford, as follows:—

Year	Month	Place	Length (cm)
1960	September	Ardmore	6.0
1960	August	Passage East	7.5
1961	"	Passage East	6.3 7.2, 7.7
1960	"	Ardmore	7.5, 7.7, 9.1
1960	"	Dunbrattin	6.2
1961	October	Youghal	6.7

The maximum length was 9.1 cm and the average length 7.2 cm.

#### LABRIDAE

The two commonest Irish wrasses are the corkwing, *Crenilabrus melops*, and the ballan wrasse, *Labrus bergylta*. First season fry and juveniles of the former, and first-season fry of the latter, were common in tide-pool collections at Seapoint in 1948 and 1949. The adults of both were common on the Dublin coast. O-group and immature specimens were absent from beach seine samples from the south and west coasts of Ireland, although adults were found in the beach seine collections.

#### AMMODYTIDAE

Sand-eels, mostly small specimens, were taken in considerable quantities in the beach seine. Critical review of the European sand-eels has shown that the number of species involved is greater than was formerly believed. (Corbin 1950; Duncker and Mohr 1939). Positive identification was not carried out on any of these samples.

Four species have now been recorded from the Irish coast, namely *Ammodytes marinus*; *A. lancea* (= *A. tobianus*); *A. lanceolatus*; and *A. immaculatus* (Molloy 1966).

#### TRACHINIDAE

The greater weever, *Trachinus draco*, is not infrequently taken in Irish waters (Went 1959) but seldom close to the shore. The lesser weever, *Trachinus vipera*, appears, however, to be common close inshore on many parts of the coast where conditions are favourable i.e. where the sand is of a suitable gritty texture. Where sand-eels burrow, weever are likely. In July 1961 at Passage East, 18 specimens ranging in size from 7.5 to 13.1 cm were taken in the beach seine. Isolated specimens were taken at Rosslare, Ardmore and Fethard as follows:—

Year	Month	Place	Number of Specimens	Length in cm
1961	July	Passage East	18	7.5 to 13.1
1961	"	Rosslare	1	5.6
1960	August	Fethard	Several	not measured
1960	September	Ardmore	2	7.2, 10.7

Lesser weevers were found to be common along the beach at Courtown Harbour.

#### SCOMBRIDAE

Three mackerel, *Scomber scombrus*, of the O-group were taken in Wexford Harbour and Passage East in the beach seine in 1960 and 1961.

Year	Month	Place	Length (cm)
1960	August	Wexford Harbour	12.1 (fork length)
1961	"	Passage East	7.5 cm and 10.0 (fork length)

#### GOBIIDAE

The black goby, *Gobius niger* L. is common in brackish situations, often amongst mud and stones, on many parts of the Irish coast. The

rock goby *Gobius paganellus* Gmelin is common in rocky situations on many parts of the Irish coast. Neither of these species, however, was taken in the beach seine, nor in the collections on the south shore of Dublin Bay.

*Gobius microps* Kröy is now recognised as distinct from *Gobius minutus* Gmelin, from which it differs in vertebral count; in the arrangement of the papillae on the head; and in the complete absence of scales on top of the head, and on the nape as far back as the commencement of the dorsal. It is known to be plentiful in water of low salinity on the north side of Dublin Bay e.g. in the Bull Island area, but it was not taken in the collections on the south side of Dublin Bay. A specimen was identified from a fauna collection made in Sally's Lake, Burtonport on August 11, 1966 (Salinity 27.4 parts per thousand).

Gobies of the "*minutus*" type were frequently taken in the beach seine and in some instances e.g. Wicklow, September 1961, specimens of *G. microps* were present. As the beach seine examples of *minutus* type goby were not critically analysed, however, they are omitted from this paper, since they were probably a mixture of species.

*Gobius pictus* Malm and *Gobius flavescens* Fabricius (= *G. ruthensparri* Euphrasen) were both taken in Dublin Bay, but only the latter in the beach seine.

#### *Gobius minutus* Gmelin Freckled Goby

This small goby is common everywhere in shallow salt or somewhat brackish water, on bottoms of sand, muddy sand or even mud. It is of some importance as a food for bass, flounders, gurnards and young gadoids, and it is sometimes preyed upon by such small shore fishes as *Cottus bubalis*.

It was frequent in collections on the south side of Dublin Bay, on Merrion Strand, at Seapoint, at Salthill, and in Dun Laoghaire Harbour.

On May 23 to 25, 1948, large numbers of fry of this species were found in the tide-pools at Seapoint. A few were only 6 mm long, the rest mostly 14 mm. They were swimming at the surface along with shoals of mysids, and specimens transferred to aquaria also swam at the surface. On June 9, 1948, they were still plentiful at Seapoint, but had now descended to the bottom—as had also, by this time, the specimens in aquaria.

In any one season, two size groups could be recognised, which appeared to be two successive year classes. Those in the larger size group were mature. Details of collections are given in Table 5.



Fig. 1. Map showing principal collecting stations referred to in the text.

TABLE 5. *Gobius minutus* from Dublin Bay, Leinster, Ireland

Date	Size Group A.		Size Group B.	
	Mean Length	Range	Mean Length	Range
May 23-25, 1948	6.0	—		
	14.0	—		
June 9, 1948	19	—		
June 28, 1948	21	15-29		
June 29, 1948	14	—		
July 9, 1948	21	12-28		
July 14, 1948	25.5	12-36		
October 4-5, 1948	50	Single specimen	79	78-80
June 29, 1949	—		42	Single specimen

A specimen placed in an aquarium when 19 mm long on June 9, 1948, reached a length of 25 mm by June 28, and a length of 29 mm by July 7.

It is probable that spawning occurs over a considerable period during the spring and summer, judging by the considerable size variations in samples of young fish. Maturity appears to be attained about a year after hatching, and it is possible that the spawned gobies do not survive the second winter.

The diet includes copepods, amphipods and chironomid larvae, with copepods probably the principal constituent.

#### *Gobius pictus*, Malm Painted Goby

This species is often found associated with *G. minutus* and is also demersal. It shows, however, a preference for rather coarse sand and shell debris. It is very similar to *G. minutus*, but in the water looks more yellowish grey, and the pale saddles on the back are conspicuous and well defined. In the adults, there is a row of dark spots along the base of the membrane of both dorsal fins. The dark flecks along the mid-line of the side are fewer, and more widely spaced than in *G. minutus*, and do not show any tendency to form vertical bars, as in *G. microps*. According to Holt and Byrne (1903) this species grows to 55 mm. The species is plentiful in Dublin Bay. It was identified from 1960 beach seine catches on the east and south coasts. Specimens obtained at Seapoint in 1948 had the following size distributions:—

October 3 — 26, 34, 37 mm

October 4 — 25, 26, 30, 31, 34 mm

When transferred to an aquarium, they rested on the bottom but frequently glided up and over the stones. They ate small amphipods.

*Gobius flavescens* Fabricius=*G. ruthensparri* Euphrasen

The "tail-spotted goby" is common, probably all round the Irish coast, in shallow water in or near weeds, where it swims in shoals in mid-water. It is the species frequently seen swimming about, near, and over steps in harbours. It is slender, translucent, but rather more compressed than *pictus* or *minutus*. The colour is greenish or brownish, with pale saddles on the back, a large conspicuous more or less round dark spot at the end of the caudal peduncle and a line of iridescent blue dots along the side, more intense in the males. In the water, it often has a chequered appearance. According to Holt and Byrne (1903), it attains a length of 64 mm.

Specimens were obtained in Dublin Bay in 1948 as follows:—

September 11	Dun Laoghaire Harbour	25, 27, 37, 39, 42, 44 mm
October 4	Seapoint	39 mm

In the aquarium these gobies swam constantly in mid water, and fed mainly on copepods. In September and October 1949, this species was plentiful in rock pools at Sandycove in Dublin Bay, and specimens were obtained as follows:—

September 10	39, 42, 43, 45, 45, 50 mm
October 22	44, 49 mm

Some much larger specimens were seen in the same pools but not caught. The food present in the examples obtained consisted almost entirely of copepods, plus a few tiny amphipods. On April 1, 1950, a specimen, 48 mm in length, obtained at Sandycove was a female with enlarged gonads. Its stomach held some copepods and many barnacle larvae.

Beach seine specimens obtained at Carlingford Lough in August 1961 measured as follows:—

3.2, 3.5, 3.5, 3.6, 5.0, 5.4, 5.4 cm

*Gobius flavescens* was not identified from other beach seine hauls.

This species was frequently present in the stomachs of yearling pollack and coalfish from the Dublin coast.

*Aphia minuta*, (Risso)

This transparent goby lives in sandy places in shallow water. It has been infrequently recorded from Irish waters. This may be due to its presence being undetected rather than to actual scarcity. Holt and Calderwood (1895) recorded four specimens from Killybegs in June 1890, the largest a male of 55 mm. Two adults were taken in the beach seine in Dunbrattin Harbour, Co. Waterford in August 1960.

## CALLIONYMIDAE

The dragonet, *Callionymus lyra*, appears to be common and widely distributed in Irish waters (Went 1957). Females and immature males are not infrequently caught on hook and line in Killiney Bay, Co. Dublin, and sometimes from Dun Laoghaire Pier. Specimens were taken in beach seines, from Wicklow to Ardmore, and the range in size was from 5.0 to 14.6 cm.

## BLENNIIDAE

The two commonest and most widely distributed of Irish blennies are the smooth blenny or shanny, *Blennius pholis*, and the butterfish, *Pholis gunnellus*. Both are frequent on stony shores nearly everywhere. They were well represented in Dublin Bay shore collections in 1948 to 1950.

The tompot blenny, *Blennius gattorugine*, may not be uncommon in some localities, but may have a preference for the zone beyond tide marks. It was not infrequent in Ballycotton, but was absent from the Dublin Bay collections.

*Blennius pholis*, L. Smooth Blenny

In aquaria, this species is virtually omnivorous. Specimens taken in Dublin Bay contained small crabs, amphipods, gastropods, polychaetes and barnacles—the last chopped off the rocks by means of the powerful teeth, which enables this small fish to exploit a wider range of diet than most others.

Females with enlarged gonads were taken in Dublin Bay in April and May; the most advanced eggs were in a female obtained on May 28. Females were gravid at lengths as small as 7.8 cms, and males with well-developed testes were obtained as small as 6.1 cms.

The smaller specimens taken in Dublin Bay were as follows:—

September 4 1949	21 and 40 mm	April 28 1949	48 mm
September 5 1949	20, 27, 30 mm	May 28 1949	48 mm

These were all immature.

Spawning, therefore, takes place in late spring or early summer, and maturity is not attained at one year old.

*Pholis gunnellus*, L. Butterfish

This species is found mainly amongst weed-covered rocks. Its diet includes copepods, amphipods and tiny crabs. The butterfish itself has occurred in the stomach of bass.

While numerous specimens from 4.0 to 10.3 cm were taken in Dublin Bay in various months of the year, the material afforded no positive data on maturity or spawning season, nor any clear-cut indication of growth-rate.

## MUGILIDAE

The thick-lipped mullet, *Mugil labrosus* Risso (= *M. chelo* Cuvier) is common all around the Irish coast; but so far no other species of grey mullet has been positively identified from Irish waters.

*Mugil labrosus*, Risso. Thick-Lipped Grey Mullet

This is a long-lived fish, which is even slower-growing than the bass, taking about ten years to reach a length of 40.5 to 44.5 cm and 15 years or more to attain a length of upwards of 50 cm and a weight of 2,200 g.

The food of the thick-lipped mullet consists, in the main, of diatoms and other unicellular algae found in sand and mud, or forming films on rocks or weeds. It also eats vegetable detritus. While largely herbivorous, mullet also eat small invertebrates, the kinds most often found in Irish mullet being the small gastropod, *Sabanaea ulvae*; the burrowing amphipod, *Corophium volutator*; chironomid larvae; and sundry beetle larvae, small polychaetes and other lesser creatures found in the muddy, brackish situations frequented by mullet. In urban areas, mullet feed on a more varied diet, which includes such items as bread, milk wastes or fish offal.

The spawning habits of mullet are unknown in Irish waters.

The shoals of young mullet fry, swimming right at the surface in silvery patches, are familiar in many harbour and estuaries in July and August. Presumably they are plankton feeders at this stage. By September, they have become partly or largely demersal.

Juvenile mullet are common in creeks, pills, lagoons and estuaries in many places. Small mullet were taken in beach seines at Cahore (Co. Wexford), Fethard (Co. Wexford) and at Wicklow; and in the sprat weirs at Ballynatray (Cork Blackwater estuary). Yearlings were taken in a hand-net in a tide pool at Crookhaven, Co. Cork; and samples of 2+ mullet were caught in an ordinary seine in a large pool in a creek entering Dungarvan Harbour (Co. Waterford) at Barnawee. Details given in Table 6.

Table 6. Juvenile Mullet. Fork lengths (cm)

Date	Location	Age Group	Average	Range
August 1961	Cahore	0+	3.5	Two specimens
	Wicklow		3.27	2.2—3.5
October 1961	Ballynatray		4.0*	Fifty-three specimens 2.5—6.5
			4.95*	
			5.45*	
June 1960	Crookhaven	1	6.6	5.7—7.3
September 1960	Fethard	1+	12.25	11.9—12.6
September 1959	Dungarvan	2+	16.3	15.2—17.3

\* Three modes in sample

## ATHERINIDAE

Only one species of this family has been recorded from Ireland, namely the atherine or sand smelt *Atherina presbyter* Cuvier. It is often confused in fact as well as in name with the true smelt, *Osmerus eperlanus* L.

*Atherina presbyter*, Cuvier. Sand Smelt or Atherine

This fish was at one time common all around the Irish coast (Thompson 1856). During the present century it disappeared from many of its former haunts, and at about the same time it declined in numbers in Britain also (Kennedy 1954). The destruction of the *Zostera* beds by blight during the nineteen-thirties may have been a factor in its decline, as it was often found in association with *Zostera*. It spawned amongst *Zostera*; its eggs, which have adhesive filaments, becoming attached to the plants. No examples were taken in Dublin Bay during collections there from 1948 to 1950.

In recent years, however, it has been taken in beach seines on many parts of the coast, from Wicklow in the east to Dunbrattin Harbour, Co. Waterford. Atherines were plentiful in the inlet at Rosscarbery in west Cork in 1965, and examples were identified from Donegal in 1962 and from Fenit (Co. Kerry) in 1967.

The atherine is much smaller than its nearest Irish ally, the grey mullet; it does not grow to more than about 19 cm in length. It is also much more slender than the mullet; has a proportionately much larger mouth; and lacks the papillose upper lip. Specimens from Dunbrattin Harbour contained the megalopa larvae of crabs and also tiny *Crangon* sp. Some also held the bones of juvenile clupeoid fishes. At Rosscarbery, atherine were observed attacking mysids, mullet fry and very small sand-eels.

Eighteen specimens from 9.5 to 12.3 cm fork length taken at Kilmore Quay in July 1960 were all mature and all unspawned. The males had ripe milt. Spawning therefore appears to take place in late summer. Post-larvae 11 to 18 mm long were obtained in rock pools on the Wexford coast on July 25, 1967.

The scales show rather vague growth zones, but are difficult to interpret. Some operculars were examined, but as they were from fish preserved in alcohol, their legibility may have been impaired. They showed growth zones, but only in the outer portions—the bigger the fish, the bigger the area of opercular in which growth zones or annuli could not be detected. The smallest specimens whose operculars were examined were 6.0 cm fork length. They showed two definite annuli, and some other less definite marks which might or might not be annuli. The smallest specimens actually measured were 4.4 cm fork length (August) and were almost certainly not fish of the year.

Larger atherines showed up to 8 or 9 annuli in the outer portion of the opercular.

While a growth curve could not be calculated from the material examined, it would seem that the atherine differs from many other small inshore fishes, and resembles its larger ally, the mullet, in being a relatively slow-growing and possibly rather a long-lived species.

### TRIGLIDAE

Of the six species of *Trigla* recorded from British waters, one species, the long-finned gurnard, *Trigla obscura*, has not so far been positively identified from Irish waters. The streaked gurnard, *T. lineata*, is occasionally taken in offshore waters on the south coast of Ireland, but is not common (Went 1957). The piper, *T. lyra*, at one time believed to be rare or scarce, is now known to be fairly common off the south coast.

The remaining species—the red, grey and tub gurnards—are common and widely distributed all around the Irish coast.

The red gurnard, *T. cuculus*, is very plentiful in many areas—Irish Sea, south coast, north coast—but it seems to occur mainly in depth of 15 or 15 fathoms and upwards. Neither adults nor young have been obtained close inshore.

The grey gurnard, *Trigla gurnardus*, is common in a wide range of depths, on bottoms of sand and sandy mud, and adults may be encountered in any depth from a fathom to twenty fathoms and over. Two young specimens were obtained in the beach seine at Wicklow in September 1961, with total lengths of 9.3 and 11.2 cm.

The tub gurnard, *Trigla lucerna*, = *Trigla hirundo*, also frequents a wide range of depths, and adults are often found close inshore. Young specimens taken at Passage East and Fethard ranged in size from 9.4 to 15.6 cm. All the young tubs showed, on the inner aspect of each pectoral, the patch of royal blue polka-dotted with white, which is illustrated by Hardy (1959). This is not usually present in adult Irish specimens, in which most of the inner aspect of the pectoral is brownish, orange or bluish-brown, with some dark spots, but with a vivid blue border at the tip of the fin.

### COTTIDAE

*Cottus bubalis* Euphrasen. Long-Spined Sea Scorpion.

This, the smaller of the two common Irish species, is the more frequently encountered in the tide pools. It is common in rocky situations nearly everywhere. Day (1884) gives the fin ray count as D 8/11 P 16 A 9 C 10 V1/3. There is, however, much variation. 27 Dublin Bay examples gave the following counts:—

1st dorsal	7 in 2; 8 in 23; 9 in 2.
2nd dorsal	11 in 9; 12 in 17; 13 in 1.
Anal	8 in 3; 9 in 17; 10 in 7.

In ten Dublin Bay examples, the rays in other fins were:—

Caudal	10 in 3; 11 in 6; 12 in 1.
Pectoral	14 in 2; 15 in 8.

This species cannot therefore be distinguished from *C. scorpius* by fin-count. *C. bubalis* can, however, be identified by the presence of a tiny barbel at the corner of each maxillary, and by the fact that the gill-membranes are not connected across the isthmus, as in the case of *C. scorpius*. The largest *C. bubalis* in the Dublin Bay collections measured 16 cm.

The food of 38 adults from Dublin Bay comprised tiny shore crabs, amphipods, isopods, copepods, sand shrimps, hermit crabs, spider crabs, Pycnogonidae, terebellid worm, small nereids, other polychaetes, worm eggs, chironomid larvae and larvae of the seaweed fly. Amphipods were the dominant food, and shore crabs the next most important.

Ripening females were taken in January; ripe or nearly ripe females in February and March; ripe, part spent and spent fish in April; and only spent females in May and June. The smallest ripe male obtained measured 6.7 cm; the smallest ripe female 7.4 cm. Females of 6.1 and 6.6 cm taken in March and April were immature.

The measurements of young specimens taken in Dublin Bay are given in Table 7.

Table 7. Juvenile *Cottus bubalis*

Dates	Lengths (mm)	Dates	Lengths (mm)
May	15	July 22—27	36—42
June 22—23	17—35	August 8	39—45
July 7—9	16.5—33	September 5	52

A specimen of 17 mm placed in an aquarium on June 22 grew to 31 mm by July 26. The fish listed above are presumably the fry of the year.

*Cottus scorpius* L. Short-Spined Sea Scorpion

In this species, the gill-membranes are united across the isthmus, and there are no barbels at the corner of the maxillary. Fin-counts for Dublin Bay specimens agreed with Day's formula, namely D 9-10/13-14 (16-17); A 9-13 (14); C 11, Pect 16-17.

Specimens of about 18 cm were not infrequent in rock pools in Dublin Bay, and examples of up to 795 g were taken by anglers off Sandycove in deeper waters. A specimen of 23.2 cm was taken in the beach seine at Carlingford Lough.

A 795 g specimen, which measured 33.6 cm, was a female.

recovering spent, taken on June 28, 1947. It had eaten an edible crab and a swimming crab.

No small specimens of this species were taken in beach seines.

### AGONIDAE

No specimens of the armed bullhead, *Agonus cataphractus*, were obtained during the Dublin Bay shore collections, but examples were frequently found in the stomachs of codling and cod on the Dublin coast. A specimen 9.2 cm was taken in the beach seine at Passage East in August 1961.

### CYCLOPTERIDAE

The adult lump sucker, *Cyclopterus lumpus*, although listed by Went (1957) as common, is taken rather infrequently in Irish waters. Young lump suckers were, however, very frequently taken in the Dublin Bay shore collections, especially at Seapoint where they were so common, during part of 1948, as to be a typical feature of the fauna. They were much less plentiful at Sandycove. Specimens obtained at Seapoint from May to September, 1948 varied in size from 7.8 to 38.0 mm.

### LIPARIDAE

Two species of "sea snails" have been recorded from Ireland, namely *Liparis montagui* (Donovan) which is common, and *Liparis liparis* (L.) which is rare.

*Liparis montagui*, (Donovan). Montagu's Sea-Snail

This species is common in tide-pools at Seapoint, Co. Dublin. It is very variable in colour, examples obtained being variously bright yellow, greyish yellow or pinkish brown, with variable spots and sometimes mosaic markings. Two specimens showed the pattern of dark lines regarded as characteristic of *Liparis liparis*, but Dr. N. B. Marshall of the British Museum (personal communication) confirmed that they were *L. montagui*.

A female 7.9 cm taken on April 20, 1948 contained well developed eggs, and a male of 5.3 cm taken on April 13, 1949 had well developed milt. A female of 7.0 cm taken on July 6, 1949 held ripe eggs. The spawning period is known to be protracted. Several specimens taken in early July, 1948 were each 2.7 cm long, while specimens taken on September 5, 1949 ranged in length from 3.2 to 4.2 cm.

This species seems to feed mainly on amphipods and copepods.

*Liparis liparis* (L.)

This species, which is an essentially northern form, has been added to, and struck out of, the Irish list on several occasions. Thompson

(1856) considered all Irish recorded specimens to be *L. montagui*. Scharff (1890) restored the species to the Irish list as a result of examination of material in the collection of the Irish National Museum. However, he adopted as diagnostic criteria the presence of dark lines on the skin, and the presence of only 11 papillae on the sucking disc. The former character is not reliable, since, as shown above, some specimens of *L. montagui* possess a pattern of dark lines. The second character is spurious; the specimens he examined had lost two papillae from the disc. This is also the case in Day's figure (Day 1884). In life, this species, like *L. montagui*, has 13 papillae on the disc (Kennedy 1952).

Fin ray count is a reliable distinction between the two species (Burke 1930). The fin rays, however, are slight and fragile, and are covered by a loose skin. Examination in 1952 of the museum material studied by Scharff, in order to count the fin rays, would have involved risk of damaging specimens then over a century old, some of which were in a shrivelled condition. Their true identity therefore remained in some doubt.

Subsequently Wheeler (1962), using X-ray technique, examined seven of the specimens in question, and found that two were, in fact, *Liparis liparis* and the others *L. montagui*. In 1960, the British Museum received two specimens of *L. liparis* which were taken on the Arklow Bank. Thus four specimens of this species have now been positively identified from Irish waters. The two specimens in the Irish National Museum were part of an Ordnance Survey collection from Larne to the Foyle.

In the southern part of its range, *Liparis liparis* is sub-littoral, whereas *L. montagui* in our waters is frequent between tide-marks.

### GASTEROSTEIDAE

*Gasterosteus aculeatus* L. Three-Spined Stickleback

The three-spined stickleback is commonly found in nearly all fresh waters in Ireland; in all estuaries; and not infrequently in shore pools. It is plentiful in the pools on the sand at Merrion (Dublin Bay). A specimen 3.5 cm long was taken in the beach seine at Rosslare in July 1961.

*Spinachia spinachia* (L.) Fifteen-spined Stickleback

The 15-spined or marine stickleback, is common all around the Irish coast (Went 1957), between or just below the tide marks, in sheltered weedy situations. It was not taken in the sandy pools at Merrion and was not plentiful at Sandycove, but it was the commonest tide pool species at Seapoint and it was also plentiful in Dun Laoghaire Harbour. The largest specimens obtained in Dublin Bay were several of 15 cm long, the commonest length group among the adults being 11.5 to 13.0 cm. Females with ripe eggs were obtained

as early as 16 March and on 23 April, 1948, nests were found at Seapoint, some with eyed eggs and some with eggs in an earlier stage of development. These nests were made from growing clumps of red *Ceramium* weed. Males taken in spring had greatly enlarged urinary bladders, in which the thread used to bind the nest is stored. The thread was very fine and transparent and was wound round the nests, binding the fronds of weed together. The eggs were yellowish amber, about 2 mm in diameter, and females of about 13.5 cm contained 280 to 290 eggs.

*S. spinachia* feeds mainly on small crustacea. Fish eggs were also present in six stomachs examined.

Small examples were frequently obtained at Seapoint. They were usually greyish green in general tint, with a tendency, in the smaller specimens, to a chequered effect, because of alternating dark and light touches along the sides. The maximum length obtained was 65 mm and the minimum 16.4 mm.

Small specimens taken in Dublin Bay included the following:—

Seapoint	June 22	— 31, 32, 40 mm
Seapoint	June 29	— 30.0, 39.5 mm
Dun Laoghaire Harbour	June 29	— 16.5, 20.5, 30.0, 33.0 mm
Seapoint	July 8	— 64 mm
Seapoint	July 9	— 35, 41, 65 mm
Dun Laoghaire Harbour	July 14	— 38, 54 mm
Seapoint	July 22	— 45 mm
Seapoint	August 8	— 27 mm
Seapoint	September 5	— 65 mm

Adult specimens were taken by beach seine at Carlingford, Clogher Head, Wicklow and Cahore. Sizes ranged from 8.2 to 13.4 cm.

This species is now known to live for only a little over a year (Jones and Hynes 1950).

#### HETEROSOMATA

O-group flounders, *Platichtrys flesus* (L.) and plaice *Pleuronectes platessa* L. were frequently taken at Seapoint and Merrion during the Dublin Bay shore collections, but no other species was obtained. During the herring investigations, O-group plaice were taken at many stations. O-group flounders were taken at fewer stations, but were numerous where they occurred; they tended to be more abundant in estuarine situations. O-group dabs, *Limanda limanda* (L.) were less

often captured. Brill *Scophthalmus rhombus* (L.) and turbot *Scophthalmus maximus* (L.) were not infrequently taken in the beach seines, but only one sole *Solea solea* (L.) was obtained.

#### GOBIESOCIDAE

Couch (1877) and Day (1880-1884) list 3 species of British and Irish cling-fishes, namely

Cornish Sucker *Lepadogaster gouani*, Lacépède

Connemara Sucker *Lepadogaster decandollii*, Risso

Bimaculated Sucker *Lepadogaster bimaculatus*, (Bonnaterre).

Travis Jenkins (1936) lists, however, a fourth species *Lepadogaster microcephalus*, described by Brook in 1890, as occurring in Britain.

No specimens of any of the first three species were obtained during the Dublin Bay collections. The only species found in Dublin Bay was *L. microcephalus*. In general form, this species is very like *L. bimaculatus*, from which it differs mainly in the position of the dorsal fin, and in coloration. Some other Irish tide-pool cling fishes also proved to be *L. microcephalus*.

It seems probable that *L. microcephalus*, is in Ireland the tide-pool form; and that *L. bimaculatus* prefers somewhat deeper water. This is in agreement with the general observations of Fage (1935) on the two species.

The largest specimen of *L. microcephalus* obtained in Dublin Bay was 30 mm (Seapoint, 30 March, 1949); the smallest 13 mm (Sandy-cove, two specimens September and October 1949). All were obtained in kelp pools, clinging tightly to fronds of kelp. When they swam, they did so with a motion rather like that of *Liparis montagui*.

#### SUMMARY

Recent studies of the biology of the herring of the south and east coasts of Ireland resulted in the provision of data on the distribution, and in some cases the growth, of a number of Irish estuarine and inshore fishes. Collections of tide-pools fishes in Dublin Bay during 1948-50 provided data on a variety of shore fishes, and young stages of other species. The material derived mainly from these two sources, supplemented in some cases by unpublished data from rod-caught fishes, and other material, is analysed in this paper. Some of the shore fishes, and certain species of angling interest, which have not received as much attention from fishery workers as the common food fishes, are dealt with at length; data on food, spawning and habits being given where available.

During the investigations the subject of this paper, two species not included in the published lists of Irish fishes were found to be common and widely distributed, namely—

*Lepadogaster microcephalus* Brook

*Syngnathus rostellatus* Nilsson

Attention is drawn to the fact that another species not included in the Irish lists, namely *Gobius microps* Kröy is known to be common in the salt marshes on the north side of Dublin Bay. A specimen of this species was present in a fauna sample from Sally's Lake, Donegal, where the water is brackish.

During the investigations, some of the characters which earlier writers relied on to separate *Liparis liparis* (L.) from *L. montagui* (Donovan) were found to be either unreliable or spurious. *Liparis liparis* (L.) has now been positively identified from the Irish coast by Wheeler (1962).

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