



SALMON RESEARCH TRUST
OF IRELAND.

IRISH FISHERIES INVESTIGATIONS

SERIES B (Marine) No. 28 (1984)

SEASONAL CHANGES IN THE INTERTIDAL FISH AND
CRUSTACEAN POPULATIONS OF AUGHINISH ISLAND IN THE
SHANNON ESTUARY.

by

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DUBLIN:
PUBLISHED BY THE STATIONERY OFFICE.

TO BE PURCHASED FROM THE
GOVERNMENT PUBLICATIONS SALE OFFICE, SUN ALLIANCE HOUSE,
MOLESWORTH STREET, DUBLIN 2.

Price: £1.10

Seasonal changes in the intertidal fish and crustacean populations at Aughinish Island in the Shannon Estuary

by

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ABSTRACT

As part of a baseline study of the intertidal macrofauna of Aughinish Island, monthly samples of intertidal fish and crustacean populations were collected. A total of 13 fish and 7 crustacean species were identified. Of these the shrimp *Crangon crangon* L., the mysids *Neomysis integer* Leach and *Praunus flexuosus* (Müller) and the goby *Pomatoschistus microps* (Krøyer) were the most common and widespread species. Seasonal variation was apparent with low numbers in winter and spring increasing significantly in summer and autumn with the on-shore migration of adults and the recruitment of juveniles.

INTRODUCTION

With the exception of migratory fish (salmon *Salmo salar* and eel *Anguilla anguilla* (L.)), there is little information on the fish or crustacean populations of the Shannon Estuary. Indeed most of the data on the above mentioned commercial species are in the form of internal reports and are therefore not widely available. Published records include salmon (Went & Twomey, 1971), smelt *Osmerus eperlanus* (L.) (Kennedy, 1948) and eel (Moriarty, 1974) and a list of 12 species, recorded as pelagic eggs, taken in a survey at the mouth of the estuary (Kennedy, Fitzmaurice & Champ, 1973).

As part of a baseline survey of the intertidal macrofauna of Aughinish Island (52°8'N 9°4'W) (Figure 1a), data on the fish and crustacean populations inhabiting the intertidal zone were collected. The results of this survey are presented here to provide information on the movements and life cycle of these species and as a reference for future work. A full list of the intertidal macrofaunal species recorded at Aughinish Island during the baseline survey is available in O'Sullivan (1983).

MATERIALS AND METHODS

Collections for fish and crustacean species were made each month, during the period of spring tides, from December 1978 to November 1979, at five sampling stations (P1 - P5) and at quarterly intervals from a sixth sampling station (P6). The locations of these sampling stations are indicated in Figure 1b. Samples at stations P1, P2, P3 and P5 were collected using a hand held sweep net (aperture 290mm x 250mm, 1mm mesh) fished along the water's edge for a duration of 2-3 minutes. This procedure was not feasible at station P4, a small intertidal pool, from which samples were obtained by taking a scoop with the sweep net.

Samples were obtained from station P6, a deep salt marsh pool, in February, May, September and November using a small 6m x 1m beach seine (mesh 10mm x 4mm) towed the length of the pool. The seine net collected quantities of filamentous algae which trapped small fish and crustaceans which might otherwise have escaped through the meshes. Records of species observed during shore searches are also included.

Samples were rough sorted in the field and preserved in 5% seawater formalin. In the laboratory animals were sorted, identified, measured and observations made on the presence or absence of eggs and larvae. All measurements are given as total length in mm, fish - tip of snout to tip of caudal fin; crustacea - tip of rostrum to tip of telson.

RESULTS

ENVIRONMENT

TEMPERATURE AND SALINITY

Temperature and salinity measurements were made at monthly intervals at stations S1 - S4 (Figure 1b). Water temperatures were recorded at low water at stations S1, S2 and S4 using a mercury thermometer. Salinity measurements were made at both high and low water at stations S1, S2 and S4, and at high water only at station S3. Salinity was determined using a hand held, temperature compensated, optical refractometer graduated to read salinity.

Water temperatures recorded at low water rose from a minimum of 5°C in January 1979 to a maximum of 16° in July 1979 (Figure 2).

High water salinities decreased slightly in a clockwise direction from the entrance to Robertstown Creek. There was little difference between high and low water salinities recorded over a tidal cycle except at Robertstown where freshwater inflow sometimes reduced the low water salinity. There were, however, significant seasonal differences, with winter salinities of 10 - 15‰ rising during the spring and summer to reach 20 - 25‰ in autumn (Figure 3).

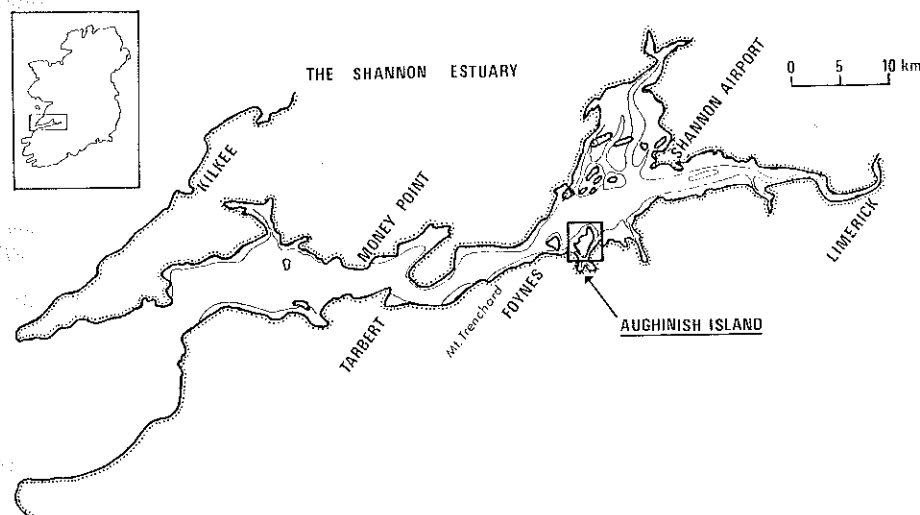


Figure 1a. Location of Aughinish Island in the Shannon Estuary.

SAMPLING SITES

Poulaweela Creek is a narrow sheltered inlet bordered by mud banks which slope convexly to a tidal creek. Station P1 was situated in the upper part of the creek, while P2 was located in a small tributary formed by a freshwater drainage pipe.

Poularone Creek is afforded some protection by off-shore islands and is open to the main estuary at both ends. It is the only shore at Aughinish where rocky outcrops extend to low water. Station P3 was located at the tip of a rocky promontory covered by *Fucus serratus* L.

Mud Beach Station P4 was a semi-permanent tidal pool (30cm x 30cm x 15cm deep) formed in an eroding salt marsh bank on the Mud Beach. The pool was at mid-tide level and retained water, thus trapping fish, as the tide ebbed.

Robertstown Creek is a narrow creek linking the Robertstown River with the main body of the Shannon Estuary. Station P5 was located on the Aughinish bank at the mouth of the Creek.

Robertstown Salt Marsh Pool is a deep pool (5m x 3m x 1m deep) on a raised salt marsh bank in Robertstown Creek. The pool retains water and has contact with the estuary during periods of spring tides only.

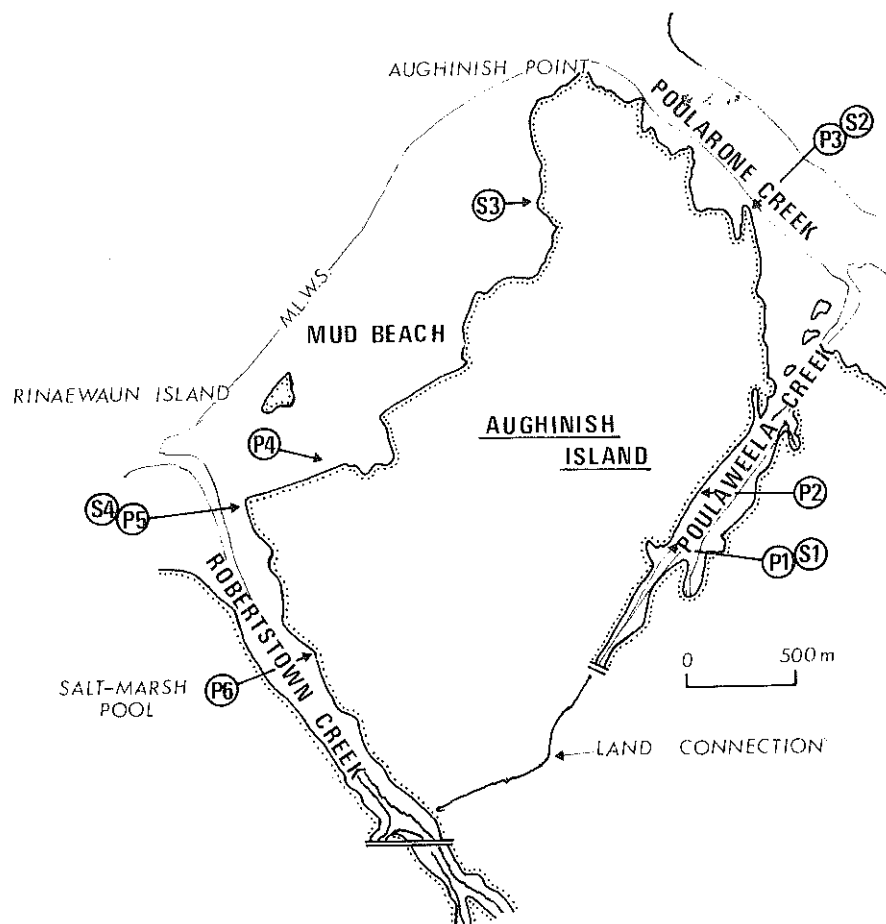


Figure 1b. Position of intertidal sampling stations at Aughinish Island. (See text for details).

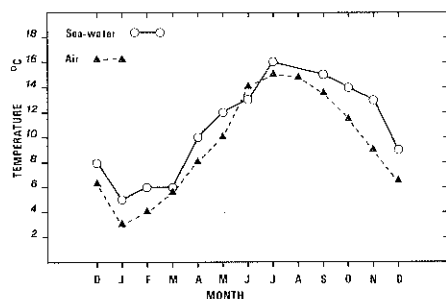


Figure 2. Seawater and air temperatures (°C) at Aughinish Island (December 1978 - December 1979).

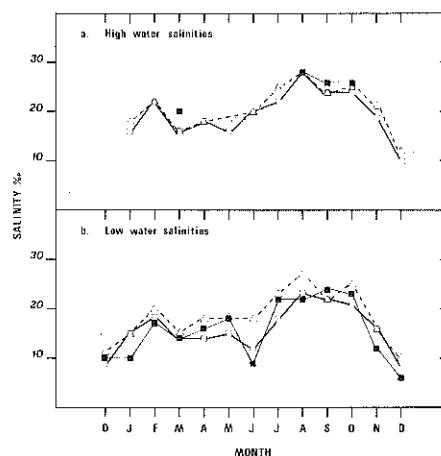


Figure 3. High water salinities (a) and low water salinities (b) at Aughinish Island. Robertstown Creek (■ — — ■), Mud Beach (O — — O), Poularone Creek (▲ — — ▲) and Poulaweela Creek (□ — — □). (December 1978 - December 1979)

FAUNA

Thirteen fish and seven crustacean species were identified from the intertidal waters surrounding Aughinish Island. Sweep net samples yielded 12 species, seine net samples yielded 10, eight species were common to both methods. A further 6 species were recorded during exploratory visits to the shore. Of the 12 species recorded in the sweep net samples a maximum of 8 species was recorded in August and a minimum of 4 in January. Of these the shrimp *Crangon crangon*, the mysids *Neomysis integer* and *Praunus flexuosus* and the goby *Pomatoschistus microps* were abundant and widely distributed. While *C. crangon* and *P. microps* were ubiquitous in their distribution, other species occurred sporadically and showed a tendency to favour certain habitats. The salt marsh pool, sampled by the seine net, was characterised by the goby *Pomatoschistus microps*, the thick-lipped grey mullet *Chelon labrosus* (Risso) and the three-spined stickleback *Gasterosteus aculeatus* (L.).

Seasonal variation was obvious with a reduction in the presence and abundance of species during winter and spring. With the onset of summer numbers increased dramatically with the onshore migration of adults and the recruitment of juveniles (Figure 4).

A full list of the species recorded and their distribution is given in Table 1. Sampling dates and corresponding low water levels are indicated in Table 2. Data on the number and type of species collected in each sample are given in Table 3 (stations P1 - P5) and Table 4 (station P6).

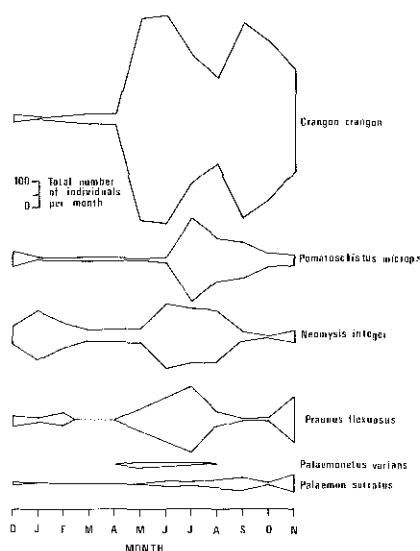


Figure 4. Seasonal changes in the relative abundance of the main intertidal fish and crustacean species at Aughinish Island. The scale represents the combined number of animals collected in monthly low water sweep samples from stations P1 - P5. (December 1978 - November 1979).

CRANGON CRANGON L

The abundance of brown shrimp was low during winter and early spring (December 1978 - April 1979) but increased thereafter (Figure 4). Length frequency data (Figure 5) indicated that the few overwintering individuals were between 10mm and 50mm in length. Recruitment began in May with an influx of juveniles (5mm) which grew rapidly measuring 10-20mm in June, 15-25mm in July, 20-30mm in September and 25-35mm by October. The overwintering population (>20mm) was distinguishable from the recruits in May and June, but by August the two populations had merged. In October, two peaks (17mm and 30mm) were apparent, suggesting that a second brood had recruited during the August/September period. The rapid growth and the presence of small individuals from May to November suggest that there may be continuous recruitment from offshore waters throughout this period but with peaks in late spring and early autumn. The largest specimen recorded measured 52mm. Egg carrying females were not observed during the survey.

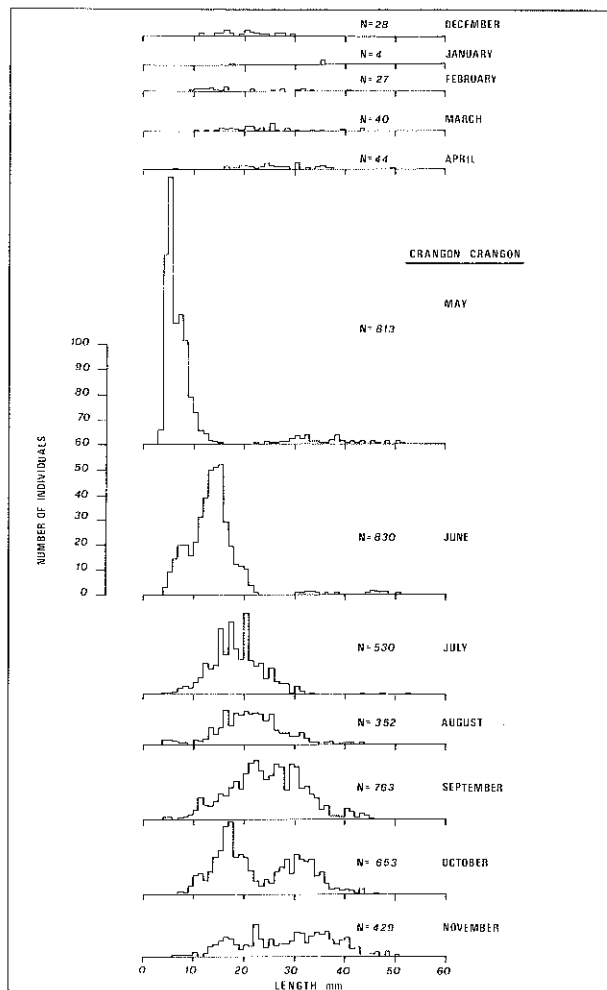


Figure 5. Length frequencies of the shrimp, *Crangon crangon*, taken in low water sweep samples at Aughinish Island during the period December 1978 to November 1979. (Station P1-P5).

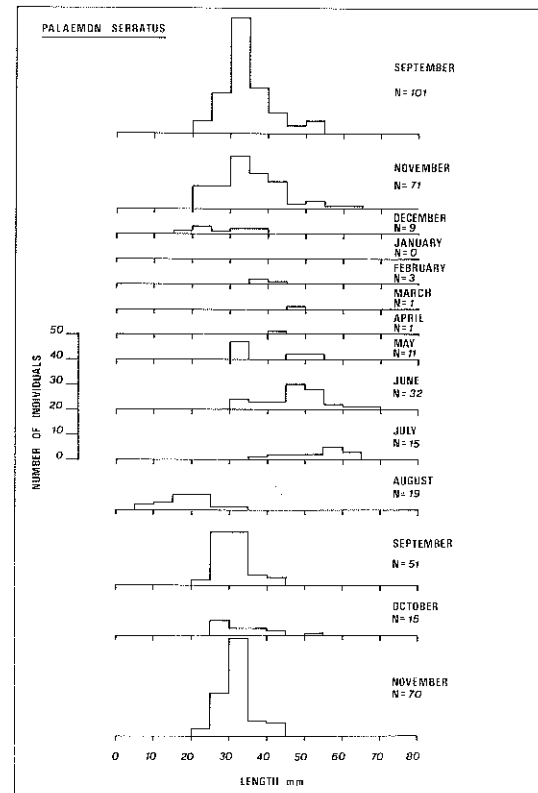


Figure 6. Length frequencies of the prawn, *Palaemon serratus*, collected in low water sweep-net samples at Poularone Creek (P3) during the period September 1978-November 1979.

PALAEEMON SERRATUS (Pennant)

At Aughinish the prawn *P. serratus* was common in the rocky Poularone Creek from May to December. One specimen was recorded in Robertstown Creek in July and a further ten were recorded there in August. The distribution of *P. serratus* around Aughinish illustrates its preference for rocky shores and raised salinities. From length frequency data (Figure 6) it was observed that the increase in abundance from May to July was due to an onshore migration of adults (30mm to 70mm) rather than an influx of juveniles. This adult population disappeared in August concurrently with the arrival of new recruits (5mm to 35mm). These recruits grew rapidly and by September/November the population structure closely resembled that of the same period in 1978. Data for September and November 1978 were collected as part of a preliminary survey. Egg bearing females were not observed during this survey.

PALAEEMONETES VARIANS (Leach)

This brackish water prawn was present in the tidal pool on the Mud Beach and in the Robertstown salt marsh pool from April to September, maximum numbers being recorded in May. All specimens collected were in the size range 20mm to 55mm, the majority measuring 20mm to 30mm. On the Mud Beach one ovigerous female was encountered in May (41mm), one in June (37mm) and one in July (39mm). This is similar to the breeding period recorded by Smaldon (1979) and Healy et al. (1982).

PANDALUS MONTAGUI Leach

Five specimens of this shrimp were recorded in Poularone, Creek, on a very low spring tide, during a visit to Aughinish in August 1978. As this is essentially a sublittoral species the fact that no specimens have since been recorded is not surprising.

MESOPODOPSIS SLABBERI (van Beneden)

Three specimens of this estuarine mysid were collected in Poularone Creek in July. While it was not common in the intertidal zone, this species is an important component of the meroplanktonic fauna of the waters off Aughinish Island (I.R. Jenkinson, pers. comm.).

NEOMYSIS INTEGER Leach

At Aughinish *N. integer* was the most abundant mysid although its distribution was very erratic. This was, no doubt, due to its swarming behaviour. Indeed on one occasion dense swarms were observed in Robertstown Creek while very few individuals were obtained at a nearby sampling station. According to Mauchline (1971a) quantitative sampling of *Neomysis* is "almost impossible". The sexes of this species were distinguishable at a length of 7mm and occasionally smaller. Females carrying eggs or larvae were observed from February to August and in November. Peaks of brooding activity were observed in February, May and August. The minimum size at which a female first became mature fell from 17mm in February to 16mm in June and 14mm in August. Broods examined in April and May contained eggs only while those examined in February and August contained mainly larvae. It appears that there are three main breeding periods with intensive breeding commencing in February rather than in April/May as described by Mauchline (1971b) for a population in L. Etive, Scotland.

Length frequency data (Figure 7) was complex and open to a number of interpretations all of which are speculative in the absence of additional data. One interpretation is that the Aughinish population behaves similarly to the one described by Mauchline (1971b). In Scotland the overwintering population, consisting of the autumn generation and survivors of the summer generation, matures in spring (April/May) and gives rise to a spring generation. This spring generation grows and matures to breed in late June and early July to produce a summer generation, which in turn grows and matures to breed in September to produce an autumn generation. Thus there are three generations per year each giving rise to the following generation. Applied to the Aughinish situation where breeding commences earlier (February) the implication is that recruitment of the spring generation was low with individuals present from June to August (i.e. members of a successful summer generation produced in April/May) breeding in August to give rise to an autumn generation which appeared in September.

On the other hand, based on the observations that females in April and May carried eggs only and that recruits in June were >8mm, and therefore unlikely to be the product of a May breeding, it could be argued that the Aughinish population behaves differently with each generation giving rise to alternate generations, i.e. summer → spring; autumn → summer; spring → autumn. However in the absence of more frequent sampling, interpretations must remain speculative. In addition periods of intensive breeding are set against a background of continuous breeding which tends to obscure trends. Life expectancy varies at different times of the year, those with the longest life span are members of the overwintering population born in September and some of which probably survive until the following June, a period of 8 months. Members of the spring and summer generations, according to Mauchline's (1971b) description, have a much shorter life span.

PRAUNUS FLEXUOSUS (Müller)

At Aughinish *P. flexuosus* was common throughout the year in Poularone Creek and present in Robertstown Creek from May to October. The slight increase in abundance observed in February (Figure 4) was due to an influx of adults, possibly migrating onshore from deeper waters. Juveniles first appeared in May and numbers increased dramatically in July. Numbers declined from August to October but increased again in November.

Length frequency data (Figure 8) were collected in February, May, July and November. Sexes were distinguishable at a body length of 10mm, the smallest brooding female measuring 16mm. Brooding females were observed from February to November, and while it is possible that the Aughinish population breeds all year round, there appeared to be two main breeding periods (February and July). In February and May brooding females measured 23 to 28mm while in July and November they measured 16 to 28mm. Mauchline (1971c) described a population of *P. flexuosus* from L. Etive, Scotland, where the overwintering population matures and breeds in early spring (May) to produce a spring generation. Some members of this spring generation become sexually mature and breed in summer (August). The progeny of this summer breeding together with the bulk of the spring generation form the next overwintering population. The Aughinish *P. flexuosus* population appears to behave similarly to this Scottish population except that, like *N. integer*, it possibly begins to breed earlier.

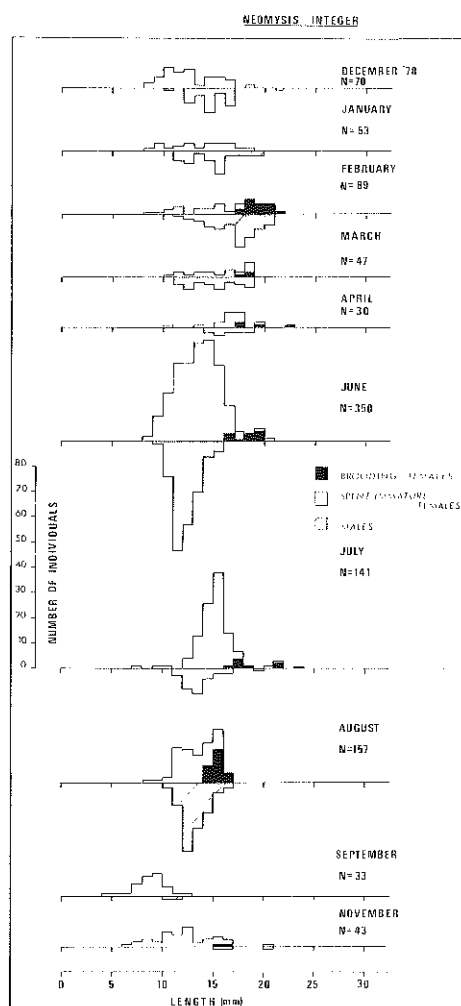


Figure 7. Length frequencies of the mysid, *Neomysis integer*, collected in sweep-net samples around Aughinish Island during the period December 1978-November 1979. No measurements are available for May or October. Data for period December-July from station P5, August-September from station P1, November from station P3.

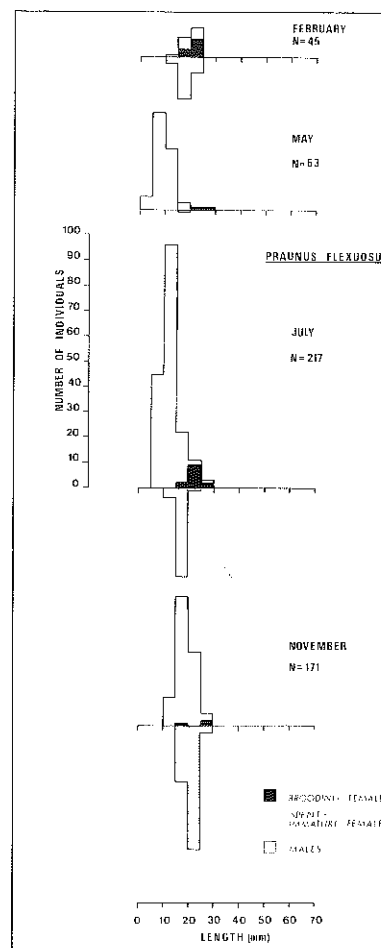


Figure 8. Length frequencies of the mysid, *Praunus flexuosus*, collected in sweep-net samples at Poularone Creek (P3) during the months February, May, July and November 1979.

POMATOSCHISTUS MICROPS (Kroyer)

P. microps was the most common and abundant fish species recorded from the intertidal zone around Aughinish Island. Numbers varied throughout the year, being low in winter and spring, increasing substantially in summer and decreasing gradually thereafter (Figure 4). This general trend was reflected by collections from all sampling stations except the Robertstown salt marsh pool where numbers appeared to increase in autumn. Length frequency data are illustrated in Figure 9.

From January to June *P. microps* was rare or absent in the intertidal zone; the smallest individual caught measured 26mm, the majority measuring 35mm to 50mm. In June there was an influx of small individuals measuring 14mm to 20mm to Poularone Creek. This was followed in July by the recruitment of even smaller individuals. In August the main population appeared to move into Poulaweela Creek. *P. microps* spawns on rocky/shelly substrates in the littoral and sublittoral zones. As Poularone Creek was the only area offering a suitable spawning site it is possible that *P. microps* spawns there and the young subsequently migrate into Poulaweela Creek and the Mud Beach.

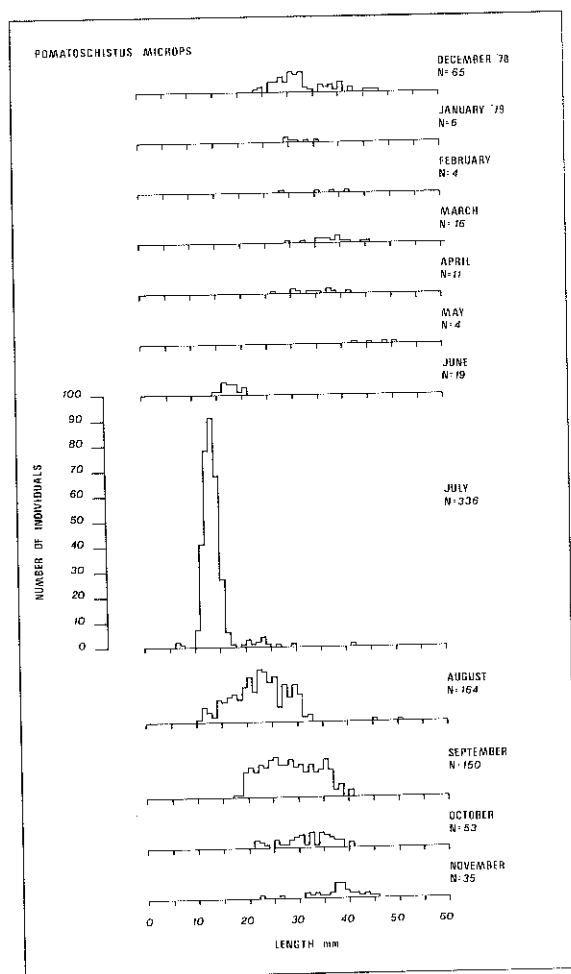


Figure 9. Length frequencies of the common goby, *Pomatoschistus microps*, collected in sweep-net samples at Aughinish Island during the period December 1978 to November 1979. (Stations P1-P5).

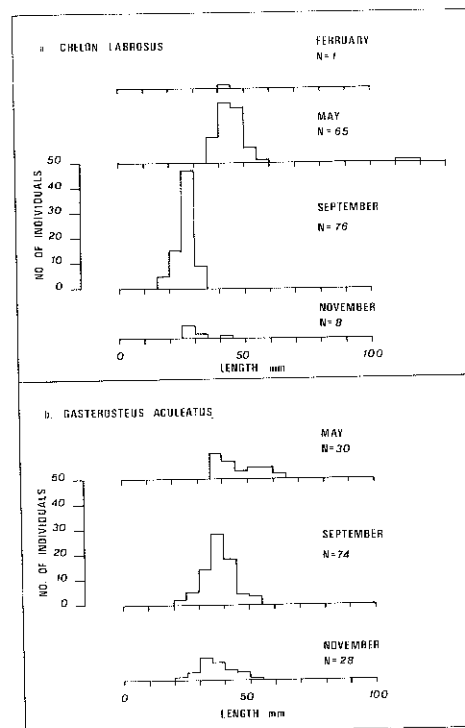


Figure 10. Length frequencies of (a) the thick-lipped mullet, *Chelon labrosus* and (b) the three-spined stickleback, *Gasterosteus aculeatus*, taken in seine-net samples from the Robertstown salt-marsh pool (P6) in February, May, September and November 1979.

Length frequency distributions (Figure 9) were very similar to those described by Miller (1975) from the Isle of Man, and by Fouda & Miller (1981) from Devon. The main difference was that while both Aughinish and Isle of Man populations were dominated by a single age group the Devon population was bimodal. At Aughinish the adult population disappeared in May to be replaced in June by new recruits. According to Miller (1975), *P. microps* is an annual species breeding at one year old and dying soon afterwards. Growth among the new recruits was rapid, individuals measuring 13mm in July had grown to 37mm by the following November. Three gravid females were caught in April on the Mud Beach (35mm, 37mm, 41mm) while one gravid female was recorded in Robertstown Creek in May (34mm). The breeding period was thus very similar to that described by Miller (1975) (April - August), and Fouda & Miller (1981) (April - July).

POMATOSCHISTUS MINUTUS (Pallas)

This sand goby was recorded only from the salt marsh pool. Eight specimens were collected in August, size ranged from 40mm to 62mm. Four specimens were recorded in November, size ranged from 57mm to 66mm.

GOBIUS NIGER (L.)

One specimen of this intertidal species was observed at low water in Poularone Creek.

CHELON LABROSUS (Risso)

This mullet species was abundant in the Robertstown salt marsh pool from May to September. Length frequency data are illustrated in Figure 10a. One specimen was recorded on the Mud Beach in both September and November. From age and growth analysis of *C. labrosus* populations from Irish waters (Kennedy & Fitzmaurice, 1969), it would appear that the individuals from the May population (35mm to 60mm) were probably 1+ individuals, while the smaller sized September population (15mm to 35mm) belonged to a recently recruited 0 group.

GASTEROSTEUS ACULEATUS (L.)

The three-spined stickleback was absent from the Robertstown salt marsh pool in February but abundant in May, September and November. Maximum numbers were recorded in September. The size frequency distribution of this population is illustrated in Figure 10b. Two specimens were recorded from Robertstown Creek in December (46mm and 47mm).

SPINACHIA SPINACHIA (L.)

Three specimens of this 15-spined stickleback were recorded in Poularone Creek in November 1978 (100mm - 106mm).

PLATICHTHYS FLEBUS (L.)

Juvenile flounder were caught in May in Robertstown Creek (10mm) and in Poulaweela Creek (11mm, 12mm) and large numbers were observed in tidal pools in June. An 80mm specimen was caught in Poulaweela Creek in September and a similar sized individual was recorded from the Robertstown salt marsh pool in November. A large 290mm specimen was caught in Poulaweela Creek in August, stomach contents revealed that it was feeding exclusively on the shore crab *Carcinus maenas* (L.).

ANGUILLA ANGUILLA (L.)

Recorded in Poulaweela Creek in April (68mm) and Robertstown Creek in April (70mm) and June.

PHOLIS GUNNELLUS (L.)

Butterfish were present under stones and rocks at low water in Poularone Creek.

CILIATA MUSTELA (L.)

Present under stones and rocks at low water in Poularone Creek.

POLLACHIUS POLLACHIUS (L.)

One specimen found trapped in a tidal pool on the Mud Beach during preliminary survey in August 1978.

SPRATTUS SPRATTUS (L.)

Four sprat were recorded from the Robertstown salt marsh pool in September (30mm to 50mm) and six specimens were collected from the same station in November (41mm to 46mm). Shoals of sprat were observed in tidal pools in Poulaweela Creek from September to November in both 1978 and 1979.

NEROPHIS LUMBRICIFORMIS (Jenyns)

One specimen was recorded from Robertstown Creek in October.

DISCUSSION

The species recorded at Aughinish were typical of the intertidal fauna of other North Western European estuaries (Perkins, 1974) and seasonal patterns of migration and recruitment agreed well with descriptions in the literature (Moore et al., 1979; Muus, 1967).

Regarding the absence of egg carrying female *C. crangon* at Aughinish Island, Meredith (1952), working in the Liverpool Bay area, observed that there was a tendency for large females to move offshore on the ebb tide so that low water samples contained a low proportion of females and of these comparatively few carried eggs. The smallest egg carrying females recorded by Meredith (1952) and Lloyd & Yonge (1947) measured 40-50mm and 45-50mm respectively. As very few individuals above 40mm were recorded at Aughinish it is probable that

here the entire adult population resides in deeper water. While this movement of adults offshore could have been caused by salinity, Meredith (1952) considered it more likely that lack of space forced the adult shrimp to follow the ebb tide. Indeed this is probably the reason for the absence of adults of a number of species from shallow intertidal waters.

The distribution of the prawns *P. varians*, *P. serratus* and *P. montagui* agreed well with their differing salinity and habitat preferences as described by Smaldon (1979). A fourth prawn species, *Palaemon elegans* Rathke, was recorded 3km west of Aughinish Island at Mt. Trenchard where salinities were somewhat higher. Similarly the ability of mysids to penetrate estuaries is in the order *N. integer*, *P. flexuosus* and *M. slabberi* and this distributional trend was apparent around Aughinish. The distribution of *N. integer* in Irish coastal waters has been described by Parker (1979).

Seasonal variations in abundance of tidal creek populations of *P. microps* were very similar to those described in the literature (Jones & Miller, 1966; Muus, 1967). Of interest however was that while the tidal creek populations were decreasing in autumn, numbers in the salt marsh pool appeared to be increasing. Jones & Miller (1966) believe that there is a correlation between seasonal migration and sea water temperature with offshore winter migration taking place in areas where temperatures normally fall below 5°C. However, they point out that with colonies inhabiting high salt marsh pools, the opportunity to migrate may be determined not only by the frequency of tidal inundation but may also be affected if suitably high tides coincide with periods of mild weather. Where the appropriate stimulus of falling temperature is temporarily lacking, fish may become trapped in these high pools. This is possibly what has happened at Aughinish.

ACKNOWLEDGEMENTS

The author would like to express his gratitude to Michael O'Briain for his assistance during the sampling programme and to Dr. Brenda Healy (U.C.D.) and Dr. Christopher Moriarty (Fisheries Research Centre) for their helpful comments on the original draft of this paper.

This work is part of a baseline survey commissioned by Aughinish Alumina Limited and their permission to publish this account is gratefully acknowledged.

REFERENCES

- Fouda, M.M. & Miller, P.J. (1981) Age and growth of the common goby, *Pomatoschistus microps*, on the south coast of England. *Estuarine Coastal and Shelf Science*, 12, 121-130.
- Healy, B., Bates, R. & McGrath, D. (1982) Marine Fauna of County Wexford - 5. Lady's Island Lake. *Ir. Nat. J.* 20, 510-526.
- Jones, D. & Miller, P.J. (1966) Seasonal migrations of the common goby, (Krøyer) in Morecambe Bay and elsewhere. *Hydrobiologia*, 27, 515-528.
- Kennedy, M. (1948) Smelt in the Shannon. *Ir. Nat. J.* 9, 151-152.
- Kennedy, M. & Fitzmaurice, P. (1969) Age and growth of thick-lipped grey mullet, *Crenimugil labrosus* in Irish waters. *J. mar. biol. Ass. U.K.*, 49, 683-699.
- Kennedy, M., Fitzmaurice, P. & Champ, T. (1973) Pelagic eggs of fishes taken on the Irish coast. *Ir. Fish. Invest.* B,8, 1-23.
- Lloyd, A.J. & Yonge, C.M. (1947) The biology of *Crangon vulgaris* L. in the Bristol Channel and Severn Estuary. *J. mar. biol. Ass. U.K.*, 26, 626-661.
- Mauchline, J. (1971a) Seasonal occurrence of mysids and evidence of social behaviour. *J. mar. biol. Ass. U.K.*, 51, 809-825.
- Mauchline, J. (1971b) The biology of *Neomysis integer* (Crustacea, Mysidacea). *J. mar. biol. Ass. U.K.*, 51, 347-354.
- Mauchline, J. (1971c) The biology of *Praunus flexuosus* and *P. neglectus* (Crustacea, Mysidacea). *J. mar. biol. Ass. U.K.*, 51, 641-652.
- Meredith, S. S. (1952). A study of *Crangon vulgaris* in the Liverpool Bay area. *Proc. Trans. Lpool. biol. Soc.*, 58, 75-109.

G. O'Sullivan: Seasonal changes in intertidal fish and crustacean populations.

- Miller, P.J. (1975) Age-structure and life-span in the common goby, *Pomatoschistus microps*. *J. Zool., Lond.* 117, 425-448.
- Moore, J. W., Moore, I.A. & Claridge, P.N. (1979) Seasonal changes in density, composition and reproductive biology of crustacean populations in the Severn Estuary. *Crustaceana*, 36, 113-122.
- Moriarty, C. (1974) Studies of the eel *Anguilla anguilla* in Ireland. 3. In the Shannon catchment. *Ir. Fish. Invest.* A, 14, 1-25.
- Muus, B. J. (1967) The fauna of Danish estuaries and lagoons. *Meddr. Danm. Fisk. og Havunders.*, N.S., Nr. 5, 1-316.
- O'Sullivan, G. (1983) The intertidal macrofauna of Aughinish Island, Shannon, Co. Limerick. *Ir. Nat. J.*, 21, 62-69.
- Parker, M. (1979) *Neomysis integer* (Leach) (Crustacea, Mysidacea): records and distribution in Ireland. *Ir. Nat. J.*, 19, 339-342.
- Perkins, E.J. (1974) *The Biology of Estuaries and Coastal Waters*. Academic Press, London. 678pp.
- Smaldon, G. (1974) *British Coastal Shrimps and Prawns*. Synopses of the British fauna No. 15. 126pp. Linnean Society of London.
- Tattersall, W. M. & Tattersall, O. S. (1951) *The British Mysidacea*. Ray Society, London. 406pp.
- Went, A. E. J. & Twomey, E. (1971) Fluctuations in the characteristics of Irish salmon *Ir. Fish Invest.* A, 7, 1-29.

Table 1 Distribution of Intertidal Fish and Crustacean species around Aughinish Island.

		Poulaweela Creek (P1 & P2)	Poularone Creek (P3)	Mud Beach (P4)	Robertstown Creek (P5)	Robertstown Salt Marsh Pool (P6)
CRUSTACEA						
Crangon crangon	brown shrimp	C	C	C	C	C
Palaemon serratus	common prawn	—	C	—	P	—
Palaemonetes varians		—	—	P	—	C
Pandalus montagui *	pink shrimp	—	P	—	—	—
Neomysis integer		C	C	P	C	P
Praunus flexuosus		—	C	—	C	P
Mesopodopsis slabberi		—	P	—	—	—
PISCES						
Pomatoschistus microps	common goby	C	C	C	P	C
Pomatoschistus minutus	sand goby	—	—	—	—	P
Gobius niger *	black goby	—	P	—	—	—
Chelon labrosus	thick-lipped grey mullet	—	—	P	—	C
Gasterosteus aculeatus	3-spined stickleback	—	—	—	P	C
Spinachia spinachia *	15-spined stickleback	—	P	—	—	—
Platichthys flesus	flounder	P	—	P	P	P
Anguilla anguilla	eel	P	—	—	P	—
Pholis gunnellus *	butterfish	—	P	—	—	—
Ciliata mustela *	5-bearded rockling	—	P	—	—	—
Pollachius pollachius *	pollack	P	—	P	—	—
Sprattus sprattus	sprat	P	—	—	—	P
Nerophis lumbriciformis	worm pipefish	—	—	—	P	—

C = common; P = present

* recorded during exploratory visits to the shore.

Table 2 Sampling dates and Low Tide Levels

Month	Dates	Height of lowest tide
December	12 - 15	0.6m
January	28 - 30	0.0m
February	26 - 28	0.0m
March	27 - 29	0.0m
April	25 - 27	0.1m
May	23 - 25	0.4m
June	11 - 14	0.5m
July	9 - 11	0.4m
August	13 - 15	0.8m
September	6 - 9	0.1m
October	4 - 6	0.1m
November	3 - 5	0.1m

Sampling dates - December 1978 to November 1979.

Tidal heights are given in meters above Chart Datum and are taken from Admiralty Tide Tables (1978, 1979) for Tarbert Island, River Shannon.

Table 4 Presence and relative abundance of intertidal fish and crustacean species collected from the Robertstown salt marsh pool (P6) in seine net samples. (February - November 1979)

SPECIES	February	May	September	November
CRUSTACEA				
<i>Crangon crangon</i>	4	0	24	31
<i>Palaemonetes varians</i>	1	26	10	1
<i>Neomysis integer</i>	293	0	0	0
<i>Praunus flexuosus</i>	1	0	2	2
PISCES				
<i>Pomatoschistus microps</i>	60	3	318	535
<i>Pomatoschistus minutus</i>	0	0	8	4
<i>Gasterosteus aculeatus</i>	0	30	74	28
<i>Chelon labrosus</i>	1	65	76	8
<i>Platichthys flesus</i>	0	0	0	1
<i>Sprattus sprattus</i>	0	0	4	6

Table 3 Presence and relative abundance of intertidal fish and crustacean species collected in sweep net samples (stations P1 -P5) at Aughinish Island. (December 1978 - November 1979).

Station P1 (Poulaweela Creek)

SPECIES	Month/	D	J	F	M	A	M	J	J	A	S	O	N
Crangon crangon		—	—	—	15	32	626	323	153	64	310	343	144
Neomysis integer		—	—	—	0	1	0	3	0	147	33	2	0
Pomatoschistus microps		—	—	—	0	1	1	0	2	5	9	52	8
Platichthys flesus		—	—	—	0	0	2	0	0	0	0	0	0
Anguilla anguilla		—	—	—	0	1	0	0	0	0	0	0	0

Station P2 (Poulaweela Creek)

SPECIES	Month/	D	J	F	M	A	M	J	J	A	S	O	N
Crangon crangon		15	0	15	7	—	181	232	—	94	94	0	32
Neomysis integer		0	0	0	0	—	0	0	—	52	0	0	0
Pomatoschistus microps		16	6	2	13	—	3	0	—	145	141	52	22
Platichthys flesus		0	0	0	0	—	0	0	—	1	1	0	0

Station P3 (Poularone Creek)

SPECIES	Month/	D	J	F	M	A	M	J	J	A	S	O	N
Crangon crangon		0	1	0	0	0	3	18	27	9	50	112	30
Palaemon serratus		9	0	3	1	1	11	33	15	19	51	15	70
Neomysis integer		0	130	14	0	21	1	A	66	0	4	0	44
Praunus flexuosus		4	15	45	0	1	63	A	218	30	3	0	171
Pomatoschistus microps		0	0	0	0	1	0	16	266	2	0	1	5
Mesopodopsis slabberi		0	0	0	0	0	0	0	3	0	0	0	0

Station P4 (Mud Beach)

SPECIES	Month/	D	J	F	M	A	M	J	J	A	S	O	N
Crangon crangon		3	0	—	0	0	0	13	44	37	44	0	23
Palaemonetes varians		0	0	—	0	1	19	15	7	2	0	0	0
Neomysis integer		0	0	—	0	0	0	0	5	0	0	0	0
Pomatoschistus microps		49	0	—	1	9	0	0	62	87	86	31	9
Chelon labrosus		0	0	—	0	0	0	0	0	0	1	0	1

Station P5 (Robertstown Creek)

SPECIES	Month/	D	J	F	M	A	M	J	J	A	S	O	N
Crangon crangon		10	3	12	18	12	6	244	306	157	265	198	200
Palaemon serratus		0	0	0	0	0	0	0	1	10	0	0	0
Neomysis integer		78	58	91	47	34	57	357	141	0	1	1	1
Praunus flexuosus		0	0	7	0	0	25	4	38	27	3	11	1
Pomatoschistus microps		0	0	2	2	0	0	3	6	6	0	0	0
Gasterosteus aculeatus		2	0	0	0	0	0	0	0	1	0	0	0
Anguilla anguilla		0	0	0	0	1	0	1	0	0	0	0	0
Platichthys flesus		0	0	0	0	0	1	0	0	0	0	0	0
Nerolis lumbriciformis		0	0	0	0	0	0	0	0	0	0	1	0

— no sample collected or sample lost/damaged.

A - abundant but not counted (weak preservative lead to disintegration of smaller specimens)

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