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T. DAVIDS AND THE RECENT MARINE AND ESTUARINE STRACODA OF THE CARDIGANSHIRE AND EMBROKESHIRE COASTS

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THAMES
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MID-SYMPOSIUM EXCURSION TO COLLECT RECENT LITTORAL MARINE AND ESTUARINE OSTRACODS FROM THE COASTS OF PEMBROKESHIRE AND CARDIGANSHIRE.

R.C. Whatley and C.A. Maybury

ST. DAVIDS.

The morning will be spent in the charming little Cathedral city of St. Davids, Pembrokeshire. This Cathedral settlement has a longer continuous history than any other in Britain, dating back for more than fourteen centuries.

In 550 AD, Dewi Sant, or Saint David (the patron saint of Wales) founded a church here and the Christian tradition has been maintained in the town ever since, despite the ravages of Danes, Vikings and "reformers". Saint David was canonised in 1123 by Pope Calixus II who decreed that: Roma semel quantum bis dat Menevia tantum. (Two visits to St. Davids equals one to Rome). Perhaps this will somewhat mollify those who voted in Houston for Italy rather than Wales!

The present Cathedral was begun in 1181 and Giraldus Cambriensis visited it in 1188 while raising money for the second Crusade. Escaping some of the more blasphemous excrescences of the so-called Reformation and the vandalism of Cromwell and his minions (although the latter's horse is alleged to have broken some of the tiles in the Nave, while he watched his canting soldiery desecrate the building), much damage and neglect took place to the detriment of the chapels and the Bishop's Palace. Many priceless missals, antiphons and other Holy books were also destroyed by the mindless zealots. It is thought, however, that the relics of Saint David, and of his fellow Saints, Caradoc and Justinian, were secreted for safety in a hidden recess in the wall between the Sanctuary and the Chapel of the Holy Trinity and that it was the bones of these three which were unearthed in 1866 during restoration work. These relics are now preserved in the latter chapel in an oaken casket which is the centrepiece of the Shrine of Saint David.

A major restoration of the Cathedral was begun in 1865 by Sir Gilbert Scott. Queen Elizabeth II visited St. Davids in 1955, the first reigning monarch to do so since King Edward I (The Hammer of the Welsh) and Queen Eleanor in 1284, 671 years earlier. In 1982, Her Majesty distributed the Royal Maundy in the Cathedral for the first time in Wales.

The Cathedral, while lacking the opulence of many of its English counterparts, has a unique charm and a deeply religious aura. Among its most noted features are its mediaeval painted tiles, carved misericordes and Irish oak Nave roof.

The adjacent, largely ruined Bishop's Palace is well worth a visit and the Giraldus Cambriensis exhibition alongside it is a must. Gerald of Wales, as he is otherwise known, wrote on his journey through the Principality with Archbishop Baldwin of Canterbury, preaching The Cross for the second crusade. The exhibition marks the 800th aniversary of this journey. A lively translation by Lewis Thorpe of his two books, Itinerarium Kambriae and Descriptio Kambriae, published in paperback in the Penguin Classics series is on sale in the exhibition (together with many other items, including Giraldus Cambriensis teeshirts!). The book is highly recommended, particularly book ii, page 255 onwards!

We expect to spend 2 hours in St. Davids but please return to the coach park at the hour advised for departure. Our very full programme for the day will not allow us to wait for latecomers!

MARINE AND BRACKISH WATER OSTRACODS.

After spending the morning in St. Davids, the buses with both participants and their families will return to Aberystwyth, making three stops to collect Recent littoral and estuarine Ostracoda en route.

We will eat our packed lunch at the first stop. We expect to spend approximately 1 hour at each collecting stop. The coaches will leave promptly at

whatever time is stated on the day. Please be on time; the coaches will not wait for you!

STOP 1 - ABEREIDDY BAY.

Abereiddy Bay, some 5 miles northwest of St. Davids, faces west and is enclosed to the north by Trwyncastell, a pronounced headland and to the south by the sweep of the almost north-south trending coastline. At low tide both sand and rocks are exposed and good growths of algae occur in the numerous rock pools. Klaus Trier, whose study of the faunas of the Pembrokeshire coast will be published in the Symposium Proceedings, has collected numerous samples from this locality which has yielded the largest number of live species of the many localities he has collected in the county.

His list of live species, collected between May 1976 and July 1979, all from littoral algae, is as follows:

Heterocythereis albomaculata (Baird)
Hemicytherura hoskini Horne
Paradoxostoma variabile (Baird)
Propontocypris pirifera (G. Muller)
Pontocythere elongata (Brady)
Paracytheridea cuneiformis (Brady)
Callistocythere badia (Norman)
Roundstonia robertsoni (Brady)
Leptocythere tenera (Brady)
Semicytherura tela Whittaker
Semicytherura sella (Sars)
Aurila convexa (Baird)
Hirschmannia viridis (O.F. Muller)
Hemicythere villosa (Sars)
Paradoxostoma bradyi (Sars)
Paradoxostoma ensiforme Brady
Xestoleberis aurantia (Baird)
Cythere lutea (O.F. Muller)
Loxoconcha rhomboidea (Fischer)
Loxoconcha elliptica Brady
Palmoconcha laevata (Norman)
Semicytherura striata (Sars)
Semicytherura nigrescens (Baird)

The occurrence of live Loxoconcha elliptica is indicative of the presence or adjacence of brackish water. A large fauna of dead marine species can be found at this locality, most of these are listed under STOP 3.

Some 4 miles to the northwest, in the small cove of Abercastle, Trier in collections taken during the same interval, also encountered an additional 6 live phytal species:

Hemicytherura cellulosa (Norman)
Paradoxostoma abbreviatum Sars
Paradoxostoma portlockense Horne
Paradoxostoma sarniense Brady
Paradoxostoma hibernicum Brady
Paradoxostoma normani Brady

The latter locality is not accessible to coaches and we shall not stop there.

The most productive method of collecting large numbers of live ostracods from rock pools is to collect large quantities of algae and to agitate the algae in a bucket or other large container of sea water and then, after discarding the algae, to collect the residue in the container on a sieve. A number of containers and sieves will be available, as will be buffered formalin to preserve the specimens.

Whatley and Wall (1969, 1975) found that the morphology of the plant, its position within the eulittoral and within the particular rock pool, were all important criteria in determining its desirability as a substrate for ostracods. Those plants with the densest, interwoven or tufted growth habit, or those with the most epiphytes, provide the greatest degree of shelter from turbulence during high water and from dessication during low water. For example, Fucus serratus, a large plant often covering the rock surfaces, contains very few ostracods unless it is densely infested with the epiphyte Ectocarpus. Fucus spiralis, which also occurs on the rock platforms, secretes a dense, slimy antibiotic to inhibit epiphyte attachment: this species has never yielded ostracods.

Perhaps the best algae to collect are Ulva spp., Cladophora rupestris,

Enteromorpha clathra, Halidrys siliquosa, and Corallina officionalis. All of these have more or less dense growth habits. However, many other algae, such as Polysiphonia nigrescens and Dumontia incrassata, with an open-fronded habit, do not usually yield any ostracods.

Holdfasts of Laminaria from deep lower eulittoral rock pools, or from the immediate sublittoral, are always an excellent source of ostracods.

The more sheltered the rock pool, and the more sheltered the particular plant within the pool the better. Very exposed pools are much less likely to contain large numbers of ostracods on their weeds than are well sheltered ones.

Details of the various algal species which, along the Irish Sea coast of Wales have been sampled for ostracods, are given in Whatley and Wall (1975).

STOP 2 - GOODWICK FORESHORE, FISHGUARD.

This is a mystery surprise locality. To our knowledge ostracods have never been collected here before; certainly nothing has been published on them. The locality is between the town of Fishguard and the Rosslare Ferry Terminal. The beach is a mixture of mud, sand, stones and rocks with abundant algae. A stream debouches onto the beach so brackish water as well as marine ostracods may be present. There will be a prize (as yet unspecified) for the largest number of species collected at this locality. Species lists with supporting evidence should be sent to the competition judge, Dr. John Eustace Whittaker, Dept. Palaeontology, British Museum (Natural History), before 1st January 1989.

STOP 3 - THE TEIFI ESTUARY.

The Teifi Estuary is, unlike most of the Welsh estuaries debouching into the Irish sea, orientated approximately north-south. The headwaters of the estuary are situated immediately downstream of the county town of Cardigan. As with the Dovey and Mawddach estuaries to the north, it is very strongly flood dominated, i.e. the estuary is only filled at high tide due to the influx of marine water. At low tide the estuary empties except for the main channel (or channels) and its tributaries. The water these contain at low tide is virtually fresh, especially in the upstream part of the estuary.

The only study made of the Ostracoda of the Teifi Estuary is that of Wall (1969 MS.) and that was very much an adjunct to his principal study, the Recent Ostracoda of Cardigan Bay. Wall collected and studied 30 samples and took a number of salinity and temperature readings.

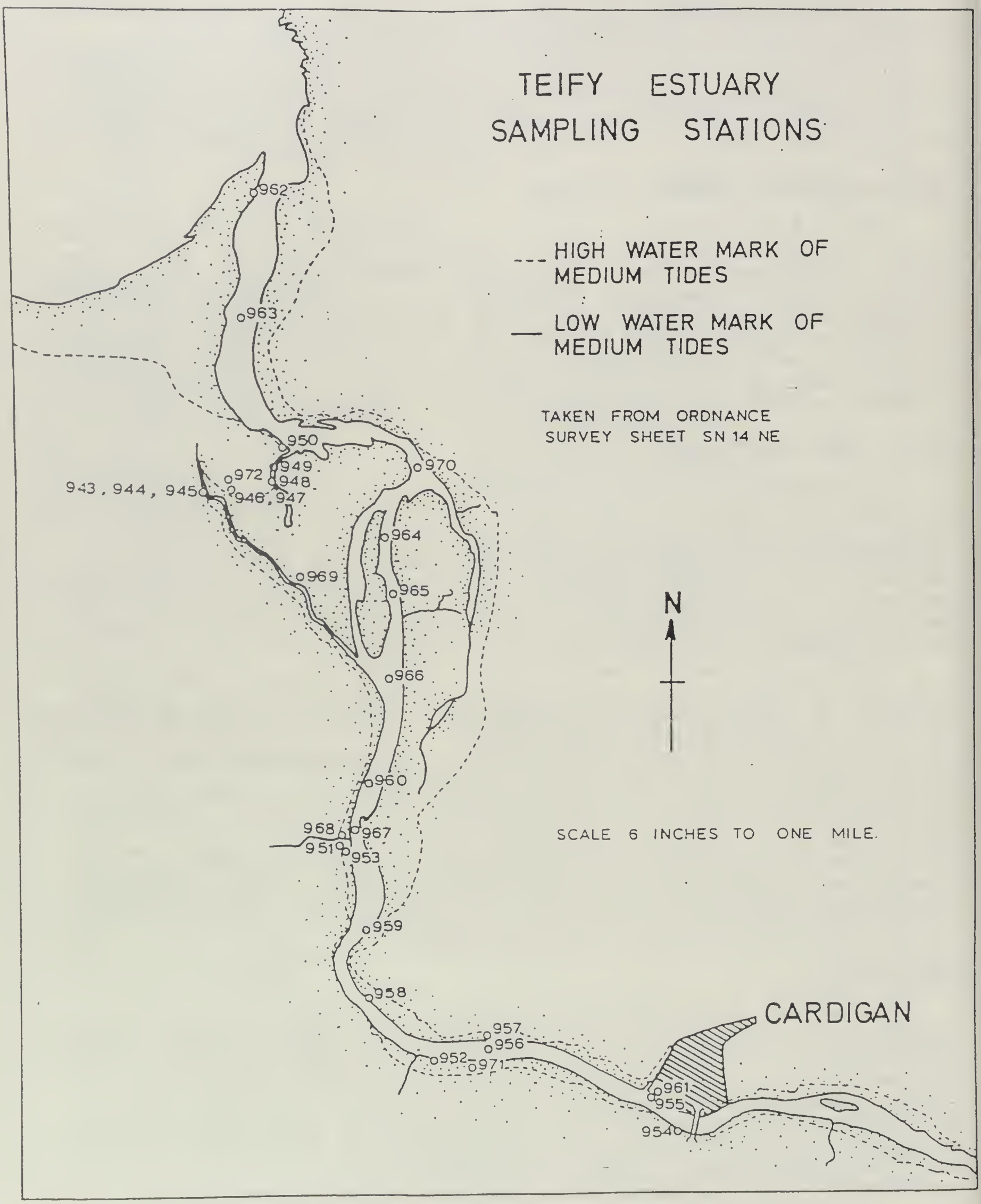
Wall's sample sations are given in Fig. 1. At station 953, the salinity varied between 30°/oo at tidal maxima and 12°/oo at tidal minima, while at station 944, the salinity varied between 18°/oo and 2°/oo. The water temperature of the main channel varied from 1°C in mid-February 1967 and 18°C in late August 1968. In small pools and shallow channels, the mid-August 1968 temperature rose to 20°C. The pH in the lower and middle estuary was usually between 7 and 8, but lower values, between 6.5 and 7 were obtained at station 944 and 5.9-6.4 at station 946. Oxygen saturation values were uniformly high, ranging from 92-110°/00, with little seasonal or areal variation.

THE OSTRACODA.

The majority of the specimens recovered by Wall were of allochthonous material introduced by various post-mortem agencies into the estuary from Cardigan Bay. In the Dovey Estuary, north of Aberystwyth only five species have been encountered live in a study involving many hundreds of samples taken over the entire estuary and over a number of years. These are: Leptocythere lacertosa (Hirschmann), L. pellucida (Baird), L. castanea (Sars) L. psammophila Guillaume and Cytherois fischeri (Sars). The living fauna of the Teifi Estuary is considerably more diverse, possibly due to its somewhat lower turbulence and more stable salinity regime. Wall encountered 9 living species. These are:

Leptocythere pellucida
L. psammophila

FIGURE 1.


TEIFY ESTUARY
SAMPLING STATIONS
--- HIGH WATER MARK OF MEDIUM TIDES
— LOW WATER MARK OF MEDIUM TIDES
TAKEN FROM ORDNANCE SURVEY SHEET SN 14 NE
N
SCALE 6 INCHES TO ONE MILE.
CARDIGAN
962
963
950
949
948
947
946
943, 944, 945
972
970
964
969
965
966
960
968
967
951
953
959
958
957
956
952
971
961
955
954

L. lacertosa
Loxoconcha elliptica Brady
Cyprideis torosa (Jones)

and in smaller numbers:

Elofsonia baltica (Hirschmann)
Leptocythere porcellanea (Brady & Robertson)
Heterocythereis albomaculata (Baird)
Leptocythere tenera (Brady)

On the basis of both the live and the dead ostracod fauna, Wall recognised 3 major assemblages of Ostracoda:

1) The Main Channel Assemblage.

Since the main channel is floored with highly mobile, fine to medium sand, it is not surprising that Wall failed to recover any live specimens there. Although in some samples, dead specimens were absent, in those areas of the main channel where energy levels are at a minimum and especially where algae act as a sediment trap, numerous dead valves can be recovered. Some of these are remarkably well preserved although others are srongly abraded. Wall's species list from stations 955, 956, 960, 962, 963 and 967 (Fig. 1) is given below:

Pontocythere elongata (Brady)
Hemicythere villosa (Sars)
Palmoconcha guttata (Norman)
Bythocythere bradyi (Sars)
Hemicytherura cellulosa (Norman)
Roundstonia robertsoni (Brady)
Eucythere declivis (Norman)
Loxoconcha elliptica Brady
Leptocythere psammophila Guillaume
Loxoconcha rhomboidea (Fischer)
Aurila convexa (Baird)
Sclerochilus contortus (Norman)
Palmoconcha laevata (Norman)
Carinocythereis antiquata (Baird)
Heterocythereis albomaculata (Baird)
Leptocythere tenera (Brady)
Leptocythere pellucida (Baird)

This fauna represents a complete mixture of three components:
i) A stenotopic brackish component (i.e. Loxoconcha elliptica).
ii) A euryhaline marine component (although none of the species concerned may actually live in The Teify Estuary) (e.g. Pontocythere elongata, Hemicythere villosa, Leptocythere pellucida).
iii) A stenohaline marine component (e.g. Aurila convexa, Carinocythereis antiquata).

The occurrence of elements of groups ii) and iii) up to three miles from the sea, is eloquent testimony of the efficacy of the flood tide as a postmortem transportation agent of ostracods.

2) The Mud Flat Assemblage.

The mud flats extend between high and low water marks of mean tides. Although exposed during much of the tidal cycle, dessication is not a major problem because of the thixotrophic nature of the mud and the fact that the living ostracods of this assemblage are infaunal.

The live fauna is dominated by two species, Leptocythere castanea and Leptocythere psammophila with subsidiary numbers of Leptocythere lacertosa occurring at most stations. Loxoconcha elliptica was also recovered fairly frequently and both Leptocythere tenera and Elofsonia baltica much more rarely. Live specimens are only common where fine mud forms the sediment; with increasing grain size (silt to very fine sand) live specimens became rarer. The stations from which the largest number of live specimens have been taken are: 946, 947, 970, and 953.

The dead fauna comprises the same three components as the channel assemblage. However, in the case of the Mud Flat assemblage, the number of

autochthonous brackish water specimens is much higher. The total dead fauna from all the stations on the mud flats is as follows:

Loxoconcha elliptica
Roundstonia robertsoni
Loxoconcha rhomboidea
Semicytherura striata (Sars)
Leptocythere castanea
Callistocythere cf. crispata (Brady)
Aurila convexa
Hemicytherura clathrata (Sars)
Semicytherura acuticostata (Sars)
Semicytherura angulata (Brady)
Cytherois sp.
Paradoxostoma ensiforme Brady
Neocytherideis subulata (Brady)
Paracytheridea cuneiformis (Brady)
Palmoccocha guttata
Cuneocythere semipunctata (Brady)
Microxestoleberis depressum (Br. & Nor.)
Paracytherois flexuosa (Brady)
Leptocythere porcellanea
Leptocythere psammophila
Cytheropteron nodosum (Brady)
Hemicytherura cellulosa
Leptocythere tenera
Leptocythere macallana (Brady & Rob.)
Heterocythereis albomaculata
Pontocythere elongata
Cythere lutea (O.F. Muller)
Carinocythereis antiquata
Eucythere declivis
Sclerochilus cf. contortus
Paradoxostoma variabile (Baird)
Elofsonia baltica
Hirschmannia viridis (O.F. Muller)
Hemicythere villosa
Cytheropteron latissimum (Norman)
Celtia emaciata (Baird)
Semicytherura sella (sars)

The ratio of dead allochthonous to dead autochthonous species is fairly constant in the Mud Flat Assemblage, approximately 3:1 to 4:1.

3) The Marsh Channel Assemblage.

Three stations, 943, 944 and 945 (all of easy access to participants - see Fig. 1) were collected by Wall in early October 1967, from a channel on the east side of the estuary. The fauna is typically a high dominance, high incidence and low diversity brackish water assemblage which is dominated by live specimens of Leptocythere psammophila, Cyprideis torosa, and Leptocythere castanea with smaller numbers of Leptocythere porcellanea. The majority of the live specimens were recovered from the flanks, rather than the floor of the channel.

Relatively few dead specimens were encountered in this assemblage and most were of autochthonous species.

On the seaward side of the narrow entrance to the estuary is a large sandy beach, Poppit Sands. Here, along the swash line, it is possible to collect large numbers of dead marine ostracods washed in from Cardigan Bay. Anyone who ventures there, however, should be certain that they do not miss the coaches when they leave for Aberystwyth as they will directly after this stop.

SAMPLE 416.

Participants attending this excursion will be given a washed residue from the richest of the several hundred stations studied by Wall (1969, MS.). This station was re-sampled in late June 1988, using the Geology Department's Research Vessel.

The sample is from silts in approximately 30m at the northern end of the Trawling Ground, an elongate NE-SW orientated linear trough filled with fine grained sediments, approximately 10 miles offshore and parallel to the coast SW of Aberystwyth. The sample is from Station 416 of Whatley and Wall (1969).

The silts at this locality contain a large incidence of specimens, many of which are juveniles, because the Trawling Ground acts as a sediment trap for smaller particles which include post-mortem transported allochthonous specimens from the prolific littoral zone and from Sarn Wallog to the north (Whatley and Wall, 1969). The samples we have studied from this station represent a low energy thanatocoenosis, with a population age structure of Type C (Whatley, 1983). It was from a comparison of the live and dead distribution and different

population age structures of Loxoconcha rhomboidea from the littoral, Sarn Wallog and the Trawling Ground, which first persuaded us of the importance of the population age structure technique in palaeoenvironmental analysis.

Wall (1969, MS.) collected Station 416 on 6 occasions and his data are reproduced in the following table:

Sample	Date	Sal. °/oo	pH	T. °C.	Transp. Fm.	O_2 ml/l	O_2 % Sat.	Ostracods			
								Live		Dead	
								No.	spp.	No.	spp.
416	21.9.66	34.7	6.6	16.5	-	-	-	3	3	878	53
	22.11.66	33.4	7.0	9.0	1.8	5.5	85	9	8	1739	45
	13.4.67	32.0	7.4	7.4	1.7	6.2	89	20	14	1767	47
	11.6.67	33.7	7.7	12.9	3.7	3.9	86	17	12	2130	47
	12.9.67	33.5	7.8	16.4	3.0	4.8	95	8	4	2297	54
	23.1.68	34.0	7.8	4.5	3.5	4.5	90	1	1	1681	50

(Sediment sample size 10ml).

The following list of the 61 species recorded from Station 416 is from Wall (1969, MS.) and Whatley (personal observation of numerous samples used for teaching purposes):

Cythere lutea (O.F. Muller)
Bythocythere zetlandica Ather. et al.
B. intermedia Elofson
Eucythere declivis (Nornam)
Pontocythere elongata (Brady)
Semicytherura tela Whittaker
S. angulata (Brady)
S. cornuta (Brady)
S. simplex (Brady and Norman)
S. striata (Sars)
H. clathrata (Sars)
Microcytherura fulva (Brady & Robert.)
C. nodosum Brady
C. pseudocrassipinatum Whatley & Masson
Microxestoleberis depressum (Brad & Norm.)
Paracytheridea cuneiformis (Brady)
Hetecocythereis albomaculata (Baird)
Leptocythere pellucida (Baird)
L. macallana (Brady & Robertson)
L. porcellanea (Brady & Robertson)
C. cf. crispata (Brady)
P. laevata (Norman)
Loxoconcha rhomboidea (Fischer)
H. viridis (O.F. Muller)
Paradoxostoma abbreviatum Sars
P. ensiforme Brady
P. pulchellum Sars
P. variabile (Baird)
S. cf.contortus (Norman)
Celtia emaciata (Brady)
R. robertsoni (Brady)
Pterygocythereis jonesii (Baird)
B. bradyi Sars
Pseudocythere caudata Sars
Cuneocythere semipunctata (Brady)
Neocytherideis subulata (Brady)
S. nigrescens (Baird)
S. acuticostata (Sars)
S. producta (Brady)
S. sella (Sars)
Hemicytherura cellulosa (Norman)
H. hoskini Horne
Cytheropteron latissimum (Norman)
C. dorsocostatum Whatley & Masson
C. punctatum Brady
Hemicythere villosa (Sars)
Urocythereis sp.
Aurila convexa (Baird)
L. psammophila Guillaume
L. tenera (Brady)
Callistocythere badia (Norman)
Palmoconcha guttata (Norman)
Sagmatocythere multifora (Norman)
Elofsonia baltica (Hirschmann)
E. pusilla (Brady & Robertson)
P. bradyi Sars
P. normani Brady
P. robinhoodi Horne & Whittaker
Sclerochilus truncatus (Malcolmson)
Carinocythereis antiquata (Baird)
Roundstonia globulifera (Brady)

REFERENCES.

WALL, D.R. 1969. The taxonomy and ecology of Recent and Quaternary Ostracoda in the Southern Irish Sea. Unpublished doctoral thesis, University of Wales, 2 vols., 555pp.

WHATLEY, R.C. 1983. The application of Ostracoda to palaeoenvironmental analysis. In Maddocks, R.F. (Ed.) Applications of Ostracoda. Proceedings of the

Eigth International Symposium on Ostracoda, 1982. Houston, Geosciences: 51-77.

WHATLEY, R.C. & WALL, D.R. 1969. A preliminary account of the ecology and distribution of Recent Ostracoda in the southern Irish Sea. In Neale, J.W. (Ed.) The taxonomy, morphology and ecology of Recent Ostracoda. Oliver and Boyd, Edinburgh: 268-298.

_____ & _____ 1975. The relationship between Ostracoda and algae in littoral and sublittoral marine environments. Bulletins of American Palaeontology, 65 (282): 173-203.

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