This second edition of the newsletter will unfortunately be published with considerable delay due to many difficulties during production. It contains the first of a number of project descriptions and autobiographies of the members of the group. It has been planned to continue these descriptions in the following editions too, and everybody who is interested is requested to contribute. Further this edition contains a survey on Fish Remains from Iberian Sites by Arturo Morales who gives a collected survey on the subject for the first time with this very useful article.

The next number of the newsletter is scheduled for publication at the end of 1983. The deadline is the 1st of November and contributions should be sent to:

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Although not previously involved in the study of fish remains, owing to their relative scarcity in Scotland partly because of poor preservation, recent excavations on medieval urban and rural sites prompted me to consider the problem of dealing with fish. Few prehistoric fish bones have been recovered from Scottish sites but medieval material from both towns and castles has been growing in quantity. The danger existed that in view of current economic stringency these remains might be stored and perhaps never
identified. Also it made sense to examine fish here in Scotland rather than sending them to England which involved extra expense and the risk of losing material in transit.

As no reference collection existed in Edinburgh it was necessary to start from the basics to which end I gratefully accepted an invitation from Dr A. Clason to study fish preparation under the excellent supervision of Dick Brinkhuizen at the Biologisch-Archaeologisch Instituut in Groningen.

On my return to Edinburgh, however, the pressure of work prevented me from immediately embarking on the fish project but thanks to the encouragement of sympathetic colleagues the necessary equipment has been obtained and laboratory space allocated to fish preparation - the laboratory is, coincidentally of course, located in the furthest corner of the building!

The principal aim of the project is to build up a skeletal reference collection of all fish species which could be found on archaeological sites as an aid to primary identification. As we are primarily a teaching establishment, the secondary aim is to acquaint students with the problems of retrieval and interpretation of fish remains so that as archaeologists working on site they will be better equipped to deal with fish remains and have a greater understanding of the contribution made by IOA studies in general.

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During the last three decades increasing attention has been paid to recovery techniques in archaeology. Zooarchaeology, too, is highly dependent on reliable data and samples of representative value. This is especially the case with
fish remains, which are usually small and very often overlooked when only hand collection is practiced.

Aside from a relatively few large species (e.g. *Silurus glanis*, *Esox lucius*) prehistoric fresh water species of the Carpathian Basin are all prone to partial recovery.

This hypothesis was tested by a combined screening-water sieving experiment. Some three cubic meters of excavation dirt were collected by random sampling following hand collection of the artifacts. Size categories of the residual material obtained by subsequent screening and sieving provided the input for a cost-benefit type calculation, which was used to quantify the efficiency of hand collection versus more refined techniques.

It was found, that the accuracy of hand collection decreases sharply within the 15.8 - 2.3 mm interval, thus affecting the vast majority of fish bones which remain undiscovered.

Due to the higher energy expenditure of more sophisticated recovery techniques, well designed sampling strategies will be required to offer reliable conclusions to Hungarian archaeologists, who should after all provide the "market" for ichthyo-archaeology.

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My research is on fish remains found in sites dating from Middle Pleistocene until Medieval times in the Netherlands and Jugoslovia.

During the last three years I also collected many skeletons of recent *Rutilus rutilus*, *Abramis brama*, *Blicca bjöerkena*, *Scardinius erythrophthalmus*, *Leuciscus idus*, *Tinca tinca*, *Peroa fluviatilis*, *Esox lucius*, *Pleuronectes platessa*, Plat-
ichthys flesus and Limanda limanda. I did this in order to find formulas to estimate the total length of the mentioned species directly from the size of one of their bones.

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I have just finished my master's thesis: "Size distribution of cod (Gadus morhua L.) and whiting (Merlangius merlangus (L.))(PISCES, Gadidae) from a mesolithic settlement at Vedbæk, North Zealand, Denmark", which is going to be published spring 1983. For the moment I am working with a small mesolithic material from the island of Bornholm, Denmark.

Inge Bødker Enghoff
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As so many other of my colleagues I have to thank Dr. Johannes Lepiksaar for helping and teaching me the pounds how to determine fish bones. After that I have had large and interesting materials from North-Norway (60-95% fish bones) to teach me even more. Most common species are cod, haddock saithe, ling, torsk and halibut. Now and then you can find catfish and red-fish also in the finds. Salmon and trout are more seldom. Of freshwater fishes pike and perch are most common.

At the first meeting in Copenhagen I was asked to work out which of the measurements were useful to Gadidae. This I am still working with. I have planned to give a report at the next meeting in Sophia Antipolis.
I am still working with a couple of big finds from Neolithicum from Finnmark - eastern part of North-Norway and some medieval finds from the western part of North-Norway.

I have a problem how to reckon the number of undetermined fish bones, when you have many thousands of fragments of unknown fish bones. How do my colleagues proceed?

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Between 1975 and 1982 I was engaged in research at the University of Sheffield on the thesis entitled "The study of fish remains from British archaeological sites". In this I discussed general aspects of the study of archaeological fish assemblages together with the analysis of one large body of material: from the excavation of a series of late mesolithic shell middens on the island of Oronsay, Inner Hebrides (Scotland). These sites revealed an important coastal fishery dominated by the exploitation of young saithe, Pollachius pollachius. The most important aspect of the report demonstrated the seasonal pattern of exploitation at the sites, using the growth rate of the fish and otolith growth rings.

A report on these sites is currently in preparation for publication. In addition I have examined fish samples from a number of sites in Britain and Italy, mostly of medieval date. I hope to examine a large assemblage from a site in the Persian Gulf in the near future.

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FISH REMAINS FROM IBERIAN SITES: A GENERAL REVIEW.

by
Arturo Morales.

I. Introduction.

Because of their physical properties, fish bones are seldomly encountered in paleontological sites. The same situation applies basically to archaeological sites even though in these cases we know that fishes occasionally represented an important resource in terms of the overall economies of certain cultures (Casteel 1976). This scarcity of retrievals seems to have caused a general disinterest in fish remains in past years, a trend which is presently changing as evidenced by the notorious increase in the number of archaeozoological publications dealing with them. In this last context a clear case of the above mentioned indigence is the Iberian peninsula, whose lag of archaeological research is evident if compared to other regions of the world, in particular Western Europe.

II. Materials and methods.

A general survey of the literature now available on the subject from Spanish and Portuguese settlements has come up with a mere 24 sites where fish remains have been cited. Of these, the first one investigated (Lumenterxa, see Map 1) was worked out in 1967, 12 more (50% of the total) were studied in the seventies, mainly by Germans, and 6 (25% of the total) come from the eighties. At present 3 more sites (2 freshwater and 1 marine) are being studied by my group in Madrid.

All these numbers are somewhat misleading for in many cases the only references of the fishes come in the general tables of the analysis, without further comments being given in the text. The presence of fish should, thus, be interpreted as "casual" and, as a matter of fact, in some studies (for example those of Cova de L'or, Cueva del volcán de Paro,
Cuesta del Negro and Cerrc de la Tortuga), the references come only as "unspecified fishes" so their value for further comparative studies is almost nil.

Since the biological and socioeconomical implications of marine and freshwater fishes are somewhat different, I have discussed both groups in this report as discrete units. The diversity of marine "fishes" (sensu lato) in Spanish waters is probably the greatest in Western Europe as more than 400 species have been recognized. Of these, some 29 (less than 10%) have been recognized. Of these, some 29 (less than 2 and 3). To these, we will have to add 2 more genera (Mugil and Trachurus), as well as 3 more genera (Labrus, Scomber and Trigla), from which definite species are known.

In contrast to this situation, the Iberian freshwater fauna, although rich in endemisms (which according to certain authors represent around 50% of the total), is probably the poorest of Western Europe numbering some 20 species, plus 10 more introduced in recent years either as gamefish (Esox lucius, Micropterus salmoides, Salmo gairdneri, etc.) or pest-fighters (Gambusia holbrooki).

Of the "echte" freshwater species only 4 (25% of the autochthonous fauna, 12.5% if the present total of freshwater species is considered) have been identified thus far. Besides, 3 important genera (Salmo, Chondrostoma and, possibly, Carassius) have also been described. To these we can add a further genus (Barbus) which has already been included in the species total as B. meridionalis, plus 2 species (Acipenser sturio, Anguilla anguilla) and one genus (Alosa) of amphidromous species (both anadromous and catadromous) which could have been included in the marine species list but which, with the exception of the sturgeon in Cueva de Nerja, have been retrieved in inland sites (see also Table 3).

III. Discussion.

Most of the species are concentrated on a few settlements (Aridos in the case of freshwater fishes, and Nerja, Zambujal,
Map 1. - Geographic location of the prehistoric sites where fish remains have been analyzed:

1. ARIDOS (prov. Madrid) acheulian (Mindel-Riss interglacial) (Morales 1980a).
2. CUEVA MILLAN (prov. Burgos) mousterian (Morales, under study).
22. CERRO MACARENO (prov. Murcia) punic (Morales in press).
24. TERUEL (prov. Teruel) middle ages (XIth century onwards) (Morales & Alvarez under study).

Toscanos and Cabezo de San Pedro in the case of marine fishes) with the remaining sites presenting usually 1-2 species. The time lapse covered by the 24 settlements described reaches from the Acheulian (Aridos) up until the Middle Ages (Teruel) (see also Map 1). All this diversity within sites and scarcity of fishes makes difficult any intent to find patterns of distribution, abundance and exploitation of the ichthhic populations in the recent part.
Table 1. - Chronological arrangement of the 24 settlements. Numbers before each one correspond to those given in Table 1. The chronology is only approximate and has been specifically modified in sites encompassing a large time span so as to restrict it to the levels where fish remains have been recovered (as, for example, Cerro de la Virgen). Inland sites are marked: ●

As regards the marine species, most of those taken come from coastal groups (Sparidae, Sciaenidae, Serranidae) and the most frequently found species on Mediterranean sites Dentex dentex (6 sites) Sparus aurata (5 sites) and Pagrus pagrus (5 sites) are still heavily fished in these waters today. The few species found on settlements along the Cantabrian coast (northern Spain) belong to the benthonic families Merlucidae and Labridae. It is noteworthy to see that more pelagic species, which today are heavily taken by the Spanish fleet, are absent (Sardina, Engraulis, Micromesistius) or almost absent (Scomber, Trachurus). Perhaps related to this question is the fact that the big sharks and tuna fish which have been found on Andalusian sites come from the historically more recent sites of Punic and Roman times. This probably means that advanced fishing technology was not available before those times to local populations. The tuna-family and very especially the common blue-fin tuna (Thunnus thynnus) travel through the Strait of Gibraltar on their gametic migrations and their systematic capture has been carried out.
<table>
<thead>
<tr>
<th>Site number</th>
<th>3 5 6 7 9 12 14 16 18 19 20 21 22 23 Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odontaspis taurus</td>
<td>+</td>
</tr>
<tr>
<td>Lamna nasus</td>
<td>+</td>
</tr>
<tr>
<td>Taurus oxyrinchus</td>
<td>+</td>
</tr>
<tr>
<td>Galeorhinus galeus</td>
<td>+ + +</td>
</tr>
<tr>
<td>Sphyraena syagena</td>
<td>+</td>
</tr>
<tr>
<td>Squatina squatina</td>
<td>+</td>
</tr>
<tr>
<td>Muraena helena</td>
<td>+</td>
</tr>
<tr>
<td>Belone belone</td>
<td>+</td>
</tr>
<tr>
<td>Merluccius merluccius</td>
<td>+</td>
</tr>
<tr>
<td>Pollachius pollachius</td>
<td>+</td>
</tr>
<tr>
<td>Morone labrax</td>
<td>+ +</td>
</tr>
<tr>
<td>M. labrax/M. punctata</td>
<td>+</td>
</tr>
<tr>
<td>Epinephelus guaza</td>
<td>+ + + +</td>
</tr>
<tr>
<td>Polyprion americanum</td>
<td>+</td>
</tr>
<tr>
<td>Mugil sp.</td>
<td>+ +</td>
</tr>
<tr>
<td>Pagrus pagrus</td>
<td>+ + + + +</td>
</tr>
<tr>
<td>Pagellus erythrinus</td>
<td>+ + +</td>
</tr>
<tr>
<td>Pagellus centrodontus</td>
<td>+ +</td>
</tr>
<tr>
<td>Sparus aurata</td>
<td>+ + + + +</td>
</tr>
<tr>
<td>Diplodus sargus</td>
<td>+</td>
</tr>
<tr>
<td>Dentex dentex</td>
<td>+ + + + +</td>
</tr>
<tr>
<td>Sphyraena ophyraena</td>
<td>+</td>
</tr>
<tr>
<td>Trachurus t./T. mediterraneus</td>
<td>+</td>
</tr>
<tr>
<td>Seriola dumerilli</td>
<td>+</td>
</tr>
<tr>
<td>Sciaena aquila</td>
<td>+ + +</td>
</tr>
<tr>
<td>Sciaena umbra</td>
<td>+</td>
</tr>
<tr>
<td>Scomber scombrus</td>
<td>+</td>
</tr>
<tr>
<td>S. scombrus/S. japonicus</td>
<td>+</td>
</tr>
<tr>
<td>Thunnus thynnus</td>
<td>+ + + +</td>
</tr>
<tr>
<td>Sarda sarda</td>
<td>+</td>
</tr>
<tr>
<td>Euthynnus alletteratus</td>
<td>+</td>
</tr>
<tr>
<td>Labrus sp.</td>
<td>+ +</td>
</tr>
<tr>
<td>Labrus bergylta</td>
<td>+ +</td>
</tr>
<tr>
<td>Trigla sp.</td>
<td>+</td>
</tr>
<tr>
<td>Trigla lucena?</td>
<td>+</td>
</tr>
<tr>
<td><strong>Total number of species</strong></td>
<td>1 2 2 16 8 1 3 16 1 1 11 1 1 2</td>
</tr>
</tbody>
</table>

Table 2. - Distribution of marine species in the settlements. Site number as in Table 1.
by coastal fleets for many hundreds of years. In this context it is interesting to remark how the four sites on which this species has been found (numbers 7, 16, 20 and 21 on Map 1) fall neatly within this route.

In relation to freshwater species, the only site which has yielded a rather varied assembly was that of Aridos (Morales op. cit.) which dates back to the Mindel-Riss interglacial and contains a rich fauna of cyprinids plus two amphidromous genera (Alosa and Anguilla) as well as a pike (Esox cf. lucius). This last species might well be considered the most interesting find of recent Iberian paleoichtiology for the moment, since the species (and family) were considered foreign to our freshwater fauna until the pike was introduced, largely for commercial purposes, back in 1948 in Aranjuez (prov. Madrid). Two other assemblages with seeming-
ly varied freshwater species are presently under study (Cueva Millán, site no. 2 on Map 1 and Tito Bustillo, not shown) but, as a casual look at Table 2 demonstrates, most of the inland sites have merely occasional finds of no further comparative interest.

As a final comment we can say that, although extremely interesting from a biogeographical point of view, much (if not all) remains to be done on the fish faunas of the late pleistocene of the Iberian peninsula in order to come up with a coherent picture of the evolution of this most interesting, and until now - most neglected group of vertebrates.

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