which the most identifiable and recognizable features are visible. Unless otherwise specified, the drawings are of the right side. Due to the asymmetric skull of the halibut, several elements from right and left sides show distinct differences. Where this applies, both sides are illustrated, unless the difference is merely one of size.

Each element is depicted actual size in order to emphasize as much detail as possible. Drawings at this scale and level of detail will enable the analyst to differentiate between various fish taxa through recognition of characteristic bone structures and features. At this scale, the relative size differences among various elements of different species also become apparent. For example, the coracoid of a 90cm long salmon is just slightly smaller than that of a rockfish just over half its size. However, it is important to remember that within families and within species, elements can exhibit a wide range of size and morphological variability. Within species element size is a direct function of fish size which continues to increase with the age of the fish.

Terminology

As far as terminology is concerned, five major sources have been drawn upon. These are Starks (1901), Gregory (1933), Norden (1961), Mujib (1967), and Bond (1979). Much controversy still exists among ichthyologists concerning the standardization of nomenclature. Therefore, most of the terminology used here is derived from Starks (1901) and Gregory (1933). Where there are bones specific to certain species, the terms have been taken from the relevant literature; ie. Mujib (1967) for the cod, and Norden (1961) for the salmon. Where new terms have come into common usage, these have been substituted for the older terms of Starks (1901) and Gregory (1933) (ie. from Gifford and Crader 1977; Bond 1979; Courtemanche and Legendre 1985).

An important factor to note in the naming of fish bones is the difference in the number of bones present among various fish taxa. While much of the skeleton of the lower bony fishes is cartilagenous, it also tends to have a greater variety of bones (Bond 1979). For example, the salmons have 7-8 circumorbitals, a mesocoracoid, orbitosphenoid, supramaxilla, suprapreopercle, and numerous caudal bones. The halibut (a higher teleost) lacks most of the above mentioned elements, and has only one nasal. The caudal fin has been reduced to two epurals and two hypurals, and the orbitals ave been reduced to several minute tubular ossicles.

Although the skeletal elements of the higher and lower bony fishes basically correspond, some of the names of the bones will be different due to specialization and particular adaptations. For example, there is no true mesethmoid in the salmon (Norden 1961:727). It has a supraethmoid bone which is not present in the cod, rockfish, or halibut. A further example is the basihyal of the salmon which is cartilaginous, overlaid with a well-ossified lingual plate (Norden 1961:734). It is the lingual plate which survives archaeologically. The basihyal of the rockfish and halibut is completely ossified. The cod has no basihyal.

Method of Specimen Preparation

For all intents and purposes, this manual is meant to supplement and complement a comparative fish bone collection. It is not intended to be a total replacement for a comparative collection, and the importance of access to such a collection for precise identification must be stressed. Adequate collections, however, are not always available, and the services of a specialist can be difficult to obtain and expensive. Making up a basic fish collection may be difficult and time consuming, but it is sometimes the only solution. What follows, is a short description of the method used for the preparation of specimens for the present manual.

The method of maceration used was a modification of the enzyme-base laundry presoaker and warm water technique described in Casteel (1976). The fish specimen was first gutted, being careful not to cut or remove any bones. To accelerate the maceration process, the fish was lightly steamed until superficial flesh flaked off easily. This excess flesh was carefully removed without damaging any bones. The remaining carcass was then left submerged in a strong presoaker solution for a few days, with checks on its progress made every day. Accurate graphic representation of the individual bony elements required a skeleton that was in the best condition possible. This meant that constant monitoring was necessary to ensure that the bones did not warp, dry-out, or begin to break down.

When the cartilage appeared to be sufficiently dissolved, the skeleton was removed in sections (ie. caudal, left and right pectoral, pelvic, and lateral facial sections, etc.). The neurocranium tended to take the longest to disarticulate. The bones were removed from the solution while they were still attached but soft enough to separate easily by hand. In this way left and right sides were not