A Review of the Need for Work on Polychaete Systematics on Indo-Pacific Coral Reefs[1]

KRISTIAN FAUCHALD
Allan Hancock Foundation, University of Southern California
Los Angeles, CA 90007

The following quote from Ekman (1953: 13) encasulates the common opinion of polychaetes as biogeographical indicators:

> "The polychaetes, which are to a large extent cosmopolitan and therefore do no throw much light on regional zoogeography, also show the boundaries between the West and East Pacific, which is a good indication of the effectiveness of this boundary."

There are several reasons for this opinion, most can be boiled down to a single common factor: polychaetes have been poorly studied in most areas and nearly neglected in tropical waters.

The molluscan fauna of Micronesia is known for about 930 species (Masuoki Horikoshi, personal communication), whereas the total reported polychaete fauna includes about 75 species. In contrast, about 750 species of polychaetes have been reported from California and about 800 to 1000 species of molluscs are found in this state (James H. McLean, personal communication). Similar equivalence between the molluscan and polychaete faunas can be demonstrated for areas in Europe. The equivalence is not biologically significant; it serves to illustrate how poorly the Micronesian fauna has been investigated.

A distinct increase in the relative importance of cosmopolitan and circumtropical species, in terms of numbers of species, can be demonstrated as one moves from boreal areas towards the tropics and from soft, sandy or muddy bottoms to hard bottoms (Fauchald, Ms.). Consequently, coral reefs should contain the highest percentage of widespread forms of all environments. Published faunal lists appear to bear out this "rule", best documented for the eastern Pacific fauna. No positive way of disproving the "rule" can be devised, but several possibilities can be mentioned.

Sampling has largely been concentrated on hard bottoms, and more particularly on corals and reef flats in tropical waters. Furthermore, most of the sampling has been done with methods unsuited for collecting the smaller polychaetes. That such polychaetes are present have been demonstrated by Kohn and Lloyd (1973) and Gibbs (1971). In boreal waters, however, sampling has concentrated on soft,

[1] Contrib. No. 12, Santa Catalina Marine Biological Laboratory. Paper presented at a Colloquium on "The need for faunistic information on Pacific coral reefs", International Symposium on Indo-Pacific Tropical Reef Biology, Guam and Palau, June 23–July 5, 1974.

Micronesica 12(1): 165–167. 1976 (June).

sandy, or muddy bottoms and the materials have been treated with methods suitable for collecting small forms. Generally, large, hard-bottom species tend to be more widespread than smaller, soft-bottom forms, especially in such families as Eunicidae and Phyllodicidae, both of which are amply represented on reefs.

Sampling in nonreef environments, just as important for an understanding of an atoll as a biologically functioning unit, has lagged behind. Quantitative samples from mud and sand in the lagoons and from the turtle-grass flats are very few. The shallow lagoons and flats have been inaccessible to the large vessels needed to handle grabs and corers, however, quantitative methods using SCUBA equipment have now been developed and good samples should now become increasingly available.

Quantitative sampling on hard surfaces is a difficult problem that has only partially been solved. The usual method has been to break open the coral coverage of a specified surface area and recover the animals from the rubble, either alive or preserved. This leads to fragmentation of most polychaetes. No method is available for identifying fragments of polychaetes and no method can be envisaged except for selected families in localized, very well known areas. Otherwise, one will always need well-preserved samples of complete animals. The sampling may have to be done as a double program; one for sampling the large, rarer organisms, which probably can be done in the traditional manner, and one for preserving smaller species. This latter can be done if the hard substrate is broken up into blocks, preferably not more than two to three inches on a side, immersed first into a narcotizing agent and later preserved. Considering the nature of the substrate, nonneutralized formalin should work well. Later decalcifying agents must be used on the coral rubble to get to the smaller animals. This method has successfully been used on burrowing bryozoans (John D. Soule, personal communication); there is no reason why it should not work also on polychaetes.

It does not take a very large accumulation of sand and mud to support a flourishing polychaete fauna; such faunules have never been adequately sampled and documented, but preliminary studies at Santa Catalina Island, California, indicates that in similar, nonreef environments, characteristic assemblages of polychaetes are present (Fauchald, in preparation).

This collecting program should adequately sample the fauna, provided that it is followed by adequate taxonomic studies. In practice, it will be impossible to list all species from all Indo-Pacific reefs; we need to reach a level where a biologist sampling the fauna can tell whether the organism in front of him is one that has been reported from the area or an "unknown" or otherwise remarkable form. We need handbooks along lines developed by Fauvel (1923, 1927) and Hartmann-Schröder (1971) for Europe, by Hartman (1968, 1969) for California, by Day (1967) for South Africa, by Pettibone (1963) for the New England region and by Ushakov (1955) for the northwest Pacific. Because of their coverage, none of these books are suitable for studies of reef polychaetes, with the exception of Day (1967) which has some coverage of reefs in the Indian Ocean.

The large number of circumtropical species mentioned above, need to be ex-

amined carefully. Minor morphological differences exist between different populations, noted for *Eunice antennata* and *E. afra* by Fauchald (1970), and appears to be common among reef-associated eunicids. The differences are always small and have been disregarded in the taxonomic literature in general. We need population studies of common species in order to establish the normal range of variability within and between populations in each of the major geographical regions. It is expected that high regional variability will be associated with a lack of pelagic larva.

The third important aspect of biology of these organisms follows from the above: we need to study the reproductive patterns at least in the same organisms being studied for their populational structure.

Once these three phases have been studied, we will be in a much better postition to assess the importance of the "rule" alluded to above and we will at the same time have gained a functional concept of the species in these polychaetes. Without a clear species concept, it is impossible to clarify the role of each species in their coenosis, and thus, ultimately, impossible to interprete the relations between accretive and decremental forces on a reef.

References Cited

Day, J. H. 1967. A monograph on the Polychaeta of Southern Africa. Part I. Errantia; Part II. Sedentaria. Brit. Mus. (Nat. Hist.), Publ. No. 656, XXIX and XVI. 878 p.

Ekman, S. 1953. Zoogeography of the sea. London, Sidgwick and Jackson, Ltd., XIV. 417 p.

Fauchald, K. 1970. Polychaetous annelids of the families Eunicidae, Lumbrineridae, Iphitimidae, Arabellidae, Lysaretidae and Dorvilleidae from western Mexico. Allan Hancock Monogr. Mar. Biol. 5: 1–335.

Fauvel, P. 1923. Polychetes errantes. Faune de France, Paris, 5. 488 p.

———. 1927. Polychetes sedentaires. Addenda aux Errantes, Archiannelides, Myzostomaires. Faune de France, 16. 494 p.

Gibbs, P. E. 1971. The polychaete fauna of the Solomon Islands. Bull. Brit. Mus. (Nat. Hist.), Zool. 21: 99–211.

Hartman, O. 1968. Atlas of errantiate polychaetous annelids from California. Allan Hancock Foundation, University of Southern California. 828 p.

———. 1969. Atlas of sedentariate polychaetous annelids from California. Allan Hancock Foundation, University of Southern California, 812 p.

Hartmann-Schröder, G. 1971. Annelida, Borstenwürmer, Polychaeta. Die Tierwelt Deutschlands 58: 1–594.

Kohn, A. J., and M. C. Lloyd. 1973. Polychaetes of truncated reef limestone substrates on eastern Indian Ocean coral reefs: diversity, abundance, and taxonomy. Int. Revue ges. Hydrobiol. 58: 369–399.

Pettibone, M. H. 1963. Marine polychaete worms of the New England Region 1. Aphroditidae through Trochochaetidae. U.S.N.M. Bull. 227(1): 1–356.

Ushakov, P. V. 1955. Mnogoshchetinkovye chervi dal'nevostochnykh morei SSSR (Polychaeta of the Far Eastern Seas of the USSR). Akad. Nauk USSR, Zool. Inst., Opred. po faune USSR 56: 1–445.