7 STOCK STRUCTURE

Nothing is known of the stock structure of fish species of major commercial and recreational interest on the GBR. Larval studies suggest that extensive dispersal of larvae of these species is likely and genetic studies suggest that relatively little genetic differentiation is likely for these species. This does not mean, however, that significant stock differentiation does not occur.

Leis and Goldman (ms) hypothesised that species whose (larval) distribution on a local scale was non-random might actively maintain this pattern rather than drift passively and could be expected to have relatively restricted population units. Species which, on the other hand, have apparently random larval distributions on a local scale might, however, be more influenced by passive drift and could be expected to have relatively wide-spread population units. With this hypothesis in mind, Leis and Goldman examined the distributions of reef fish larvae in the GBR lagoon in the vicinity of Carter Reef. They found that '1. about 60% of reef fish larvae have random distributions, and we predict these taxa will have large population units; 2. about 40% of reef fish larvae have non-random distributions and these should have restricted population units; and 3. most of the fishes of sport and commercial importance are in the first category' (Leis and Goldman MS). Leis and Goldman stressed a number of caveats to their third conclusion. The results of this and other studies of larval fish distributions on the GBR lead to the conclusion, however, that to the extent that distributions of larvae of GBR species suggest a spectrum of dispersal ranging from relatively restricted to more widespread, species of recreational and commercial importance tend to the more widespread end of the spectrum.

The length of larval duration of GBR reef fish species varies from nothing to several months (see e.g Brothers et al. 1983). Larval duration of species of recreational and commercial importance on the GBR is reviewed in Section 3 of this report. Doherty and Mather (unpublished data) have explored the hypothesis that the degree of genetic variation within a species on the GBR is inversely related to the length of its larval duration. These authors found major genetic variation within *Acanthochromis polyacanthus* even over relatively short distances. This species does not have a larval stage but broods its young. The results were expected given earlier unpublished results of electrophoretic studies by Soule (cited in Ehrlich 1975) and the observation of large colour variation in the species throughout the GBR (Allen 1975). Whereas ten of the 11 polymorphic alleles found in Acanthochromis showed very significant differences among the geographic regions examined, none of the alleles of a surgeonfish (estimated larval life = 60 days) showed any significant departures over the same area. A damselfish with a larval life of approximately 25 days showed significant variations for five out of the nine polymorphic alleles.

Doherty and Mather concluded on the basis of their preliminary results that the five species studied in detail did show patterns of variation consistent with their hypothesis i.e. there is a correlation between the genetic similarity of distant populations and the known duration of larval stages. However, all species with pelagic larvae (all the species of concern to this report) have shown low levels of variation relative to the one species in which larvae do not leave the adult habitat.

We stress again that the lack of evidence for stock structure within major recreational and commercial species on the GBR may simply reflect the lack of relevant studies, in particular studies of comparative life histories and of morphometrics within species over different regions of the GBR. Are there any pointers as to regions where differentiation is most likely or are there species that are more likely than others to differentiate?

On the basis of geographic and potential physical oceanographic isolation, the GBR might be divided into three from the perspective of larval connectivity: waters north of Cape Melville;

waters from Cape Melville to the Swains; and the Capricorn-Bunker group. The continental shelf is particularly narrow at Cape Melville and two reefs (South and North Warden) run across almost the entire width of the shelf just south of the Cape. The potential relative isolation of the Far Northern GBR may also be enhanced by the northward movement of the extension of the South Equatorial Current (SEC) adjacent to this region. The SEC crosses the Coral Sea from East to West and then bifurcates between 14^{o}S and 18^{o}S on approaching the continental shelf. The northern branch follows the shelf edge northward to the Gulf of Papua, the southern branch flows south-eastward and is the beginning of the East Australian Current. The relative geographical isolation of the Capricorn-Bunkers from the rest of the GBR is clear on a map or chart. It is also interesting that *P. leopardus* appears to grow much larger here than elsewhere on the GBR. This is not the result of the Capricorn-Bunkers being on the southern end of a cline in growth because the same species in the Swains, the closest region of the GBR, is relatively small (A.M. Ayling pers. comm., see Distributions and Habitats section above).

Are any of the species of particular interest more likely to show stock structure than others? Early life histories (Section 3) give us no clues. *Lutjanus argentimaculatus* and *L. johnii* are possible candidates because preferred habitats of these species as presently understood (rivers and rocky headlands, respectively) are much more patchily distributed along the GBR region than the preferred habitats of the other species.

7.1 Studies in Progress

None of which we are aware.