Dispersal Of Reef Fishes By Rafting

Dispersal is the way marine animals expand their geographic distribution and exchange genetic material among spatially discrete populations. Coral reef fishes disperse principally during the planktonic larval phase of their bipartite life-cycle, recruiting to reefs for the adult benthic phase. Efforts to predict the geographic distribution and gene flow amongst reef fishes using measurements such as the duration of the larvae period and larval swimming ability have so far proved unsuccessful (Victor 1991; Shulman and Bermingham 1995; Stobutzki 1998). In other marine organisms such as corals, bryozoans, gastropods and ascidians *rafting* with floating objects can contribute to the wide geographic distribution and genetic similarities among distant populations (Johannesson 1988; Jokiel 1989; Worcester 1994).

Rafting may enhance dispersal by improving survival in open water and so extending drift time in the pelagic environment

Rafting may enhance dispersal by improving survival in open water and so extending drift time in the pelagic environment. Gooding and Magnuson (1967) showed fishes (including reef fishes) associate with floating objects, but few studies have discussed the significance of such an association. However, two recent events of long distance dispersal of fishes associated with floating objects may suggest a role for rafting as a dispersal mechanism in reef fishes (Kokita and Omori 1999; and pers. obs.).

It is not clear what determines the residence time of fish on floating objects

Floating objects are often home to adult fish (Figure 1), but planktonic fish larvae can also find a suitable refuge and source of food on floating objects (Gooding and Magnuson 1967; Kingsford and Choat 1985). However, not all species appear to be attracted. Fish fauna drifting within floating objects differ from the fauna found in surrounding waters (Kingsford and Choat 1985). In addition, my own studies show significant differences in the species composition of fishes settling to similar floating and benthic experimental units. Through a preliminary bibilographic investigation and personal observations I have recorded 280 species that associate with floating objects in the Pacific Ocean, of which approximately 20%, represent reef fish species. Although this number could be considered low relative to the total number of species in the Pacific Ocean, I suspect that improved sampling could increase the count. For example almost 80% of the references are restricted to the northwest Pacific.

The second important factor in dispersal by rafting is the time fishes spend associated with floating objects. Although it is still not clear what determines residence time, the physical characteristics of the floating objects themselves are important. For example, sizes and ages of fishes are positively correlated with raft size (Hunter and Mitchell 1967). Furthermore, floating objects that don't last long in the ocean, such as detached macroalgae, harbour fewer juvenile and adult fish compared with long-lived objects, such as logs and man-made materials. However, the duration of associations between fishes and floating objects will likely depend heavily on active behaviour. For example fish may leave the raft when a certain developmental stage is reached (Kingsford and Milicich 1987) or when predation and/or competition become intense. Of course, successful dispersal by rafting would depend on successful recruitment onto reefs, either through fish actively leaving the raft or, as my colleagues and I have observed at Gorgona Island in the Colombian Pacific, direct recruitment when floating objects run aground. Considering the abundance and variety of floating objects in the Pacific Ocean, could rafting be a significant and overlooked dispersal mechanism for some reef fish species? I believe rafting deserves further study and warrants consideration in biogeographical studies of reef fishes.

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Figure 1. Adult fishes associated with a floating log.

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Camilo Mora, Deparatamento de Biologia,
Universidad del Valle, Cali-Colombia. A.A. 25360
Email<moracamilo@hotmail.com>