Deliberate translocation of marine invertebrates: a personal perspective

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The natural distribution patterns of marine invertebrates vary from species with very restricted geographical ranges to those with cosmopolitan ranges. In part this is because many invertebrates have pelagic larvae which facilitate dispersal, but often species exhibiting some sort of brooding also have broad geographical ranges. The latter pattern presumably results from the geological age of many invertebrates which has provided plenty of time for widespread dispersal. However, increasingly, natural distribution patterns are being modified either accidently or deliberately. The accidental transport of marine invertebrates by hull fouling or transport by ballast water is not the focus of this paper, and is dealt with by Hutchings (1999 and references therein), although the two activities cannot be completely separated.

While the introduction of exotic terrestrial organisms has been the focus of many studies, the introduction of exotic marine organisms has rarely been discussed until recently. These studies have concentrated mainly on introductions via ballast water or as hull fouling organisms (Carlton, 1985) and not on introductions by activities which have often been considered as being benign. It is these latter activities which are considered here and which may also have a considerable impact on our marine ecosystems.

Populations of marine invertebrates may be deliberately translocated for two main reasons: aquaculture both for human consumption and for bait, and collecting marine invertebrates for marine aquaria.

Aquaculture

Historically, stocks of oysters and mussels have been moved along coasts and between countries. In Australia the Pacific oyster *Crassostra gigas* was deliberately introduced into Tasmania in the late 1940's and early 1950's and populations are now found all along the south east coast (Pollard & Hutchings, 1990). The species competes with the native Sydney Rock oyster *Saccostrea glomerata* and is regarded as an inferior species with regard to taste. While this a problem for the fishery/aquaculture industry it also has ecological consequences. It appears that not only was the Pacific oyster introduced but also associated mud worms, species of *Polydora* spp. (F. Spionidae) which are regarded as pests by the oyster growing industry as they disfigure the oyster shell, reducing its commercial value. The genus *Polydora* also occurs in Australia and it is now impossible to determine which species are native and which were introduced; certainly some species are regarded as more of a pest than others. So not only have external pests been translocated but it is possible that internal parasites and pathogens have also been redistributed along the coast. While the Pacific oyster has spread along the east coast, populations of the Sydney Rock oyster have also been translocated along the coast, to maximise growth and because settlement of spat is better in some estuaries than in others. This transport of the Sydney Rock oyster has been going on for decades with no detailed records being kept, so any distinct genetic strains present within the species have been eliminated or diluted. Some evidence for such strains existing is that some populations of oysters are more resistant to a major disease affecting the Sydney Rock oyster in the northern estuaries of NSW (QX disease) (Nell *et al.*, 2000)

For the oyster industry it is probably too late to conserve the different genetic strains of oysters which may have existed along the east coast of Australia, and we probably now have a genetically, homogenous population along the coast. Perhaps some restrictions could be put in place for the less well developed mussel industry. Translocation of mussels from Tasmania to Port Phillip Bay does occur and recently it became apparent that not only mussels were transported but also the Pacific Sea star *Asterias amurensis*

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which is major pest in some Tasmanian estuaries. Individual sea star were found in 1988 in Port Phillip Bay around the mussel pilings; within a year it was estimated that there were over 12 million individuals within the Bay (Thresher, 1999). Even more worrying is the potential for this sea star to spread along the coast both eastwards and westwards, and the possible impact this highly efficient scavenger may have on benthic marine invertebrates.

While it is too late to conserve the natural variation within the commercial oyster species along the east coast of Australia, it may be possible to implement some control in the developing industry of breeding invertebrates for bait. At the moment, this industry is restricted to polychaete worms. Several genera are used and currently most worms sold in bait shops have been collected from the wild. One of the species (an undescribed *Marphysa* sp) occurs in seagrass beds and such localities are closed to diggers in NSW by Fisheries. However, this species is collected from seagrass beds in Moreton Bay, Queensland by licensed diggers and specimens are shipped to suppliers throughout New South Wales. As these and other worm species are sold by length and the current price is about $500 per kilo there is a very strong incentive to breed these worms commercially.

Pilot studies are currently being carried out in NSW to try to breed these worms (Hutchings unpublished data). As *Marphysa* sp. has pelagic larvae, there is the potential for them to be released into NSW waters when the large breeding tanks are cleaned, accidental release of juveniles into non-native waters may occur. In addition, breeders obtaining their stock worms from bait shops would have no idea of the original source of the species, so we may have mixing of different populations of the species, and with it the potential loss of genetic diversity. Such translocation of populations may also be spreading pathogens and parasites but we know little about these in polychaetes or variations which may occur between populations.

Currently most of these studies are low key, backyard projects, and it seems unlikely that they would be following the recently developed Federal Guidelines or code of practice to the translocation of species (National Policy for the Translocation of Live Aquatic Organisms, 1999) which have been adopted by NSW Fisheries. In addition, most of these projects are almost secret activities and regulatory Authorities in most cases unaware of their existence. Informal discussions with NSW Fisheries Officers suggest that they will only implement the Guidelines if they receive particular complaints, they lack the personnel and resources to actively implement the Guidelines.

The scale of this problem is difficult to judge as I receive regular phone calls mainly from NSW and have for the past 30 years from fisherman interested in breeding polychaete worms either for themselves or to sell to the local shops. There is no way of knowing how many of these people actually begin to try and breed the worms after I explain to them these species breed annually and have a pelagic larval stage. I suspect that most are just catching worms and trying to keep them alive in large tanks until the holiday period rather than having any success in breeding them. Permits from NSW Fisheries are only required if brood stocks exceed bag limit and are being sold.

Collecting marine invertebrates for marine aquaria

Finally, there is an increasing interest in keeping marine aquaria. Fauna for these tanks may be collected personally by SCUBA diving or bought at the local aquarium shop where details as to the origin of the species in question is rarely known. As maintaining a marine aquarium is more difficult than keeping a freshwater tank, it may be that when boredom sets in, the contents of the aquarium are discharged into the local creek or into the sea. We know from freshwater aquarium fish industry, that exotic species from South America and other countries have been brought into Australia and been released into our waterways where they have survived and bred (Pollard & Burchmore, 1986).

As we know very little about the genetics of marine invertebrates, we should be erring on the side of caution, and there should be public awareness programs encouraging people from releasing such species back into the wild. Aquarium and bait shops should also display posters explaining the potential problems. Currently in NSW, the collection of marine invertebrates does not does not require a permit if bag limits are not exceeded and specific equipment is used. However abalone and crayfish cannot be collected on SCUBA. From

the 23rd March 2001 a recreational licence will be required in NSW for collecting all marine invertebrates. Obviously policing of this will be difficult and will require a massive education and public awareness program.

A National Translocation Policy for Live Aquatic Organisms (1999), has been developed and endorsed by all States, but this cannot apply retrospectively and only applies to commercial operators. Unlicensed operators may well continue to ignore these regulations, and they do not apply to people just breeding or keeping animals for their own use. In NSW, implementation of the Policy is through NSW Fisheries.

In conclusion there are problems with the unregulated and unmonitored translocation of marine invertebrates, and the National Policy should be enforced; but, realistically with current funding to Fisheries Agencies this is unlikely to occur in all cases. More importantly we are losing the natural biodiversity of our native marine fauna, but we cannot assess at this stage how widespread this is and its impact biologically /ecologically on our marine ecosystems. We simply lack the knowledge. Such diversity may be important for species to survive in increasingly impacted environments.

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