



## Death in the live reef fish trades

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When we think of trade and marketing in live reef fish, — larger species destined for food, brightly coloured ones for aquarium display — we tend not to consider a darker side; death before reaching the consumer or, for aquarists, prematurely after purchase. Yet the mortality associated with these trades can be significant and, if this causes more fish to be harvested, is also wasteful. On the upside, much of this mortality could probably be avoided, and can certainly be reduced. This article highlights what is known and, more importantly, what is being done, about unnecessary mortalities in the live reef fish trades. I also touch briefly on some associated questions of animal welfare.

Estimates indicate that cumulative fish mortality from capture to consumer are incredibly variable and can often be high, producing significant wastage in both trades (Johannes and Riepen 1995; Wood 2001; Sadovy and Vincent 2002). Mortalities typically range from a few per cent to more than 80 per cent according to one or, more likely, a combination of, poor capture and handling, inadequate husbandry practices, facilities and transportation, and the inclusion of unsuitable species.<sup>2</sup>

While some problems arise from inexperience and could be solved, others may be symptomatic of prevailing attitudes or lack of knowledge within a particular sector. These are not likely to be resolved without training, introduction of alternative methods, changes in perception, or the development of legislation or codes of conduct. Several examples serve to illustrate some of the problems involved and the approaches being taken to deal with them.

The live reef food fish trade (LRFFT) involves the wild capture of both marketable size fish and juveniles destined for mariculture grow-out<sup>3</sup> to saleable size (hatchery production of juveniles will not be

considered here) of certain reef fish, particularly groupers (Serranidae). High mortalities from capture to consumer can be a problem for adult fish especially when they are caught with chemicals such as sodium cyanide, caught by hook and line but improperly degassed (i.e. the process of removing air from the gas bladder, which expands when fish are rapidly retrieved from deeper waters), or foul-hooked, and when generally handled or shipped poorly or inexpertly. Mortality rates are relatively low for net-caught fish, unless taken with the fyke or bag nets used to capture post-settlement juveniles for grow-out (reviewed in Sadovy and Vincent 2002). Juveniles destined for grow-out are often maintained and shipped in stressful conditions that doubtless contribute to high levels of mortality prior to export and while in culture<sup>4</sup> (Sadovy 2000).

The marine aquarium trade (MAT) includes the capture and shipment of over 1000 species globally, particularly smaller species, and often juveniles of medium-sized reef fish. Mortalities may be associated with physical damage, use of sodium cyanide, poor conditions in holding and transport, and stress (Wood 2001). For example, in the Philippines, a major source of aquarium fish and where cyanide is often used, mortalities can reach 20 per cent within a few days of capture when fish are held under poor conditions prior to collection by middlemen (Baquero 1995). The inclusion of species that cannot withstand capture and shipping or do not adapt readily to aquarium life adds further to overall losses (Wood 2001), while as much as 40 per cent of species currently traded may not be suitable for the average aquarist (Sadovy and Vincent 2002). A survey of over 300 aquarium fish retailers indicated that mortality levels of fish imported from the Philippines (where various middlemen are often involved) ranged

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2. The term 'unsuitable species' means species that are unlikely to survive shipment or captivity for a considerable proportion of their potential lifespan (MAC 2001).

3. Grow-out refers to the process of maintaining sub-market sized fish in captivity until attaining marketable size.

4. Refers to any fish grown-out in captivity irrespective of whether its was hatchery-reared or taken from the wild as a juvenile.

from 30 to 60 per cent within three days of arrival in the United States (Rubec et al. 2000). On the other hand, in countries where the collector is also the exporter, good practices often keep mortality levels very low.

What is being done to reduce wasteful mortality? The good news is that several projects specifically aim at reducing mortality levels, although in many cases it is still too early to be able to gauge long-term overall success rates. Examples include alternatives to sodium cyanide by introducing less destructive gears such as hand or barrier nets (for the MAT), or hook and line coupled with proper air bladder deflation (for the LRFFT) (e.g. Barber and Pratt 1997). Many facilities at the import stage of the MAT now have excellent filtration systems and include practices that minimise mortality levels (Wood 2001). For the LRFFT, growing experience has much improved survival at the import level, while in transit the use of aerated or oxygenated bins, as opposed to oxygenated bags in polystyrene boxes, has reduced mortality (Frazer McGilvray, International Marinelife Alliance, pers. comm.).

For the MAT, industry standards are now being developed, which 'outline the requirements for third-party certification of quality and sustainability in the marine aquarium industry from reef to retail'. These standards address, among many other issues, best practices for harvesting, holding, packaging and transport to ensure the optimal health of harvested organisms, including during export, import and retail. The final working version of the Marine Aquarium Council (MAC) Core Standards provisionally sets the allowable limits of marine aquarium organism mortality at the species level at one per cent dead on arrival and one per cent dead after arrival per species and per shipment for each link in the chain of custody.<sup>5</sup> Businesses that comply with these standards (whether industry operators, facilities or collection areas) can be MAC-certified, the benefit ultimately being that such certification should be good for business (MAC 2001).

Other organisations in the industry have also developed their own codes of conduct to address many of the problems, in addition to voluntarily not trading in species considered to be impossible to keep (Wood 2001; Sadovy and Vincent 2002). For the LRFFT, plans are now being drafted to develop a voluntary code of contact for industry standards, through a collaboration of several NGOs with a major industry player, which will address the problems of both wild-caught and cultured fish (Frazer

McGilvray pers. comm.). Two final points must be considered. The first is that follow-up studies after implementation of such measures are needed to evaluate their effectiveness in reducing mortalities and other wasteful practices and to improve implementation. The second is that, in any fishery, dealing with a problem such as unnecessary mortality is only part of the much bigger problem of resource management, which must always be integrated into the overall solution.

The not-so-good news is that fishing practices producing high levels of mortality in both target, and sometimes non-target (or bycatch), species continue. Mortalities are typically undocumented and unsuitable species are still traded. In this context, 'unsuitable' also encompasses species that are unmanaged and readily threatened by overfishing (examples include several angelfishes, seahorses, *Epinephelus lanceolatus*, and the humphead wrasse, *Cheilinus undulatus*) (IUCN Red List of Threatened Species 2000; <http://www.iucn.org/themes/ssc/red-lists.htm>). Trade or volume estimates, if made at all, tend to rely on export or import figures, points in trade after which much mortality may have occurred. This means that actual volumes and extraction rates are typically higher than import or export records would indicate. This is particularly likely in many of the major producer countries where mortalities tend to be highest and monitoring least developed. Moreover, trade in species unsuitable for life in the average aquarium continue in the MAT, despite a great variety of suitable species. The massive fry trade, involving millions of post-settlement and juvenile fish for mariculture grow-out, is also associated with significant losses at all levels (Sadovy 2000).

A final, and more controversial, point to consider — and one that goes beyond the more general issues of animal health and welfare — is quality of life for fish that enter the live reef fish trades. In some countries there is growing public concern that even for terminal markets, animals should not experience pain and suffering, especially unnecessarily, while *en route* to retail markets (Olin 2001). Without entering the debate on what might constitute pain and suffering for fish, it is clear that this issue needs to be addressed by the industry, and ideally, proactively. As just one example of possible implications, in San Francisco's Chinatown, animal rights groups, including Chinese groups, brought a cruelty suit against merchants 'for keeping live fish and other animals under conditions of pain, suffering, distress and deprivation' (Rollin 2001).

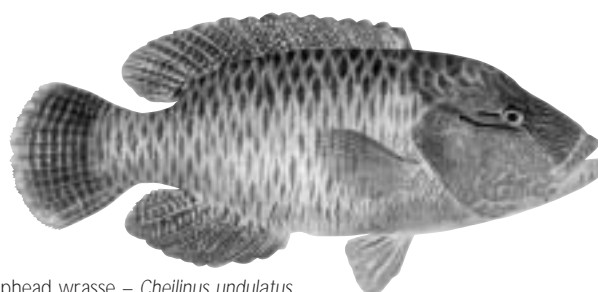
5. There are typically at least four such links. Chain of custody refers to the sequence of commercial operations or people responsible for the collection and trade in marine aquarium organisms, from collectors to retailers and buyers. For the retailer to be able to offer certified marine organisms, all components of the chain of custody handling the organisms must be certified (MAC 2001).

It is clear that considerable progress, particularly in the MAT that attracted attention much earlier than the LRFFT, has been made in the last decade. However, much remains to be done to reduce wastage through unnecessary mortalities and to factor mortality reduction into the much greater challenge of natural resource management. In particular, the role of an informed and discerning public in effecting change has yet to be developed.

Wood (2001) concluded for the MAT there are three reasons to avoid premature deaths, and I suggest that similar arguments apply to the LRFFT. The first is that every fish that dies early puts extra pressure on natural resources because of the take of replacements. The second reason is that there is a general consensus in many countries that it is not ethical to trade in live animals, unless their health and welfare are ensured, while unnecessary and early deaths give the trade a poor image. The third reason is that mortalities also mean economic losses for business. Success for both current and developing initiatives attempting to deal with the problem of mortality, therefore, should ultimately be of benefit to both resource and resource user. Adoption of good practices could be much enhanced by the participation of a critical public who to demand responsible use of limited natural resources.

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Humphead wrasse – *Cheilinus undulatus*