Linking consumer demands for environmentally friendly farming with a biological basis of ethical quality

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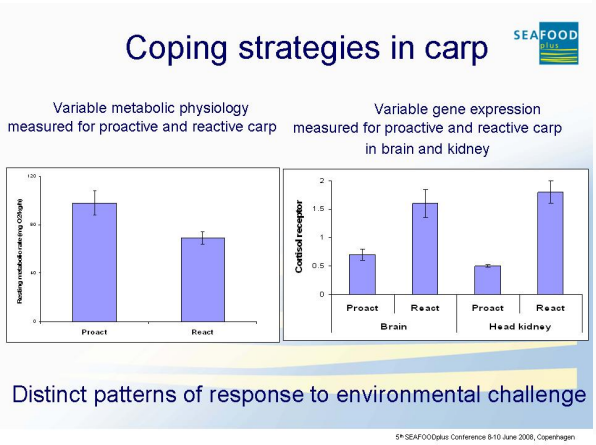

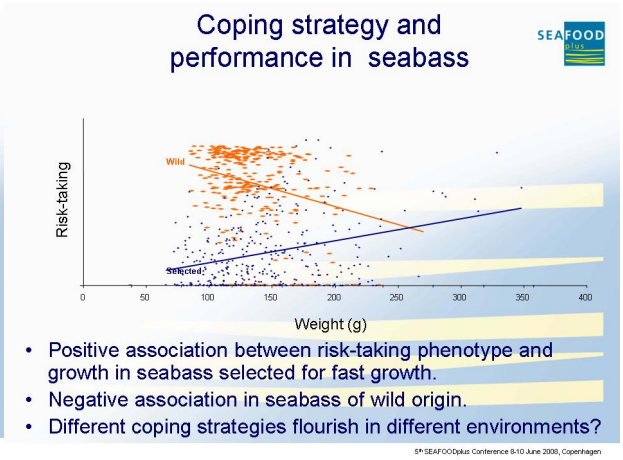

'Environmentally friendly' in its broadest sense includes the requirement for ethical quality and there is increasing public concern that farmed fish should experience good welfare. There are a number of obvious requirements for ethical quality, such as the availability of suitable food and sufficient space, that are dependent on species and life history stage. However, within a species and life history stage, all animals are not interchangeable in terms of their requirements for ethical quality, reflecting the existence of striking and consistent differences in how individuals respond to challenge ('coping strategies'). Typically, *proactive* individuals show an active, adrenaline-based response to challenge, take risk in the face of potential danger and have a high resting metabolic rate. In contrast, *reactive* individuals show a passive, cortisol–based response to challenge, avoid risk and have a low resting metabolic rate. Different coping strategies exist and persist in nature because individual showing them do well under different selection regimes, with proactive individual flourishing when resources are abundant and predictable and reactive individuals doing well when resources are sparse and unpredictable. Such a spectrum of behavioural and physiological variation has been reported for many vertebrate groups, including fish.

In this talk, we will characterise different coping strategies using data from common carp collected in the ETHIQUAL project in SEAFOODplus. These data range in level from behaviour, through metabolic physiology and endocrinology to gene expression in the brain. Proactive and reactive carp show different patterns of growth when exposed to typical husbandry stressors. The effects of inadvertant domestication or selection can illuminate the evolutionary biology of coping strategies. The competitive environment is very different in intensive husbandry conditions and in the wild and the former is likely to favour proactive animals and the latter, reactive ones. Data on seabass collected in the ETHIQUAL project demonstrate striking variability in risk-taking (predictive of coping strategy) among both wild fish and fish from a strain selected for fast growth. Interestingly, the association between risk-taking and size is diametrically opposite in the two stocks, with a negative relationship in wild fish and a positive relationship in the selected strain. This result indicates that the circumstances that favour fast growth (a component of production and welfare in aquaculture) depend on the coping strategy of the fish concerned, probably as the combined result of context-dependent differences in the ability to acquire food and of different patterns of energy utilisation. The message that, within a species, some individuals have been 'designed' by natural selection to flourish in circumstances somewhat similar to those found on well-run, productive fish farms could be important for public perception of the welfare of farmed fish.