

# Update on best practice approaches to the welfare and husbandry of fish, cephalopods and decapods

Adrian J Smith<sup>1</sup>, Penny Hawkins<sup>2</sup>, Tore Kristiansen<sup>3</sup> and Cecilie Mejdell<sup>4</sup>

<sup>1</sup>Norecopa, P.O. Box 750 Sentrum, N-0106 Oslo, Norway; <sup>2</sup>Research Animals Department, RSPCA, Wilberforce Way, Southwater, West Sussex, RH13 9RS, UK; <sup>3</sup>Institute of Marine Research, P.O. Box 1870 Nordnes, Bergen, Norway; <sup>4</sup>Norwegian Veterinary Institute, P.O. Box 750 Sentrum, N-0106 Oslo, Norway

Fish account for 12% of the 11.5 million research animals used annually in the EU, an increase of nearly 30% since 2008. The number of cephalopods (including squid, octopuses and cuttlefish) and decapod crustaceans (e.g. crabs and lobsters) is unknown because regulation of cephalopod use by Directive 2010/63/EU began in January 2013 and decapod use is still out of scope. However, several countries (e.g. Austria, New Zealand and Norway) do regulate the use and humane killing of decapods, and there is support for the view that these animals should be given the benefit of the doubt regarding ability to suffer and need to refine housing, care and procedures.

Since there are over 30,000 species of fish, living in a large range of habitats, as well as a diversity of cephalopods and decapods, there is a clear need for species-specific, science-based guidelines on the care and use of the species used in research. It is generally accepted that fish are sentient and should be protected as other vertebrates, but there is still debate about aquatic invertebrates. Large decapod crustaceans show complex behaviour and appear to have some degree of awareness, with systems for nociception and considerable learning ability. For example, recent research on crayfish suggests that the hormone serotonin is involved in the mediation of anxiety and stress in crayfish, as in humans.

The EU can conduct thematic reviews of the Directive, including new scientific knowledge, and the growing weight of evidence on pain perception in decapods could be the basis for such a review.

## Severity classification

Directive 2010/63/EU requires the severity of procedures to be classified as 'non-recovery', 'mild', 'moderate' or 'severe', using criteria set out by the European Commission. A 2009 EC Working Group report provides examples of such procedures, but not all are relevant to aquatic species.

A working group set up by the Norwegian Consensus-Platform for the 3Rs, Norecopa ([www.norecopa.no](http://www.norecopa.no)) gives supplementary guidance on severity classification in fish research, including examples of 'subthreshold', 'mild', 'moderate', 'severe' and 'upper threshold' procedures. This will make it easier for fish researchers to implement the Directive.

More information is available at [www.norecopa.no/categories](http://www.norecopa.no/categories)



Photo: VESO Vikan

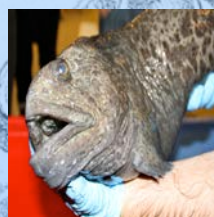


Photo: Aurora Branstad

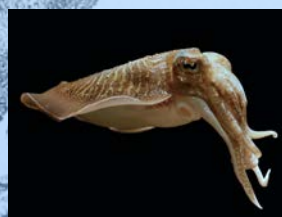


Photo: [http://it.wikipedia.org/wiki/Sepia\\_officinalis](http://it.wikipedia.org/wiki/Sepia_officinalis)

Two **international consensus meetings on the care and use of fish in research** were held by the Norwegian School of Veterinary Science and Norecopa. All presentations and consensus documents with recommendations are available at [www.norecopa.no/consensus-meetings](http://www.norecopa.no/consensus-meetings).

There is evidence for increased neural and behavioural complexity, growth rate and learning performance in animals given an enriched environment. Papers on environmental enrichment are beginning to emerge. There is a great need for more research in this area.



Squid: [http://en.wikipedia.org/wiki/File:Loligo\\_vulgaris.jpg](http://en.wikipedia.org/wiki/File:Loligo_vulgaris.jpg); Octopus: [http://en.wikipedia.org/wiki/Common\\_octopus](http://en.wikipedia.org/wiki/Common_octopus)



Searching for the few guidelines and other 3R resources on fish, cephalopods and decapods that *do* exist can be a daunting task. Norecopa, in collaboration with the US Animal Welfare Information Center (AWIC), has recently launched a database, **3R Guide** ([www.3R Guide.info](http://www.3R-Guide.info)) providing a global overview of guidelines, databases, regulations, email lists and journals. All entries are classified by Type (e.g. database), Category (e.g. fish) and 3R Relevance (e.g. Refinement). **3R Guide** is an essential starting point when searching for 3R resources for aquatic species.

**Guidelines** for the care and welfare of cephalopods are being jointly drawn up by CephRes (a non-profit association aimed to promote the advancement of biological research on cephalopods), The Boyd Group (a UK-based discussion forum on the use of animals in science) and FELASA (the Federation of European Laboratory Animal Associations).

The UK Home Office is drafting a **Code of Practice** for animal care that includes fish and cephalopods, which should be published by the end of 2014.

Charles River UK offers courses covering Home Office modules 1-4 for those using fish and cephalopods.

Methods are being developed to refine the use of crustaceans to monitor effects of environmental changes on marine animals, for example in connection with oil extraction and CO<sub>2</sub> storage. External sensors measure heart frequency in crabs and shell closure time in mollusks, after which the animals can be returned to their original environment:



Photos: Shaw Bamber, International Research Institute of Stavanger

## Conclusions

**A number of useful resources are emerging for improving the welfare and husbandry of fish, cephalopods and decapods – but there is still a pressing need for species-specific guidelines. Hopefully, the requirement in the new EU Directive (Article 49) for National Committees to share good practice and exchange information on the operation of animal welfare bodies will increase the flow of information and raise standards.**

Norecopa has set up a website with references and links to more information on the welfare and husbandry of fish, cephalopods and decapods:

[www.norecopa.no/aquatics](http://www.norecopa.no/aquatics)