What we do to kill an octopus (*Octopus vulgaris*)
- Anecdotal information on octopus suffering in fisheries and what can be done about understanding the processes and minimizing consequences*

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Abstract

Between 2007 and 2012, approximately 9 million individual *Octopus vulgaris* were captured annually in Portuguese fisheries.

Unlike most fishery resources, octopus are not easily killed by the action of the fishery. After being hoisted on-bord, they are generally fit, regain consciousness of their whereabouts, and try to return to sea.

A variety of methods was developed through the ages to incapacitate each animal. In Portugal, the most traditional methods employed have been: clubbing the head; penetrating the brain by a blade; reversing the mantle; and more recently holding in a suspended net.

Particularly in Asia, fishermen are not indifferent to the way octopus are handled after capture, some less stressful methods being preferred for product quality reasons. In Portugal, the single method that raises concerns about quality is slicing the brain, ironically one of the less stressful methods of euthanasia.

The possibility of changing attitudes in fisheries through appeals to ethical behaviour remains to be demonstrated. More likely, reference to the quality of a product can indirectly result in better handling. Through legislation or otherwise, it is the onus of science to deal with the 10^3 animals used in scientific environments, the 10^6 in aquacultures, but also the 10^n in fisheries.

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What we do to kill an octopus (*Octopus vulgaris*) -

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Cephalopods & Fisheries

Cephalopods have a large and complex nervous system, with a “central processing unit” that can be described as a brain and additional ganglia which appear to be able to process decentralized “decisions”. Octopus show signs of a high degree of awareness of themselves and their surroundings and are capable of adapting their behaviour both under normal and abnormal conditions, such as being in or out of the water.

Individuals are handled by humans for two main reasons:

As **experimental models**

Welfare is protected by Eu directive/2010/63/EU

For **human consumption**

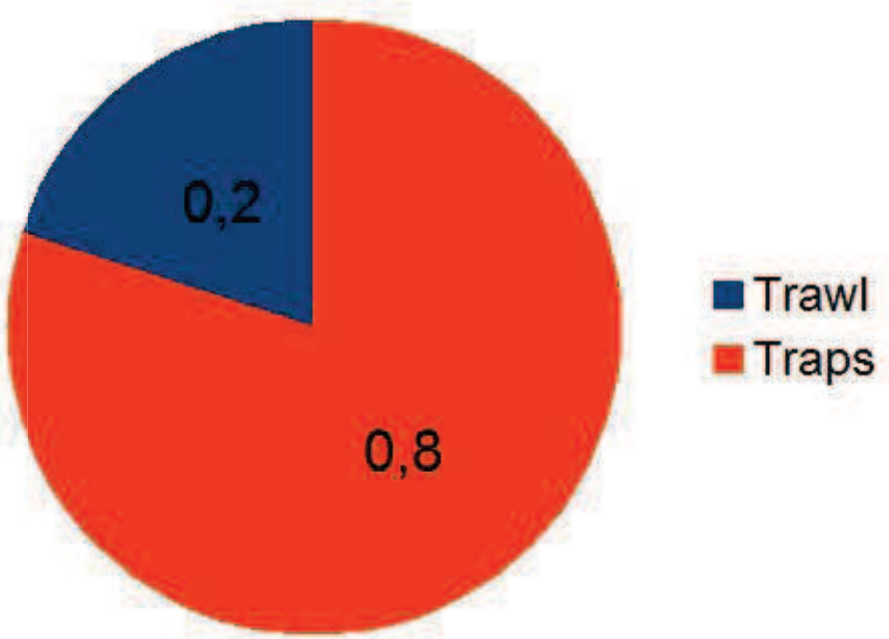
In **Aquaculture,** animal welfare is considered in the code of conduct for best practices in aquaculture

but in **Fisheries,** welfare is absent of the code of conduct for responsible Fisheries (FAO, 1995) and from the MSC certification scheme

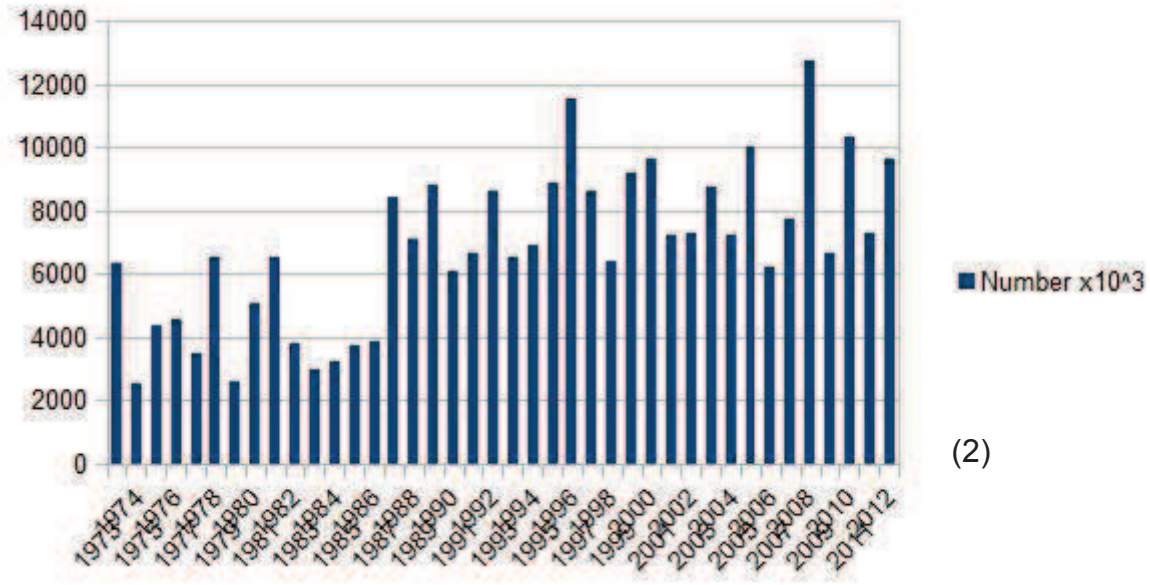
Octopus Fisheries Background in Portugal

Octopus are fished in Portugal in three main gear types:

- multi-species bottom-trawls
  - as target and by-catch species
  - un-modified gear of standard-sized mesh
- multi-species baited-traps
  - as target and by-catch species
  - in standard and purposefully modified gear
- directed shelter-traps
  - always as target species
  - various designs - always octopus-specific



Landing History



(2)

- Landings in numbers assume 1 octopus roughly equates 1Kg (on average)
  - In theory between 2007 and 2012 about 9x10^6 octopus killed annually
  - In practice average weight can be as low as 0.67Kg or roughly 50% more octopus killed

Trawling

- Most trawling for octopus in central Portugal (1-2)
  - muddy and sandy-bottoms in front of estuaries

- Commercial trawling duration varies roughly from 1-6 hours
  - but octopus sometimes escape net bags (3)

- Octopus *always* come on-deck alive
  - separated from rest of catch and killed individually

Trapping

- All octopus-directed traps are used throughout the Portuguese coast
  - Over all types of bottom
  - Throughout the shelf
    - concentrated over shallower waters from ½ mile of shore

- Baited-traps attract octopus in day-time feeding activity
  - Octopus go in to feed and often out after feeding (4)
  - Octopus resting inside the traps are hoisted at night in the south and during the day in the west
  - No mature females are caught

- Shelter-traps attract octopus to rest (inactivity)
  - Octopus are free to roam in and out of “traps”
  - Often used as laying dens by females
  - Not size-specific but tend to attract “best-size-matched” animals
  - Hoisted during the day - octopus kling strongly inside

“Pre-Decking”: stress

In general, from observation and incidental recordings of uncontrolled experiments, we assume that all octopus can survive the fishing methods employed by Portuguese fisheries and can “collect their thoughts” after a relatively short time of being engaged.

Stress from trawling (for < 30 minutes after being engaged)

- Being chased
- Being collected in proximity with potential predators
- Being compressed

Stress from trapping (for < 15 minutes after hoisting begins)

- Being hoisted

“Post-Decking”: stress and suffering

Octopus are individually manipulated when decked

Decking presumably brings stress to the extreme, and octopus are not helpless fish on-deck: they crawl about and actively search to return to water

- Show signs of a degree of conscious knowledge of their predicament. Therefore:
  - timing of death “post-decking” is significant
  - killing method is significant

- Time between decking and killing in Portuguese fisheries is not long
  - In trawling most octopus are extracted from the catch immediately after decking and incapacitated (before fish are boxed to take to sorting tables)
  - In trapping most octopus are dealt with less than 1 minute after arrival on deck
    - in bait-trapping extracted forcibly by hand pulling
    - but in shelter-trapping burnt with sodium hypochlorite bleach to promote extraction

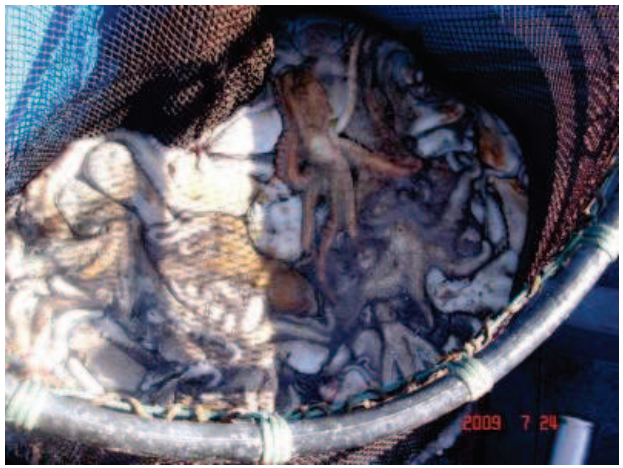
Then ...
what (a) way to die ...

Professionally preferred killing methods in Portugal:

1. Clubbing head (fallen into disuse)
2. Slicing brain
3. Reversing mantle
4. Holding *en masse* in suspended net bag (grown into common practice)

Extruding by bleach

Slicing brain



Holding in suspended net

Alternatives

- Stress needs to be minimized in octopus fisheries as in any other human handling of live animals:
  - Delays minimized
  - Euthanasia must be accomplished through swiftest methods available

- Commercial nature of activity in Portuguese fisheries dictates practice through minimizing delay in sequence of procedures and negative impacts on market acceptance
  - Time from engagement to decking already minimized
  - Time from decking to incapacitation already minimized
  - Time from incapacitation to death can be reduced (or maintained low) by selection of method of euthanasia
    - Brain slicing or Head clubbing preferable to Mantle reversal or Suspension in net

Euthanasia

- In Japan octopus are generally chilled to numbness purportedly to prevent the release of stress hormones prior to death and in that way improve the taste of flesh
  - This may not correspond to fact as there is evidence of long suffering induced by low temperature (5)

- In Portugal markets abhor octopus with “evidence of maltreatment” such as bleach-induced discoloration and blade injuries to the head
  - Bleach induced discoloration is a sign of maltreatment and should be avoided
  - Blade injury to the brain on the contrary is a swift method of euthanasia similar to brain spiking (5)

- In Portugal there is no tradition of selection of method of euthanasia for organoleptic considerations

Conclusions

- Ethical behaviour in animal handling in fisheries needs to be considered
  - several orders of magnitude higher numbers of animals processed in fisheries than either aquaculture or scientific experimentation

- Market and professional activity impose self-constraints
  - to optimize handling time and market value
  - prefer killing octopus *en masse* in suspended nets
    - ethically worst choice of method
    - abandonment of better traditional methods of euthanasia

- Public concerned about well-being
  - partially misinformed

- Science can improve dissemination of experimental results to
  - Inform about levels of stress hormones and suggest improvement to taste through reduced suffering
  - Inform about indications of what may be maltreatment or otherwise

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