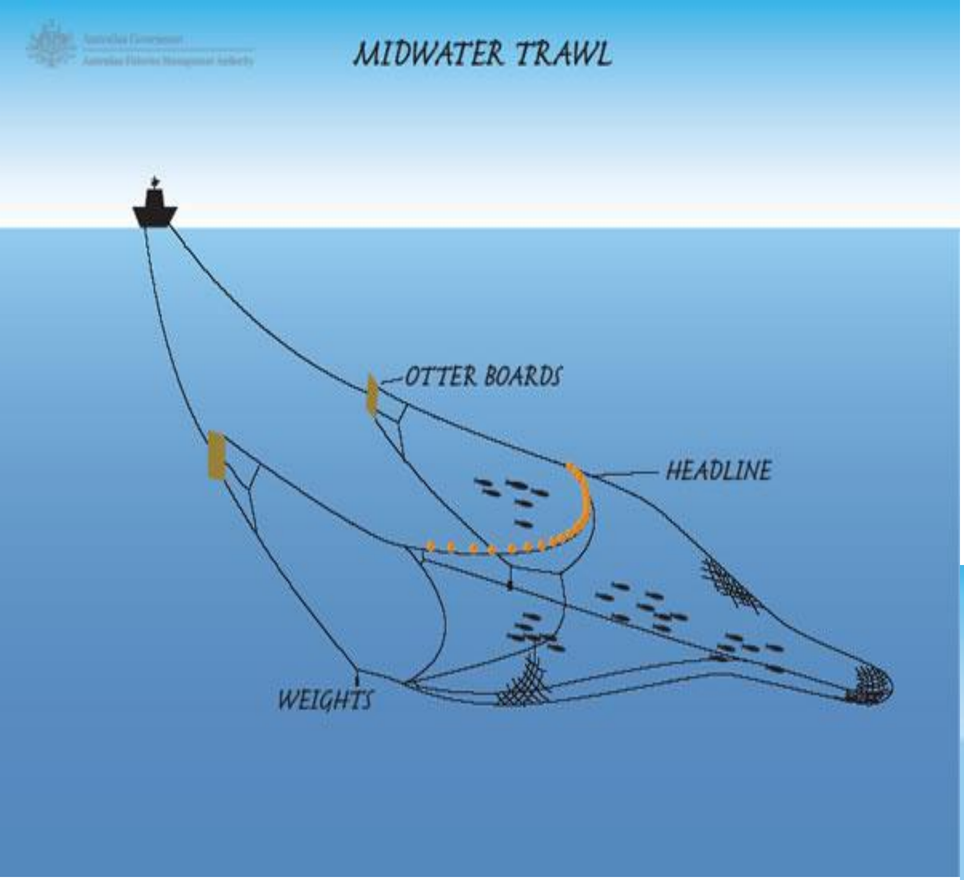
Fish Welfare

Marine fisheries

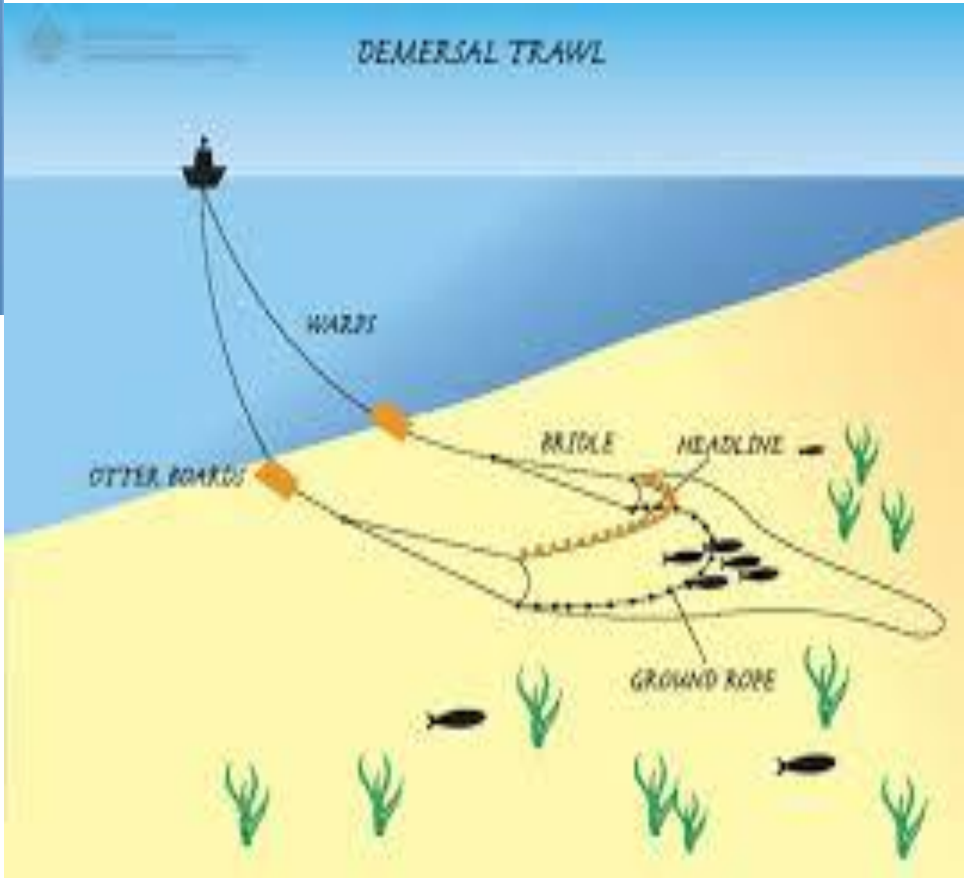
- ***physical injuries & pain***
  - ***skin and scale damage from nets***
  - ***hook injuries***
  - ***gill irritation & injuries***
  - ***bruising from fish pumps***
- ***osmotic stress***
- ***over-exertion***
- ***compression in nets***
- ***live-baiting***

Fish farming

- ***genetic selection &***
  - ***precocity*** ***(rough handling during grading)***
  - ***physical deformities*** ***(and growth rate; triploidy; transgenics)***
  - ***monosex culture*** ***(YY chromosome in tilapia)***
- ***fish transport***
- ***poor water quality***
- ***overcrowding***
- ***predation***
- ***increased frequency of disease***
- ***inability to migrate in mature stock***
- ***cage noise***
- ***inability to swim to deeper water during storms***
- ***abrasion against pond and cage walls***
- ***handling stress***
- ***cannibalism***



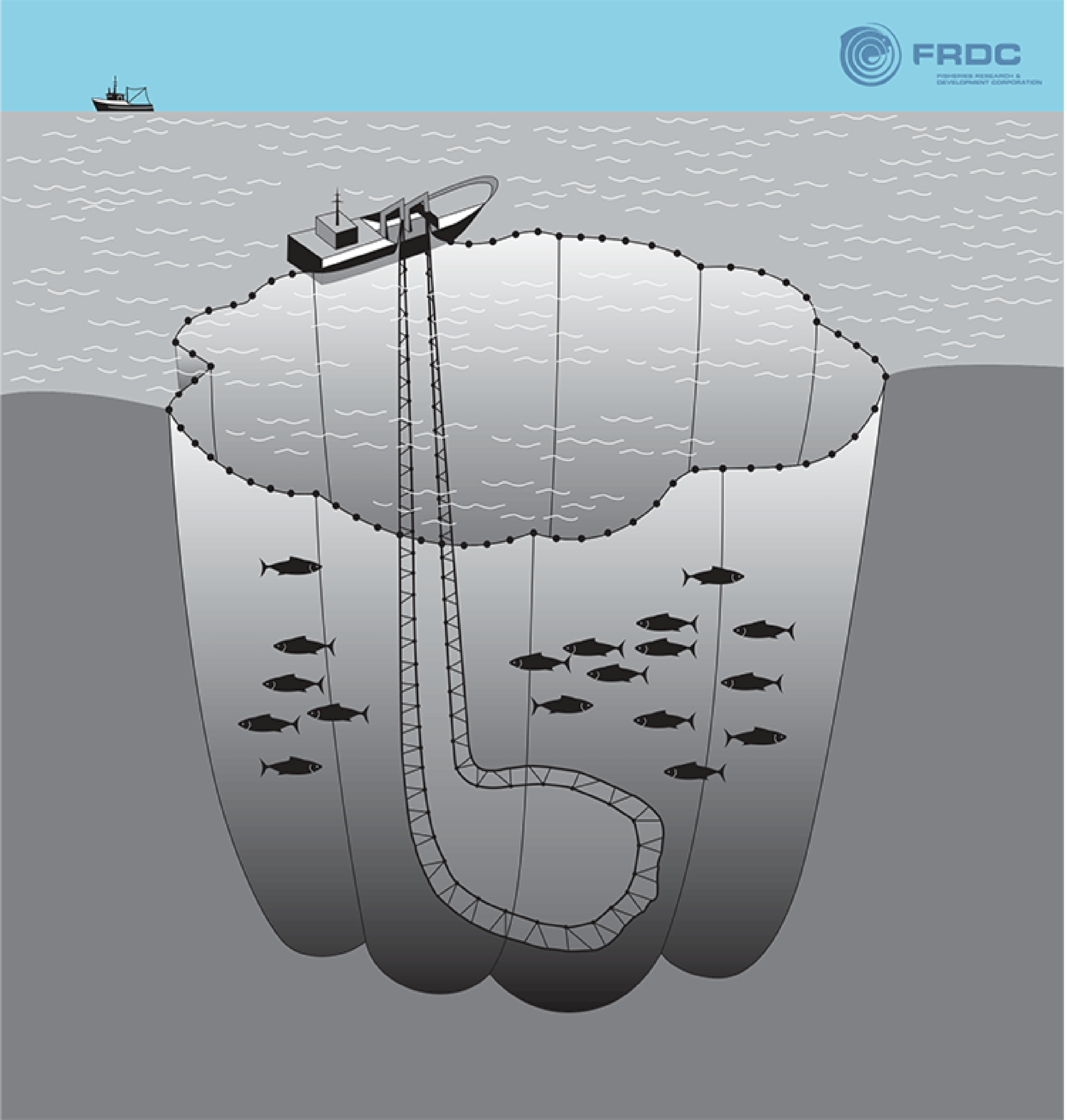
Trawling
(pesca com rede de arrasto)



Exhaustion
Skin & scale damage
Compression
Non-selective

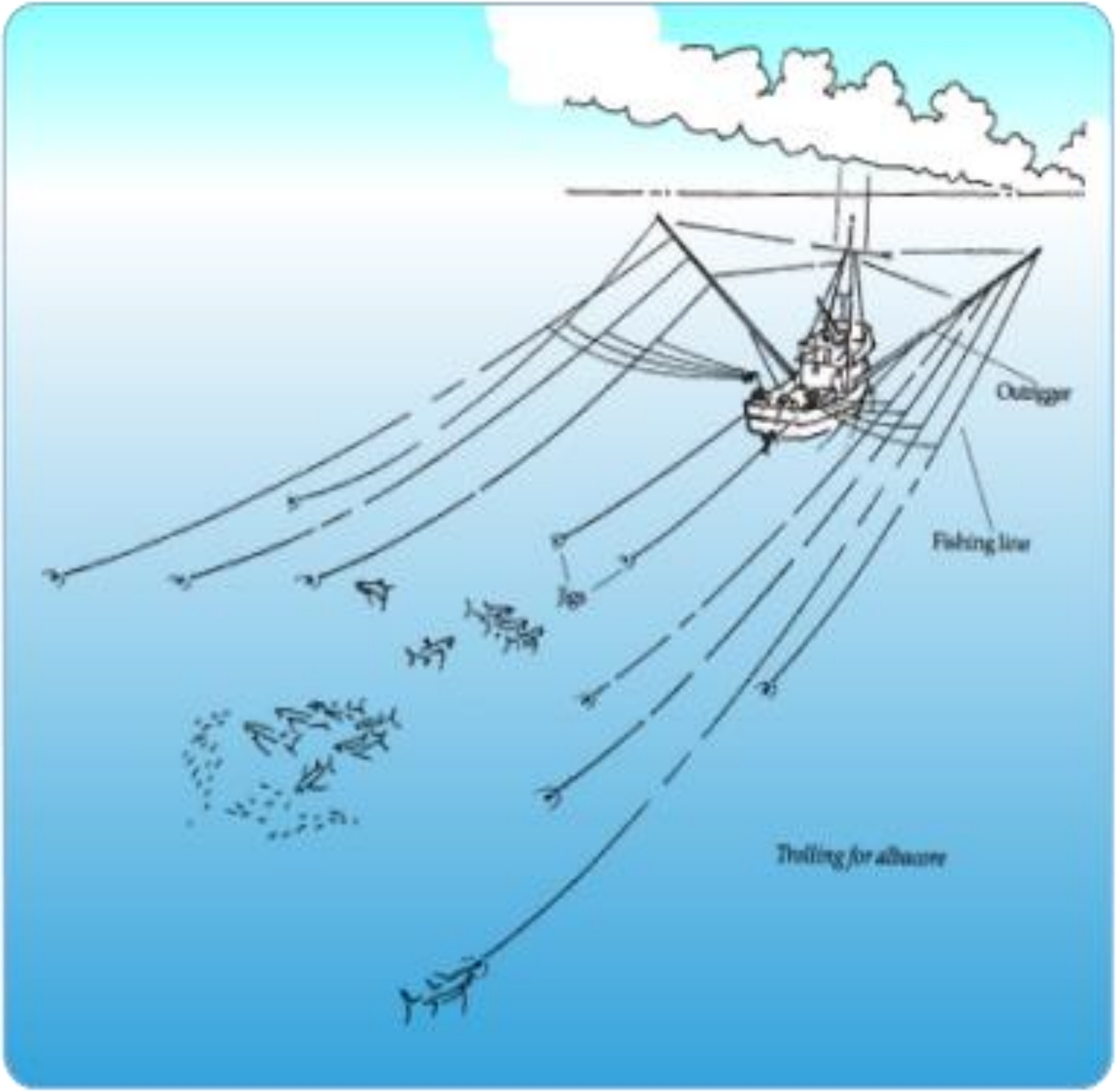
Compression

- **impaired respiration from compression of the operculum** (asphyxiation)
- **prolapse at the cloaca**
- **prolapse at the mouth**
- **burst bellies**
- **reduced venous return** (syncope)



***Purse seine netting** (pesca com rede de cerco)*

Less exhaustion
Less damage than trawling
Compression
Injuries from fish pump



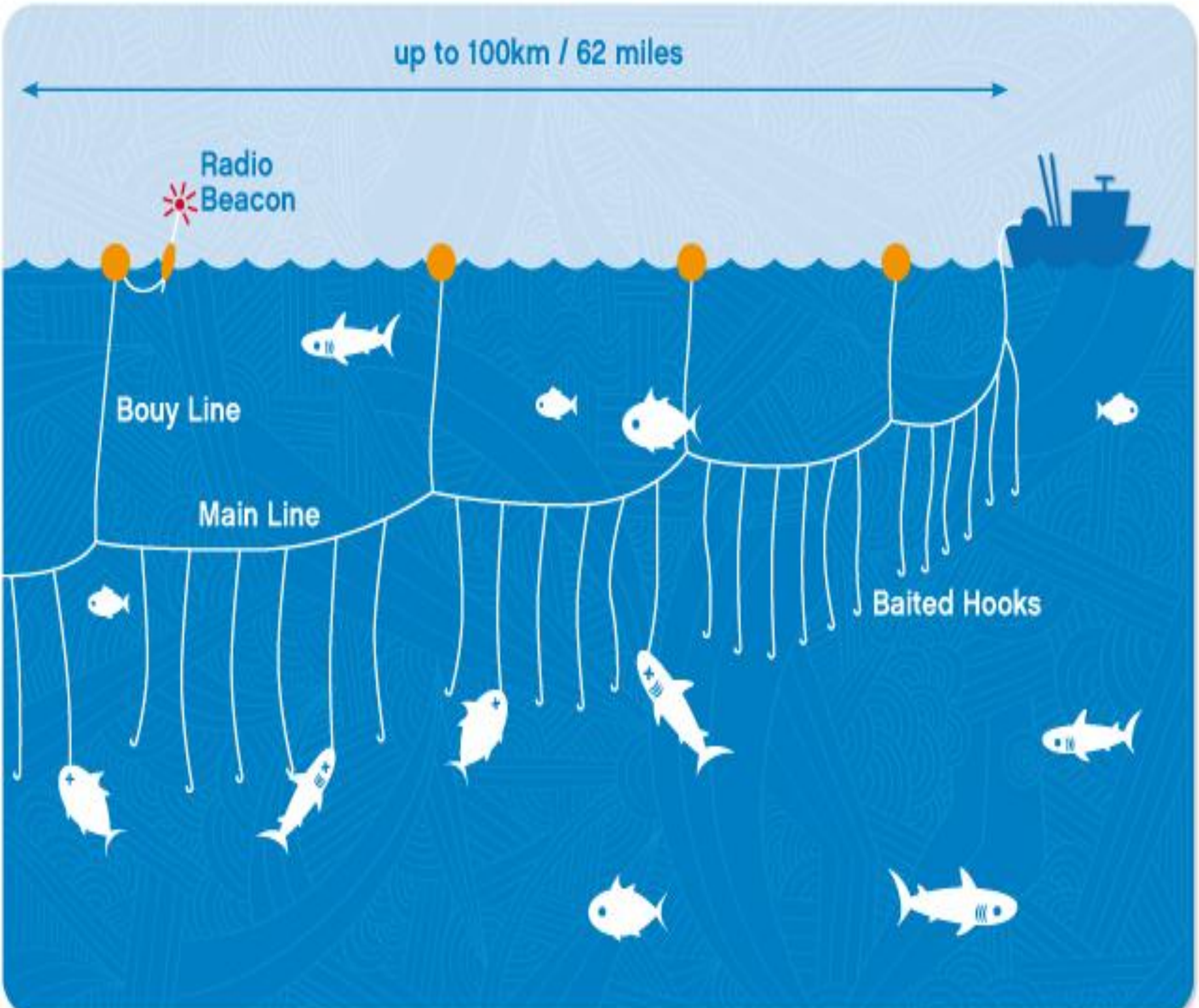
Trolling
(carretilha)

Hooking in the wrong parts of the fish

Tangling in the lines

Trolling in salmon

Parts hooked	*% of fish*	*% dying immediately*	*% dying in 4 – 6 days*
Corner of mouth	**23**	**1**	**6**
Eye	**23**	**3**	**18**
Lower jaw	**15**	**2**	**10**
Cheek	**9**	**4**	**12**
Gills	**4**	**30**	**55**

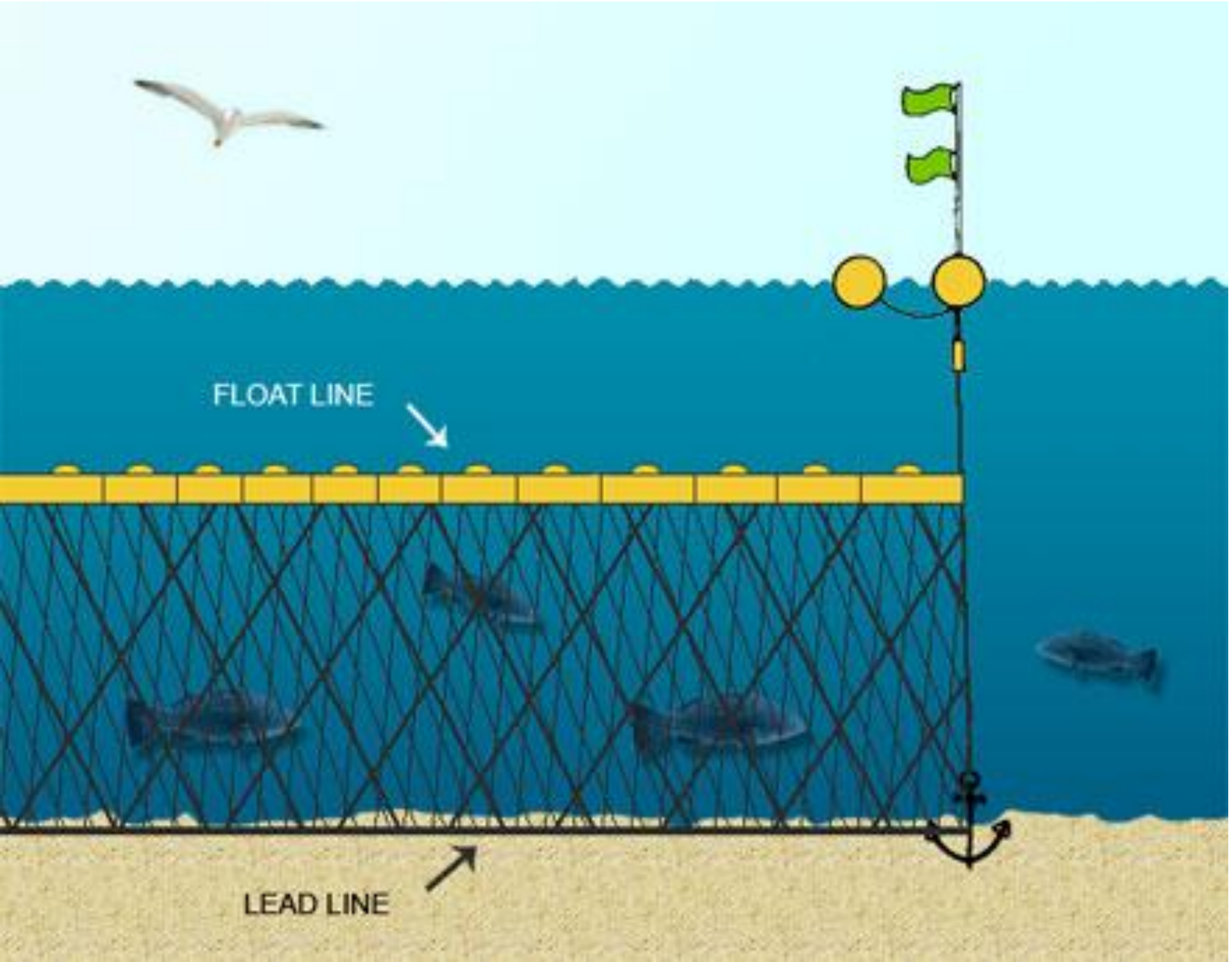


Longline fishing
(pesca com palangre)

Fish can be held on the hooks for a long time

Catching birds

Gillnet Fishing (pesca com rede de emalhar)



Skin and scale damage

Gill irritation and injury

Injury when net is brought in

Gaffing in large fish

Pole & line Fishing
(pesca com linha e vara)

Probably the most humane fishing method, but becoming less common

Angling *(pesca à vara)*

Rapid darting movements – coughing – spitting – head shaking – fleeing – belching gas from the swim bladder – sinking – lying on the bed of the river.

If there is <u>no</u> tension in the line, the fish only shows coughing, spitting and head shaking, and may soon start feeding.

Taken together, what does this suggest ?

Live-baiting (isca viva)

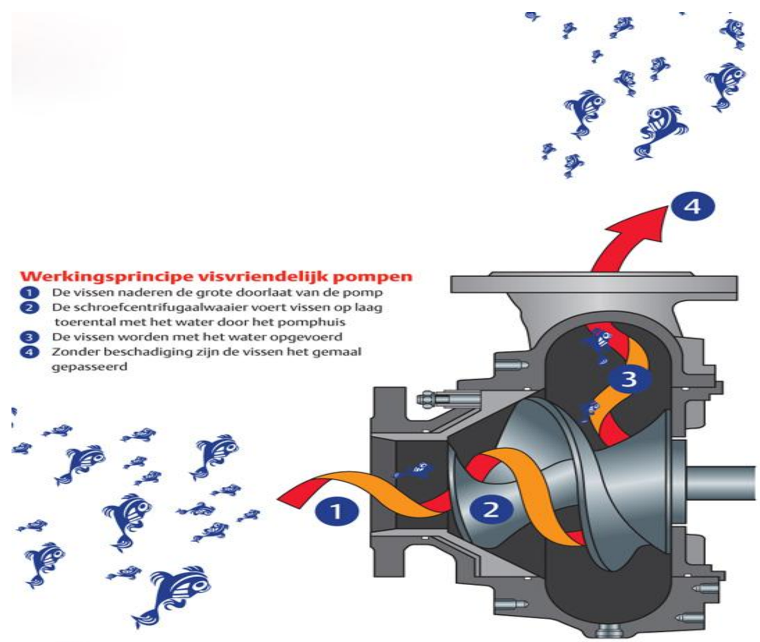
- **throwing live fish into the water to draw the target fish towards the boat**

- **attaching live fish to hooks**

The Codes of Practice on live-baiting are more concerned with disease transfer and reducing the impact on ecology of a river or lake, than with welfare.

Fish pumps

- **can cause skin abrasions, fin damage and bruising**
- **modern designs cause less injury**
- **using the right pump speed for the fish species and size is critical**



Bruising

A NIR spectroscopic method is being developed for assessing bruising in fish. Presently it can detect bruises below the skin to a tissue depth of 1 cm.

Exhaustion

- **Exercise stress causes an increase in plasma**
  - **catecholamines**
  - **cortisol**
  - **p_aCO_2**
  - **K^+**
  - **Na^+**
  - **Creatine phosphokinase**
  - **(lactate)**
- **In fish H^+ is buffered by histidine and anserine in muscle**
- **Severe exercise stress diverts energy away from osmoregulation, causing osmotic stress. Also, adrenaline causes gut contraction and this reduces water absorption. Together this can result in a slow death from osmotic stress.**

Fish farming

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  - *- precocity (rough handling during grading)*
  - *- physical deformities (and growth rate; triploidy; transgenics)*
  - *- monosex culture (YY chromosome in tilapia)*
- *fish transport*
- *poor water quality*
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Precocity in salmon (sexual maturity after the first winter at sea)

- some fast growing strains of salmon reach sexual maturity early. When salmon reach puberty muscle lipid and pigments are transferred to the gonads and skin, and the meat becomes watery and has irregular colour. In addition they develop secondary sexual characteristics which fish buyers avoid.

- this is managed by culling in the autumn those fish which appear to be precocious. This is done manually and is very stressful and damaging for the fish.

Physical deformities

- **About 25% of salmon are downgraded because of physical deformities:- eye cataracts, curved jaw, short opercula, spine deformities, gill deformities. Some of these conditions are linked to fast growth.**
- **Triploid strains are now being bred to produce sterile offspring. This reduces precocity. However, triploids can have the deformities listed above plus reduced gill surface area** (and hence greater susceptibility to hypoxia when stressed)**.**

Monosex culture

- **Tilapia often over-breed, and when there are too many offspring they are too small in size for the fishmeat market.**
- **Growing monosex fish prevents this problem. A YY-chromosome male line has been developed. When mated with normal XX-chromosome females, male only XY-chromosome offspring are produced.**
- **Are there any behaviour problems in YY-chromosome line ?**

Fish transport

Tuna cage towing

Salmon well boat

Water quality

This is probably the most important feature in farmed fish welfare. It is influenced by

- **overstocking**
- **overfeeding**
- **floating plant cover**
- **shade**
- **decaying vegetation**

Key components determining water quality are

- O_2 NH_3 NO_2 PO_4 **concentrations**
- **pH**
- **suspended solids**

Stocking density

High stocking densities can lead to

- **poor water quality**
- **disease risks** (pathogen loading, stress and immune competence, risk of skin damage and infections)
- **cannibalism**
- **competition for feed and uneven growth**
- **social stress**

The hazards depend in part on water flow rate, and some people prefer to set standards in terms of water quality rather than spatial needs.

How would you recognise overstocking in a fish pond ?

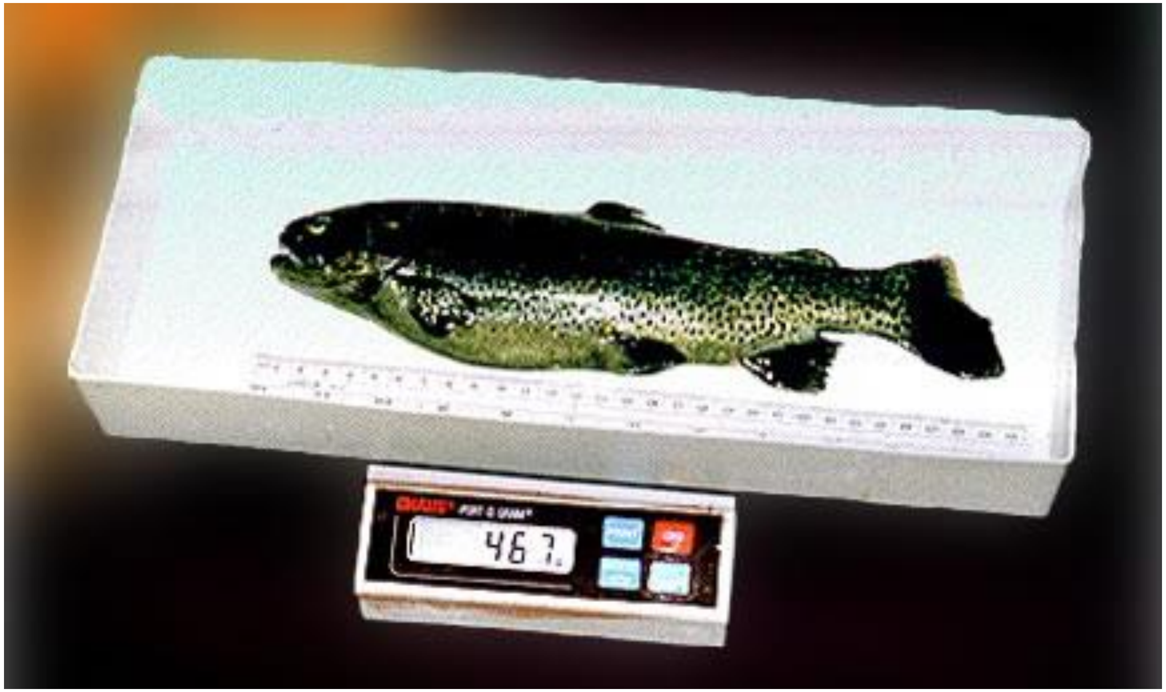
…. from

- measurements of water quality
- fish coming to the surface to gulp air
- schooling behaviour
- fin erosion
- divergence in body size

Predation

Most of the control methods focus on exclusion or deterrents

Fin damage



Concrete ponds in trout farms

Fighting in salmon

Fin rot diseases

Damage from fish pumps

Abrasive nets

Net mesh size is too large

Fin damage reduces the market value of the fish

Cage noise

Fish are sensitive to noise transmitted through the water.

The joints in the frame of the cage articulate, and generate noise, especially during storms

Eyestalk ablation

The eyestalks enable vision and they also release hormones which inhibit molting. Removing both eyestalks results in prompt molting and the shrimp or prawn then grows faster. It would have a shorter lifespan if it was not harvested for slaughter.

Stunning & slaughter

Emersion
Water containing CO_2
Electrical stunning
Concussion

Most fish are not bled at slaughter. But, some shark species need to be bled to avoid off-flavours from urea and ammonia.