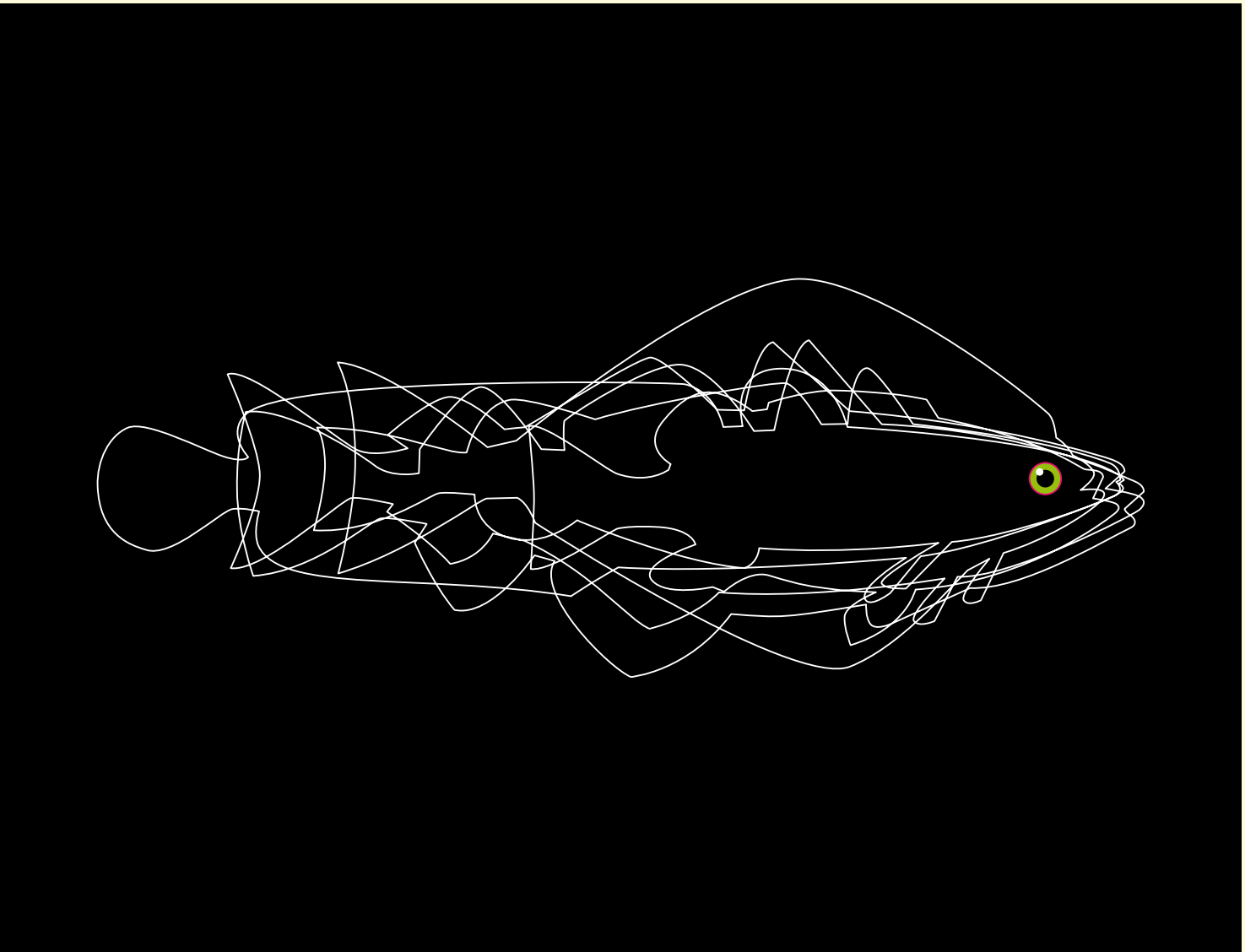
Ethical treatment of fish

Report of the Federal Ethics Committee on Non-Human Biotechnology (ECNH)



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1 Introduction

The demand for edible fish in Switzerland is constantly rising. The majority of the fish consumed in Switzerland, both from wild fisheries and from fish farms, is imported. As in other countries, there are also plans in Switzerland to encourage the breeding and raising of salt-water and freshwater fish in aquaculture for the domestic market.

Parallel to these developments, over the past three decades and in particular in the last ten years, some researchers have considered closely the question of whether fish are able to feel pain. There results have triggered a controversy regarding the methods of raising and killing fish. Reports of how fish are slaughtered in intensive fish farms in particular have raised the awareness of the general public regarding the way in which fish are treated.

Taking an ethical perspective, the question arises as to whether fish ought to be considered morally, regardless of their use to humans. Article 120 of the Federal Constitution states that the dignity of living beings shall be taken account of, and thus the question arises as to the moral status of these living beings. A discussion with regard to other vertebrates has already been held in the public domain, and the answers have found expression in various pieces of legislation, including the Animal Welfare Act. As yet we have neglected to hold this discussion to the same extent with regard to our treatment of fish. In the light of the problems of overfishing and the consequent intensification in fish farming, the public debate on the treatment of fish is dominated by questions regarding the low-resource, environmentally and socially sustainable use of fish and food production which is not damaging to human health or the environment. Little attention has been paid to the issue of the moral status of fish and whether we have ethical responsibilities towards *individual fish*.

In view of its constitutional mandate to reflect on the dignity of living beings from an ethical perspective and to make recommendations for concrete action, the Federal Ethics Commission for Non-Human Biotechnology (ECNH) feels required to address this issue. Following a brief description of the current use of fish (Section 2), it focuses on two main points. Firstly, it looks at the main arguments on the ability of fish to experience pain raised by the latest scientific research. The results of this debate may be relevant for the subsequent discussion on the ethically acceptable treatment of fish, subject to the fundamental ethical position taken (Section 3). Secondly, the Commission addresses the following questions: ought we to consider fish from a moral viewpoint, regardless of whether they are of use to us or not? Which criteria should be applied and do fish meet these criteria? (Section 4). On the basis of its answers to these questions, the ECNH makes practical proposals for treating fish in an ethically acceptable manner (Section 5) and to formulate recommendations (Section 6). Where there is no legal basis requiring ethical considerations, these recommendations are aimed at legislators. Where the legal basis already exists but legislation is applied inadequately from an ethical point of view, the recommendations are aimed at law enforcement agents.

2 Context of the ethical debate

2.1 Developments in the use of fish

The majority of wild fish consumed by humans is caught by the high-technology fishing industry. The instruments available to this industry place enormous pressure on fish stocks and in some cases are leading to a drastic reduction in fish populations. In some areas stocks are being fished to such an extent that the populations can no longer recover sufficiently. Current stocks cannot be sustained under these circumstances. These developments are often referred to as "overfishing of the oceans". A collapse in fish stocks has an impact on biodiversity and an economic impact on all those whose livelihoods are wholly or partially dependent on fishing. The extent of this impact varies according to the region involved. For people in subsistence economies making a living from fishing, the collapse in fish stocks can lead to adverse social changes and in some circumstances to nutritional needs going unmet, fish being the main source of protein for a fifth of the world's population.[1]

Edible fish come not only from wild fisheries; for many years they have also been raised in fish farms. Classical fish farming usually involves artificial waters such as ponds (e.g. carp, zander, pike), cordoned-off natural waters (trout, grayling, char) or floating cages in open waters such as rivers (catfish) or coastal bays (salmon). Due to the rising demand for edible fish and decreasing yields from wild fisheries, commercial fish farming increased twelve-fold between 1980 and 2010.[2] In recent decades closed-system aquaculture has been developed in order to be better able to control and increase yields, cut down on the vast amounts of water and energy used and reduce environmental pollution in the form of waste water. Fish farming is therefore becoming less dependent on the availability of natural waters. In Switzerland, too, it is now possible to produce both freshwater and saltwater fish in modern facilities.

Besides questions concerning the humane and species-appropriate treatment of fish farmed in intensive aquaculture, the environmental impact

1 See etc Group, Communiqué No. 111, September 2013, *Putting the Cartel before the Horse…and Farm, Seeds, Soil, Peasants, etc. – Who Will Control Agricultural Inputs?*, p. 26, www.etcgroup.org/putting_the_cartel_before_the_horse_2013.

2 See etc Group, Communiqué No. 111, September 2013, p. 26.

of the latter also needs to be considered. For example, predatory fish (such as trout and salmon) farmed in aquaculture feed on other fish, and the feed they receive is usually produced from wild fish and by-catch.[3] The spread in aquaculture thus increases the pressure on wild fish, and this can only be reduced by replacing feed for predatory fish with fish from other sources or by farming more herbivorous fish (e. g. catfish).

Because fish are farmed so intensively, it is often necessary to employ antibiotics. The use of antibiotics in animal production can lead to negative effects on the health of both humans and animals, because (among other things) the risk of developing a resistance to antibiotics is increasing via the consumed fish or could increase via the waste water discharged into the environment. Furthermore, problems associated with the vast volumes of water used in aquaculture and the pollution caused by the waste water should not be ignored.

In order to optimise fish for intensive farming and production and to minimise undesired side effects, attempts are being made to alter fish by technical means. One of these methods is genetic engineering.[4] Other technologies are also being developed and increasingly employed.[5] The current debate surrounding the use of genetic technology and other methods to alter living creatures in some way focuses mainly on vertebrates other than fish. When the use of these technologies on fish is discussed from an ethical perspective, it is mainly in relation to environmental concerns rather than the effects on the fish themselves. However, it is clearly also necessary to debate issues concerning the use of new technologies on animals also in relation fish.

Besides industrial fishing methods and industrial fish production, other ways of exploiting fish are increasingly coming to the public's attention, for example the use of fish in experiments, angling, keeping fish in zoos and wildlife parks, as a hobby in private homes, the use of fish in medicinal treatments[6] or even in spa treatments.[7]

2.2 Recent scientific studies on the ability of fish to feel pain

Many people assume that fish can feel pain. However, many others hold the view that fish are not sentient beings. Within scientific circles there are also varying opinions on this matter.

Those who do not believe that fish feel pain base this view on the fact that fish have different brain structures from mammals. Some scientists are of the opinion that we do not even need to ask whether fish experience pain as they lack the nerve endings which send pain signals to the brain. However, over the past decade there has been more widespread research into whether fish have the necessary and sufficient prerequisites to feel pain, despite this difference in their brain structure. The results of studies into the cognitive ability of fish carried out over the past twenty years also

3 By-catch is fish and marine animals which are caught as the result of industrial fishing techniques, but are not the intended catch. Some by-catch is turned into feed, but for the most part it is thrown as waste back into the sea, where it does not usually survive.

4 An example of a genetic modification to fish is an Atlantic salmon in whose genome the US company "Aqua Bounty" inserted an extra growth hormone gene from a Pacific Chinook salmon. Along with a promoter gene from an *ocean pout* (an eel-like creature found in America), this makes the salmon grow not only during the spring and summer months but throughout the whole year. In this way it reaches its market size after 16 to 18 months instead of after three years, as it would naturally.

5 For example, sexual development can be controlled in fish by adding hormones during an early stage of development. In fish farming, male tilapia are preferred because they gain weight at a faster rate.

6 In medicine, tiny nibble fish (doctor fish, *Garra rufa*) are used to treat skin diseases such as neurodermatitis. The fish nibble away the patient's diseased skin and so help alleviate the symptoms of the disease.

7 As the fish nibble away the dead upper layer of skin, they are also used in spa treatments (in particular in pedicures). In Switzerland, however, no licences have as yet been granted for this use of fish, as it is not compatible with animal welfare laws.

challenge the idea of fish as non-sentient beings capable only of reflex responses (see Section 3).

The issue of whether fish feel pain is legally relevant; the Animal Welfare Act requires that no-one may inflict pain, suffering or harm on an animal, induce anxiety in an animal or disregard its dignity in any other way without justification.[8]

In the ethical debate the issue of sentience – depending on the fundamental ethical position held – also plays a central role when it comes to deciding which ways of treating living beings are ethically acceptable (see in particular Section 4.2).

2.3 The wide biological range of fish and their legal status

There is an immense biological range of creatures known as fish. Of the approximately 64000 vertebrates known today, about half are fish. However, fish do not form a single unit in zoological terms. The term "fish" simply groups together those animals which are similar in morphology.

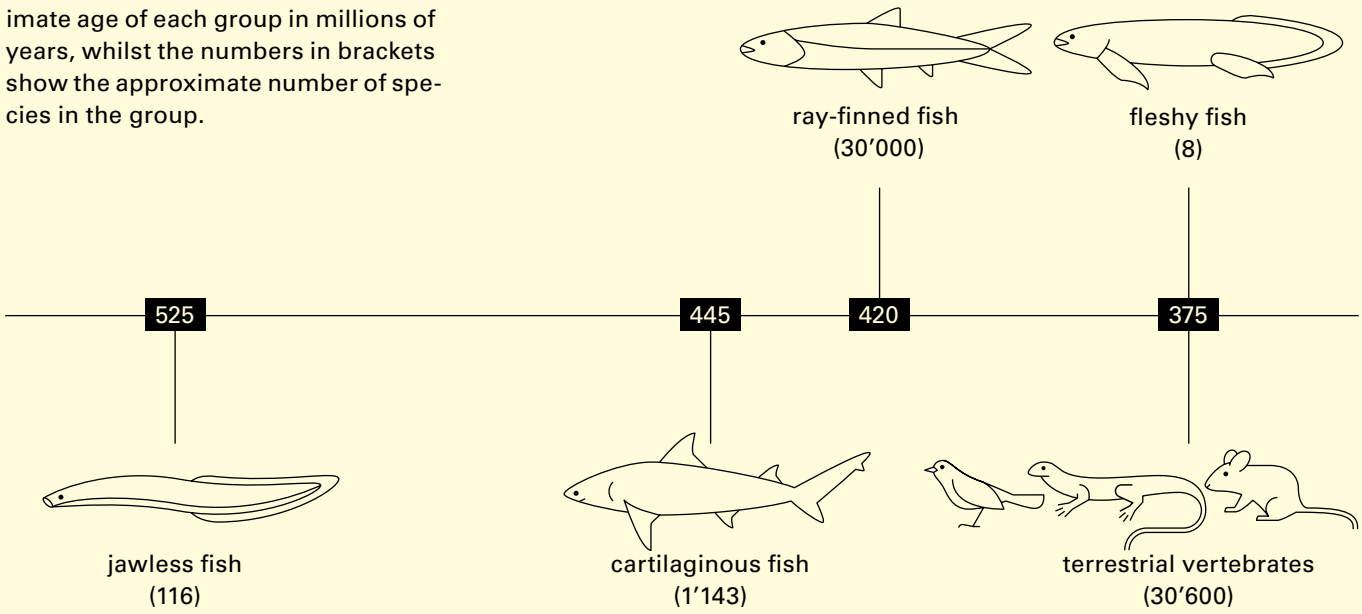
The modern use of fish is in accordance with the general conditions and trends in industrial food production, as are also common in other forms of livestock production. However, unlike in the case of fish, scientific debate on the production of higher vertebrates has been held publically for some time. This discrepancy is also reflected in the degree of differentiation in their legal status. As vertebrates, fish come within the scope of the Animal Welfare Act, and so currently essentially enjoy the same legal status as other vertebrates. However, in view of the wide biological variation in fish species, if we compare the legal regulations for the treatment of fish with that of other livestock, domestic animals or laboratory animals, we find that there is far less species-specific differentiation in the legal treatment of fish.

There is a range of socio-cultural explanations for the current use of fish and the different degree of differentiation in legal regulations on the treatment of fish. However, these cannot be used as a justification for treating fish in a particular way. Perceptions influenced by social and cultural circumstances and moral beliefs based thereon can change, either because they are challenged by new experiences or new empirical knowledge, or because altered perceptions give rise to a call for more in-depth investigation and new research. In morally pluralistic societies, there is an even greater need for rational reflection on moral traditions. For where a conflict arises between contradictory moral beliefs and the associated diverging behavioural codes, this often leads to a (re-)examination of the ethical justification of those moral beliefs, both in the public and academic debate. Against this background, recent scientific research into the ability of fish to feel pain and their cognitive ability can be seen as a reaction to a growing moral unease about the methods used to catch and kill fish.

8 Art. 4 of the Animal Welfare Act (SR 455, Animal Protection Act of 16 December 2005).

Evolutionary tree of vertebrates

All vertebrates with the exception of terrestrial vertebrates are known as fish. These creatures display different degrees of biological similarities to each other and to terrestrial vertebrates. The figures on the left-hand side of the diagram show the approximate age of each group in millions of years, whilst the numbers in brackets show the approximate number of species in the group.



3 Ability of fish to feel pain and their cognitive ability

3.1 Object of the scientific controversy

Insofar as research was carried out at all into the ability of fish to feel pain, until recently the opinion predominated in scientific circles that fish are born with set behavioural patterns determined by reflexes and instinct. Even though they are considered relatively complex creatures, according to this view they have neither the capacity to perceive something as negative, i.e. unpleasant or harmful, nor do they have cognitive ability.

Some still hold this view, but it is increasingly being called into question. Based on empirical studies over the past two decades, some researchers have come to the conclusion that fish do indeed feel pain and have cognitive ability. Cognitive ability is ethically relevant to the extent that it is able to influence the ability to experience pain, fear, stress and other negative sensations. Furthermore, some scientists are of the opinion that cognitive ability has ethical significance, regardless of whether it leads to the experiencing of negative feelings. Pain is a multi-faceted, complex phenomenon into which considerable research still needs to be done. Nor is the evolutionary emergence of the ability to feel pain yet fully understood.

In order to gain an overview of the state of scientific research and the arguments introduced into the debate, the ECNH commissioned zoologist Helmut Segner to conduct a literature review on the biological perspective of nociception and the ability to feel pain in fish.[9] However, the topic raises not only scientific but also philosophical questions. The ECNH therefore also commissioned philosopher Markus Wild to provide a summary of the philosophical aspects of the debate on cognition, consciousness and pain in fish.[10]

The following presentation of the arguments marking this controversy refers in large part to these two studies. The ECNH restricts its discussion below to those aspects of pain and the ability to feel pain which it considers to be relevant to the debate.[11]

9 Segner, Fish. Nociception and Pain – A biological perspective. Published by the ECNH, 2012.

10 Markus Wild, Fische. Kognition, Kognition, Bewusstsein und Schmerz – Eine philosophische Perspektive. Published by the ECNH, 2012. Markus Wild has been a member of the ECNH since 2012.

11 For a more in-depth discussion on different types of pain, see literature references under Segner (2012) and Wild (2012).

Until recently, scientific studies about the ability of fish to feel pain have been limited to a type of pain associated in other vertebrates with acute injury to the body surface. Such pain is usually referred to as "simple" pain – as opposed, for example, to chronic pain. Simple pain is accompanied by an unpleasant and localised sensation, indicating that the animal has suffered or is suffering tissue damage. This leads to changes in the affected creature's physiology and behaviour. Its purpose is to cause the creature to attempt to escape this condition, i.e. to remove the cause of tissue damage or to prevent further damage, and to encourage regeneration. The avoidance response to a stimulus – which can be shown to cause pain in other organisms – is not proof of an ability to feel pain in fish, as it may simply be an "unconscious" reflex reaction.

More recent studies that, inter alia, have set in motion the scientific controversy over the ability of fish to feel pain are also limited to a small selection of teleost (bony) fish: salmon, trout-like fish, perch, zebra fish and goldfish. This is not a random selection. As edible fish, stocking fish[12] or those used in animal testing, these fish are of economic or scientific interest. Since the selection reflects only a small part of the vast spectrum of biological varieties of fish, we need to ask whether it is possible, on the basis of the study results, to develop arguments which can also be applied to other teleost fish. Even though no studies have been done into the ability to feel pain and the cognitive ability of cartilaginous and jawless fish, the results on teleost fish prompt the question as to whether cartilaginous and jawless fish might have inherited the same characteristics and abilities from a common ancestor or could have developed them via independent evolutionary paths.

12 Stocking fish are young fish bred and raised for consumption by humans. They are released into modern aquacultures and fish ponds and into natural waters which are fished.

3.2 Biological indicators for the ability to feel pain

In order to assess whether living beings meet the requirement of being able to feel (simple) pain, seven biological indicators are normally tested:[13]

1 Presence of nociceptors.

2 Connections to the central nervous system. These are neural pathways that connect nociceptors to the brain.

3 Processing in the upper brain areas or structures of the electrical signals from nociceptors.

4 Presence of opioid receptors and endogenous opioids in the brain.

5 The creature reacts to analgesics.

6 The creature can learn avoidance behaviour in order to evade noxious stimuli.

7 The creature can alter its normal behavioural routines.

The varying assessments in the current scientific discussion as to whether fish can feel pain stem on the one hand from the different weighting given to these indicators for the ability to feel pain; on the other hand, opinions diverge as to whether these indicators are present in fish. However, it is generally accepted that, in order for a living being to experience pain, certain physiological and anatomical conditions must be met.

3.3 The principal arguments

Nociceptors

Nociceptors, which convert potentially tissue-damaging thermal, chemical or mechanical stimuli into electrochemical signals, are a biological necessity but not sufficient to cause a living being to feel pain. Nociceptors transmit the pain signal to the spinal cord, where it is filtered and transmitted to the brain. Studies on rainbow trout have shown that the stimulation of certain nociceptors is forwarded via electrochemical impulses to the central nervous system of the fish. From this it can be concluded that teleost fish have functional nociceptors.

13 see Bateson (1991); Segner (2012, p. 78).

noxious stimuli
Thermal, chemical or mechanical triggers for electrical signals which indicate to the brain that harm has been caused to the organism.

nociception
Nerve cell activity which is triggered by noxious stimuli and can lead to pain.

nociceptors
Free nerve endings (receptors) which transform thermal, chemical or mechanical stimuli from tissue damage or injury into electrical signals.

endogenous opioids
Substances produced by the body which have an analgesic (pain-relieving) effect similar to morphine.

opioid receptors
Receptors responding to opioids and transmitting their effect.

prefrontal neocortex
Part of the frontal lobe of the cerebral cortex.

homologue
In biology, homology is the fundamental similarity of organs, organ systems, body structures, physiological processes or behaviours in two groups of living beings because of their common evolutionary origin without necessarily fulfilling the same function.

analogue
In biology, analogy indicates the similarity in function and/or structure of organs, proteins, genes or behaviours in different groups of organisms whose common ancestors did not display this characteristic. Similar features observed in different creatures can be attributed to their function, without the creatures necessarily sharing a close biological relationship.

In humans and other mammals, pain signals are transmitted to the brain via different types of neural fibre. Fast-conducting fibres lead to short-lived, slight pain. Slow-conducting fibres lead to intense, sustained pain. Unlike in mammals and birds, slow-conducting nerve fibres are rarely found in teleost fish.[14] Some scientists consider the presence of these fibres to be particularly relevant to the ability to feel pain. The absence of this type of fibre in most or all species of teleost fish is therefore used as an argument against the hypothesis that fish can feel pain.

A counter-argument in this scientific debate emphasizes that the significance of slow-conducting fibres for fish to be able to feel pain remains unclear. From the absence of slow-conducting fibres it cannot automatically be inferred that fish in general do not feel pain; they possess many fast-conducting fibres, which are significant for an ability to feel "simple pain". Furthermore, it is conceivable from an evolutionary perspective that slow-conducting fibres may be less significant for the aquatic life of fish than for terrestrial vertebrates.[15]

Brain structure

The main argument against an ability to feel pain in fish is that they lack the necessary brain structure, in particular the neocortex, to consciously experience pain. This therefore suggests that fish respond to noxious stimuli in a purely reflex manner.

Others acknowledge that it is difficult to conclude that fish are able to feel pain on the basis of structural and functional analogies with mammals or evolutionarily determined similarities to mammalian characteristics. However, there are good reasons to doubt that the absence of a neocortex is a sufficient argument for assuming that fish do not feel pain. Even though the neocortex plays a key role in humans' ability to feel pain, this ability results from the interaction of the neocortex with evolutionarily ancient brain areas such as the thalamus. It is therefore unclear to what extent the neocortex is a general requirement for living beings to feel pain. For one thing, phylogenetically older parts of the brain, which fish also possess, may be sufficient for the ability to feel simple pain.

14 No studies exist into the presence of nociceptors of any kind in cartilaginous fish.

15 It is argued that severe pain due to burns, acid burns or bruising (for example by falling from a height) are transmitted via slow-conducting fibres. These types of injuries are typical of terrestrial beings, but not of aquatic fauna.

Since the perception of pain is possible via various physical and biological pathways, it is also conceivable that in fish other brain areas take on this task. In order to answer the question of whether fish feel pain, additional indicators should be taken into account, such as the response to noxious stimuli and cognitive ability, which play a role in the ability to feel pain.

Reaction to harmful stimuli

In previous experiments fish showed no or only minor effects to stimuli that would normally be perceived by humans to be extremely painful, e.g. bee stings to the lip or injuries caused by a fishing hook in the mouth area. Furthermore, painkillers which are highly effective in humans, such as morphine, showed no effect in fish. One argument states that this suggests that fish do not have the ability to feel pain. From physiological changes and behavioural reactions, even avoidance reactions, it cannot be inferred that fish experience pain. A distinction should be drawn between unconscious perception of harm (nociception) and conscious pain.

The counter-argument is that studies certainly do exist in which morphine was shown to have an effect on fish, *e.g.* in zebrafish, an ornamental fish between one and four centimetres long. In this fish mutations and malformations can be clearly observed. It has therefore been used for some time as a model organism for genetic and toxicological studies.[16]

In zebrafish, the use of morphine leads to a physiological reaction or behavioural changes which are also observed when noxious stimuli are suppressed with morphine in animals which are acknowledged to possess the ability to feel pain. In further studies it has also been demonstrated that fish have neurotransmitters that are released in response to noxious stimulation. In other organisms whose sentience is recognised, these substances are considered to be the body's own "pain pharmacy". They are thus seen as indicators of the perception of pain. The fact that fish produce these neurotransmitters indicates that they have an ability to feel pain. In addition, a faster heart rate, accelerated gill activity and changes in the hormonal

16 Gonzalez-Nunez, V., Rodríguez, R.E. 2009. The zebrafish. A model to study the endogenous mechanisms of pain. ILARJ. 50, 378–86; Correia, A.D. et al. 2011. A novel behavioral fish model of nociception for testing analgesics. Pharmaceuticals 4, 665–80; Malafoglia, V. et al. (2014). Extreme thermal noxious stimuli induce pain responses in zebrafish larvae. Journal of Cellular Physiology 229/3, 300–8.

balance could also be interpreted as signs of a reaction, even if is not yet clear whether such a reaction is actually associated with negative sensation.

Cognitive ability

The term "cognition" is used inconsistently in scientific literature. In general, it refers to the processing of information by a living being. Cognitive ability covers, inter alia, perception, remembering, learning, spatial orientation and planning, cooperation and communication. The form in which this cognitive ability to process information is expressed can differ greatly in different species.

Based on the results of empirical studies, some fish biologists are convinced that fish have a sophisticated cognitive capacity. They conclude that in fish learning is more than the mere associative linking of information. They conclude from empirical studies that some fish species have a long-term memory and well-trained spatial ability. These fish seem to be able to distinguish other individuals by their visual features and perceive changes in social hierarchies. They also conclude from fish's behaviour that they pass on habits and knowledge gained from experience (e.g. about spawning grounds or food sources). Further empirical studies suggest that fish are to some extent able to memorise a number of objects and use them for orientation purposes. Some individual fish species have also been observed to produce tools, actively change their environment or cooperate in hunting. Cognitive performance and spatial orientation in humans are situated in the neocortex. Even without a neocortex, fish are able to demonstrate this cognitive capacity. While this is not sufficient proof that fish are sentient, it is an important indication that such is the case.

In contrast, other scientists maintain that it is inappropriate to draw conclusions about an ability to feel pain from such behavioural observations. Although the neurophysiological conditions of fish do not exclude the possibility that fish show complex behaviour, it cannot be inferred from these phenomena that they possess the ability to feel pain. The behaviour could also be purely reflex, that is, information could also be processed without negative sensation.

3.4 Options for assessing the arguments with regard to the ethical discussion

Even though there is a consensus within academic circles that certain physiological and anatomical conditions are necessary in order for an organism to perceive something as negative, opinions are divided as to how meaningful the results of studies on such indicators are. On the one hand, each indicator considered to be a biological prerequisite for experiencing pain is taken into account individually. On the basis of these indicators, it is shown in what way fish differ from other vertebrates considered to be sentient beings. If certain indicators are not met, the overall conclusion can be reached that fish are not capable of feeling pain. An alternative approach is to consider the indicators as a whole. Even if fish do not meet individual indicators considered relevant for the perception of pain in other living beings, we can say that concentrated evidence

is obtained based on the totality of the test results.

Ethics deals with normative questions of right and wrong, not with empirical questions about the properties of being. In cases where there is uncertainty with respect to empirical questions, ethics can, however, aid in coming to a rational decision.

The ethical debate cannot determine whether or not fish are sentient beings. It is a huge challenge to obtain knowledge about a living being's perception of pain which can be considered to be scientifically sound (not simply intuitive). Pain is a very complex phenomenon which is as yet only imperfectly understood. Although we can draw up indicators to test the ability to feel pain, we do not know if these are the right ones or if we have considered all the necessary indicators. In the treatment of fish, therefore, we must make decisions without being certain whether they have the ability to feel. From an ethical viewpoint, it matters how we assess the existing incomplete knowledge. What can be considered to be certain knowledge? Where are there plausible grounds for doubt and which aspects do we currently know nothing about, yet believe to be relevant to the issue of the ability to feel pain?

Options

The ECNH members established four options for assessing the scientific arguments with regard to the ability to feel pain:

1 Fish do not meet the necessary criteria for the ability to feel pain. There are currently no indications that fish experience negative sensation.

2 More recent empirical findings do at least suggest that there are scientific grounds for doubting that fish are generally insensitive to pain. The possibility that at least some fish experience negative sensations must be considered.

3 Currently available scientific findings do not indicate that fish are sentient beings. However, on the basis of the data gathered, it is difficult to rule out that some fish, at least, experience pain.

4 On the basis of the scientific findings it must be clearly stated that some fish have a specific ability to feel pain.

Options 1 and 4 are clear, definitive statements. According to option 1 it is certain that currently available information does not provide any indication that fish are able to feel pain. According to option 4, however, this same information clearly indicates that at least some fish are able to feel pain.

Options 2 and 3 contain varying degrees of uncertainty. Advocates of option 2 state that it indeed cannot be decided whether or not fish feel pain on the basis of the current findings, but that there are plausible grounds to doubt that they are insensitive to pain. Option 3 goes one step further. Advocates of this option believe that today's knowledge involves such strong grounds for doubt that it is difficult to refute that at least some fish experience pain.

Positions represented in the ECNH

The **majority** advocate option 3.

One **minority** support option 2 and a **second minority** option 4.

Option 1 is **not** represented within the ECNH.

It can be stated that – as the lowest common denominator – all members of the ECNH at least do not exclude the possibility that some fish can experience pain, of whatever kind.

3.5 Ethical relevance of the discussion on the ability to feel pain and cognitive ability of fish

Empirical evidence on the characteristics and abilities of fish such as the ability to feel pain and cognitive ability help us – depending on the ethical position of principle – to answer the question of whether and, if so, which fish belong to that group of living beings which are to be considered morally for their own sake.

Furthermore, these characteristics and abilities may help us decide to what extent fish can be considered morally in comparison to other living beings.

The ethical relevance of the ability to feel pain and the cognitive ability of fish is addressed in the following chapter.

4 Moral status of fish

In the following section the ECNH addresses the question of whether fish should be considered from a moral viewpoint, regardless of whether they are of use to us. Which criteria should be applied? Do fish meet these criteria? The answers to these questions determine the moral status of fish.

4.1 Ethical value categories

In order to determine the moral status of fish, the ECNH first identifies three ethical value categories.[17]

1 Something can be said to have instrumental value if it is of use to humans or other creatures. A fish, for example, has **instrumental value** as a source of food or as part of the ecosystem we want to preserve so that fishing can continue to provide a livelihood in a given region.

2 **Relational value** arises where a relationship exists. An example of the relational value of a fish is the intangible value of a Japanese koi[18] to a koi enthusiast, whereas to another person the same koi appears to be just any old fish.

3 A living being can be said to have **inherent worth**, regardless of whether someone can make use of it or has a relationship to it. Living creatures with inherent worth may also have instrumental or relational value. However, they may never be treated in a certain way only on the basis of their instrumental or relational value, as this would be disregarding their inherent worth.[19]

Various ethical theories provide different answers to the question of what it means when an animal has to be considered from a moral viewpoint.

In deontological ethical theories, the ethical rightness of an action is determined by whether it is in accordance with the obligations that we have towards an individual being with inherent worth. This approach is represented by the **vast majority** of ECNH members.

There are other ethical theories, in particular consequentialist ones, according to which an action is considered as morally right or wrong solely on the basis of its consequences for those

17 The terms and differences do not cover all the possible value categories. However, the ECNH considers them to be sufficient for the following discussion. See also ECNH, The dignity of living beings with regard to plants. Moral consideration of plants for their own sake, 2008, p. 7 (www.ekah.admin.ch).

18 The koi is a cultivated variety of the carp and can have a very high *monetary* value among enthusiasts.

19 In this report the term inherent worth is used as an aid to categorisation, without the intention of implying the extent of its significance. With regard to the legal discussion, we refer to the prevailing interpretation of the constitutional concept of "dignity of living beings" (Article 120 of the Federal Constitution), which considers that (non-human) creatures have different degrees of inherent worth, whereas Article 7 of the Constitution (human dignity) can be generally interpreted to mean that such a consideration with regard to humans is not acceptable.

affected. If what counts is the morally relevant good or the best outcome, then there is no inherent worth in the deontological sense. According to the consequentialist approach advocated by a **minority** in the ECNH, the value of an organism depends on how much of the morally relevant good it bears in itself or may realise as its bearer. The minority therefore also uses the term "inherent worth", but in a "weak sense". This approach thus also ties in with the constitutional concept of the dignity of living beings.

4.2 Do fish have inherent worth?

Do fish have inherent worth? In other words, do they belong to the types of living beings which should be considered from a moral perspective, even though they are neither of instrumental use nor have a relational significance to us? A range of ethical positions provide different answers to this question. Set out in brief below are those fundamental positions and decision criteria which the ECNH members deem to be relevant to the discussion on the ethical treatment of fish.[20]

Theocentric positions. One interpretation of the theocentric position considers God alone as having inherent worth. All living beings created by Him have moral value by virtue of their relationship to God. Fish have relational value, but no inherent worth. Another reading of theocentrism assumes that God creates living beings with moral value for their own sake. This interpretation is linked – depending on the criteria required to substantiate inherent worth – to the arguments in the positions described below.

Anthropocentric positions place humans at the centre. Only humans have value for their own sake. Fish therefore have no inherent worth.[21]

Pathocentric positions focus on pain and sentience as ethically decisive criteria for the inherent worth of a living being. The presence of a form of sentience presupposes an independent positive or negative experience and possibly certain cognitive processes. A fish has moral value inasmuch as it has some form of inner experience, that is to say, it experiences something as being good or bad.

20 See also the short overview of various positions and critiques of them in the ECNH publication "The dignity of living beings with regard to plants. Moral consideration of plants for their own sake." A fundamental criticism of "centralist" positions is that a moral view is almost always taken from a position of human self-understanding and is defined by humans. We thus run the risk of assuming that humans are morally privileged just because of the biological criterion of belonging to the genus "homo sapiens". In essence, therefore, according to this criticism, all centric positions are anthropocentric and are not able to account for the otherness of non-human beings.

21 This does not exclude the fact that people may have an obligation to treat other living beings without cruelty. This ethical obligation does not stem from the inherent worth of other living beings, but lies in the belief that humans should not degrade themselves morally by committing acts of cruelty.

Biocentric positions consider *all* living beings morally for their own sake. This position takes the view that sentience in a being is not a prerequisite for claiming it has inherent worth.

We can essentially distinguish two biocentric approaches. Living beings either have inherent worth because the fact of being alive in itself has value for its own sake, or they are to be considered for their own sake because as bearers of a good life they pursue their own "good", and this has moral value for its own sake. This second approach assumes that living creatures have, as it were, an inscribed, species-specific target.

Ecocentric positions place the focus not only on living things, but also on the natural world as an all-encompassing, complex interplay of entities.

A holistic reading of this position attributes inherent worth to collective entities such as ecosystems, habitats, species or populations, the natural world, the earth or even the universe. To advocates of an individualistic interpretation, all individual beings which are part of the natural world have moral value for their own sake; this includes both living things and non-living things such as lakes, mountains or landscapes. Ecocentric positions thus answer the question as to whether fish have inherent worth in different ways.

Positions represented within the ECNH

The **majority** of ECNH members argue in favour of variants of the biocentric position, as a result of which fish have inherent worth because they are living beings or because as living beings they have a specific, inherent purpose.

A **minority** hold a pathocentric position. Sentience, that is, the ability to perceive something in itself as negative, is considered to be a valid criterion for deciding whether a living being has inherent worth. According to this position, fish have inherent worth inasmuch as they are sentient creatures.

Another **small minority** hold a theocentric position, maintaining that living beings created by God do not have moral value only as a result of their relationship to God but also that God creates beings with inherent worth. In further argumentation, this minority adhere to the biocentric position.

From these positions held by the ECNH, it can be concluded that in our treatment of fish we should consider them from a moral viewpoint – either because they are living beings, or because they are sentient. It should be noted here that this does not exclude the fact that we may, for other reasons, have an ethical duty towards entities which do not meet the criterion considered as morally relevant to having inherent worth.

All this does not explain what the moral obligation to consider individual fish consists of. Depending on the theoretical approach, negative duties may arise, e.g. the duty not to cause pain to fish, or positive duties, such as ensuring as far as is possible and reasonable that they enjoy well-being or that they thrive (e.g. in a consequentialist

reading, to maximise their ethically relevant good).

The **majority** of ECNH members argue in favour of a negative duty towards living beings with inherent worth, whilst a **minority** consider positive duties to be justified. What this means for the practical treatment of fish is explained in Section 5.

4.3 To what extent does inherent worth count?

The next step is to determine to what extent a creature with inherent worth counts; how are we to decide when there are conflicting duties towards different living beings with inherent worth? What is the value of fish over other living beings with inherent worth? A distinction can be made between two possible answers.

Egalitarian positions

According to an egalitarian position, it is our duty to treat equally all living beings which meet the same morally relevant criteria, regardless of what kind of creature they are and of their abilities and characteristics. Comparable morally relevant interests of all living beings should be given equal weighting.

An egalitarian position – especially in the case of all non-anthropocentric positions – can have far-reaching ethical consequences. The same value should be attributed to the morally relevant interests of humans as to comparable interests of other living beings with inherent worth. As a rule, egalitarianism is criticised for the fact that it is too radical in its consequences and that it is not practicable.[22]

A further criticism of this position suggests that it is difficult to set criteria which are comparable to the interests of living beings with inherent worth. There is a risk of selecting the criteria in such a way that human interests are always given special weight. This applies in particular to a position of moderate egalitarianism.

Hierarchical positions

Hierarchical positions require that the interests of all living beings with inherent worth be considered, but not

22 Some non-anthropocentrics thus argue in favour of moderate egalitarianism. They proceed from the idea that, in cases of self-defence, it is acceptable to weight the interests of certain creatures higher because they live a "richer life". For example, human beings are permitted to harm other living beings in their morally relevant interests in order to survive. According to this position, however, this situation should always be the exception.

all equally. In general, a hierarchy of complexity is established according to the morally relevant characteristics of a living being with inherent worth or its morally relevant interests. In this position, the interests of living beings with greater complexity are weighted more strongly than comparable interests of less complex living beings. This is usually justified by the fact that the complexity of a living being's characteristics correlates to its ability to detect harm or to be damaged in its interests.

Hierarchical positions are usually criticised for the fact that they assume a *scala naturae*, either intuitive or religion-based, which provides grounds for attaching greater importance to human characteristics and interests than to comparable characteristics and interests in other living beings. Abilities are given higher ethical weighting the closer they are in their complexity to those of human beings. In this way, establishing a hierarchy of the importance attributed to morally relevant criteria might be interpreted as speciesism, insofar as human interests are given a higher weighting based directly on the complexity argument but indirectly because of the species to which they belong. Another criticism suggests that less complex living beings may be more affected by exposure to harm exactly as a result of their lack of cognitive skills, e. g. they may experience greater pain because they do not have the capacity to classify the harm as non-hazardous and temporary.

Positions represented within the ECNH

The **large majority** of ECNH members advocate the hierarchical position. Comparable interests of different living beings with inherent worth count to varying degrees. The more complex a living being, the more strongly its ethically relevant interests are weighted.

Within this group, the vast majority are of the opinion that human beings have an indisputable inherent worth; this is the core of the concept of human dignity. It is, in contrast, permissible to weigh up the morally relevant interests of animals and other non-human creatures. According to this position, however, this does not lead us automatically to give precedence to all human interests. Priority is given only to those human interests whose higher weighting can be justified in the particular case assessed.

A **minority** of ECNH members believe that comparable ethically relevant interests of all living beings with inherent worth should be considered equally important.

4.4 Interim conclusion

To summarise, we can state that all members of the ECNH consider the criterion of sentience, i. e. the ability to perceive something as negative for one's own life, as an ethically relevant criterion for the way we treat fish. For the majority, representing a biocentric position, sentience is not, however, a prerequisite for arguing in favour of the inherent worth of fish. However, they consider the ability to feel pain and cognitive ability to be important considerations if fish are to be treated according to the needs of their species so they can thrive. For the minority, representing a pathocentric position, sentience is the definitive criterion for determining the inherent worth of fish. If fish can feel pain, then they should be considered from a moral viewpoint.

In their assessment of the empirical studies, all members share the opinion that it cannot be ruled out that certain fish are sentient beings. The majority assume that it can at least be seriously doubted that fish are insensitive to pain (option 2), or even that the evidence is so convincing that it must be assumed that they are sentient (option 3). The minority consider that the scientific findings provide clear evidence that some fish feel pain (option 4).[23]

With respect to those fish on which no scientific studies on the ability to feel pain are available, all members see at least a plausible possibility that they too – possibly via a different evolutionary path – have developed the conditions to possess some sort of sensitivity to pain.

It is thus the view of all the ECNH members that awareness and care should be exercised in the treatment of fish, even if no complete certainty exists regarding their ability to feel pain. What this actually means and what practical consequences the positions held within the ECNH have for the ethically acceptable treatment of fish will be described in the following section.

23 For the options discussed by the ECNH see p. 14.

5 Practical consequences for an ethically acceptable treatment of fish

5.1 Various practical ramifications of egalitarian and hierarchical positions

Hierarchical pathocentric or biocentric positions, as represented by the majority of the ECNH, do not on principle exclude the admissibility of types of fish use such as capture fishing, aquaculture or the use of fish in animal experiments. However, we must ask under what conditions a specific use is acceptable from an ethical viewpoint. The answer depends, inter alia, on what moral status fish have in the case of a conflict of interests in relation to other living beings, and on the criteria according to which these interests should be balanced. Hierarchical positions are therefore faced with the challenge of providing criteria for weighing up the moral status of fish against the moral status of other organisms, as well of establishing the balance of assets or interests in a particular case. Even when a hierarchical position is taken, the duty to ensure animal welfare as far as is possible and reasonable may arise.

Insofar as these positions consider it ethically acceptable to kill fish, special attention should be paid to the requirements for the methods of killing. The general practical requirement must be that the fish are killed without pain or stress. The application and development of killing procedures and practices are to be observed. Also, it should be carefully ensured that the legally permissible killing techniques meet requirements when applied practically, both when a single fish is killed or when fish are killed in large quantities in aquaculture or in industrial fishing.

Egalitarian pathocentric or biocentric positions, as represented by a minority in the ECNH, lead to the implication that animals should not be killed at all, insofar as these positions essentially assign the same moral status to all (vertebrate) animals, including humans, and they link these with individual legal rights such as a right to life or the protection of animal welfare. Specifically, this means that neither the production and breeding of edible fish in aquaculture nor fishing practices of any kind can be morally justified. If there exists a duty to ensure animal welfare over and above the right to life, it follows that there should also be a far-reaching ban on use when this involves negatively impacting animal welfare. The use of fish in (harmful) animal testing is also ethically inadmissible in this case.

Egalitarian positions are usually criticised for the fact that they contradict widespread moral intuitions, fail to recognise the hierarchical differentiation criteria and pursue an impracticable ideal. The minority of ECNH members, representing an egalitarian position, perceive the ideal as a point of orientation for treating fish in an ethically justifiable manner. We should continue to strive towards this ideal goal, even if it can probably only be achieved in a long and gradual process. *In holding this viewpoint, even the minority can conditionally accede to the following considerations and recommendations, insofar as they can lead to an improvement in the way fish are currently treated.*

5.2 Practical consequences for the treatment of wild fish and for capture fishing

Although not all members of the ECNH consider it as proved beyond reasonable doubt that fish feel pain, all share the view that the ability of fish to feel pain cannot be ruled out and that this is morally relevant to the treatment of fish. Consequently, it cannot be ruled out that pain is inflicted on fish in the context of industrial fishing, professional fishing and angling. Depending on the fishing technique, fish of different species suffer injuries before they are slaughtered. In the case of industrial fishing, most of the fish die of suffocation. Whether and under what conditions fishing is ethically acceptable are questions which the members answer in a variety of ways according to the ethical position they hold.

For the **majority of ECNH members**, advocating hierarchical positions, the admissibility of fishing should be decided by weighing up interests. The damage to and negative impact on fish (pain, stress, death and other negative impacts on their welfare as well as violation of their dignity) should be weighed against the human interest. However, according to this majority position, not only the interest of the survival of humans – who are placed higher in the hierarchy – can be used to justify fishing. There are other qualified interests, such as the need for a balanced and varied diet, that can justify the infliction of damage to and the killing of fish under certain circumstances. However, the majority do not consider purely profit-oriented fishing interests to be qualified interests. Nor is the interest of the fishing tradition alone sufficient ethical justification to cause stress and death to fish, according to the majority opinion. Tradition is not an ethical argument in itself. Furthermore, neither can pleasure in angling (e. g. the already banned practice of catch and release, with damage inflicted to the fish in the process) be considered as a qualified interest.

In all cases in which damage caused to fish may be justified, damage should be kept to a minimum and the fish should not suffer pain when killed. Implementation of this ethical requirement would necessitate some fundamental changes, particularly in industrialised fishing. Furthermore, only fish which had been captured and killed by methods which met the named requirements could be imported into Switzerland.

For the **minority of the ECNH**, advocating egalitarian positions, fishing is essentially not justifiable; fishing should be banned. Fishing would only be possibly justifiable in individual cases and under very specific conditions, for example if it provided a source of food necessary for the survival of a certain group of people without alternatives. The minority assume that this is not the case in Switzerland, where other dietary options are available.

The **ECNH is of the unanimous opinion** that angling for purely pleasurable purposes – e. g. the practice of catch and release, which is already banned – cannot be ethically justified. The interest of pleasure does not outweigh the interest of the fish not to suffer damage or experience pain. With regards to other practices in angling, the ECNH recommends the

introduction of further awareness-raising measures. Training information for anglers should be regularly updated to include the latest research results on the ability of fish to feel pain and their cognitive ability. Furthermore, a person's specialist knowledge required to obtain a fishing licence should be regularly checked. Exceptions to general rules in the treatment of fish that lead to a greater negative impact on the fish should be avoided if possible. For example, a certificate of competence should in all cases be required in order to obtain a fishing licence, even a temporary licence, which can currently be obtained without such proof. Considering that this type of authorisation (e.g. a daily licence) is also issued to anglers with little knowledge and practical experience, these exceptions are incomprehensible from an ethical perspective. They also contradict animal protection requirements to keep the stress inflicted on the fish as low as possible and to ensure that death is painless.

5.3 Practical consequences for fish farming

The ECNH members differentiate between species-appropriate husbandry and humane husbandry with regard to fish farming. Humane husbandry focuses on the welfare of the individual animal. This is ensured, among other things, when the animal (if possible) is free of stress.[24] However, it is unrealistic to think that we can know the individual needs of each animal. The ECNH also considers it plausible that when species-specific needs are considered, this also largely takes account of the individual needs of an individual member of this species. The ECNH therefore believes it is justifiable, when establishing the requirements of an individual, to consider the needs of the species in general.

Species-appropriate husbandry can mean two things. Firstly, it can be understood as the keeping of animals under conditions similar to those experienced in the wild. Secondly, the needs that members of a species have as a rule can give an indication of how the species should be kept appropriately. Animals kept by humans differ from wild animals not only in the fact that they are more or less restricted in their freedom of movement. Unlike wild animals, they are not exposed to certain threats or are exposed to a lesser degree, for example to the danger of being killed by other animals or of falling victim to natural events or those caused directly or indirectly by humans. Furthermore, domesticated animals may develop other needs to those of their wild cousins. The criteria for species-appropriate husbandry therefore vary.

When assessing the requirements for species-appropriate husbandry, we should therefore not only consider the needs of similar types of wildlife, but take into account the specific needs of domesticated animals. The ECNH members therefore conclude that ethically acceptable husbandry and breeding practices are only possible when there is sufficient basic knowledge to ensure animal welfare and

24 When talking about ensuring animal welfare here and on the following pages, the authors intend the contribution that humans may make to an animal's welfare and not an absolute guarantee of its welfare.

when careful attention is paid to new findings on the needs of fish and husbandry practices are adapted accordingly. A minority of ECNH members also recommend that fish in Switzerland which are not bred or kept on a commercial basis should only be kept under the condition that there is sufficient understanding of their needs in order to ensure the welfare of the fish in question.

The competent authorities should ensure that those involved in fish farming have sufficient knowledge about the specific needs of the fish they keep, and that the requirements are implemented in such a way that they do in fact meet the needs of those particular fish.

Additional consequences for fish farming in aquaculture

Aquaculture is a closed system of fish farming. If there are problems with the functioning of the farm, then compared with open systems there is a higher risk that the entire fish stock may be damaged or die. The ECNH members agree that the interests of the fish should be weighted higher than the economic profitability of the farm. Technical risks should therefore be minimised to the extent that malfunctions will not, in all probability, result in all the fish dying.

In order to ensure there are sufficiently detailed indicators for animal welfare and for the requirements of species-specific welfare in aquaculture, special attention must be paid to the group behaviour of fish. The ECNH believes that, in the absence of indicators, there is no basis for assessing whether the requirements to ensure animal welfare are met and whether the indicators such as water quality[25], stock density, amount and frequency of stressors and design of the surrounding infrastructure are sufficient and appropriate or whether the present mortality is not too high compared to natural mortality.

Fish farming for medical purposes and spa therapies

For representatives of hierarchical positions, the therapeutic use of fish may be ethically acceptable under some circumstances, even if it is stressful for the fish. When interests are weighed up it must be shown that the stress suffered by the fish in a particular case is less than the medical benefit to the patient. In order to weigh up interests appropriately, it must first be known or determined to what extent the fish suffers, and secondly, the effectiveness in reducing suffering that humans achieve by the therapeutic method must be scientifically explained. If it is shown that the stress suffered by the fish is unreasonable, their therapeutic use should be prohibited.

Similar considerations apply to the use of fish in spa treatments. In general, one could also try to weigh up the stress of fish on the one hand against the human interest on the other. However, the ECNH is unanimously of the opinion that the interest in using fish in spa treatments does in no way

25 e.g. temperature, pH-value, hardness, oxygen content, (where appropriate) salt content, current and rate of flow (in particular for migratory fish), irradiation, water depth (in particular for demersal fish) and water additives; also, criteria to meet the fish's species-specific needs.

outweigh the stress caused to the fish, no matter how slight, and so cannot be justified.

Consequences for keeping fish privately

The possible stress experienced by fish kept privately (i.e. not for commercial purposes) is weighed against an interest that is, in comparison, morally subordinate. However, the ECNH believes that keeping fish privately can be justified when the fish are kept in a way appropriate to the species, they are bred in an ethically acceptable way and, if originating in the wild, they are caught in an ethically acceptable way.

The demands that are made on the treatment of fish in other areas of use should, if at all possible, be extended to the practice of keeping fish privately. Keeping fish in a manner appropriate to the species requires specific knowledge. To ensure this, measures to increase awareness and training should be introduced, as is the case in other areas of pet ownership. The introduction of controls should also be seriously considered, especially with regard to particularly demanding fish species.

5.4 Practical consequences for research on and with fish

The **majority** of the ECNH do not consider research on and with fish to be unacceptable per se. There may be grounds for justification.

The ECNH differentiates between three research objectives:

- research on fish to expand knowledge about fish which may be to the benefit of the fish themselves;
- research on fish to gain knowledge about other creatures, in particular humans;
- research for the enhancement of fish.

Research on fish to expand knowledge and to the possible benefit of fish

Research is carried out on fish to generate knowledge that may also benefit fish themselves. However, the same research results may also be used to gain greater profit from fish thanks to this knowledge. Such research may involve invasive methods, for example in studies in which bee venom is injected into fish in order to learn about their sentience. Even if this invasive research may ultimately benefit fish, the stress caused to the fish must be weighed against the knowledge interests and their usefulness, as required by the Animal Welfare Act. New insights into the ability to feel pain and the cognitive ability of fish should also

already be applied in the choice and design of the research methods themselves.

Few ethical objections can be raised against non-invasive research such as pure behavioural research (ethological research), provided the fish are not subjected to stress. In order to gain more insight into the behaviour of fish and to ensure their humane treatment, non-invasive approaches to research in particular should be specifically supported and encouraged. Furthermore, research projects should be initiated and supported on fish that are made use of, but that so far have not been the subject of scientific study or only in a limited manner.

Research on fish to the benefit of other living beings

The second area of research uses fish in animal experiments to gain knowledge which is of benefit to humans and other living beings. The findings may, for example, involve the effects of medicines.

Egalitarian positions do not consider this use of fish to be justifiable in principle. The members who hold these positions still debate whether exceptions are permitted in emergencies, and how these could be justified. In all cases, an exception should only be permitted if every effort is made to find alternatives to the current practice of animal testing.

According to the hierarchical positions represented by a majority in the ECNH, it is acceptable to weigh up the interests involved. Stressful animal experiments on fish may be performed to the benefit of other living beings – placed higher in the hierarchy – in particular of humans, when it is found that the human interest outweighs the negative impact on fish in the specific case.

According to the majority position, another prerequisite to cause stress justifiably is that no less stressful alternative exists with which the same research objective can be achieved. However, the research strategy which is applied with this purpose – the "3Rs" (Replacement, Reduction, Refinement[26]) concept developed in the field – may actually result in greater stress being caused to fish. This can happen because the interests of fish are frequently weighted lower than those of other vertebrates and so in animal experiments rodents tend to be replaced by fish. The ECNH, however, is of the opinion that there is no normative reason to classify fish lower than, for example, rodents.

Research for the enhancement of fish

A further research area in which fish are used in favour of the interests of third parties concerns research to alter fish in order to bring greater benefit to others (known as enhancement). New technologies are used, e. g. genetic engineering of salmon to accelerate their weight gain, thereby increasing their economic value.

26 The 3R concept refers to efforts to avoid animal testing as far as possible and to replace them with alternative methods (*replacement*) or reduce the number of animals used (*reduction*). It also involves designing animal experiments in such a way that the animals involved suffer as little pain and suffering as possible (*refinement*).

According to the **majority** of the ECNH, when deciding if such research is acceptable it is again necessary to weigh up the various interests, whereby qualified interests may ethically justify such experiments on fish. The risks that arise for people and the environment from an intentional or unintentional release of the fish need to be considered. Only if a risk assessment were able to demonstrate, on the basis of sufficient data on damage scenarios and the probability of damage occurrence, that a related risk is acceptable, and only if the benefits gained outweighed the negative impact on the fish, would such research on fish to increase yield be acceptable. However, the ECNH assumes that in the case of genetically modified fish there is currently insufficient data to allow a proper risk assessment to be carried out.

For the **minority** of the ECNH, holding an egalitarian position, experiments on fish for commercial purposes cannot be justified on principle, regardless of the associated risks.

5.5 Remarks on the ethical treatment of fish independent of their inherent worth

Central to this report is the discussion about the moral status of fish and the ethical demands that arise from the inherent worth of fish. As explained in Section 4, there are other values besides the inherent worth of fish that determine our treatment of fish from an ethical perspective. These include in particular their instrumental value, e.g. their function as part of the ecosystem or as a food source for humans and other living things. Measures to protect the ecosystem and sources of food in general by means of species conservation or protection of fish habitats are also relevant when considering the moral status of fish. Measures to protect waters against pollution and contamination, against noise pollution from shipping, and against damage to natural habitats caused by energy generation etc. generally benefit the individual fish and are therefore also desirable from an ethical point of view.

6 Summary of the recommendations for the ethically justifiable treatment of fish

Recommendations on keeping fish

– Fish should always be kept in such a way that their species-specific requirements are taken account of. In order for this to be the case, appropriate indicators on fish welfare need to be developed and codified. They should be based on current scientific findings.

– The members believe that for it to be ethically acceptable to keep and breed fish, those involved in fish husbandry should have sufficient basic knowledge to ensure the fish's welfare and pay careful attention to new findings on the needs of fish, adapting their husbandry practices accordingly.

  A minority of the ECNH also recommend that fish in Switzerland which are not bred or kept on a commercial basis may only be kept under the condition that there is sufficient understanding of their needs in order to ensure the welfare of the fish in question.

– The ECNH believes that particular attention should be paid to the fact that compared to their wild cousins, farmed fish can develop other needs, and that these should be studied and taken into account. In particular, the group behaviour and welfare requirements of farmed fish should be studied and considered.

– Compared to open farming systems, aquaculture involves an increased risk that the entire fish stock could be damaged or die as the result of a technical malfunction. Technical risks should therefore be minimised to the extent that malfunctions, in all probability, will not result in the mass death of the fish. The ECNH believes that from an ethical viewpoint the interests of the fish should be weighted higher than the economic profitability of the farm.

– Before authorising the use of fish for medical and therapeutic purposes, scientific studies should first be done into the stress caused to the fish and the effectiveness of this method in reducing suffering in patients. If it is found in a consideration of interests that the stress caused to the fish is unacceptable, the ECNH finds that their use should be banned.

– The ECNH is of the opinion that the interest in using fish in spa treatments does in no way outweigh or justify the stress caused to the fish, no matter how slight. The use of fish in spa treatments should therefore be prohibited in all cases.

– The ECNH believes that keeping fish privately can be justified when the fish are kept in a way appropriate to the species. To ensure this, the ECNH recommends introducing measures to raise awareness and train owners, as is the case in other forms of pet ownership. There should also be greater transparency regarding the origin of the fish, fishing methods and transport conditions. The introduction of controls should also be seriously considered, in particular with regard to especially demanding fish species.

Recommendations regarding requirements for methods of killing

– Currently permissible and new methods of sedating and killing fish should be examined in the light of the latest scientific findings on fish's ability to feel pain and cognitive ability in order to ensure that they suffer as little pain and stress as possible.

– These requirements must in particular be met in practical applications.

– Particular attention should be paid to the practical application in large farming systems and in industrial fishing practices due to the large number of fish which are killed.

– Angling and killing fish without the prerequisite specialist licence should remain illegal and, in the exceptional cases where it is permitted, should be prohibited in future. The ECNH believes that exemptions to this cannot be justified, as they would increase the probability of fish suffering.

Recommendations for research on fish

– New findings on the ability to feel pain and cognitive ability of fish should be taken into account when selecting research methods.

– In order to learn more about the behaviour and species-specific needs of fish, targeted support should be given to non-invasive research methods.

– Findings from behavioural research can provide guidelines for the species-appropriate treatment of fish.

– Studies should be initiated and promoted into fish of which we make use but into which little or no research has been done as yet.

– Efforts to develop less stressful alternatives to existing animal testing (the 3Rs: *replacement*, *reduction*, *refinement*) should not automatically lead to the use of fish in experiments. In the view of the ECNH, there is no normative basis for classifying fish lower than other vertebrates in the hierarchy.

– Like all animal experiments, those carried out as part of research into and the application of new technologies for the purpose of enhancing fish must also be justified in a (legally required) weighing up of interests. Since we are dealing with applied research, the ECNH finds that when the interests are considered, we should take into account both the stress caused to the animals and the risks to humans and the environment arising from any intentional or unintentional release of the fish. The majority of the ECNH find that only if a risk assessment were able to demonstrate, on the basis of sufficient data on damage scenarios and the probability of damage occurrence, that the risk is acceptable, and only if the benefits gained outweighed the negative impact on the fish, would such research into fish enhancement be acceptable. The majority of this group assume that the currently available data is insufficient for an adequate risk assessment to be made.

Recommendations for legal differentiation and enforcement

– An enormous range of biological creatures are covered by the term "fish", both biologically and legally. From an ethical point of view the ECNH therefore finds no convincing reasons not to consider fish in the same legal terms as other vertebrates and domesticated animals in terms of the level of protection afforded to them and a differentiation of the regulations.

– Attention should be paid to the legal differentiation needed to meet the requirements of fish husbandry methods which take account of the welfare of the species. It should also be considered whether the currently applicable general requirements regarding the capture and killing of fish and the use of technology are sufficiently differentiated to ensure the fish's welfare in all areas of use and for all fish species.

– New findings on the ability to feel pain and cognitive ability of fish should be incorporated into the legal requirements and law-enforcement processes on an ongoing basis.

– Considering the new varieties of fish and the new forms of use (such as aquaculture), the establishment of specialist agencies to support the necessary differentiation in the law and its implementation in law enforcement should be considered. These agencies would have the task of establishing the needs of specific fish species and ensuring the legally compliant treatment of fish according to their use.

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