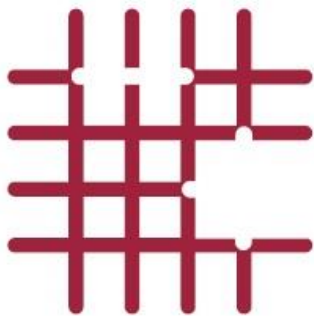


Fish Welfare



COUNCIL ON
ANIMAL AFFAIRS

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Procedure

This advisory report from the Council on Animal Affairs (*Raad voor Dierenaangelegenheden*, RDA) was prepared by a panel of Council members comprising Mr M.C.T. (Martin) Scholten (chair), Mr A.G. (Andreas) Dijkhuis, J.T. (Joost) de Jongh, Ms M. (Marijke) de Jong-Timmerman and Mr F.L.B. (Franck) Meijboom. The panel received support from deputy secretary Ms M.A. (Monique) van der Gaag and secretary Mr M.H.W. (Marc) Schakenraad from the RDA agency.

Document overview

The rationale for this advisory report is outlined in Section 1, and addresses two questions. Question 1: Do understandings in society and scientific literature warrant greater concern for the health and welfare of fish, and give cause to update the government's current policy position in this respect? If so, question 2 follows: What key aspects and developments can best be addressed to promote the welfare of fish, and what impediments are envisaged (if any)?

Section 2 provides an overview of the present situation regarding the various categories of fish, the number of affected animals per category and the existing laws and regulations in this area. Section 3 then addresses the first question, and Section 4 looks at the second question. The conclusions and recommendations are given in Section 5.

Summary

Fish play various roles in Dutch society. We eat, catch and farm them, admire them in our homes and professional aquariums, and use them as laboratory animals for testing purposes. Depending on their purpose, fish care falls under a range of laws and regulations. These regulations currently make little to no mention of fish welfare, however. Attention to fish welfare has gradually increased in recent decades, in policy, research and society as a whole. The ethical question of how we wish treat animals in general (and here, fish in particular) is being raised with increasing regularity. In light of this increasing attention, the Council on Animal Affairs (RDA) has conducted a closer examination of fish welfare.

Two key questions were considered:

Do understandings in society and scientific literature warrant greater concern for the welfare of fish, and give cause to update the government's current policy position in this respect?

If so, question 2 follows:

What key aspects and developments can best be addressed to promote the welfare of fish, and what impediments are envisaged (if any)?

Nine categories of fish apply when answering these questions. The category of fish that live in the wild and are not caught is left aside here, as the focus of this report is on the direct interaction between people and fish. The following eight categories are addressed, however:

1. Pelagic sea fishing
2. Sea-floor fishing
3. Recreational fishing
4. Inland fishing
5. Aquaculture
6. Trade in, and the commercial husbandry of, ornamental fish (public aquariums)
7. Fish in private homes
8. Fish used in research (laboratory animals)

Many of the laws and regulations governing fisheries, aquaculture and trade in ornamental fish in the Netherlands are based on EU regulations. The Netherlands also has its own policy in this regard. Few regulations address fish welfare – no parts of the EU Common Fisheries Policy (CFP) address welfare directly, for example. In the Netherlands, the use of living fish as bait is prohibited on welfare grounds. The European Transport Directive

outlines the criteria applicable to the transport of living vertebrates, which includes fish. In order to keep fish as production animals, the species must be listed in the relevant appendix to the Animal Husbandry Decree (*Besluit houders van dieren*). To qualify for inclusion on the list, certain criteria must first be met, including some relating to welfare. The killing of animals (including fish) is also subject to EU regulations aimed at reducing pain and distress. Additional welfare regulations are under development in the Netherlands concerning the stunning of eel before they are killed. There is almost no legislation that applies specifically to ornamental fish, aside from the general care requirements outlined in the Animal Husbandry Decree. Traders are also obliged to inform non-professional customers of the care, housing, behaviour and costs of keeping a fish as a pet.

More fish welfare regulations exist in the private sector, such as the air transport regulations by the International Air Transport Association (IATA). Rules of conduct for recreational fishing are distributed by the Dutch Angling Federation (*Sportvisserij Nederland*) and for zoos by the Dutch Zoo Federation (*Nederlandse Vereniging van Dierentuinen*, NVD). Various privately organised quality marks for edible fish incorporate welfare regulations, and sector association Dibevo has a quality mark that includes aspects of animal welfare.

In terms of government policy, increasing attention to the welfare of animals (and specifically fish) has been observed in both the Netherlands and the European Union. In its Recommendations Concerning Farmed Fish (2006), for example, the Council of Europe stipulates that fish farmers must cater for the biological characteristics and needs of the animals under their care. Dutch policy, set down in legislation such as the recent Animals Act (*Wet Dieren*), regards fish as sensitive creatures to which a duty of care applies.

Ongoing scientific research is giving weight to the claim that fish can feel pain. In 2017, for example, the European Food Safety Authority (EFSA) argued that fish should be treated in the same manner as mammals and birds when it comes to consciousness and welfare. There are also major differences between fish species, and much of the necessary knowledge is still missing.

In society as a whole, fish welfare is still not as 'attractive' as the welfare of birds or fish, for example. Still, animal welfare organisations (along with the media) are devoting more and more attention to fish and their welfare. Existing sustainability characteristics continue to focus mainly on fish populations, however, rather than the welfare of individual fish.

In the Netherlands, respect for the intrinsic value of animals – which therefore includes fish – is set out in various laws. The Council believes that this entails a moral responsibility to show concern for the animals and their welfare, health and integrity. Additional interests and values are also at play, usually related to the context in which the animals are used and their status. All of the above should ultimately determine the extent to which we cater for the needs of animals, how we fulfil our duty of care and what level of animal welfare we wish to realise in certain practical contexts. For evaluation purposes, the Council recommends the One-Health Assessment Framework that it published in 2015.

The answer to question 1 is therefore as follows: Recent decades have seen much new published scientific research on, and increased attention in society to, fish welfare. The council believes that this additional knowledge and information, increasing social concern and technological developments constitute good reason to update the policy position regarding fish welfare. Fish welfare and integrity are aspects that are still considered too little in the treatment of fish, although there are many positive initiatives underway.

In response to question 2, the Council believes that greater attention to the welfare of fish is required in all categories. Respect for intrinsic value requires ongoing and thorough consideration of the fact that human actions involving animals have an impact on these animals, thereby conferring a moral responsibility onto humans. The first step for the government is therefore to draw up a fish welfare policy. The available policy instruments can be deployed to promote innovative good practices. The Council believes the best option is a tailored approach, where policy is implemented to improve fish welfare in collaboration with research, industry, professional practice and society. Professional practice in particular is essential in order to reach the fish welfare objectives. In this context, existing laws and regulations can sometimes stand in the way. Other impediments to fish welfare may include the following: the subservience of welfare to other considerations, such as the economy or ecology; the lack of information or its distribution; the lack of technologies and methods available for application in practice; and the relative lack of attention to fish welfare in the market and society.

When taking steps, it is important to take heed of the existing barriers in the relevant sectors. Interests vary between categories. The figure below lists both general and species-specific starting points for addressing the welfare of fish. These are intended as an initial means of support; in practice, a tailored approach will be necessary to fill in the details. It is up to individual parties to implement measures to improve the welfare of the fish in question.

General recommendations for all fish	Expand, extend and enhance all current developments pertaining to fish welfare, and encourage, support and provide opportunities for new developments.							
	Facilitate information provision and knowledge exchange (central coordination, between individual parties, tailored to audience, evaluation of effectiveness).							
	Enable research and innovation (generation of theoretical and practical knowledge), e.g. welfare as an assessment criterion, for all categories of fish in society.							
	Raise awareness throughout the chain (all direct links, from policy to practice, from research to society).							
	Create market supply and demand for welfare-friendly fish and fish products.							
	Pelagic sea fishing	Sea-floor fishing	Inland fishing	Recreational fishing	Aqua cultuur	Orna-mental fish Trade, commercial	Orna-mental fish In private homes	Labo-ratory fish
Category-specific recommendations	Selective fishing, welfare-friendly fishing using current or new techniques, stunning/slaughter methods, shorter time between catching and slaughter, quality marks that include fish welfare, national and international collaboration.	welfare-friendly fishing, quality marks that include fish welfare, shorter time between catching, stunning and slaughter, stunning before slaughter	Increasing fishing operators' knowledge and expertise, enforcement, and development of practical tools	Stockman-ship and management, increasing species-specific knowledge, knowledge exchange, welfare as a quality-mark criterion	Improving accessibility to health care, greater attention to welfare during transport.	Increasing knowledge about the impact of husbandry and care on the results of experiments	increasing species-specific knowledge, Increasing knowledge about the impact of husbandry and care on the results of experiments	

Conclusions and recommendations:

- The realisation that fish are sentient beings and acting accordingly must be more strongly emphasised in the catching, keeping and purchasing of fish.
- Fish welfare is a broad field with a significant degree of variation.
- The Council advises the government to do more to ensure acknowledgement of the intrinsic value of fish. Current knowledge allows for the inclusion of fish welfare as a pronounced element of policy, e.g. by including welfare as an integral component of new research projects (and their evaluation), broadening and accelerating current initiatives, promoting the generation and dissemination of knowledge, and identifying and eliminating the existing barriers in each sector.
- Dutch practice offers various initiatives capable of improving fish welfare either directly or indirectly. This is encouraging, and merits significant investments.
- The Council believes that, rather than by way of exception, welfare should be viewed as a standard consideration in decisions affecting fish.
- In view of the large numbers of fish being kept in the Netherlands, the Council advises wider availability of veterinary and zoological information in practice.

1. Introduction

1.1 Rationale and questions being addressed

In 2002, the Council on Animal Affairs (RDA) was commissioned by the State Secretary of Agriculture, Nature and Food Quality (LNV) to publish an assessment framework and admissions procedure for the designation of new fish species to be farmed for production purposes. Two years later, the RDA published a negative/positive list for reptiles, amphibians and fish to assist with the implementation of Article 33 of what was then the Animal Health and Welfare Act (*Gezondheids- en welzijnswet voor dieren*). In 2016 the advisory report on the 'Assessment Framework for Production Animals' (*Toetsingskader productiedieren*) was published, which also applies to fish (RDA, 2016).

Depending on how humans intend to use them, fish care falls under a range of laws and regulations. The existing laws and regulations currently make little to no mention of fish welfare. In a more generic sense, Dutch society is concerned with the ethical question of how we treat (and wish to treat) animals in general, and here, fish in particular. Attention to fish welfare has gradually increased in recent decades, in policy, research and society as a whole. Alongside countries such as Norway, the United Kingdom, New Zealand and Australia, attention to fish welfare in the Netherlands is increasing, in the aquaculture sector especially. In light of this, the Council has investigated fish welfare in greater detail.

This advisory report addresses two key questions:

Do understandings in society and scientific literature warrant greater concern for the welfare of fish, and give cause to update the government's current policy position in this respect?

If so, question 2 follows:

What key aspects and developments can best be tackled to promote the welfare of fish, and what impediments are envisaged (if any)?

1.2 Approach

This advisory report concerns only fish and excludes other forms of aquatic life, such as shellfish, crustacea and aquatic mammals. Nine categories of fish are identified, including one category of fish that live in the wild and are not caught by humans. This category is beyond the scope of this report, which focuses on the direct interaction between humans and fish. This does not change the fact that human activities and actions nonetheless impact on both these animals and their welfare, however. This report concentrates on the following eight categories of fish, in which fish are either under the care of humans or impacted by their actions.

These categories are:

1. Pelagic¹ sea fishing (trawling in particular)
2. Sea-floor fishing (cutters in particular)
3. Recreational fishing
4. Inland fishing
5. Aquaculture
6. Trade in, and the commercial husbandry of, ornamental fish (public aquariums)
7. Fish in private homes
8. Fish used in research (laboratory animals)

The two questions proposed in the paragraph above will be addressed separately. In order to answer the first question, a summary has been drawn up of the laws and regulations governing the various categories. Next, an overview is given of the current situation with regard to fish welfare from various perspectives: policy, science, society and the market, as well as sector practice. This information provides the basis for conclusions on whether current government policy on fish welfare requires updating. To answer the second question, we examine the welfare of fish and the attention devoted thereto from a range of perspectives. Lastly, this report makes policy and economic recommendations for the improvement of fish welfare in the Netherlands.

Various experts were consulted in the production of this report, and visits made to companies that work with live fish.

¹ Pelagic fish are those that live in schools and can be found throughout the water column, from just above the sea bed to the water's surface; often these fish do not approach the coast.

2. Fish

2.1 Categorisation

The world has more than 32,000 species of fish (Fishbase, 2017), and new species are discovered regularly. These species can be categorised in many different ways. For this report, fish have been categorised based on their human applications, which also assists in creating links with the policy areas under which they fall. This means that some species of fish will fall under multiple categories. One such example is the carp, which is kept in outdoor ponds by private individuals (as a pet), caught by recreational anglers (fishing), cultivated for consumption (aquaculture) and also used as a laboratory animal. In addition, to gain a wider perspective, the life cycle of fish has been divided into four stages, starting with the source. Fish are either farmed or caught in the wild; sometimes kept/stored, transported, and then (if intended for consumption) slaughtered. Table 1 shows a diagram of this process.

Table 1: Categorisation of fish by application and stage in their life cycle

Phase \ Category	Fishery ^{1,2,3,4}	Aquaculture ⁵	Companion animals ^{6,7}	Laboratory fish ⁸
Source of the fish	Caught in the wild	Farmed and limited caught in the wild*	Farmed and limited caught in the wild	Farmed and limited caught in the wild
Keeping the fish	-	Basins (aquaculture)	Aquaria / ponds	Laboratory-facilities
Transportation of fish	-	Tanks	Bags, tanks, special transport	
Killing of fish	On board***	Slaughterhouse**	Limited	

1. Pelagic sea fishing, 2. Sea-floor fishing, 3. Recreational fishing, 4. Inland fishing,

5. Aquaculture, 6. Trade in, and the commercial husbandry of, ornamental fish (public aquariums), 7. Fish in private homes, 8. Fish as laboratory animals

* eels in aquaculture are caught in the wild, many other species are farmed

** slaughter may take place on location at the fish farm

*** instead of slaughtering and taking fish home, recreational anglers often throw the fish back into the water

Fish husbandry draws a distinction in application between aquaculture and aquarium (ornamental) fish. Where the fish are intended for consumption, the goal is to give them as contented and healthy a life as possible, and to slaughter them as humanely as possible. Ornamental fish, on the other hand, are intended to give enjoyment for as long as possible; in their case, the goal is quality of life and longevity.

2.2 Fish numbers per category

Nearly all estimates of the (global) numbers of fish in each category are approximate and fall within a wide range. Based on the data available, table 2 offers an indication of the number of fish in each category.

Table 2: National and global fish figures per category

Category level	Fishery ^{1,2,3,4}	Aquaculture ⁵	Companion animals ^{6,7}	Laboratory fish ⁸
The Netherlands	4 x10 ⁹	5 – 17 x10 ⁶	18 x10 ⁶	Ca. 30.000
Global	0,97-2,7 x 10 ¹²	0,037-0,12 x 10 ¹²	Trade: 1,5 x10 ⁹ , in total much more	Not known*

1. Pelagic sea fishing, 2. Sea-floor fishing, 3. Recreational fishing, 4. Inland fishing, 5. Aquaculture, 6. Trade in, and the commercial husbandry of, ornamental fish (public aquariums), 7. Fish in private homes, 8. Fish as laboratory animals

* laboratory fish are not registered in all countries (e.g. the United States)

Source: Fishcount, 2017 (categories 1, 2, 3 4 and 5); HAS & FD, 2015 (6 and 7); OFI, 2017 (6 and 7); NVWA, 2016 (category 8)

There are various reasons why no exact numbers are available in any category. Fisheries and aquaculture often measure fish by weight instead of number, giving approximate values for categories 1-5. There is also much unregistered fishing and farming in addition to the registered volumes. Fishcount (Mood and Brooke, 2010; Fishcount, 2017) calculates the numbers based on the figures issued by the United Nations Food and Agriculture Organisation (FAO) and estimated weights of the fish caught. Some of the fish caught in the fishing industry are intended for the production of fishmeal and fish oil, serving as a raw material for aquaculture feeders. When estimating the number of fish in each category, the question arises of whether this portion should belong to aquaculture, or to the fishing industry. The number of fish being farmed for consumption continues to increase. In 1974 this proportion was only 7%; by 2014 it had exceeded 50% (FAO, 2016). In addition to consumption, fish are also caught for non-food purposes and to produce fishmeal and fish oil. The percentage of farmed fish (relative to the total fishing industry) was 44% in 2014, and is expected to exceed 50% by 2025 (FAO, 2016).

The aquarium sector (categories 6 and 7) also includes some unregistered trade and farming (Ploeg, 2005, among others). The Netherlands has several large wholesalers in ornamental fish that import predominantly from Asia, but also from other parts of the world. Some of these fish remain in the Netherlands, and some are exported to international markets (the largest being Europe). Estimates place the total annual number of commercially traded fish in the Netherlands at 5-6 million. Exchange and sale of fish also occurs among ornamental fish hobbyists. Private individuals tend to keep mainly

freshwater fish. Aquarium owners do not generally keep detailed data on the numbers of fish in their tanks or ponds. Dutch market research provides annual estimates for pet ownership in the Netherlands (HAS & FD, 2015).

Many countries require registration of laboratory animals (category 8). The regulations are not the same in all countries, however. The EU has regulations intended to create uniformity in registration practices (Directive 2010/63/EU); the first five-yearly reports are expected in 2018. The Experiments on Animals Act (*Wet op de dierproeven*, WOD) stipulates that it applies to living, non-human vertebrates, including larval forms capable of independent feeding (WOD, 2017). Regulations also exist for determining whether certain actions qualify as animal experimentation or not. These are described in the WOD. For example: catching and slaughtering fish specifically for the collection of otoliths (a part of the inner ear, used for determining age) is always classified as animal experimentation; collecting otoliths from commercially caught fish is not, however, and nor is doing the same with bycatch fish that die during the commercial fishing process. Commercial bycatch fish killed for their otoliths that would otherwise have been returned live to the water *do* count as animal experiments requiring a permit, however (CCD, 2017). Obligations to register laboratory animals vary greatly all over the world: laboratory fish in the United States do not require registration, for example, and in Canada all fish that are 'tagged' for fisheries research are registered as such. These major differences in registration make accurate estimates impossible.

Based on the data available (see Table 2), an indication can be given of the relative sizes of the categories. It is clear that all categories involve large numbers of fish, and the fishing industry would seem to be the largest category.

2.3 Laws and regulations

Because the fishing, aquaculture and ornamental sectors are international, many of the laws and regulations applicable to fish in the Netherlands are derived from European legislation. The Netherlands also has its own policy in this regard.

Fishing industry

The key legislation for professional sea fishing comes from the European Common Fisheries Policy (CFP), which governs the management of European fishing fleets and the preservation of fish populations (EU, 2017). The CFP was created for the management of a communal set of resources, and gives all European fishing fleets equal access to EU waters in order to promote fair competition. Populations can grow, however they are not

inexhaustible and overfishing does occur in some populations. The EU member states have therefore taken action to ensure that the European fishing industry is sustainable, and that it does not threaten population sizes or productivity in the long term. The CFP was implemented in the 1970s and has been revised several times since then, most recently on 1 January 2014

(https://ec.europa.eu/fisheries/cfp_nlhttps://ec.europa.eu/fisheries/cfp_nl). It contains no explicit sections on fish welfare. Welfare is addressed indirectly through the prevention of undesirable catches (in the interests of the fish that are not caught), and through the prohibition of specific catching techniques for ecological reasons (less bycatch, undersized fish and damage to the habitats of other forms of aquatic life). The CFP intends to ensure that the fishing and aquaculture industries are ecologically, economically and ethically sustainable. The Dutch government believes that the fishing industry must remain an economically healthy one which employs many people (rijksoverheid.nl, 2017).

Recreational fishing

Recreational fishing (category 3) is usually a leisure activity without any commercial interest. Under Article 21 of the Fisheries Act 1963, in order to fish in Dutch inland waters one must either be the owner of the fishing rights (the owner of either seigniorial fishing rights or of the land beneath the water, or be the lessee of the fishing rights) or have written permission from the owner of the fishing rights. Because most people themselves do not own fishing rights, recreational anglers are generally dependent on written permission from those who do. These are often angling associations that lease the fishing rights from the owner of the land under the water (a private individual, a municipality, the government etc.) or professional anglers (*Sportvisserij Nederland*, 2017). Legislation also includes a number of specific articles relating to this branch of sport (*Reglement voor de binnenvisserij* [Inland Fishing Regulations], *Uitvoeringsregeling visserij* [Fisheries Implementation Regulations]) that list prohibited fishing methods, permitted locations/times and minimum sizes for certain species of fish (any smaller and they must be thrown back). Fishing with live bait is also prohibited (i.e. living vertebrates and some Crustacea/shellfish); using live insects is permitted, however (Animal Husbandry Decree).

Aquaculture

Fish farming falls under the aquaculture category. Strategic guidelines for the aquaculture sectors were also published in the CFP 2013, with community priorities and general objectives applicable to the entire EU. Using the guidelines, the Commission and the member states are working together to improve production and competitiveness within the sector. The member states have been asked to draw up multi-year plans that aim to

encourage aquaculture. For fish farming, Council Directive 2006/88 EU (on aquaculture animals and the prevention of disease) contains provisions for keeping and trading in aquaculture animals and products thereof, including a permit obligation for aquaculture production and processing businesses (Commission Regulation 1251/2008). In the Netherlands, this Directive is implemented via the Regulation on Aquaculture (*Regeling aquacultuur*). The Transport Directive (1/2005) stipulates criteria that must be met when transporting live animals (including fish). Incidentally, this Directive only applies to the transport of animals for commercial purposes. Countries are free to establish stricter welfare requirements for the transport of animals within their own territories (Article 1.3). Most of the criteria applicable to fish as production animals under the Regulation on Aquaculture are described in general terms, as the needs of different species vary greatly. In order to keep fish as production animals, the species must be listed in Appendix II to the Animal Husbandry Decree, which currently contains 21 species.

Ornamental fish

There is virtually no specific legislation governing categories of ornamental fish (6 and 7). Fish kept as pets fall under the Animals Act (*Wet Dieren*), which applies to animals in captivity. Animals kept as production animals have a separate status under the Act. Requirements and guidelines have been included on the criteria applicable to animal care and husbandry. The Animal Husbandry Decree contains general guidelines on accommodation and care for animals (with the exception of fish as production animals). Not all of these are suitable for fish, and are more often directed at mammals and birds. The same Decree stipulates that when fish are sold as pets, the vendor must provide written information on accommodation, care, conduct and the costs of keeping fish to the new owners. On its website, the National Pet Information Centre (*Landelijk Informatie Centrum Gezelschapsdieren*, LICG) offers [pet information leaflets](#) on the most commonly kept fish species. Wholesalers also often issue this information to retailers. The Veterinary Medicines Regulation (*Regeling diergeneesmiddelen*) includes an article enabling the sale of specific small packages of medicines for aquarium animals, which were previously exempt from registration under the '5-gram rule'. Exactly which trade permit holders are allowed to do so, the small packages of antibiotics they are allowed to sell and under what conditions, are published in the Government Gazette (*Staatscourant*, 2017).

Laboratory animals

Laboratory animals are governed by separate laws and regulations. EU Directive 2010/63/EU includes criteria for the protection of animals used for research purposes. In the Netherlands, this Directive is implemented via the Experiments on Animals Act (*Wet op*

de dierproeven) and the Laboratory Animals Decree (*Dierproevenbesluit*). Specific attention must be devoted to the species-specific needs of fish, which include water flow and water quality, oxygen, nitrogen compounds, pH and salinity levels, temperature, light, noise, food and interaction, population density and environmental complexity. Fish must be slaughtered by means such as an overdose of anaesthetics (potentially following sedation) or after stunning. Catching wild animals for experimental purposes must be performed by a competent individual, using methods that do not cause any avoidable pain, suffering, distress or permanent injury. Animals that are injured or in poor health must be examined by a vet or other relevant expert, and measures taken to minimise the suffering of such animals.

Fish slaughter

If fish in any category are to be slaughtered, from a welfare perspective the means of doing so is deemed important. Council Regulation 1099/2009 (EC) concerning the protection of animals at the time of slaughter stipulates rules for slaughtering production animals or for culling purposes. Only Article 3(1) applies to fish: 'Animals shall be spared any avoidable pain, distress or suffering during their killing and related operations.' The remaining articles exclude fish, because a scientific recommendation and economic evaluation were still required at the time of writing. Recreational fishing is also outside the scope of the Regulation. In the Netherlands, this Regulation is embedded within the Decree and the Regulation on Animal Husbandry (*Regeling houders van dieren*), which lists the conditions under which non-production animals may be slaughtered.

Regulations explicitly mentioning fish

The Netherlands has a number of laws, decrees, schemes and regulations that apply to fish or to activities concerning fish. Regulations governing fish generally apply to a specific category. Table 3 lists the key laws and regulations for each category. To evaluate the extent to which fish welfare is represented in these and other laws/regulations, a search was conducted (in Dutch) on www.wetten.overheid.nl for the words 'fish' 'aquaculture' and 'laboratory animal' (*vis*, *aquacultuur* and *proefdier* respectively). Forty-five results were returned that included the term and were related to fish in the same sense as this document. Thirteen of these documents included a direct or indirect reference to fish welfare, such as the prohibition on using living vertebrates as bait, and appropriate fish husbandry. In general, it can be said that legislation contains little detail on the subject of fish welfare.

Table 3: Setting requirements for the welfare of fish in a number of key regulations and acts in a certain category (X = yes)

act/ decree / regulation	category	Fishery ^{1,2,3,4}	Aquaculture ⁵	Companion animals ^{6,7}	Laboratory fish ⁸
Animals Act and Animal Husbandry Decree			X	X	
Transportverordening (commercial transportation)			X	X	X
Regulation on Aquaculture (based on Regulation 2006/88 EG)			X		
Fishery Act		X			
Experiments on Animals Act (based on Regulation 2010/63 EU)					X
Fishing Regulations		X			

1. Pelagic sea fishing, 2. Sea-floor fishing, 3. Recreational fishing, 4. Inland fishing, 5. Aquaculture, 6. Trade in, and the commercial husbandry of, ornamental fish (public aquariums), 7. Fish in private homes, 8. Fish as laboratory animals

New policy

The Dutch government has announced that stunning eel prior to slaughter is to become compulsory. This requirement is not yet in effect, however, due to dependencies on the progress of the amendment to the Disease Specialists Decree (*Besluit diergeneeskundigen*) and the Animal Husbandry Decree (*Besluit houders van dieren*) (Parliamentary Papers, 2015).

New European policy is also under development that will influence fish, such as a new regulation titled the Animal Health Law that will enter into force in a few years' time. This regulation will not address animal welfare, however: 'The present regulation includes no provisions for the regulation of animal welfare. Animal health and animal welfare are related, however: improved animal health leads to improved animal welfare, and vice versa.' There are multiple references to the need to consider the welfare of animals, but without any explicit provisions.

Dutch policy also uses means other than laws and legislation to devote attention to fish welfare, such as information provision, research and funding.

2.4 Private-sector regulations, agreements and initiatives

It is not only the public sector that sets regulations; the private sector has also established relevant frameworks. This section presents four examples of agreements that have been made in the private sector that affect the welfare of fish.

Firstly, the International Air Transport Association (IATA) has made agreements regarding the transport of live animals by commercial airlines, in the form of the Live Animals Regulations (LAR). Examples include the requirements for transport conditions on the ground and in the air, and for how animals should be treated. The purpose of these regulations is to ensure the safe and humane transportation of live animals via aircraft.

A second example is offered by the codes of practice that have been drawn up in several sectors. The recreational fishing sector has produced the Fish Welfare Code of Practice for Recreational Fishing (*Sportvisserij Gedragcode Welzijn Vis*), based on the Code of practice for recreational fisheries by the European Inland Fisheries Advisory Commission (EIFAC) and FAO (www.sportvisserijnederland.nl) The Dutch Angling Federation also alerts its members to other aspects, such as the call in 2015 to refrain from releasing pond/aquarium fish into open waters. The Federation also employs enforcement officers, who monitor whether anglers abide by the code of practice.

The Dutch Zoo Federation (NVD, 2010) also has a code of practice, or Ethical Code, which puts top priority on animal welfare. Zoos constitute a separate group of ornamental fish keepers.

Initiatives exist to make animal welfare a part of quality marks for fish intended for human consumption; those by the MSC (Marine Stewardship Council) and ASC (Aquaculture Stewardship Council) are by far the biggest and most-well known. To date, animal welfare has been only a limited and indirect part of quality marks (see also Section 3.3). The Fish-Farming Eco-label criteria (*Milieukeur kweekvis*) include a number of welfare aspects, and the Better Living (*Beter Leven*) quality mark has set criteria for various species of farmed fish. Currently no fish farms have this certification, and at present there seems to be a lack of market demand. It does offer the opportunity for retail differentiation based on animal welfare, however.

Sector organisation Dibevo has created the Beloved (*Dierbaar*) quality mark for the pet sector, aimed primarily at promoting pet welfare. The Beloved ornamental fish criteria are relevant to wholesalers, retailers and koi dealers, and include requirements for accommodation and care for aquarium animals, and the qualifications of the carers.

3. Views on fish welfare: is there cause to modify the policy position?

This section addresses the first question, i.e. whether understandings in society and scientific literature warrant modification of the government's current position regarding pain and stress among fish.

3.1 Current policy position

The Dutch government supports European policy concerning fish welfare, which is seeing a trend towards greater attention in this regard. In 1997, in the Treaty of Amsterdam, the European Union officially stipulated that welfare is a key area of concern in how we treat animals that are sentient beings (EU 1997), a stipulation that was reinforced in the Treaty of Lisbon in 2007 (EU, 2007). The European Food Safety Authority (EFSA) has formulated a justification as to why fish should be included in this category (or should at least be given the benefit of the doubt) and why they are indeed sentient beings that fall under the obligation to protect.

The Council of Europe has published Recommendations Concerning Farmed Fish, which entered into effect in 2006. These regulations state that 'the basic requirements for the welfare, including health of farmed fish consist of good stockmanship, husbandry methods appropriate to the biological characteristics of the animals and a suitable environment, so that the conditions under which farmed fish are kept fulfil their needs'. This definition is linked to the European agreements on treatment of animals. There is no discussion of whether fish are self-aware or suffer emotional distress. In 2016, the European Aquaculture Advisory Council (AAC) was founded in order to fulfil the agreements in the CFP, staffed by industry representatives (60%) and other stakeholders, including NGOs (40%). One of the themes addressed by the AAC is the health and welfare of fish (AAC, 2017).

In 2007, the Netherlands published the Animal Welfare Memorandum (*Nota Dierenwelzijn*), which includes a vision statement from 2007-2011 regarding the key fish-welfare objectives. These include improvements to husbandry, transport and slaughtering of fish in aquaculture, an evaluation of the recreational angling code of practice, and more selective catching methods and reduction of bycatch in the fishing industry. The government desires European collaboration on 'fish welfare', and in the 2012 Animal Welfare Memorandum, explicitly mentioned research on the welfare of farmed fish including a focus on stunning methods prior to slaughter, and transport. The Netherlands also encourages domestic means of improving the lives of fish, initially through

commissioning research, and also through incentive schemes. In 2010, for example, the Sustainable Aquaculture Benchmark (*Maatlat Duurzame Aquacultuur*) entered into force, which has financial schemes attached that allow new or renovated fish farms that meet the benchmark to enjoy tax benefits. In 2016 the State Secretary sent an 'animal welfare status report' to the Dutch House of Representatives, outlining that the stunning and slaughter of fish is and remains a point for concern, for both the industry and the government. The report also referred to the experiment and trial on the stunning of three species of flatfish (plaice, flounder and sole) on board fishing vessels, and to the subsidy of eel-stunning equipment and the imminent obligation to stun eel prior to their slaughter. Lastly, the report refers to high-quality water for farmed fish. Based on research, Wageningen UR has determined limit values for the water quality parameters (ammonia, nitrate and nitrite) of farming water for Clarias and African catfish, and an ammonia limit value for European eel and pike perch. Research is also underway into nitrate and nitrite limit values in eel-farming water (Parliamentary Papers, 2016). In 2018, the Ministry for Agriculture, Nature and Food Quality (LNV) approved five Aquaculture Innovation grant applications, some of which explicitly include welfare aspects.

The European Union has introduced the landing obligation, which stipulates that the fisher must also transport bycatch to the shore under certain conditions. This obligation is now being implemented in the Netherlands. For several years, the government has commissioned research from Wageningen University & Research on the effectiveness and impact of the landing obligation on fisheries, fish populations and ecological conditions. Animal welfare is affected both directly and indirectly in this respect (the welfare of fish and other forms of aquatic life that are not caught, for example, or the duration of the suffering of injured fish).

The position of the Dutch government is that animals – and therefore fish – have intrinsic value. Article 1.3 of the Animals Act defines the recognition of intrinsic value as: ' [...] the recognition of animals' integrity as sentient beings. In drawing up rules under or pursuant to this Act, and in taking decisions on the basis of these rules, due consideration shall be given to the impact of these rules or decision on the intrinsic value of the animal, notwithstanding other legitimate interests. In all cases, any violation of the integrity or well-being of animals, beyond what is reasonably necessary, shall be avoided and the care reasonably required by the animals guaranteed.' The implication of this recognition is that policy take it into account.

In summary, Dutch policy sees fish as sentient beings, to which we have a duty of care.

3.2 Scientific perspective

Much research is conducted worldwide on animal welfare, and often focuses on the neurobiology, physiology and ethology of animals. Much of the focus on fish is concerned with whether they are aware of stimuli, and whether they produce positive or negative responses. Major differences have been observed between fish species, which is one reason why extrapolation of data across species is not always justified (Braithwaite et al., 2013). Fish welfare is therefore a large field, encompassing a significant degree of variation. The stimuli to which a species is exposed also have meaning within the context of the animal's natural habitat. There are still many gaps in our knowledge on the welfare of fish. Many methods are available that can be used to detect welfare (e.g. Van de Vis et al., 2012). Recent years have seen a shift from research on feeding/other behaviour, endocrinology and combinations thereof, towards studies on emotion and cognition in fish (Braithwaite et al., 2013; Cerqueira et al., 2017). Research on fish welfare increasingly employs new techniques (Martinez, 2015; Van de Vis et al., 2012;). There are still many gaps in our knowledge on the welfare of fish, as most measurements have only been taken from a limited number of fish species.

As previously mentioned, scientists are still in debate regarding whether fish can feel pain, however there is more and more scientific evidence to suggest that this is indeed the case. It has also been confirmed by the EFSA (European Food Safety Authority) and OIE (World Organisation of Animal Health) (EFSA, 2009a; OIE, 2017). Many reviews of this topic have been conducted (incl. Sneddon, 2015; Rose et al., 2012; Braithwaite & Ebbesson, 2014), and many articles on fish welfare also commence with a brief review of this literature. Experiencing pain requires both a nociceptive system and the capacity for mental awareness. Nociception refers to an organism's ability to perceive tissue damage, or the threat thereof. Doing so requires the presence of certain structures within the animal. Studies by Sneddon (among others) have shown that fish do indeed possess these structures (o.a. Sneddon & Gentle, 2002; Sneddon et al., 2003; Sneddon, 2015). Based on what is called the 'analogy postulate' (which takes comparable anatomy, physiology and behaviour between humans and other animals as the basis for the existence of comparable subjective experiences) and on homology (shared evolutionary origin of structures), it is now widely agreed that fish do experience pain in some form. Fish have nociceptors (Sneddon, 2003, 2015), respond to injurious or painful events (Reilly et al., 2008), respond positively to analgesics (Sneddon, 2003) and can learn avoidance behaviour (Yue et al., 2004; Dunlop and Laming, 2006), all of which points to the conscious awareness of pain. Fish also have a variety of cognitive capacities that aid them in undesirable situations (Pyanov, 1993). Siamese fighting fish (*Betta splendens*)

demonstrate different behaviour towards others of their species, depending on whether they have seen these others winning or losing fights with other fish (Oliveira et al., 1998).

As mentioned above, however, there are major differences between fish species, where the evolutionary utility of structures and functionality are relevant to their further development. When exposed to pain stimuli or disturbing behaviour, fish display physiological and ethological stress responses comparable to those of mammals (Sneddon, 2003). Little is still known about the over 30,000 species of fish, however there are clear indications among those that have been investigated that this consciousness does indeed exist. Some fish in this category include trout, eel, catfish, salmon, zebra fish, Siamese fighting fish, and others. Different species also respond in very different ways (Braithwaite et al., 2013; Ebbesson and Braithwaite, 2014; Rey et al., 2015; Damasio and Damasio, 2016; Reilly et al., 2008, and others).

In 2009, the EFSA concluded that the concept of welfare is relevant to all vertebrates, including fish (EFSA, 2009a). These animals have the right to a certain level of protection, as outlined in the Treaty of Amsterdam (EU, 1997) and later in the Treaty of Lisbon (EU 2007). Our knowledge of mammals and birds far exceeds our knowledge of fish, as there has been far less research conducted on the latter (EFSA, 2009a). In a 2017 report on animal consciousness, the EFSA stated that fish should receive the same treatment as mammals and birds with regard to consciousness and welfare (EFSA, 2017).

Under the precautionary principle (i.e. the principle stating that the likelihood of animals suffering pain also be avoided as much as possible) there are therefore good arguments for minimising potential pain (De Jonge et al., 2015). Or, as posited by Maximillian Padden Elder (2014) in his article titled 'The Fish Pain Debate: broadening humanity's horizon': 'The science behind fish sentience has advanced to the point where a serious discussion on the human-fish relationship is warranted. It is argued that enough scientific evidence exists to provide evidence for fish sentience and suffering. However, for those unconvinced in light of both scientific and popular consensus, the precautionary principle, where we treat fish as if they may suffer, will ultimately be advocated as an appropriate approach for fish welfare.'

The question of how we as humans wish to treat fish also has an ethical component. An overview of the moral status of farmed fish is given by Bovenkerk en Meijboom (2012), for example.

3.3 Social perspective

Attention in society to the welfare of fish intended for human consumption is limited, but would seem to be on the rise (*Vismagazine*, 2003; Nieuwenhuis, 2017). Whereas welfare plays a major part in the success of meat and poultry quality marks in supermarkets, welfare is virtually never mentioned in the quality-mark criteria for fish products. In stores, Dutch consumers prefer not to be able to recognise what animal each product comes from, however they purchase whole fish – including the head and tail – without a problem. The consumer experience of fish would seem to be clearly different than for pork, rabbit or chicken.

This distinction between mammals and birds on the one hand and fish on the other is also evident in the consumption of meat or fish. Some people who claim to be vegetarian still occasionally eat fish. In a recent Belgian study, one-quarter of respondents either 'agreed' or 'leaned towards agreement' with the statement that 'fish consumption is also vegetarian' (Mullee et al., 2017). People can become vegetarians for health reasons, due to ethical objections to the consumption of meat, or to promote sustainability. Among these three reasons, people generally see more reason to avoid eating beef, pork and chicken than to eliminate fish from their diet. Consumption of fish is also promoted more often than meat: the Health Council of the Netherlands (*Gezondheidsraad*, GR) and the Netherlands Nutrition Centre (*Voedingscentrum*, VC) recommend eating (oily) fish at least once per week (GR, 2017; VC, 2017).

Mammals seem to elicit more empathy from humans than fish – even aquatic mammals rank more highly on the empathy ladder than fish in the same oceans (FAWC, 2014). Labels on cans of tuna state that the tuna catch is dolphin-friendly, however there is nothing about how the tuna ended up in the can. The Better Living (*Beter Leven*) quality mark, which many Dutch retailers set as a purchasing criterion for many meat products, also has criteria applicable to farming several fish species (Van de Vis et al., 2013). The fishing and fish farming industries generally operate within a global market, led by the worldwide ASC (Aquaculture Stewardship Council) and MSC (Marine Stewardship Council) quality marks. These marks generally do not contain any direct welfare criteria. MSC focuses on the sustainable catch of traceable, wild fish. Three principles apply: maintaining healthy fish populations (no overfishing), minimum impact on the ecosystem, and good fisheries management (regulations, implementation, compliance, enforcement, knowledge). In terms of sustainability as a broad concept, these are already major steps. The welfare benefits lie in the fish that are left in the oceans, and the protection of their habitats. The ASC's objective is to reduce the impact of fish farming on the environment.

The quality mark specifies regulations for limiting the use of antibiotics, more sustainable fish food and better working conditions for staff. The fish food contains less fishmeal and more plant-based matter, which offers welfare benefits by reducing the volumes of caught fish necessary for feeding fish in farms.

There are several international labels that incorporate welfare as an explicit element, such as RSPCA-assured (previously Freedom Food) for salmon and trout in the United Kingdom, *Naturland* that has criteria for biological aquaculture, and Global GAP.

Social organisations that promote animal welfare (such as the Dutch Society for the Protection of Animals, *Wakker Dier*, the Dutch Society for the Protection of Fish and Eurogroup for Animals) maintain a clear standpoint on fish: like mammals and birds, they have consciousness and sentience, and more care should be taken to ensure their welfare (*Vissenbescherming* 2011, *Wakker Dier*, 2015, and others). These organisations raise the issue of individual fish welfare, and to a lesser degree the issue of overfishing in certain fish populations. Organisations such as the World Wide Fund for Nature (WWF) value fish populations over individual fish. The WWF was at the inception of the MSC and ASC sustainability labels. In the Netherlands, the WWF collaborated with the North Sea Foundation (*Stichting De Noordzee*) to launch *Viswijzer* (Fish Smarter), which aims to give consumers clear information on the impact of fishing or farming on the environment and fish populations. It has become both a successful instrument and a practical tool for use in retail and the catering sector. In 2007, supermarkets gradually ceased selling certain species of fish, such as eel and butterfish. Eel started making a slow return to stores in 2017, under the Sustainable Eel Fund label (*Duurzame Paling Fonds*) by the Dupan foundation, an organisation that focuses on helping eel populations. The label means that the producer has made a contribution to maintaining eel populations, or to research thereon.

The media is also devoting increasing attention to fish welfare, often focusing on fish, fishing operators and consumers (Nijland, 2012; de Vré, 2015; Nieuwenhuis, 2017, among others).

3.4 Commercial perspective

The Dutch activities affecting the eight categories of fish listed in Section 2 nearly all form part of a global network. The degree of self-sufficiency in ornamental fish in the Netherlands is low; certain species of fish are imported for consumption, however more fish are exported on balance.

Fishing industry

The fishing industry is a sector with a long history in the Netherlands. The sector for fish intended for consumption and the production of fishmeal/oil is currently driven by strong international forces. The Dutch fishing industry focuses almost exclusively on fish for consumption, with the size of the sector and fleet governed by the applicable fish quotas. Countries do have the capacity to innovate themselves, potentially in collaboration with other countries. As a rule, fishing with electricity is prohibited in the European Union, although the EU has issued a temporary exemption for electric pulse fishing (using a brief electric surge). Within this exemption, the Netherlands has developed a pulse fishing technique for flatfish, which must be startled into the net. Traditionally this is accomplished using a bottom trawler; the difference between bottom trawling and electric pulse fishing is that bottom trawlers startle the fish by dragging chains over the sea floor, whereas electric pulse fishing does so using electric jolts. Approval of this technique is still under discussion within the EU.

Quality is of economic importance when selling fish for consumption, which is affected by the methods used for the catching, on-board management and processing of fish. Preventing harm to the fish throughout this process improves their quality and shelf life (Esaiassen et al., 2013; Olsen et al., 2013 and 2014). With this in mind the catching, management and slaughter methods used are key elements that also impact fish welfare. The understanding of the importance of fish quality is another influencing factor. Improved quality is currently no guarantee of higher prices (Sogn-Grundvåg en Henriksen, 2014).

The global fisheries and aquaculture supply chains are extremely competitive, and cost prices are generally the definitive factor in keeping businesses afloat. Mutual competition between fishing operators and farmers can also be so strong that it impedes collaboration, in turn limiting opportunities for innovation and market influence. Although there have been initiatives in the past that aim to take control of niche markets in stores via specific product or process characteristics, such initiatives have as yet not led to large-scale successful long-term results. The exceptions are ASC and MSC, whose success is partly due to their international implementation and the purchasers' support base.

Aquaculture

Over recent years, aquaculture in the Netherlands has seen many small, local initiatives aimed at more sustainable farming practices. Many of these run aground due to economic factors, but occasionally fail for other reasons, such as inadequate available expertise or limited opportunity to implement plans. However, despite the Netherlands' relative lack of experience in aquaculture (with the exception of eel) and small production volumes, the

high-quality fish-farming sector is a large one. Examples include the farming of pike perch, turbot and yellowtail kingfish in recirculation systems.

Recreational fishing

Recreational fishing is a unique part of the fishing sector. To fish in public waters, anglers must own a fishing permit: these are purchased annually, and allow fishing under specific circumstances related to the fishing equipment used, fishing times, locations, and the species that may be caught. They also prescribe which fish must be returned to the water, and which may be taken home. The Recreational Angling Code of Practice (*Sportvisserij Gedragscode*, which is based on the EIFAC/FAO Code of practice for recreational fisheries) includes the following provisions regarding fish welfare: 5. The fish caught must be either immediately returned unharmed to the same waters or, if intended for private consumption or use as bait, be immediately killed (via a strong blow to the head). The Code also specifies how caught fish are to be treated, in terms of both hook removal and prior to slaughter for consumption. The Dutch Angling Federation thus contributes to the better treatment of fish, and conducts its own enforcement activities (*Dutch Angling Federation*, 2015).

Ornamental fish

In addition to price, exclusiveness is also a relevant factor in successful ornamental fish supply chains. Prices are higher for rare fish species. The range of advanced aquariums and associated equipment available from pet stores has broadened in recent years. For example, there are systems that monitor water quality and automatically refresh the water as necessary. The aim when keeping ornamental fish is to give them a long and healthy life, in order to enjoy them for as long as possible. Retailers and commercial keepers (such as farmers, stores and commercial fish husbandry) often possess specific expertise regarding the fish. For consumer retailers, it is appealing to keep ornamental fish in visually attractive aquariums that often include vegetation and opportunities for concealment. Wholesalers, too, often generally provide concealment opportunities for species that require it. This sector also concentrates on selling live, healthy fish.

When selling to consumers, less information is available on the habitat and care provided for the fish. This group of fish keepers is heterogeneous, and varies from passionate hobbyists who spare no expense or effort, to less committed fish owners. Owners are sometimes confronted with a lack of good-quality information or reliable knowledge on certain species of fish. There are now specialist retailers where lots of information is available, via QR-codes on tanks and the like. Less committed ornamental fish owners are

generally difficult to contact via the regular channels (Sullivan, 2014). In practice, pet owners' lack of knowledge and motivation is one of the main risk factors impacting fish welfare (Steiger, 2006, among others). The provision of information to private individuals who keep fish often runs via specialist pet stores, societies, forums and the internet. Relatively few fish are ever brought to the vet, and many vets' knowledge of fish is therefore very/extremely limited. Specialist stores do stock small quantities of medicines specifically for treating fish with health problems, however. The available knowledge on the living conditions and state of welfare among ornamental fish in private homes is limited, making research on this topic difficult. The Board of Associated Inspectors (2017) that operates under the Dutch Aqua Terra Association (*Nederlandse Bond Aqua Terra*) has developed inspection guidelines (*keurwijzers*) for conducting home aquarium and terrarium inspections (<http://www.cbkm.nl>). Using these guidelines, aquariums are evaluated according to many different aspects (including welfare criteria for fish) and the owners receive recommendations on how to make the habitat better and healthier for the fish. Members can register for an inspection voluntarily.

3.5 The implications of recognising intrinsic value

The intrinsic value of animals (including fish) is mentioned in the Experiments on Animals Act (*Wet op de dierproeven*, 1977) the Flora and Fauna Act (2002) and the Animals Act (2013), and refers to recognising the value of an animal in and of itself, regardless of its utilitarian value to humans. To the Council (RDA, 2017) this means the following:

'Respect for intrinsic value requires ongoing and thorough consideration of the fact that human actions involving animals have an impact on these animals, thereby conferring a moral responsibility onto humans. Acknowledgement of the intrinsic value of animals requires that actions involving animals be continually justified, and our duty of care fulfilled. The recognition of intrinsic value does not exclude the possibility of using animals for human purposes, however it does imply upholding the "no, unless" principle as a starting point when considering the treatment of animals. The first question that arises in this context concerns whether our treatment of animals is also in the interests of the animal, and therefore demonstrates respect for intrinsic value. If the use of animals is not in the interests of the animal, a justification for the activity is required' (RDA, 2017).

Recognition of animals' intrinsic value confers a moral responsibility to show concern for the animals and their welfare, health and integrity. This responsibility is not context-dependent, unlike the concrete implementation of the ensuing duty of care, which can take many forms depending on the context. Animal health, welfare, integrity and individuality

will all depend, in part and to varying degrees, on the adaptability and natural behaviour of the animal or group of animals in question. Social ethics incorporates views on the relationship between humans and animals, which may vary over time and across categories. The integral consideration of values within a specific usage/other context will ultimately determine how the duty of care should be implemented, what limitations are imposed on the animal, and the extent to which they require the animal to adapt in terms of behaviour or physiology. Both scientific knowledge of animals and social ethics should be included in this consideration. A diagram of the above is given in Figure 1.

Figure 1: The relationship between the concepts of intrinsic value and duty of care (RDA, 2017).

The animal is the focus of intrinsic value. And although animals have the same basic needs regardless of their living conditions (a carp is still a carp, whether it is a pet, a production animal, laboratory animal or lives in the wild), there are more interests and values involved than those of the animal alone. These are usually related to the context in which the animal is used and its status, e.g.:

- the purpose for which the animal is being kept (for consumption, companionship, entertainment, nature preservation, as a hobby/relaxation, research);
- status attributed to the individual or group of animals; this will depend, in part, on the level of personal connection with humans, which seems to be lower for fish than for mammals;
- the information available on the animal;
- the size of the existing population of the species; and
- economic, ecological, egocentric, cultural and other interests/values.

All of the above ultimately determines the extent to which we cater for the needs of animals, how we fulfil our duty of care and what level of animal welfare we wish to realise in certain practical contexts. Transparency on these considerations is important in order to demonstrate the basis on which decisions are taken, and also increases awareness of the consequences of these decisions. Fish intended for consumption must be slaughtered, for example. Fish used as laboratory animals for toxicological research will be exposed to toxic substances. The Council believes that ethical considerations must always play a part in deciding the acceptability of reduced welfare due to human actions.

One assessment framework for facilitating this process is the One Health framework published previously by the RDA, which can be used when making policy decisions. To be

clear: policy is not only pursued by the government – companies, organisations and individuals also make their own 'policy decisions', with varying degrees of awareness and consideration.

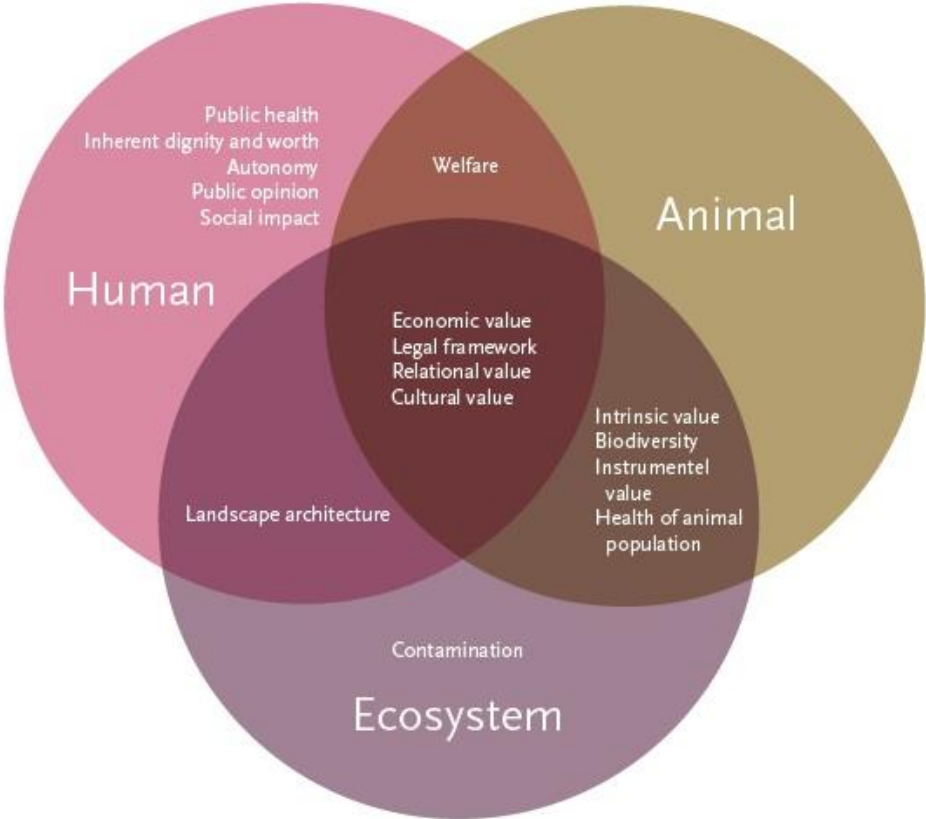


Figure 2: The One Health assessment framework, which incorporates all interests as part of decision-making

3.6 Conclusion to question 1: Is there cause to update the government’s current position?

The first question presented in the introduction to this report was:
Do understandings in society and scientific literature warrant greater concern for the welfare of fish, and give cause to update the government’s current policy position in this respect?

Yes. Recent decades have seen much new published scientific research on, and increased attention in society to, fish welfare. New scientific advances have confirmed the Council’s position from 2003, which states that fish experience forms of pain, anxiety and stress (RDA, 2003).

There is no recent policy that explicitly takes the welfare of fish into consideration and distinguishes between the various purposes and applications of fish. The additional data and information available on fish neurology, physiology and ethology, the increasing level of social concern, and technological advances all give cause to update the policy position on fish welfare.

Based on its previous position paper on fish welfare, the aforementioned scientific and social insights and the implications of allocating intrinsic value to fish, the Council concludes that the treatment of fish still caters inadequately for their welfare and integrity (although there are some positive initiatives in this regard). Based on the considerations in this Section, the Council would also like to call on both the public and private sectors to devote active attention to fish welfare. Other relevant parties and stakeholders may also play an active role.

4. Towards improved fish welfare

After responding to the first question in Section 3, this Section addresses the second question posed in Section 1.1 concerning the key aspects and developments for improving fish welfare, and any envisaged barriers thereto.

4.1 Welfare indicators and risk factors

4.2 Indicators

Animal welfare is often associated with the five freedoms drawn up by the Farm Animal Council in 1993, which are based on the work of the Brambell Committee (1965) and are also referred to in the Animals Act: ‘... the reasonable care provided to animals should at least include freedom from: a) thirst, hunger and malnutrition; b) physical and physiological discomfort; c) pain, injury and diseases; d) anxiety and chronic stress; and e) freedom to express normal behaviour, to the extent that such can be reasonably demanded’ (Animals Act, 2017). These freedoms constitute the basis for many welfare assessments. Recent years have seen the development of another concept – Welfare Quality – which offers an even better means to ensure animal welfare (Korte et al., 2007, among others). This concept also incorporates animals’ adaptability, and their living conditions (RDA, 2017). The EU Welfare Quality project has produced a Europe-wide protocol for assessing animal welfare: it is an extension of the five freedoms, and is based primarily on the characteristics of animals and measurements taken from them (WQ website, 2017).

Welfare Quality involves four principles and a total of twelve criteria. The principles are: good feeding, good housing, good health and appropriate behaviour. There are currently no Welfare Quality protocols for fish; the development of the Better Living criteria has provided a springboard for doing so (Van de Vis et al., 2013).

Due to practical considerations, research and practice often use factors related to health and physiology in order to assess welfare. In production animals, production characteristics (such as reproduction, growth and mortality rates) are often recorded and used as welfare indicators. The emphasis generally lies on animals kept in captivity that are at the disposal of humans for longer periods. In the case of fish, this means reservoir and aquarium animals being kept in fish farms, zoos and private homes. The freedoms also apply, however, to other fish while they are at the disposal of humans. The fish caught by recreational or commercial fishers are also at the disposal of humans, and from the moment of their capture are essentially ‘in captivity’ (see also the Explanatory Memorandum to the Animals Act on this topic). Power of disposal brings responsibility. We

also have a responsibility to non-captive animals: these also have the right not to be mistreated, and deserve to be properly cared for as necessary. This also requires human intervention, which may be inconsistent with the 'hands-off' principle. An evaluation of the circumstances is therefore needed (Parliamentary Papers, 2008).

The five freedoms provide the basis for measuring the extent of welfare (or violation thereof). However, as mentioned above, knowledge has advanced and improved frameworks are now available (Korte et al., 2007). A more detailed process for assessing the welfare of fish in specific situations is desirable. Due to the enormous variation in fish species, it is impossible to state in general terms what all fish require in terms of welfare. Providing for the five freedoms will require further specification per species (or family of species). Consider mammals, for example: there is no general set of regulations that simultaneously applies to dolphins, giant pandas and sheep. And so pigs, laying hens and calves all have their own specific legislation when it comes to housing and care. To date, most research has focused on the needs of individual fish species in farms, and practical housing and care information is available for a large number of aquarium fish (National Pet Information Centre (LICG) website, 2017). More detailed criteria on other fish species will require more research.

4.3 Risk factors

Key welfare risks can be provided in general terms, based on the various life-cycle stages and common activities performed involving fish. The details and priority of the various risk factors will vary from species to species. For example, a richer environment is more important for ornamental fish (whose natural habitat is the coral reef) than for fish that come from the ocean; the movement needs of these two types of fish, however, may be a different story entirely. The various aspects will therefore impact the welfare of different species in different ways.

Broadly speaking, it can be said that any aspect that threatens any one of the five freedoms can be considered a risk factor. Many authors and organisations have conducted risk assessments on the welfare of fish in captivity (incl. Cook, 2016; Johanson et al., 2006; Van de Vis et al., 2013). The common elements are those listed below, which could be specified in greater detail for each species and category. Such is outside the scope of this report, however. The Council initially examined whether there is enough common ground to say anything at all about fish welfare. The next step is to look at potential measures, and how to get welfare higher up on the agendas of the relevant parties.

Catching fish in the wild involves the following potential risk factors:

- the catching method;
- treatment after catching;
- the impact on the ecosystem and habitat of fish that are not caught;
- slaughter methods (and, if these are not instant, the potential lack/inefficacy of stunning methods) for fish intended for consumption; and
- transport of fish that are traded live, such as ornamental fish. These fish actually fall under the category of fish in captivity, however due to their origins, transport is also included as a risk factor for sea fishing.

Fish held in captivity involve the following potential risk factors:

- selection and breeding of fish (including those bred for external characteristics);
- feeding (diet, how food is administered, volume per individual);
- water quality;
- sub-optimal population density;
- inadequate/unsuitable diet or habitat;
- management (e.g. sorting);
- predation (for fish in unprotected open waters);
- health (including the risk of anti-bacterial resistance);
- transport; and
- slaughter methods (and, if these are not instant, the potential lack/inefficacy of stunning methods).

Activities may also affect the welfare of fish other than those being targeted in the supply chain. Examples include the prevention of bycatch (*not* catching fish ensures the *avoidance* of discomfort) and tailoring aquarium/reservoir conditions to one particular species, while other species also live in the same waters.

It lies outside the scope of this report to specify all risks for each category and the most common fish species, however this will be necessary in order to identify the major risks and to eliminate or mitigate them. This has already been done for several species, including eels and catfish (EFSA, 2008, 2009b).

Some starting points can also be given for each category. Converting these into actual improvements (reducing risks and threats to welfare, producing alternative methods, etc.) will also require the inclusion of other relevant aspects.

4.4 Starting points

The starting points will therefore be different for each category, depending on the current state of affairs and other objectives. This section lists several potential starting points for modifying policy in order to benefit fish welfare.

Fisheries: commercial fishing

Commercial fishing places fish at human disposal for a relatively short period: from the moment they are netted or hooked (or otherwise captured) until they die, after which point their welfare is no longer of any concern.

In commercial fishing, the length of time between capture and death is therefore a good place to start for improving fish welfare. It could either be shortened, or treatment methods modified to remove threats to welfare, e.g. the length of the trawl, net-emptying frequency, net types, speed during fishing and the way fish are brought aboard. Fish processing (e.g. stunning) and slaughter methods also present opportunities for improvements. These aspects can also serve to improve the quality of the fish itself (less damage to fish = improved shelf life) and penetrate new, higher market segments, in northern Europe in particular. Fish quality and animal welfare are not incompatible, and the combination can also bring economic benefits. These aspects are not expected to see implementation in practice in the short term.

Fisheries – recreational fishing

In recreational fishing, the expertise of the angler has a large impact on fish welfare. Being removed from the water is always a stressful experience for fish, and how they are handled partly determines the extent of their distress. Catching and handling methods also continue to impact the welfare of fish after they are returned to the water. Failure to consider these aspects is often no reflection of unwillingness to do so, but rather a lack of the necessary knowledge or expertise. The same applies to the risks of leaving hooks, lines or nets behind in fishing spots or excessive feeding with bait, which also presents welfare risks to other animals such as birds. Progress can be made by educating the entire target group as a whole. Information and training are important aspects of recreational fishing, including compliance with guidelines such as the Code of Practice.

Aquaculture

In a general sense, husbandry, transport and slaughter are the key welfare aspects in aquaculture. In recent years, both the sector and the government have invested in implementing appropriate stunning methods for the fish species most commonly farmed in

the Netherlands. Water quality is also an aspect of increasingly greater interest. This trajectory can be continued and accelerated. The market plays an important part in the marketing of animal welfare as a purchasing criterion or requirement for entry to a higher market segment. Existing quality marks and assessment frameworks (such as ASC and *Better Living*) are suitable in this regard.

Sharing knowledge is of particular importance when it comes to new species. Species that appear on the list of acceptable production animals may be immediately farmed by anybody who applies for a permit. Collaboration and the exchange of knowledge and information prevent these farmers from having to reinvent the wheel each time. The Netherlands Enterprise Agency (RVO) is responsible for the application process for adding new species to the production animals list, in which animal welfare is a key criterion. The RVO has no template available that lists the necessary welfare aspects/criteria. Each application is assessed on its merits individually, by a panel of independent experts. Living habitat is an element relevant to fish in captivity (water quality, environmental complexity, population density), and transport/slaughter methods are priority aspects.

If the Netherlands wishes to be a leader in aquaculture expertise, a well-organised sector of sufficient scope will be essential. It is up to policy and practice to realise these conditions, in which fish welfare is a potentially distinguishing feature.

Ornamental fish

Distribution of information at points of sale (among other channels) is a legal obligation, and should be enforced (RVO, 2017). This obligation is addressed in a wide variety of ways, ranging from failure to fulfil it entirely (Animal Welfare Web [*Dierenwelzijnsweb*], 2017) to the provision of both written and oral information, advice and aftercare. In-store products and methods for keeping and caring for fish are important at points of sale, to serve as examples for potential buyers. The *Dierbaar* (Beloved) quality mark is already taking advantage of the higher levels of knowledge and expertise available at specialist retailers.

Little is known about the welfare of fish kept by private individuals; it is assumed that most fish owners make an active effort to care for their fish as well as possible. The welfare of ornamental fish benefits from more knowledgeable and competent owners. One oft-overlooked aspect is the killing of fish by their own owners (e.g. in cases of serious illness). In addition to effective methods, the internet also promotes bad methods for doing so, such as putting fish in the freezer, flushing them down the toilet, or releasing

them into surface waters. These last two also constitute a risk to both public health and ecology, even if the fish are already dead when they are flushed/released. The Dutch Angling Federation has also advised against releasing aquarium fish into open waters (Dutch Angling Federation, 2015), which can have major consequences. The government in Alberta (Canada), for example, has launched a major campaign to inform the public of the dangers of releasing aquarium/pond fish into open waters (Alberta Government, 2015).

The fish most commonly kept as pets are goldfish, guppies and the cardinal tetra. In 2003, it was estimated that twenty million fish were sold annually via pet stores and other channels (Kersbergen et al., 2003), with roughly the same number being kept as pets (RDA, 2006). Estimations put the number of ornamental fish in the Netherlands at around eighteen million (HAS & FD, 2015). In recent years, between 17 and 27 million ornamental fish were imported annually via Schiphol airport (in 2016 and 2012, respectively) (Zomer et al., 2015 and Tafro, 2017). This does not include those fish that entered the EU via airports such as Frankfurt or Brussels and were then transported to the Netherlands. While some of these fish are intended for export, the remainder stay in the Netherlands and are sent to retailers, such as pet stores or garden supply centres with animal departments. Private trading also takes place via other channels, such as exchange or sale among hobby breeders. The scope of this avenue is not known, but is smaller than the sales via regular commercial channels. It is difficult to get a clear idea of the exact number of ornamental fish sold annually via each channel based on the data currently available. Based on the above information, the average lifespan of ornamental fish cannot be determined without further research. There is a large degree of variation in the maximum lifespan of ornamental fish, due to the nature and origin of the range of species kept in the Netherlands. Arriving at an average age would therefore require a calculation, and such a figure would still reveal nothing about the way these animals are kept. Additional research is required to get a better idea of the current situation, including the potential risks and ways to mitigate them.

Laboratory animals

Analogous to keeping livestock, the requirements for the husbandry of laboratory animals and animals for consumption/as pets vary widely. Methods for keeping and treating fish affect the performance and results of the research. The requirements of housing and care of fish as laboratory animals vary between species. This aspect requires ongoing attention, and research on the specific aspects of each species is therefore necessary. The representativeness and reproducibility of animal experiments is partly dependent on the

animals' background and care, and differences in response between individuals (incl. Rey et al., 2015).

4.5 Current developments towards improved welfare

In all categories, developments are underway that will improve fish welfare, and include various initiatives by the government, representatives, companies and individuals to raise awareness of fish welfare. Some examples are given here, in an overview that is not exhaustive but does give an indication of the initiatives that are already in progress. They show the willingness of many of the parties involved to invest energy in improving fish welfare on an ongoing basis.

Fishing industry

In commercial fisheries, where catching or farming fish is an economic activity, the generation of income and continuity are the key aspects. If income is threatened, there will be less financial leeway to experiment and invest in animal welfare. Other aspects may also take precedence over the welfare of the animals. The development of catching methods, for example, may focus more on population management of a species in a certain area, preventing bycatch or on lessening the ecological impact of a fishing activity than on the welfare of the fish being caught.

Innovation in fisheries is generally determined by the criteria in the Fisheries Innovation Fund (*Innovatiefonds voor de visserij*). Innovations in catching systems could make more explicit inclusion of the welfare of the fish. Selective fishing is currently an ongoing point for attention, from both a policy and sector perspective. Catching species that are of no economic value will benefit nobody. There is much potential improvement in the application of different catching techniques – not only in terms of more selective fishing, but also in increasing the welfare of the fish during the catching process. This applies both to fish that are not caught due to the new method, as well as to animal-friendly techniques resulting in reduced injury and mortality during the catching process. This last aspect is of relevance from a commercial standpoint.

In the Netherlands, there is currently one company that stuns fish while they are still on board, a technique that is still under development. A second development in fisheries is the movement towards more selective fishing, as in electric pulse fishing. The Dutch government is in support of these innovations and developments. The impact of innovations on fish welfare is not always a standard part of development and evaluation procedures.

The aspects of commercial fishing important to welfare are the methods used to catch and slaughter fish, as well as their treatment before they are killed (including temporary storage on board). There is still very little attention to the welfare of animals being caught and slaughtered on board.

Society also displays very little concern for the slaughtering of fish without stunning/analgesics, despite the fact that this is required for other animals (e.g. sheep). When purchasing meat, consumers demand a more animal-friendly product. This same demand must be encouraged and augmented for fish. All parties in the chain can contribute to this development, and the market will play a key role in fast-tracking improvements.

Recreational fishing

Recreational fishing is usually for the purposes of enjoyment; generating income is not a motivation for these anglers. Turnover in recreational fishing was estimated at 700 million per year around ten years ago (Smit et al., 2004). The number of recreational anglers has been estimated at 1.7 million, around one-third of whom are members of the Dutch Angling Federation (*Sportvisserij*, 2017). This association represents the interests of recreational fishing as a leisure activity. It communicates actively with members and other stakeholders, and includes attention to fish welfare in its communications. The Code of Practice, for example, includes guidelines for the treatment of fish, along with competition regulations aimed at keeping fish welfare as high as possible.

Aquaculture

In the Netherlands, there are fish-welfare criteria that must be met before a species is included on the list permissible for aquaculture in the Netherlands. There are no welfare criteria for species that have already been admitted and are currently being farmed, however. Welfare is an explicit factor included when evaluating applications to farm new species. There is no standard procedure used in these evaluations; the final assessment is carried out by an independent panel of experts. The Council published an assessment framework in 2002, outlining methods for evaluating whether there are acceptable grounds from a welfare perspective for keeping fish for production purposes that are not yet being farmed in the Netherlands. These are often new species about which little is still known; generally the operator is first issued with an exemption in order to investigate the needs of the fish more fully. After inclusion on the list, the species may be farmed.

Ornamental fish

Keeping fish as pets (in ponds or aquariums) is generally also a leisure activity. Various societies and forums exist that facilitate information exchange on keeping and caring for various fish species. In 2007, the following three welfare issues were prioritised in ornamental fish: lack of expertise and quality information, a lack of veterinary knowledge, and problems related to housing, care and feeding (Rothuizen and Hopster, 2007). The last decade has seen active efforts towards improving the information provided to fish purchasers by both the sector and the government. In 2007 the National Pet Information Centre (*Landelijke Informatie Centrum Gezelschapsdieren*, LICG) was founded, whose activities include the development of information leaflets for various animal species. In December 2017, the number of leaflets on fish totalled 23: two on the same species (goldfish), fifteen for individual species, and six for groups of species, some of which also address individual species (LICG, 2017). Under the Animal Husbandry Decree (*Besluit houders van dieren*), it is also compulsory to provide written information on housing, care, behaviour and costs upon sale of fish. The extent to which this leads to behavioural change among owners is not known.

The Beloved (*Dierbaar*) quality mark for companies in the pet sector sets out specific requirements for animal housing, hygiene and care, as well as the professional competence available in the business that allows them to distinguish themselves in the market.

Laboratory animals

Fish constitute a growing proportion among laboratory animals. Looking purely at the numbers, fish are in fourth place (after mice, rats and chickens). A species very popular among laboratory fish is the zebra fish (*Danio rerio*). There is continual interest in the replacement, reduction and refining of animal experiments with a view to reducing the number of laboratory animals. One application of laboratory fish is in toxicity research. Various international locations are currently working on reducing the number of laboratory animals involved in studies on the acute toxicity of chemicals in fish. When keeping fish as laboratory animals, suitable housing and ensuring humane endpoints are important elements. An 'endpoint' is the moment when the pain and/or discomfort experienced by animals ends or is ameliorated, and can be achieved in various ways (CCAC, 1998). As for other categories, there is great variety between fish species, and knowledge on individual species is necessary (incl. Boerrigter et al., 2015). There can also be major variation within a single species: selection or other factors may produce genetic differences resulting in two different lines that, while still categorised under the same species name,

nonetheless have different specific needs and show varying responses (Gorissen et al., 2015), as well as differences between individuals within the same line (Castanheira et al., 2017). Needs can also vary according to the age of the fish. All of the above means that a tailored approach is necessary, and the required knowledge is not yet available in all situations.

4.6 Potential measures

In addition to the existing initiatives, the RDA sees further opportunities for improving fish welfare and moving it higher up on the social agenda. As an initial step, the Ministry of Agriculture, Nature and Food Quality (LNV) could consolidate and communicate its broader position on fish welfare, as well as on the various specific categories. The government could also do more to encourage improvements to fish welfare and attention thereto.

Policy serves as a course of action for realising certain objectives. In other words: it provides the guidance and resources for realising set targets by a certain time. The applies to government bodies, as well as commercial parties and other stakeholders. Examples of potential policy instruments include those aimed at behavioural change, garnering support or information, financial or social incentives, regulation, implementation and enforcement, or monitoring and evaluation.

Listing the most suitable instruments for each category is beyond the scope of this report. The Council believes the best option is a tailored approach, where policy is implemented to improve fish welfare in collaboration with research, industry, professional practice and society.

Laws and regulations can sometimes serve to work against innovation, which is why it is sometimes practical not to over-regulate areas that are still being explored. The Council Regulation on the protection of animals at the time of killing (1099/2099) sets out many regulations governing the permissible methods for stunning and slaughtering animals. Germany has supplemented this with eel regulations (*Tierschutz-Schlachtverordnung*, 2012) that describe the required voltage for stunning eel. A study by Lambooij et al., (2002) has shown that in practice, this voltage is not adequate to stun all animals immediately. When investigating the slaughter of fish, researchers measure brain activity to determine whether the animal is conscious and experiencing any pain/other brain signals.

More information is already available on the need of many fish in captivity for a richer habitat, and on appropriate stunning/slaughter methods for aquaculture species. Further implementation of this knowledge in practice can be encouraged in various ways, e.g. by the sector, interest organisations, social organisations and government bodies. The LICG and the ornamental fish industry have already drawn up specific housing and care criteria for many species. These guidelines are currently treated as recommendations, however the public and private sectors could take the initiative to improve compliance in this regard. In such a case, evaluations of good stockmanship would be based on the guidelines, with justified exceptions permissible, depending on the circumstances. The LICG guidelines should be reviewed in light of any new information or developments, in which case harmonisation of the various parties' guidelines will be necessary (e.g. between the LICG and various ornamental fish wholesalers). The sector could encourage this initiative. A greater understanding of the current situation in private homes and the level of knowledge of the fish owners will allow an overview to be created of potential further steps. Aspects such as health care, and possibly the euthanasia and disposal of fish in private homes, may also merit attention here.

4.7 Barriers

As shown in Section 4.3, there are already many initiatives aimed at improving fish welfare. There are occasional barriers, however. Without going into too much detail, these include the following:

When weighing up various interests, fish welfare is often not considered a priority (the economy and ecology take precedence).

A lack of knowledge among the relevant parties, and of distribution of the information available.

Technologies and methods for many fish species are not yet viable in practice.

From a social and market perspective, fish welfare is not really on the radar.

The forces and interests at play vary between categories, and an analysis of this arena is outside the scope of this report. When taking steps, it is important to take heed of the existing barriers in the relevant sectors in order to allow effectively tailored solutions.

In 2003, an exploratory survey titled Focus on Fish Welfare (*Viswelzijn in beeld*) was conducted with a view to creating a policy agenda (Kersbergen et al., 2003). Many of the items mentioned in the survey are still relevant today, and it is important to know which barriers have held back their implementation.

4.8 Conclusion to question 2: Starting points, developments and barriers to the improvement of fish welfare

All categories require greater attention to welfare. The specific approach taken will differ for each category and sub-category. The first step for the government is to draw up a fish welfare policy. The available policy instruments can be deployed to promote innovative good practices.

Various initiatives are being taken in practice that benefit fish welfare – this is of crucial importance, as it is in practice where effective fish welfare is achieved, and where welfare and other goals (such as income, ecology, recreation or the environment) can go hand-in-hand. Occasionally objectives may be at odds (or seem to be), and more time and energy will be required to make progress. This Section has provided a summary of the starting points and developments, and briefly mentioned the major barriers.

5. Conclusions and recommendations

This RDA advisory report has responded to the following questions:

Do understandings in society and scientific literature warrant greater concern for the welfare of fish, and give cause to update the government's current policy position regarding fish welfare?

And if so:

What key aspects and developments can best be tackled to promote the welfare of fish, and what impediments are envisaged (if any)?

Greater attention to fish welfare is both possible and desirable. The policy developed by government and other parties offers greater scope in this respect. The Council's aim with this report is to expressly bring fish welfare into focus for all parties involved. Although the government can play a leading role, the Council believes that all parties must contribute to the fish welfare agenda. A targeted approach is necessary within each fish category to ensure that tailored steps are taken. Deliberations and decisions must take place in a transparent manner, and innovative good practices deserve promotion. The effectiveness of public and private-sector fish-welfare policy will require evaluation in several years' time.

Fish welfare is a broad field, encompassing a significant degree of variation. Most of the welfare information available pertains to the aquaculture sector; there is also a relatively large amount available on the needs of ornamental fish.

The Council advises the government to invest more in the acknowledgement of the intrinsic value of fish. The current state of fish research allows for the inclusion of fish welfare as an explicit and transparent policy element. This can be achieved in various ways, e.g. by including welfare as an integral component of new research projects (and their evaluation), broadening and accelerating current initiatives, promoting the generation and dissemination of knowledge, creating opportunities and identifying and eliminating the existing barriers in each sector.

Dutch practice already offers various initiatives capable of improving fish welfare either directly or indirectly. The Council sees this as a very positive development, and sees even more opportunities for action. One important requirement is that, rather than by way of exception, welfare should be viewed as a standard consideration in decisions affecting fish. Welfare is one of the relevant factors in deliberating how we treat (or wish to treat) fish.

The understanding that fish are sentient beings and acting accordingly must be more explicitly anchored in the catching, keeping and purchasing of fish.

Only a limited number of people in the Netherlands possess veterinary and zootechnical knowledge of fish. Fishkeepers can often not go to a regular vet. In view of the large numbers of fish being kept in the Netherlands, the Council advises for wider availability of veterinary and zoological information in practice.

The RDA advises raising welfare awareness in all categories of fish. This report indicates which activities are considered the most effective, and create the greatest benefit for improving fish welfare. These are intended as an initial means of support; in practice, a tailored approach will be necessary to fill in the details. It is up to individual parties to implement measures to improve the welfare of the fish in question. The integral RDA assessment framework can be used to select activities: in the Netherlands, the consideration of fish as animals, as part of commercial fisheries and as a food source represents a broad spectrum of values (their economic and cultural value, to name two).

Figure 3 presents a summary of the various activities proposed and described in Section 4.

General recommendations for all fish

- Expand, extend and enhance all current developments pertaining to fish welfare, and encourage, support and provide opportunities for new developments;
- Facilitate information provision and knowledge exchange (central coordination, between individual parties, tailored to audience, evaluation of effectiveness);
- Enable research and innovation (generation of theoretical and practical knowledge), e.g. welfare as an assessment criterion, for all categories of fish in society;
- Raise awareness throughout the chain (all direct links, from policy to practice, from research to society);
- Create market supply and demand for welfare-friendly fish and fish products.

Category-specific recommendations:

- Selective fishing, welfare-friendly fishing using current or new techniques, stunning/slaughter methods, shorter time between catching and slaughter, quality marks that include fish welfare, national and international collaboration;
- Shorter time between catching, stunning and slaughter;
- Increasing fishing operators' knowledge and expertise, enforcement, and development of practical tools;

- Stockmanship and management, increasing species-specific knowledge, knowledge exchange, welfare as a quality-mark criterion;
- Improving accessibility to health care, greater attention to welfare during transport;
- Increasing knowledge about the impact of husbandry and care on the results of experiments.

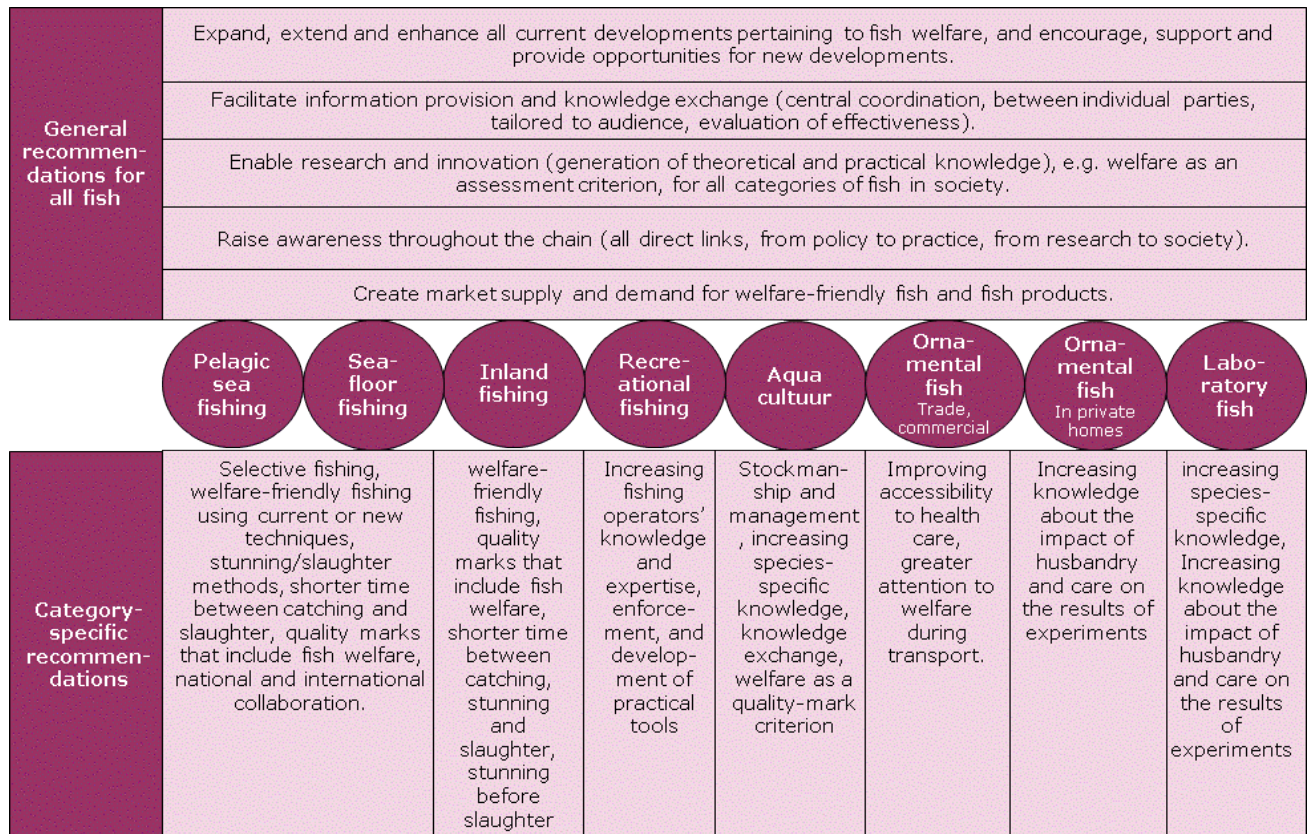


Figure 3: Overview of starting points for improving fish welfare, explained in the report in greater detail.

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