Fishing for facts
AN INTRODUCTION TO THE UK ORNAMENTAL FISH TRADE
Foreword

We estimate there could be more than 100 million fish sharing our homes and garden ponds, making them the UK’s most populous pet species.

There is much debate about so-called ‘exotic’ pets, including ornamental fish, such as whether their trade is sustainable, the zoonotic and other biosecurity dangers they pose and how hard they are to look after. Also, the legal, sustainable trade is often incorrectly conflated with illegal trafficking without distinction. Much of this debate is based around misconceptions about the trade and keeping of ornamental fish and is often based on misleading or inaccurate information. As the UK trade association representing the businesses behind home aquariums and garden ponds we are keen that decisions affecting our sector are based on an accurate representation of the facts.

This report seeks to provide a factual overview of the UK trade in ornamental fishes. It provides information on the scale and structure of the trade and describes the comprehensive controls that already exist to govern it. Drawing on robust evidence, it explores the facts about the trade and keeping of live ornamental fishes in terms of welfare standards, health and zoonotic risks, invasive and biosecurity risks, and sustainability. It will demonstrate that many of the risks highlighted are often over-exaggerated and misrepresent the facts.

Our industry deals with a wide range of live aquatic species, from fish and amphibians to invertebrates (such as shrimp and corals) to plants, and provides the necessary equipment and support to ensure successful keeping of those species in the home aquarium or garden pond. In this report we concentrate on the trade in live ornamental fish because this is a key driver for our industry.

We hope this report will help to better inform future decisions affecting the ornamental fish trade.

Dominic Whitmee
Chief Executive
Ornamental Aquatic Trade Association (OATA)

OATA was established in 1991 and represents more than 800 members from across the UK ornamental aquatic industry, from importers and wholesalers to manufacturers and retailers. Our objective is to support the activities of all those engaged in the ornamental aquatic trade. We aim to enhance the reputation of the trade by promoting the benefits derived from it, setting high standards, providing good education and training, and encouraging responsible ownership and enjoyment amongst fish keepers.

The ornamental aquatic trade is the catch-all term for our industry and covers a range of activities relating to aquariums in both homes and businesses and pond and water features in gardens, even if they do not contain fish. The word ornamental distinguishes our sector from the trade in food fish destined for our plates. We use the term home aquarium to distinguish from public aquariums to which some businesses in our sector supply fish and equipment.
The fish we keep
IN OUR HOMES AND GARDENS

Most home aquariums will hold a community of colourful tropical freshwater species. Marine (saltwater) and coral tanks tend to be kept by more experienced aquarists and can be more expensive to run, requiring more specialist equipment and involvement. Garden ponds may be home to cold-water fish although many remain fishless and are important wildlife havens for native invertebrates, amphibians such as newts and frogs, and an important water source for many terrestrial animals.

Ornamental fish – those we keep as pets – fall into two main categories:
FRESHWATER and MARINE fish.

FRESHWATER FISH

Freshwater fish can be either cold-water or tropical. Cold-water fish live primarily in garden ponds and will survive in cooler unheated water.

Tropical freshwater fish require warmer water that is maintained with a heater and few will survive without that constant higher temperature. There is a great variety of species available to choose from. By far the most popular choice of tropical aquarium is a “community tank” where multiple, often small-bodied, peaceful species co-exist in an aquarium. This set up is the one most commonly recommended for beginner fishkeepers.

The vast majority (95%) of freshwater fish are captive bred and supplied mainly from Asia (Singapore, Thailand and Sri Lanka).

ESTIMATED SALES OF COLDWATER FISH

- 89% Goldfish
- 7% Koi
- 2% Orfe
- 2% Tench

ESTIMATED SALES OF TROPICAL FRESHWATER FISH

- Tetras 25%
- Poecilid livebearers 19%
- Catfish 11%
- Gourami 9%
- Barb 8%
- Cichlid 7%
- Cyprinid – other 6%
- Loaches 5%
- Danios 3%
- Rasbora 3%
- Rainbowfish 1%

ESTIMATED SALES OF TROPICAL MARINE FISH

- 20% Damsel
- 5% Angelfish
- 3% Butterflyfish
- 2% Fireshies
- 2% Grammas and Bass
- 1% Triggerfishes

TROPICAL MARINE FISH

Tropical marine (saltwater) fish are mostly native to coral reefs and need heated water with salt added to the required salinity. In addition, there are typically different requirements for water quality as keepers must replicate an environment as dilute as the ocean. Saltwater fish are usually kept by more experienced aquarists because there is a requirement for more detailed technical knowledge to meet the fishes’ physiological needs.

Although there is a growing sector of successful captive rearing programmes for certain species of marine fish in trade (such as Clownfish) many species will be collected in the wild by artisanal local fisheries using low impact techniques.

There are estimated to be fewer than 700 marine ornamental fish species in trade in the UK and the majority of these are sold in small quantities. Fewer than an estimated 120 species make up 80% of the UK marine ornamental fish trade. Total numbers of individuals sold in trade are typically much lower than tropical freshwater species.

Planted underwater gardens within tanks that are scaped with rockwork, wood and aquatic plants are increasing in popularity. These often have no fish at all or small species to emphasise the impact of the aquascape. There are even international competitions for the best scapes and aquascapers in the hobby.

Some fishkeepers become passionate about keeping and breeding particular species and will often join hobby groups to learn more and share their knowledge. These groups often contribute to conservation efforts of wild species whose natural ranges may be under threat from habitat loss or degradation. See pages 16 to 17 for other benefits of keeping fish. These can range from educational benefits in raising awareness about conservation to learning about water chemistry, biology and geography, and the calming health benefits of keeping fish.
**For what it’s worth**

**A SNAPSHOT OF THE UK ORNAMENTAL FISH INDUSTRY IN 2020**

- **4 million** households own pet fish
- **£400 million** the estimated amount spent by pet fish owners annually on their hobby
- **14%** of the population
- **£15.7 million** UK import value of ornamental fish in 2020*
- **1,023 metric tonnes** volumes of live ornamental fish coming into the UK in 2020*
- **50,000+** the amount of people the pet industry employs*
- **c 12,000** employed by aquatic-related businesses
- **100 million+** OATA’s estimate of the number of pet fish kept in the UK
- **c 8.5 million** customers a year visit aquatic retailers.
- **Industry data**

---

The UK aquatics industry is made up of retailers, importers, wholesalers, manufacturers, aquatic plant growers and sellers, fish breeders and pond and aquarium consultants.

---

*Despite the twin effects of Covid-19 and the UK’s exit from the EU, the value remained remarkably stable in 2020, believed to be due to heightened interest in indoor and home-based hobbies such as fishkeeping.

*Exchange rate fluctuations makes freight weight a better indicator of fish imports. Since 2005 freight weight has steadily decreased which is probably a combination of improved ways to transport fish (most of the freight weight comprises the water rather than the fish) as well as falling market demand (and therefore fewer fish).

---

**Monthly import data shows appeal for pet fish was high in 2020**

Split between freshwater and marine fish imports by freight weight*

- **Freshwater fish**
  - **2020**: 77%
  - **Marine fish**
  - **2020**: 23%

---

Monthly freight weight (metric tonnes) of ornamental fish imports into the UK in 2020 (blue bars) compared with average figures for each month over the average for the prior 5 years (2015-2019, grey bars).

---

Monthly import data shows appeal for pet fish was high in 2020, possibly as a result of increased home working and an uptake of indoor hobbies like fishkeeping*.
In 2020, the UK imported ornamental fish from 40 countries (compared with 47 countries in 2019). The reduction in exporting countries is thought to be a result of Covid-19 impacts on flight availability.

31 countries (33 in 2019) exported freshwater fish

22 countries (28 in 2019) exported marine fish

(some countries export both marine and freshwater fish)

By far the largest proportion of fish kept as pets in the UK are tropical freshwater fish, the majority of which are captive reared and not taken from the wild. They pose low zoonotic and biosecurity risks because they are kept in home aquariums which are closed systems, they are handled rarely, and would very rarely survive in UK waters if released.

Top 10 countries exporting ornamental fish to the UK in 2020

1. Singapore
2. Japan
3. Israel
4. Indonesia
5. Sri Lanka
6. Thailand
7. USA
8. Maldives
9. Philippines
10. Colombia

These top 10 countries are responsible for 88% of the total value of imported ornamental fish in 2020.
A fish’s journey

FROM COUNTRY TO KEEPER

There is little commercial rearing of ornamental fish in the UK. Most come from across the world, with 40 countries providing all types of fish to the UK in 2020. Approximately 75% of these overall are captive bred fish. For freshwater fish only 5% are sourced from the wild compared to about 90% of marine fish. It is important to note that captive-breeding of marine fish is a growing sector and these numbers are likely to change over the coming years.

The industry depends wholly on the provision of live and healthy aquatic animals so there are strong incentives to keep fish healthy throughout the entire supply chain and to ensure they are sustainably sourced. These incentives are supported by regulation along every step of the supply chain from breeding or collection in the country of origin to the home aquarium.

COUNTRY OF ORIGIN

Generally, regulation falls into four broad categories:

- Local fisheries management measures such as fishery management plans and quotas governing allowable take.
- Customs controls which track traded species, quantities, price and destination to ensure the right taxes etc are paid.
- Species protection controls to ensure the sustainability of species in trade and/or their conservation status.
- Animal health controls to ensure exported species are not carrying infectious diseases.

IN THE AIR

- International Air Transportation Association (IATA) rules apply and state: "Shippers must pack fish to survive unattended for at least 48 hours from time of acceptance by the airline" and sets out packaging and labelling requirements.
- Fish travel in a sealed environment, packed in bags with water and oxygen and are fasted prior to travel to prevent the build-up of waste products which would compromise their welfare.
- If a badly packed consignment reaches the UK it may result in a prosecution for animal cruelty.

ON ARRIVAL IN THE UK

- All live fish enter the UK through Border Control Posts. Animal and Plant Health Agency (APHA) vets, CEFAS’s Fish Health Inspectorate (FHI), UK Border Force (UKBF) and HMRC examine accompanying health certificates, customs declarations and any CITES documentation as well as undertake visual checks to assess the health and welfare of transported fish.
- Fish importers must register as an Aquaculture Production Business and are regularly inspected for biosecurity purposes by FHI.
- The Import of Live Fish Act governs the freshwater fish species that are allowed into the country.

TRANSPORT IN THE UK

- Welfare of Animals in Transport Orders overseen by APHA set out the rules governing the welfare of animals in transport and apply to all commercial live animal journeys across the UK.
- Fish transported from airports remain in packaging complying to IATA standards.

IN THE PET SHOP

- Animal Welfare Regulations in England outline the welfare standards that English pet shops selling animals must meet. There are detailed standards which cover the five welfare needs of animals (for a suitable environment, diet and housing, to be able to behave normally and to be protected from pain, suffering, injury and disease). These include water quality standards, the need for staff training and good knowledge about the species sold and the provision of care information for all animals sold. At the time of going to print, Wales and Scotland are developing similar regulations.

IN THE HOME

- Fishkeepers, like any pet owner, are responsible for the five welfare needs of their animals as outlined in the Animal Welfare Act 2006.
- The Wildlife and Countryside Act makes the release of pets such as fish into the wild a criminal offence.
- Invasive alien species legislation identifies species that are illegal to keep in the UK.

*A summary of the key regulatory controls is at Annex 1.
The ornamental fish trade is built on the supply of live healthy fish so maintains high standards of animal welfare throughout the supply chain.

Fish mortalities in transport are lower than generally thought

Fish mortalities are often seen as a barometer of bad practice and there is a much-cited statistic of 73% mortalities in the global ornamental fish trade. This figure is erroneous at best as it refers to a study published more than two decades ago. It has been disputed by recent research, particularly given that it refers to sparse, anecdotal evidence from a specific group of importers rather than from verified data. Neither does the figure withstand economic scrutiny as no industry could sustain itself over the long term if such losses really existed.

The Heathrow Animal Reception Centre, where 80% of ornamental fish pass through its inspection processes, have noted less than 1% of mortalities on arrival. It has also been acknowledged by the CITES Animals Committee that high mortality amongst shipments of live animals is mostly an issue associated with illegal trafficking. If animals are transported according to IATA rules, there are rarely issues with mortality.

Industry bodies such as OATA in the UK and Ornamental Fish International (which represents the rest of the world) have done much to drive up standards, including through the introduction of Codes of Conduct that member businesses must adhere to.

The ornamental trade plays a key role in educating consumers about fish care

Pet retailers are proactive in educating customers to improve public understanding of good husbandry techniques which is also a requirement of pet shop licensing. Businesses have created their own systems to check their customers’ knowledge and provide care advice, online materials and videos to educate new and existing keepers. Often fishkeepers themselves, good retailers will get behind initiatives that promote good welfare, such as the Big Fish Campaign, which sought to raise awareness about large-growing fish.

A fuller examination of animal welfare in the UK ornamental fish trade is at Annex 2.

PET FISH ARE WELL CARED FOR

Fishing for facts

HOW THE INDUSTRY HELPS

SETTING STANDARDS

To be a member of the UK’s representative body for the ornamental aquatic trade, OATA, all member businesses must adhere to its Code of Conduct which sets out requirements on animal welfare and other standards. Members must also adhere to specified, minimum water quality standards, the number one factor in fish welfare.

GOOD PET SHOPS ARE GOOD PLACES TO BUY FISH

Good pet shops inspire fishkeepers through the enthusiasm and knowledge of their staff. Pet shop licensing requires staff to be trained in the species they sell so they can check their customers’ knowledge and set-up before they sell any animal. Contrary to popular opinion good pet shops can play a role in stopping impulse buying. They are subject to public scrutiny every day they open, not just through formal local authority inspections, but also by the estimated 8.5 million customers annually who visit aquatic pet shops and will report animal welfare problems very quickly if they see them.

TRAINING

In conjunction with industry experts, OATA has developed City & Guilds accredited training programmes specific to the industry and covering water quality, filtration, fish biology and fish health to help staff provide informed and accurate information to customers.

WORKING WITH OTHERS

Through its trade association OATA, the industry works with organisations such as the All Party Parliamentary Group for Animal Welfare (APGAW); the Companion Animal Sector Council (CASC); The Pet Charity (TCC); the Pet Advertising Advisory Group (PAAG) and the Animal Welfare Network Wales (AWNW) as well as directly with Government, to promote improved welfare standards for ornamental fish.

ADVICE AND GUIDANCE

Care information for fishkeepers is key to ensuring that fish are well looked after in the home aquarium or garden pond. OATA has produced 45 different care leaflets, including the widest available range of species-specific care information, and a series of YouTube videos on how to successfully set up and maintain different types of aquariums. All are available free of charge.

Many retailers develop their own care information for customers and will often have their own systems to guide customers in making good buying choices when it comes to setting up a new aquarium or adding fish to an existing one. These range from in-store and online information to videos for new fishkeepers. Many retailers offer water testing facilities enabling customers to bring in a sample of tank water giving shop staff an excellent opportunity to educate customers on improving water quality and how to pick the right species for their tank.

Pet care information is also freely available on the Pet Portal, an initiative of The Pet Charity supported by OATA, which provides a single source of pet care advice and information for pet owners or people interested in getting one, all validated by experts.

Based on information available in the Pet Portal, the Pet Charity, British Veterinary Zoological Society (BVZS), British Small Animal Veterinary Association (BSAVA), and the Companion Animal Sector Council (CASC) are developing Pet Know How where prospective pet owners can take an online test to check their current knowledge of their pet’s needs. On successful completion they will receive a certificate they can present to pet retailers to demonstrate they have researched and understood the care needs of the animal they wish to purchase.

OATA has produced a range of additional guidance to help businesses ensure the welfare needs of the fish they trade are met, such as on the selling of fish online and transporting and acclimatising fish. Advice has also been issued on giving fish as prizes, the trade in dyed fish and the use of fish as decorations.
Health risks and biosecurity

PET FISH ARE SAFE TO KEEP

Ornamental fish pose low zoonotic and biosecurity risks because they are kept in home aquariums, handled rarely, and are highly unlikely to survive in UK waters if released.

The COVID-19 pandemic has brought the issue of zoonotic diseases (the ability for pathogens to jump species from animal to human) to world attention.

There are risks of both zoonotic and vector borne (when another organism passes on a disease) transmission with all animals. Historically there have been recorded cases of zoonotic disease leaps between fish and humans despite routine exposure to fish pathogens for hundreds of years. Any pathogen that infects fish is by definition adapted to infecting hosts in water so we know that good barriers (such as gloves and covering cuts) and hygiene (such as washing hands and equipment) are effective controls and are in place for those that work with live fish.

The ornamental fish trade presents a low biosecurity risk Importing non-native fish comes with biosecurity risks but the UK adopts high standards at the border to protect our indigenous species. Fish health checks are carried out throughout the supply chain by trained officials from Fish Health Inspectorate (FHI) and Animal and Plant Health Agency (APHA). These concentrate largely on cold-water pond fish such as Koi which pose the greatest risk to UK fish populations in terms of invasion risk and disease transmission. Imports of cold-water species are subject to 100% checks by FHI.

The import, outbreak and spread of diseases is more responsive than Government action and the aquatics industry has demonstrated this by taking voluntary action to stop trading in species it has identified of concern. For example, the industry voluntarily stopped trading in five plant species considered an invasive risk, including Floating Pennywort and Water Primrose, before regulations were introduced. More recently, the industry has promoted trading only in native species of certain snails and mussels and has issued guidance to avoid the unintentional import of zebra mussels.

The aquaculture industry is an important sector of the UK economy and is regulated by the Aquaculture Production Inspectorate (API). Aquaculture operations are subject to routine inspection by FHI to report potential outbreaks. The trade plays a key role in preventing the spread of invasive species.

Our industry is highly aware of its role in preventing the spread of invasive species, particularly aquatic plants. OATA recommended a voluntary ban on a number of aquatic plants many years before they were banned by Defra. OATA also actively supports campaigns such as Be Plant Wise. Businesses provide an active role in raising awareness of invasive risk by including labelling on their products explaining that aquatic species should not be released into the wild.

A fuller examination of the health and biosecurity risks of the UK ornamental aquatic trade is at Annex 3.

HOW THE INDUSTRY HELPS

SETTING STANDARDS

To be a member of the UK’s representative body for the ornamental aquatic trade, OATA, all member businesses must adhere to its Code of Conduct which ensures members to be able to practically demonstrate they operate a biosecurity plan and take all reasonable precautions to prevent the import, outbreak and spread of diseases.

ADVICE AND GUIDANCE

OATA’s Biosecurity document provides comprehensive advice to businesses on the measures they can adopt to make informed decisions on where to buy fish from and how to minimise the chances of either receiving or passing on disease or health problems in fish.

OATA provides advice on appropriate hygiene standards to avoid the transmission of zoonotic diseases and OATA customer care sheets carry advice on good hygiene practices, such as hand washing and not to use the mouth to siphon water during water changes.

A key way to prevent the spread of invasive non-native species is by raising public awareness. Many of the industry’s leading manufacturers carry ‘No release’ messaging on aquarium product packaging, and some also include it on till receipts, with the potential to reach the estimated 8.5 million customers annually who visit aquatic pet shops. Similar messaging is carried on all OATA customer care sheets and fish bags which are available for pet shops to use when packing fish for customers to take home. The Pet Code of Practice co-authored by OATA and the Reptile and Exotic Pet Trade Association (REPTA) provides guidance on the responsible keeping of non-native pets, for both owners and traders.

OATA has produced a range of additional guidance to help businesses ensure health and biosecurity risks are minimised, such as on the packing, transportation and acclimatisation of fish to minimise stress and reduce disease risk. Guidance has also been produced on hazardous aquatic animals, genetically modified fish, the use of antibiotics, and recommendations not to sell fish if they are to be used for some cultural practices because of concerns about animal welfare or illegal release into the wild.

TRAINING

OATA has developed City & Guilds accredited training for the industry covering invasive non-native species and how biosecurity measures can prevent and/or reduce the risk of their introduction and spread.

AFFIRMATIVE ACTION

The industry works closely with the GB Invasive Non-Native Species Secretariat in developing advice, guidance and other measures aimed at removing or minimising the risk of spread of invasive species. Industry activity can be and often is more responsive than Government action and the aquatics industry has demonstrated this by taking voluntary action to stop trading in species it has identified of concern. For example, the industry voluntarily stopped trading in five plant species considered an invasive risk, including Floating Pennywort and Water Primrose, before regulations were introduced. More recently, the industry has promoted trading only in native species of certain snails and mussels.

The ornamental fish trade presents a low biosecurity risk Importing non-native fish comes with biosecurity risks but the UK adopts high standards at the border to protect our indigenous species. Fish health checks are carried out throughout the supply chain by trained officials from Fish Health Inspectorate (FHI) and Animal and Plant Health Agency (APHA). These concentrate largely on cold-water pond fish such as Koi which pose the greatest risk to UK fish populations in terms of invasion risk and disease transmission. Imports of cold-water species are subject to 100% checks by FHI which also registers and regularly inspects the Aquaculture Production Businesses which import them. The import of Live Fish Act dictates which freshwater fish species are allowed for trade in England and Wales (with similar legislation for Scotland). Some diseases are heavily monitored and legally notifiable, such as Koi Herpes Virus (KHV) and Spring Viraemia of Carp (SVC). These diseases are kept at bay through high cooperation from the industry which works actively with FHI to report potential outbreaks. Tropical fish are a comparatively low biosecurity risk because they won’t survive in the UK’s colder water (needing consistent temperatures above 20°C) and are kept in ‘closed systems (an aquarium). They also all arrive with health certificates and are visually inspected at the border.

A bigger issue of concern for our industry is anti-microbial resistance (AMR). There is a growing body of research highlighting the role of agriculture in promoting the development of AMR because of the potential overuse of antibiotics to prevent disease as opposed to treat it. In the UK, the use of antibiotics in fish is regulated and can only be prescribed by a specialist vet but there are legitimate concerns about the import of AMR bacteria and pathogens from ornamental aquaculture facilities abroad.

Both academia and industry groups such as OATA and OFI recognise the danger of overuse of antibiotics and improved international efforts to monitor and reduce this practice are needed.

The trade plays a key role in preventing the spread of invasive species.

Our industry is highly aware of its role in preventing the spread of invasive species, particularly aquatic plants. OATA recommended a voluntary ban on a number of aquatic plants many years before they were banned by Defra. OATA also actively supports campaigns such as Be Plant Wise. Businesses provide an active role in raising awareness of invasive risk by including labelling on their products explaining that aquatic species should not be released into the wild.

A fuller examination of the health and biosecurity risks of the UK ornamental aquatic trade is at Annex 3.
PET FISH ARE MOSTLY CAPTIVE REARED

Ornamental fish in the aquarium trade are captive reared or collected from the wild in low volumes using non-destructive fishing techniques.

Any trade that relies on the direct or indirect use of natural resources is rightly subject to questions about its sustainability, whether it impacts the conservation of species in the wild, and whether the species in trade are sourced using environmentally damaging methods. These are all common misconceptions about the ornamental fish trade. Independent research indicates the majority of fish sold in the ornamental aquarium trade are sourced sustainably with minimal impact on wild populations.

The majority of ornamental fish in trade are not wild sourced. 77% of UK pet fish are freshwater fish which by and large are sourced from aquaculture, with marine species that are mostly collected from the wild representing just 23% of fish in trade. Only 5% of freshwater fish are collected from the wild compared with 90% of marine ornamental fish. Tropical freshwater fish are generally easier to keep, with wide tolerance of water parameters, adaptability to food types and easier to breed in captivity. Marine fish, which rely on ocean currents and suitable coral reefs to breed, make them harder to captive rear successfully; although recent breakthroughs in captive-rearing techniques are changing that.

Tropical fish are generally collected from the wild in smaller volumes than freshwater fish because the market is smaller; generally because it is more complicated to maintain marine aquariums and marine species are usually more expensive to buy.

Around three quarters of the fish found in UK home aquariums and garden ponds have not been sourced from the wild but sustainably from aquaculture farms. There is currently little commercial rearing of tropical freshwater fish in the UK because of the costs associated with large scale production. Many of these farms are found in low to medium economically developed countries, such as Thailand and Sri Lanka, where the industry represents an important year-round income for local communities.

The trade in wild collected fish is high value, low volume with low environmental impacts. In contrast to food fisheries, catching fish for the home aquarium industry is considered ‘high value, low volume’, meaning fishers collect fewer fish but get more money per live fish.

Where fish are collected from the wild, efforts are made to ensure they are sourced sustainably and there is no over-exploitation, for example by the seasonal rotation of collection sites. For example, the most common species in trade, Chromis viridis, is abundant in the Indian and Pacific oceans (from east Africa to Hawaii) and collected across dozens of collection points in order to avoid over exploitation in any one region. Importers will often only order what they require and not accept alternatives helping to avoid the over-collection of easy-to-target species. Due to the large distributions and breeding strategies of most coral reef fish, population replenishment is likely to mitigate the relatively small portion of fish collected for the ornamental trade.

As the value is in healthy, non-stressed fish, non-destructive, low stress methods of collection are favoured. Fish for the UK ornamental trade are commonly collected by hand, using hand-held nets and live traps. Practices, such as using cyanide to stun fish to make them easier to handle and which can damage coral reefs, are not supported by the UK industry. Businesses and fishkeepers want healthy, long-lived fish so there is no market in the UK for fish collected in this way. Recent years have seen a decline in usage of such techniques in favour of low-impact hand fishing alongside the implementation of local management measures. Many UK importers work closely with their overseas suppliers and regularly audit their supply chains to ensure animals are healthy and not collected using destructive fishing techniques.

A fuller examination of sustainability in the ornamental fish trade is at Annex 4.
The COVID-19 pandemic showed the importance of pets to both our mental and physical wellbeing16 but even before that, research studies have demonstrated that home aquariums have beneficial effects on our mood, stress levels, heart and blood pressure27,28. What is also notable is the role that both public and home aquariums have on our engagement with the natural world and in developing a growing interest in conservation29,30,31. Research has demonstrated that looking after pet fish in home aquariums can spark a personal interest in conservation as well as improving scientific literacy among fishkeepers as they learn to grips with water chemistry and the ‘ammonia cycle’ and fish biology.

This colourful slice of ‘nature in the home’ can have important benefits for those without access to green spaces in cities or who live in flats or houses without gardens27,28.

A major multi-national company and OATA member69 signed up all its supply line which monitors human rights and that correct and sustainable working practices are implemented throughout the whole supply chain to ensure they can maintain the standards required from source to destination, supporting training, local compliance, boat repairs, improving working conditions and ensuring audits occur in situ by suppliers’ staff.

**H ow the Industry Helps**

**Fishing for facts**

The ornamental fish trade can promote conservation in remote parts of the world and spark an interest in conservation in those who keep fish, along with improving fishkeepers’ scientific literacy and health and well-being.

Wild collection fisheries can play an important role in conservation

Although wild collection plays only a relatively small part in our industry, it nevertheless plays an important role in conservation. Communities that catch fish understand the need to conserve their local environment to ensure a longevity of supply and hence income – they are the stewards of their local ecosystems because their livelihoods depend on it. The absence of an ornamental trade that provides a livelihood involving the non-destructive use of ecosystems, increases the likelihood of alternative more destructive forms of employment, such as food fisheries or extractive industries, being taken up30.

**Consumer attitudes drive high ecological standards**

Consumers are increasingly interested in understanding where their fish come from and companies respond because they do not want to be associated with unsustainable practices which can be reputationally damaging. The industry relies on the provision of live and healthy fish so companies invest in training and traceability and regularly audit the companies they interact with along the supply chain. Organisations such as Project Piaba, which supports the trade in wild collected freshwater fish in the Amazonas region of Brazil, tap into this with its motto ‘buy a fish, save a tree’30. In addition, the growing captive breeding sector for marine ornamental fish32 has provided initiatives that not only provide a sustainable supply of fish but also is increasingly providing a much-needed new revenue stream for many poorer communities alongside traditional low-impact fishing techniques33.

With the publication of the Dasgupta Review34, the need for industries to invest in natural capital to offset their use of nature is being increasingly recognised35,36. In addition, conservation scientists increasingly advocate for nuanced solutions to biodiversity loss that empower local people to sustainably utilise and manage natural resources. The UK trade in ornamental fish is well placed to achieve these outcomes as an industry that is intrinsically linked to the non-destructive use of biodiversity in some of the most remote regions on earth. The UK ornamental fish industry is proactive in its efforts to preserve biodiversity and serves as a vehicle to encourage and achieve wider public engagement with the natural world.

A fuller examination of the ecological and societal benefits of the trade in ornamental fish in the UK is at Annex S.

**Delivering positive conservation outcomes**

A major multi-national company and OATA member has pioneered a new approach to the restoration of coral reefs to help support the livelihoods of those in its supply chain whilst also doing what it can to increase the health of ocean ecosystems by bringing them back to life. Working in partnership with local communities the company uses locally produced steel structures which are coated with coral sand extracted from the site of the restoration and attached with coral fragments rescued from the local reefs. The structures are connected together underwater to provide a solid platform for corals to rapidly grow and fish to colonise. At its site in Indonesia, and in just three years, coral cover increased from 5% to 60%, fish abundance increased threefold, biomass twofold, and the structures now cover over 40,000m2 of reef37,38. Watch a video about this work here by scanning the QR code with your smartphone app.

**E nsuring Ethical Practices**

One of the UK’s leading importers of marine ornamental fish and OATA members signed up all its supply lines to SEDEX39 which works with businesses to improve working conditions in global supply chains. This ensures a socially responsible supply line which monitors human rights, and ensures local legislation is respected and in place, and that correct and sustainable working practices are implemented throughout the whole supply chain. This business funds companies in its supply chain to ensure they can maintain the standards required from source to destination, supporting training, local compliance, boat repairs, improving working conditions and ensuring audits occur in situ by suppliers’ staff.

**Pets are good for us**

**Did you know:**

- Watching fish can help reduce blood pressure, heart rate, stress and anxiety17.
- Pets help children too. Research has shown interactions with home aquariums are effective therapies for regulating mood and stress in children generally, as well as those with Autism18,19, and Attention Deficit/Hyperactivity Disorder19.
- Pets can improve productivity at work20.
- Pets in care homes can help to lessen loneliness and stress levels. Aquariums have been found to improve staff satisfaction and save money in dementia units20.
- An aquarium in the dining room improved appetite among residents21.
- Pets help people connect with nature22. A tropical fish aquarium brings a direct connection with nature into our homes in an increasingly urbanised world.
- 32% of people in the UK say a pet provides companionship and friendship and 52% believe that pets help those who may be feeling lonely, even before the 2020 lockdown. Over 9 million people in the UK have said they often feel lonely23.
- During the 2020 UK lockdown more than 90% of survey respondents said their pet helped them cope emotionally24.
- Animal ownership had a positive impact on mental and physical health during the COVID-19 lockdown phase through various mechanisms, including companionship and emotional support and encouraging physical activity which helped to distract owners from inner feelings of distress, providing a source of motivation to engage owners in activities, responding to owners in an intuitive manner and providing a sense of connectedness or normality25.
- Pets are estimated to save the NHS at least £2.7 billion every year, which could be a conservative estimate26.

16 Fishing for facts

17 Fishing for facts
Summary of the key regulatory controls governing the UK ornamental fish trade

Many regulations exist to control the trade in ornamental fish and provide powers to Ministers to ensure welfare, biosecurity and other standards are maintained in the UK. This Annex outlines some of the main controls relevant to the UK ornamental fish trade but is by no means comprehensive.

Animal Welfare

International Air Transport Association (IATA) Live Animals Regulations10 Requires commercial operators who sell animals to meet specified standards.

Welfare of Animals in Transport Orders

Sets the worldwide standard for transporting live animals by commercial airlines, ensuring all animals are transported safely and humanely by air. Packaging and transport requirements are designed to minimise welfare impacts and mortalities during transport and are regularly reviewed. International carriers will not transport fish unless they meet IATA standards.

Welfare of Animals in Trade

Welfare of Animals in Trade requires pet shops to ensure potential buyers understand the welfare needs of animals prior to purchase and to provide information on the appropriate care of the animal.

Animal Welfare Act

Places a duty of care on pet owners to ensure that the needs of animals they are responsible for are met, i.e., for a suitable environment, diet and housing, to be able to behave normally and to be protected from pain, suffering, injury and disease.

Biosecurity/health/disease and pest transmission

Import of Live Fish Act

Lists the freshwater fish species that can be imported into England and Wales. Species are considered to represent a biosecurity risk are excluded from the list.

Invasive Alien Species Regulations

Restricts the import, keeping, movement and trade of listed species and provides for measures to be taken in relation to invasive alien species.

Wildlife and Countryside Act

Prohibits the release into the wild of any animal outside its native range.

Aquatic Animal Health Regulations

Ensures that animals placed on the market are clinically healthy and free from disease, including requirements for Aquaculture Production Businesses to be authorised and to operate in a manner that will not lead to an unacceptable risk of spreading disease, to be accompanied by an animal health certificate, and for operators to notify regulators of any suspicion of the existence of listed diseases.

Sustainable sourcing

CITES Regulations

Implements the Convention on International Trade in Endangered Species (CITES) which provides a mechanism to ensure that the international wildlife trade is sustainable and does not threaten the conservation status of wild species. Requires the issue of import and export certification that confirms the trade is not detrimental to the conservation of wild populations. The 2019 CITES Conference of the Parties agreed to Decisions 18.296-18.298101 on marine ornamental fishes which propose a comprehensive examination of the trade.

Animal Welfare

The industry plays a vital role in ensuring high welfare standards for all animals that are in trade throughout the supply chain. Organisations such as OATA, OFI and member businesses are proactive in ensuring high welfare standards not only because a healthy non-stressed fish has greater value but also because individuals within the trade have enthusiasm and care for the welfare of the fish they trade.

Sourcing of fish for the ornamental aquatic trade is subject to monitoring from industry groups such as OATA, OFI and suppliers to ensure high standards of animal welfare. Methods used to ensure welfare standards are largely dependent on where species are sourced from. The majority of fish in trade are sourced from managed aquaculture where welfare standards are regularly monitored by those who are active in the supply chain. Importers in end countries will regularly check standards on fish farms, and in particular monitor water quality and fish health that can have knock on effects further down the supply chain if not optimal. Industry group such as OFI set standards for members who produce fish for the trade54.

The role of industry in driving up welfare standards is often overlooked. Industry bodies such as OATA and OFI monitor and contribute toward critical research that investigates animal welfare bottlenecks within the industry. Welfare within the supply chain, such as retailers and manufacturers, will fund both their own and independent, peer-reviewed research into methods that improve animal welfare standards within the industry. For instance, a review into stress and welfare by Stevens et al59 supported by industrial partners gave a broad ranging critique of trade practises with potential avenues for improvement. Such suggestions included the use of stress reduction techniques pioneered by food-fish aquaculture during key steps in the commercial fish production chain. Subsequent research supported by industry has identified effective methods for stress reduction, such as the addition of environmental supplements or early identification of certain behaviours - line with suggestions made by earlier reviews60-62. In addition, industry bodies such as OATA regularly feed into government consultations on improving animal welfare63 utilising up to date scientific research to justify appropriate measures to ensure high welfare standards for fish in trade.

In addition to maintaining high welfare standards for the culture of live fish, the industry is rightly conscious of welfare issues associated with wild collection. It is important to consider that wild collected fish represent a small proportion of live fish imports and those that are imported for the UK trade are collected mostly using methods that ensure the least amount of stress possible64. The greatest market demand for the ornamental sector is for live healthy non-stressed fish and as such the dominant fisheries methods reflect this.

In the case of freshwater fisheries, shoals of fish are encouraged into wide nets which are then lifted into wide tubs for transportation to holding pens. Other methods include the use of real or artificial refuges of cryptic species, that are then lifted into a fish swim into the net as they leave the refuge65. In some cases, active netting such as the use of seine nets are used to gather larger fish over a wider area, such as Discus and Arowana66.

Marine fisheries can employ similar non-destructive methods to freshwater fisheries, such as the use of traps and artificial refuges. In addition, local divers and snorkelers can use sticks to chase fish out of crevices for capture in barrier nets67. Destructive practices that were once common such as cyanide fishing or blast fishing are illegal in source countries and the UK trade actively monitors supply chains and in particular sourcing methods when importing wild collected fish. In addition to the monitoring of supply chains, OATA has actively funded research into methods to detect cyanide in marine fish imported into the UK68.

Data for mortality on arrival is sometimes considered a proxy for stress levels in studies of welfare in transport of ornamental fish69. However, the use of this statistic has been widely amplified by some recent literature70-71, due to the findings of a particular study that estimated that 73% of fish arrived dead72. Such reviews are typically not valid as fish mortality in transport is often as high as 73% mortality73 which has been widely cited since. Notwithstanding that the age of this publication makes it relevant on the industry bodies such as OATA are active in ensuring the welfare of animals throughout the supply chain. Organisations such as OATA and OFI monitor and contribute toward critical research that investigates animal welfare bottlenecks within the industry.

Despite this, with figures ranging from 0%-1%. This no doubt is due to the high packing standards implemented throughout the supply chain.

Retailers that stock ornamental fish and industry groups such as OATA are active in ensuring the welfare standards of fish prior to and after the sale of live fish. Retailers have a large role to play in educating potential fish keepers of the different needs and requirements of species. Industry representatives such as OATA set standards for members to ensure that customers are given the right information before the purchase of fish for their home aquarium to ensure that the right animal goes to the right home. The Big Fish campaign.

ANNEX 1

ANNEX 2

Animal Welfare

The industry plays a vital role in ensuring high welfare standards for all animals that are in trade throughout the supply chain. Organisations such as OATA, OFI and member businesses are proactive in ensuring high welfare standards not only because a healthy non-stressed fish has greater value but also because individuals within the trade have enthusiasm and care for the welfare of the fish they trade.

Sourcing of fish for the ornamental aquatic trade is subject to monitoring from industry groups such as OATA, OFI and suppliers to ensure high standards of animal welfare. Methods used to ensure welfare standards are largely dependent on where species are sourced from. The majority of fish in trade are sourced from managed aquaculture where welfare standards are regularly monitored by those who are active in the supply chain. Importers in end countries will regularly check standards on fish farms, and in particular monitor water quality and fish health that can have knock on effects further down the supply chain if not optimal. Industry group such as OFI set standards for members who produce fish for the trade54.

animal Welfare
promoted by many OATA member retailers was highly successful in educating the public of the need to be aware of eventual body size of many species that have traditionally been kept as aquarium fish. The success of this campaign was due in no small part to the enthusiasm shown by those employed in the industry, such as the Pet Portal and Pet Know How that aim to give current and prospective pet owners the information they need to understand the care needs of different pets.

Summary
The trade in companion animals, including fish, is often viewed in a highly subjective manner, with some perceptions conflating the ornamental trade with a lack of regulation and little regard for welfare. In reality, the trade in live ornamental fish is highly regulated by a suite of national and international legislation, applied throughout the supply chain to ensure high welfare standards from source to eventual home (see pages 8 to 9). The role of the ornamental aquatic industry in driving increased welfare standards throughout the supply chain is often overlooked. This is enacted through:

- Self-regulation by industry bodies setting high standards which often feed into the creation of new legislation or government guidance.
- Industry support of research that investigates sources of potential stress and tests novel methods for improved welfare.
- Strict adherence to existing legal frameworks that govern the entire supply chain.
- Proactive efforts by individuals employed in the trade to improve public understanding of good husbandry techniques.

In addition, common misconceptions about the trade are often the result of a failure to consider the specific context around individual studies or recent evidence published in peer reviewed journals.

ANNEX 2

Health risks and biosecurity

Human Health
In light of the COVID-19 pandemic, the role of animals as potential reservoirs for pathogens and spill over events which have detrimental effects on human health has gained increased scrutiny. There are many examples of diseases with high transmissibility between humans linked to contact with animals, either as a vector borne disease or as a zoonotic disease. A zoonotic disease is one that has previously infected an animal species, evolves to be able to make the species jump from its original animal host114. A vector borne disease (VBD) is one which a disease infects via another organism, carrying the pathogen from one host to another, such as malaria in mosquitoes115. Although there is certainly a potential for all animals to pose risk of infection, it is also the case that the specific context of human-animal interactions should be taken into account before the imposition of potentially inappropriate and harmful measures. The One Health approach considers health and disease at human, animal and environment interfaces to promote a whole society management of risk. This approach, advocated across scientific disciplines, considers appropriate actions to combat potential health risks whilst considering restrictions on people’s livelihoods and wellbeing, animal health and welfare, and conservation of ecosystems110,116.

Historically there have been few recorded cases of zoonotic disease jumps from fish to humans in multiple species, despite theoretically high levels of close contact and therefore exposure to potential pathogens112,116,119. Fishermen, fishmongers, fish farmers, as well as those who work in the ornamental aquatic trade, have had routine exposure to fish pathogens for hundreds of years. Although there have been historical changes in exposure levels and medical knowledge, the lack of recorded zoonotic outbreaks is underpinned by clear biological principles that afford humans a significant degree of protection. Phylogenetic distance, i.e. the evolutionary distance between organisms, has been shown to be a good predictor of how likely a zoonotic disease is to emerge between species121. Recent work has shown that the greater the distance between hosts, the less likely it is that a disease may pass between them125. When talking of aquatic organisms, this manifests itself in clear bio-physical hurdles that potential pathogens would have to cross39. Any potential pathogens would have to pass39. Any potential pathogens that infects aquatic organisms is by definition adapted to infecting hosts in a trade require through the use of gills or similar structures there is minimal risk of COVID-19 transmission to hobbyists and workers in the ornamental aquatic industry from live animals126. That said, recent scientific literature has assessed the COVID-19 risks associated with exposure to fish and other aquatic animals. To date, there are no recorded cases of fish viruses to humans12 and recent research has found minimal risk from food fish or their products120. A recent study found that the majority of fish species lacked the appropriate cell surface proteins to interact with the Sars-Cov-2 spike protein that causes initial infections121.

Some occupational risk to inhaled pathogens is posed by working within certain aspects of the ornamental aquatic industry. The transfer of some diseases is theoretically higher when working with outdoor ponds, such as Legionella or Welts disease129. Although water features present in ponds can create aerosols through which these diseases can be transmitted the potential for infection is considered low110. This is due to generally low concentrations found in pond water and potential pathogens but also high levels of ventilation due to ponds being situated outdoors. In addition, the widespread use of UV sterilisation of outdoor pond water in fish in is considered effective at reducing the effective load of pathogens such as legionella in the water column.

Disease incidences within the UK ornamental aquatic industry can be effectively protected against by the implementation of high standards of hygiene such as recommended by OATA and legal requirements on health and safety. All businesses that sell live animals in the UK must adhere to risk assessments and standard operating procedures on hygiene in order to qualify for a licence to operate. In addition to this, OATA provides detailed guidance on biosecurity to its members by encouraging aquatic-specific hygiene measures such as covering cuts on hands and arms, wearing appropriate PPE, net dips, and hand washing before and after handling animals116.

Assessment of COVID-19 specific risk
The COVID-19 pandemic has been identified as a zoonotic disease and further investigations have highlighted that certain animal species may be a potential risk in spreading the disease that causes COVID-19, such as mink117, bats118, and others116. Although the evidence for animal-human transmission of COVID-19 and indeed other Coronavirus is varied, it is prudent for all industries to accurately assess the risk of COVID-19 transmission.

As discussed above, phylogenetic distance underpins the lack of recorded cases in fish and other aquatic animals. Research has found that there is negligible incidence of any Coronavirus in aquatic animals, and those found are of low virulence116. The key mechanism for the spread of COVID-19 and Coronaviruses is through respiratory infection via aerosol or droplets. Given the aeration systems in trade require through the use of gills or similar structures there is minimal risk of COVID-19 transmission to hobbyists and workers in the ornamental aquatic industry from live animals126. That said, recent scientific literature has assessed the COVID-19 risks associated with exposure to fish and other aquatic animals. To date, there are no recorded cases of fish viruses to humans12 and recent research has found minimal risk from food fish or their products12. A recent study found that the majority of fish species lacked the appropriate cell surface proteins to interact with the Sars-Cov-2 spike protein that causes initial infections121.
It could be said that the largest potential risk is through contamination of surfaces from areas with high transmission. Studies have shown the viability of the COVID-19 virus on multiple surfaces which are used throughout the supply chain of live animals. The virus remained viable up to 24 hours on cardboard and 48 hours on plastic surfaces such as polystyrene (insulated boxes) and polyethylene (transportation bags). The half-life, i.e. half the amount of viable virus present, was 6.8 and 3.5 hours respectively. Given that fish are packaged to survive for 48 hours in transit, it could be estimated that the likelihood of COVID-19 remaining viable on the surface of fish imports is quite low. In addition, guidance from the Scientific Advisory Group for Emergencies (SAGE) shows that respiratory transmission is much more likely than transmission from surfaces, and that regular hand washing is obeyed. Based on current available information from the scientific literature and from the UK government, surface transmission from live animal imports carries minimal risk, similar to that of transmission of other goods.

### Fish health

The trade in live fish by its very nature could be subject to potential outbreaks or high transmission of fish diseases. In particular, mixing of stocks from different sources and temporary periods of high fish density could arguably lead to issues of disease transfer. As such, the trade in ornamental fish adopts high standards on fish health with appropriate measures to reduce disease. This not only protects against stock loss and maintains high welfare standards, but also adheres to specific regulations on aquatic animal health. The use of sterilisation equipment, such as UV sterilisers and ozone, is widespread throughout the UK industry, as well as in many of the facilities that fish are sourced from. Checks on fish health are also carried out throughout the supply chain by trained officials such as the Fish Health Inspectorate (FHI) and other border control agencies, such as the Animal and Plant Health Agency (APHA). These checks are a great extent on “cold-water” fish in trade as they have the greatest likelihood of acting as a vector to native fish populations. Some diseases in particular are heavily monitored, and are legally notifiable such as Koi Herpes Virus (KHV) and Spring Viraemia of Carp (SVC). Such diseases are kept at bay by high cooperation of industry actors who actively work with the FHI to report potential outbreaks. In contrast to cold-water species, “tropical” fish may have comparative low risk of disease transfer to native populations as: they are unable to survive in the wild and are kept in self-contained environments (aquariums).

An issue of growing concern for scientists and industry alike is that of anti-microbial resistance (AMR). AMR is the growing trend of bacteria adapting to the use of anti-microbial agents, such as antibiotics, so that their use becomes ineffective. This is often promoted through the inappropriate use of these agents as preventative measures as opposed to targeted treatment of diseases. There is a growing body of research that actively questions the role of aquaculture in promoting the development of AMR. In the UK, the use of antibiotics in fish is regulated and can only be prescribed by a specialist vet but there are concerns about the import of AMR bacteria and other pathogens from source countries. At present, antibiotics are not widely used within the UK trade and are only ever prescribed by veterinarians under very specific circumstances.

Both academia and industry groups such as OATA recognise the danger of potential overuse of antibiotics by ornamental species. Improved international efforts to reduce the practices that promote AMR are needed to reduce future potential outbreaks of difficult to treat pathogens.

### Invasive species

The movement of species by humans outside of their natural ranges poses the potential risk of those species becoming established and invasive outside of their endemic range. The impacts of these species becoming established in novel environments can cause various problems to native ecosystems, such as altering community structure, driving local extinctions, erosion and public health concerns. As such, species in trade in the UK for the ornamental sector are subject to high levels of monitoring and regulation. However, the use of the trade in ornamental species is not a suitable measure to mean that some species are subject to bans that may have unintended consequences for the wellbeing of the industry, fishkeepers and local communities in source countries.

The majority of fish in the UK trade are classed as tropical species and such have consistently average annual temperatures well above 20 degrees to survive. Therefore, the invasive potential for most species is quite low due to the physiological needs of most tropical species in trade. However, ornamental species becoming established in temperate countries such as Germany, these invasions are only monitored because of the use of native fish populations. In the UK such power plants are generally located on coastal or estuarine sites with greater capacity for the natural environment and, as such, are unlikely to facilitate invasions in the same way.

Some species however may have a wider temporal tolerance and, as such, may be present in our environments, not linked to natural water courses. In order to cause significant pressure on local species, fish have to overcome local predation, and exist in high enough numbers for them to act as a vector. Prevailing environmental conditions also must be optimal for the survival of any released species. Study shows that releases of non-native species in aquatic environments need to be in high enough numbers of individuals for establishment (survival and reproduction) to occur. Given that ornamental species that are either legally or accidentally released are generally released singly or in small groups, the risk of ornamental species becoming established is considered very low by industry bodies such as OATA. This does not however exclude the possibility of disease/parasite transfer to wild fish populations, an issue that has been highlighted in food fish aquaculture of non-native species. Although this is a potential risk, it is worth highlighting that regulations for animal activities licensing ensure that aquaculture facilities are monitored andLICENSED to prevent any potential emerging challenges in fish health and public health concerns. As such, species in trade are only ever prescribed by veterinarians in the UK for the ornamental sector are subject to high standards regarding hygiene and health and safety, but also clear biological barriers to disease between humans and fish.

### Summary

The trade in ornamental fish has its own set of challenges with regards to health and biosecurity for both those that work in the industry and the animals that are traded. Continual assessment, improvement and monitoring of standards is essential for the long-term sustainability of the trade as well as for the health of animals, people and environments linked to the industry.

#### The potential impacts on the health of people involved in the trade

The industry is subject to strict legal controls on fish health and biosecurity throughout the supply chain. Controls already in place are designed to mitigate the potential spread of disease and species, and in the UK these are subject to inspections by the Fish Health Inspectors where necessary. That said, industry groups such as OATA are alive to potential emerging challenges in fish health and biosecurity, such as that of AMR and believe that international and industry collaboration is needed to ensure existing high standards are maintained.

In addition to the pressures above, industry and hobbyists actively engage with the prevention of invasions. Such as OATA have recommended a voluntary ban within the industry on the trade in several aquatic plant species with invasive potential prior to official bans imposed by the Department for Environment, Food and Rural Affairs (Defra) and the industry groups, such as OATA, are regulated and kept under regular review by the Fish Health Inspectorate. Although this is a potential risk, it is worth highlighting that regulations for animal activities licensing ensure that aquaculture facilities are monitored and LICENSED to prevent any potential emerging challenges in fish health and public health concerns. As such, species in trade are only ever prescribed by veterinarians in the UK for the ornamental sector are subject to high standards regarding hygiene and health and safety, but also clear biological barriers to disease between humans and fish.
Sustainable sourcing

Any trade that relies on the direct or indirect use of natural resources is subject to questions about its sustainability, i.e. that its exploitation does not result in an overall reduction in its prevalence145,146. Common misconceptions about the trade in ornamental fish are that fish are not sourced sustainably and use destructive fishing methods. Independent research indicates that the majority of fish sold in ornamental aquarium trade are sourced sustainably with minimal impact on wild populations146,147, and the industry remains vigilant against the unsustainable practices of the illegal wildlife trade. Moreover, the wider benefits (socio-economic and ecological) of the UK trade in ornamental fish are often overlooked due to conflation with the illegal wildlife trade.

Ornamental fisheries utilised by the UK fall into one of two categories: marine and freshwater. Each are characterised by differing methods of sourcing, dictated by the ecology and physiology of the fish groups in trade, i.e. the natural life cycles of traded species dictates their ease of culture (explored in more detail below).

Ornamental freshwater fisheries
According to OATA's 2019 annual trade report1 and Wild Caught Ornamental Fish: the trade, the benefits, the facts1 and other published literature1 the majority of tropical freshwater fish species are sourced from aquaculture (approximately 95% of individuals sold) with wild collected freshwater fishes representing only around 5% of trade volume. It is important to consider that tropical freshwater fish represent the majority of species sold for home aquaria and garden ponds148. In the UK, where of households that own fish (14% of UK households)1, 77% are freshwater fish over the other opposite (marine fish). In particular, the trade in marine ornamentals has long been a suggested strategy for reducing the impact of commercial food fisheries149. Recent work on the export of ornamental marine fish from Indonesia found that approximately 85% of the species sold were listed as Least Concern on the IUCN red list15. In addition, recruitment of fish to coral reefs (where most ornamental species in trade are found) is often said to be space limited, not resource limited150. Coral reefs are highly productive, and the removal of select individuals is likely to free up space for new individuals to settle there, maintaining high levels of fish biomass151.

When considering the impacts of wild collected ornamental fish, it is worth considering that marine fishkeeping makes up a relatively small portion of the overall trade in ornamental fish152. The presence of fish farming is vitally important to many rural communities that rely on natural resources is subject to questions about its sustainability, i.e. that its exploitation does not result in an overall reduction in its prevalence145. Common misconceptions about the trade in ornamental fish are that fish are not sourced sustainably and use destructive fishing methods. Independent research indicates that the majority of fish sold in ornamental aquarium trade are sourced sustainably with minimal impact on wild populations146,147, and the industry remains vigilant against the unsustainable practices of the illegal wildlife trade. Moreover, the wider benefits (socio-economic and ecological) of the UK trade in ornamental fish are often overlooked due to conflation with the illegal wildlife trade.

Ornamental marine fisheries
In contrast to freshwater fish, marine fish sourcing is dominated by individuals collected in the wild145, supplemented by a smaller but growing sector in aquaculture145. Typically, marine ornamental fish species tend to have more complex life cycles, with larval fish having a long planktonic phase before settlement, with adult body size of the Common Clownfish, Amphiprion percula, is around 10cm but individuals are commonly sold at 2-3cm157. As such, the relative impact on overall fish stocks of targeted species is low. Targeting of small to medium sized individuals has long been a suggested strategy for reducing the impact of commercial food fisheries152. Recent work on the export of ornamental marine fish from Indonesia found that approximately 85% of the species sold were listed as Least Concern on the IUCN red list15. In addition, recruitment of fish to coral reefs (where most ornamental species in trade are found) is often said to be space limited, not resource limited150. Coral reefs are highly productive, and the removal of select individuals is likely to free up space for new individuals to settle there, maintaining high levels of fish biomass151.

The methods of fishing for ornamental marine species has often been scrutinised due to the prevalence of local fishers employing destructive and illegal fishing techniques such as cyanide poisoning146 and blast fishing145. Such practices are not supported by the UK trade in marine ornamental fishes, with industry working with local fishers to discourage their use in favour of low impact, collected-to-order fisheries. Because of this, the general decline in the use of such practices has been observed in ornamental fisheries, with local fishers favouring low impact, collected-to-order fisheries.

The trade in marine and freshwater species are characterised by different methods of sourcing, with minimal impact overall on wild populations. This is why the ornamental fish trade is considered "high value, low volume." The industry supports local communities, through the aquaculture of species in trade, wild collection where it is sustainable and supports local communities, and the use of non-destructive fishing methods.

<table>
<thead>
<tr>
<th>Family</th>
<th>2012</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blenniidae</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>Gobiidae</td>
<td>11%</td>
<td>13%</td>
</tr>
<tr>
<td>Pomacentridae</td>
<td>9%</td>
<td>13%</td>
</tr>
<tr>
<td>Pomacanthidae</td>
<td>24%</td>
<td>18%</td>
</tr>
<tr>
<td>Pseudochromis</td>
<td>11%</td>
<td>8%</td>
</tr>
<tr>
<td>Syngnathidae</td>
<td>10%</td>
<td>13%</td>
</tr>
</tbody>
</table>

This graph shows the increase in captive bred ornamental fish species available in trade from 2012 to 2017. The table shows the proportion of these taken up by the 6 main families cultured (taken from Pouil et al., 2020).
Ecological and societal benefits

The trade in ornamental fish has wide-ranging benefits not just for businesses and wildlife. There is a growing body of evidence showing the positive role that the industry can play in both enhancing biodiversity and individual wellbeing.

Ecological benefits

The need for the sustainable use of natural resources by industries is becoming more apparent as time goes on. Industries that utilise the natural world are increasingly becoming aware of the need to reinvest in ‘natural capital’ to offset the use from nature. Initiatives such as investing in “Blue Carbon” have already been pioneered by multinational companies such as Apple16 and Mitsubishi. There is recognition in the ornamental aquatic industry of the role that biodiversity plays in its sustainability. The ornamental industry exist because of the natural diversity of fish, providing hobbyists with high variety of fish to keep as pets. Local fishers that supply the ornamental trade can provide financial support for a coral reef restoration project in Northern Bali, Indonesia, to promote increased recruitment and local livelihoods. LINI also supports local fishers to use non-destructive techniques to harvest fish for the ornamental aquaculture trade. These techniques have been pioneered since 2010 to improve local livelihoods but not at the expense of local biodiversity. In addition to restoration efforts, LINI has also set up an Aquaculture and Training centre to work with local people to culture fish species for the ornamental supply chain that otherwise might be fished from local reefs, such as the Banggai Cardinalfish and Percula Clownfish. Project Piaba is an initiative that promotes the sustainable capture of ornamental fish from the Rio Negro region in Brazil and incentivises local fishers to actively engage in the conservation of the local rainforest. In addition to the productivity of aquatic habitats, not only for economic sustainability but also as a community of people that value the natural environment. In order to achieve this, the trade in ornamental fish and other aquatic animals both in the hobbyist community but also in public aquaria. Industry provides both financial and technical support (in the form of equipment, food and supplements) to hobbyist groups that are engaged in the conservation of endangered species. Notable examples such as Zebra Pleco catfish166, livebearing fish and cichlids are encouraged in their endemic ranges by habitat destruction. Deforestation, dam building, agricultural run-off) are protected by the trade and hobby community by acting as biological refugia through captive breeding efforts167. This is also mirrored in some of the most popular species in the aquarium trade. Aquaria. These are highly impacted or even functionally extinct in some populations, and exist almost entirely within the ornamental trade. Recently industry bodies, such as OATA, have also supported the establishment of a new initiative, Shool, to support the conservation of freshwater biodiversity.

Societal benefits

Aquarium keeping, and the trade that supports it, is increasingly recognised for its ability to shape our behaviour and wellbeing. The need for public engagement with the natural world to foster the development of pro-conservation related behaviours in the public, with exposure to high levels of captive biodiversity has long been recognised as valuable in improving the public engagement with positive action. In particular, interactions with aquariums has long been recognised as valuable in improving the public engagement with positive action. In particular, interactions with aquaria have been shown to have widespread benefits for dementia and Alzheimer’s patients, as well as those with Autism175, and Attention Deficit/Hyperactivity Disorder176. The ornamental aquatic industry plays an important role in supporting communities that rely upon it throughout the supply chain. Many fish that supply the industry are sourced in less developed regions that rely heavily on it for their income. Aside from traditional sources of income from the trade, such as wild collection and that correct, sustainable working practices are in place. A major UK importer of marine fishes uses the services of a governmental organisation run by marine scientists to actively support local communities by providing funding for projects of wider social benefit, such as the building of schools, churches,
and paying for boats that are essential to people’s livelihoods. These efforts, alongside those highlighted in the case studies above, illustrate that the UK trade in ornamental fish is one that strives to be socially and environmentally responsible in its sourcing of fish.

Summary

Fishkeeping has wide ranging benefits and has great potential as a positive force for safeguarding biodiversity and improving mental well-being in both adults and children. Industry groups actively engage in pro-conservation activities, by providing financial, practical and knowledge support to governments, NGOs and local people who work in the aquarium trade.

With the publication of the Dasgupta Review in 2021, the need for industries to recognize the value of biodiversity is greater than ever. The UK trade in ornamental fish is one that already is proactive in its efforts to preserve biodiversity and is a great channel to achieve wider public engagement with biodiversity outcomes.

The COVID-19 pandemic has highlighted the impact mental health issues can have on individual wellbeing. The keeping of fish and other companion animals is shown to help people cope with arising mental health issues and could be a valuable tool in managing the mental health needs of individuals.

References

10. International Air Transportation Association. IATA live animals regulations 2020. 2020;
22. Ornamental Aquatic Trade Association. OATA Code of Conduct. 2015;
30. Ornamental Aquatic Trade Association. OATA Say No to Goldfish at Fairs. (https://ornamentaltfish.org/say-no-to-goldfish-at-fairs-say-no/)
32. Ornamental Aquatic Trade Association. OATA Fish as decorations position statement. 2015 (https://ornamentaltfish.org/)
33. Ornamental Aquatic Trade Association. OATA City and Guilds Training Programmes. (https://ornamentaltfish.org/training/)
37. AWINW. Animal Welfare Network Wales. (https://www.awinw.org.uk/)

ANNEX 5

Fishing for facts

28 Fishing for facts

ANNEX 6

29 Fishing for facts
ANNEX 6


54. Ornamental Aquatic Trade Association. UK Aquarists warned to be vigilant for invasions from alien species. 2020. (https://ornamentalfish.org/uk-aquarists-warned-to-be-vigilant-for-invasive-species/) 


58. Project Pbla – Buy a Fish, Save a Tree. http://projectpbla.org/


ANNEX 6


134. OATA. OATA ANNUAL REPORT. 2019;


138. Gafanovich M. Aquarium therapy and ADHD. https://www.mynycdoctor.com/aquarium-therapy-adhd
