

A review of fish welfare and public health concerns about the use of *Garra rufa* in foot spas

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Abstract

*The fish spa industry in the UK started in 2010 and has developed at a rapid rate. This novel beauty treatment is now available in many outlets and involves large numbers of fish held in compact self-contained recirculating systems. Several concerns regarding public health and fish welfare in this unlicensed business have been raised by several organisations. This paper discusses various aspects of the Animal Welfare Act (2006) and how these apply to the use of *Garra rufa* in these facilities.*

Introduction

Garra rufa are freshwater fish that originate from the river basins of the Middle East and is one of about 100 *Garra* species in the family Cyprinidae. These fish live in outdoor pools of some Turkish spas where they ‘nibble’ off the thickened and dead skin of human bathers. Consequently, this species of fish is also known as ‘doctor fish’, ‘nibble fish’ or ‘Kangal fish’; the latter name being taken from a spa town in the mountainous area of central Turkey where they are found. This slender greyish brown cyprinid has pharyngeal teeth but the sucking mouth has an expanded lower lip that forms a round or oval sucking pad, which has sharp keratinised edges used for scraping food from the surface of submerged rocks and logs. This feeding method is the basis for their use in foot spa treatments in beauty salons where customers sit with their feet submerged up to mid-calf level for sessions lasting up to thirty minutes. A few other species of fish are also used in fish spas, and hands may also be immersed in the tanks. In addition to the cosmetic treatment of normal skin, the fish remove superficial scaly patches that develop on the skin of patients suffering from psoriasis and eczema, leaving the underlying skin surface smooth and clear of scale. This action, in combination with exposure to sunlight, is considered to bring medical benefits to some patients.

Business in the UK

Fish spas developed in the Far East many years ago, later spreading to Europe and opening in the United States in 2008. They first appeared commercially in the United Kingdom in May 2010 and the number of premises quickly expanded over the following 12 months. A survey in the spring of 2011 identified 279 fish spas in the UK, with more planned to open over the following months. Companies supplying fish and manufacturing the equipment for these spas have also become established during this time. Due to concerns about commercial exploitation and over-harvesting, *Garra rufa* have been given legal protection in Turkey, although much of the trade now comes from suppliers in the Far East. The fish are bought at about 4–6 cm in size and in 2011 cost approximately £1.40 to £2.40 each.

In the UK, most fish spas consist of tanks containing about 100 litres of water with external canister filtration and ultra-violet sterilization units concealed under the adjacent seating area (Figs 1–3). These recycling filter systems may service one or several tanks depending on their size and capacity, and are often standard commercial items as used in the aquarium hobby. The self-contained fish spa units are usually sold as single or twin systems and can cost £1,500 and £2,000 respectively. Smaller units for children or hand manicures are also available. Units may be purchased outright or leased through some companies. The stocking density in the tanks varies from 60 to 200 fish per tank.



FIG 1: A fish spa in a shopping arcade.



FIG 2: Single user fish pedicure systems, with the cover in place over the tank on the left.



FIG 3: The external canister filtration and ultra-violet system is housed under the seating area.

Fish foot spas are offered as a service in beauty salons which may have one or two units but are also found in dedicated businesses with several units in a stand-alone shop, some of which are glamorous up-market enterprises. Small mobile units are also located in shopping malls and sports centres where there is a large customer footfall. In 2011, one national chain of salons had between 30 and 40 branches with more planned to open. The cost to a customer at that time was about £1 per minute, with lower rates for longer sessions.

Areas of concern

When fish spas were first introduced into the UK in 2010, there was much publicity in the press and on national television about this novel beauty treatment. Due to the rapid development of the industry and lack of documented evidence it has been difficult to fully assess the main concerns about public health risks and fish welfare in a business in which there is limited regulation of its services. The importation of this species from outside the European Union for non-ornamental use (i.e. spa or medical purposes) requires authorisation by the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) on an annual basis. Although there are no official coordinated records of the number of *Garra rufa* imported into the UK for the fish spa trade, over 35,000 per week were imported at times in 2011 (CEFAS, personal communication). Such high numbers suggest that there was a rapid expansion of businesses or a high turnover of stock due to mortalities since the natural lifespan of this species is thought to be between 5–7 years.

On 26 August 2010, the Ornamental Aquatic Trade Association (OATA) issued an advice note to its members advising caution about involvement in this business sector. In July 2011, the Royal Society for the Protection of Cruelty to Animals (RSPCA) issued a Local Government Brief and in October 2011 the Fish Veterinary Society published a Briefing Statement on the use of *Garra rufa* used in fish spas, which primarily related to fish welfare. In addition to these formal publications, the *Practical Fishkeeping* magazine has published articles and used its internet forum to debate the issue. Several other on-line web sites such as www.petforums.co.uk have also hosted opinionated discussions. There are now on-line petitions which are campaigning to stop the misuse of *Garra rufa* fish, claiming that hundreds of fish are suffering and dying. After concerns were raised by Local Authority environmental protection officers and other human health agen-

cies, the Fish Spa Working Group published the *Guidance on the management of the public health risks from fish pedicures* in October 2011 although this did not examine welfare issues. Following publication of this document, several national newspapers published articles highlighting the public health risks on 18 October 2011.

Animal welfare legislation

The Animal Welfare Act (2006) is the main piece of legislation that affords protection to animals in England and Wales by giving those responsible for animals a legal duty of care. The Act states in Section 9, that it is the duty of the person responsible for the animals to ensure their welfare and that it is an offence if they do not take reasonable steps to ensure that the needs of an animal are met. Subsection 2 states that '*for the purposes of this Act, an animal's needs shall be taken to include:*

- a. its need for a suitable environment,*
- b. its need for a suitable diet,*
- c. its need to be able to exhibit normal behaviour patterns,*
- d. any need it has to be housed with, or apart from, other animals, and*
- e. its need to be protected from pain, suffering, injury and disease.'*

Similar legislation has now been enacted in other countries. Interpretation of these requirements requires an understanding of the natural needs, environment and behaviour of *Garra rufa* fish. There are many fish spas where the level of care and management is of a high standard but equally there are others where standards are less than ideal. Although some suppliers provide detailed care sheets for fish being used in fish spas, there are concerns that some people with the daily responsibility for the care of the fish may have limited experience in fish keeping given the primary focus of the beauty business.

Need for a suitable environment

Garra rufa are benthic fish, living on the bottom and hiding among the rocks and vegetation. They are thought to prefer fast moving water but they are also found in small ponds and lakes. All fish require a stable environment with good water quality at the correct temperature in order to remain healthy.

Their natural water temperature range is subtropical, varying from 15–28°C although they also live and breed in some outdoor thermal springs in Turkey where water temperatures may reach 38°C. One fish supplier's web site suggests that fish are heated to 36–40°C to verify that they are authentic *Garra rufa* fish and stating that other *Garra* species will not survive these temperatures – this practice should be condemned on welfare grounds because it is potentially harmful to the fish.

In fish spas, the water should be well oxygenated, using air-pumps and air-stones. The filtration system should maintain good water quality, free from pollution by metabolic waste products. Regular water quality tests should be performed by personnel with some understanding of the nitrogen cycle and filtration system so that appropriate action can be taken promptly if the water quality deteriorates. Written records must be kept with the levels of ammonia, nitrite, nitrate and pH as a minimum requirement. The frequency of the tests will depend on the stability of the system and stocking density, and may need to be done more than once daily. Contamination of the water with fake tan, cosmetic creams, medicinal products and antiseptics must be avoided and the customers' feet must be thoroughly cleaned and dried prior to immersion. Water pollution by disinfectants used to clean the tanks must be avoided. The use of environmental aerosols and perfumes must be minimised, particularly since air-borne chemicals may become concentrated in the water by the air-pumps and become toxic to the fish.

Need for a suitable diet

Garra rufa are omnivorous and naturally feed on aufwuchs, a biofilm of organisms such as algae, plankton and small invertebrates that live on the submerged surfaces in aquatic environments. At times when food is scarce, and human bathers are present, these fish will resort to skin-feeding behaviour. It is debatable whether they actually consume dead skin or if the skin is purely removed during the process of natural foraging while searching for food items. The nutritional value of dead skin is questionable, consisting primarily of keratin, which is relatively indigestible compared to their natural diet. Consequently, the 'nibbling' behaviour performed in foot spas is encouraged by hunger. More research is required to determine a suitable balanced diet for these fish in captivity. As a compromise, they should be given a reputable ornamental fish pellet food, sufficient to be eaten in two minutes, twice daily. Uneaten food should be removed to prevent water pollution but it may also indicate early signs of disease with loss of appetite.

Need to be able to exhibit normal behaviour

These fish are generally considered peaceful schooling fish. The stocking density in these facilities far exceeds that which exists in the wild. It is not known what impact this has on the behaviour of the fish although the frenzied feeding that occurs at times when customers immerse their extremities suggests that this is unlikely to be normal (Fig 4). This is inevitably stressful for the fish, and the degree of body contact between fish will increase the spread of ectoparasites. It has been noted that the fish frequently jump out of the water, therefore the tanks must be covered when not in use by customers. Fish will occasionally make desperate attempts to escape from poor water conditions by jumping and this behaviour may be more significant given the benthic nature of these fish. The bare glass tanks in most fish spas offer little opportunity for environmental enrichment since this primarily aims to provide a hygienic environment for customers. Equally, there are seldom off-show areas where the fish can be rested between customers: longer resting periods have been shown to increase the lifespan of animals in touch pools in public aquaria (G Burrows, personal communication).



FIG 4: Frenzied feeding behaviour following immersion of a user's finger.

Need to be housed with or apart from other animals

The nature of the fish spa business requires a high stocking density in order to optimise customer satisfaction. In general, these facilities use only one species although in some, other colourful fish such as guppies (*Poecilia reticulata*) are added to make the tank more visually appealing to customers. An inappropriate choice of species may cause additional stress.

Need to be protected from pain, suffering, injury and disease

While most people may be sensitive to animal suffering, many may not be able to recognise it in fish. Many new fish keepers are not aware that fish disease can be investigated professionally or seek professional assistance when fish mortalities occur. Despite the detail of some care sheets provided by some fish suppliers, it is rare for them to recommend that terminally ill fish should be humanely killed or that professional assistance should be obtained. Consequently, many new fish keepers go through a steep learning curve during the first few months, when fish mortalities inevitably occur and probably go unreported, and fresh stock are added to maintain the population.

At present, fish spas obtain most of their fish health advice from their suppliers, who have a legal obligation to provide correct care information. Some fish spa owners are former hobbyists with some personal fish keeping experience. However, professional veterinary involvement in fish spas is very low and the author received very few responses from colleagues following an enquiry on British and international list servers. This suggested that veterinary surgeons were rarely approached by fish spa owners or importers for professional assistance.

Despite the large size of the fish spa industry, there are very few scientific reports of disease problems. High mortalities due to *Citrobacter freundii* were recorded at a private fish hatchery in Korea (Baeck *et al.* 2009) and *Aeromonas sobria* from a hatchery in Slovakia (Majtán *et al.* 2012). *Streptococcus agalactiae* (Group B) was identified as the cause of death in recently imported consignments in the UK in 2011 (CEFAS, personal communication). *Mycobacterium marinum* has also been found in one case of chronic mortalities from a fish spa in the Netherlands (P Werkmann, personal communication). Given the large numbers of these fish imported into the UK for non-ornamental purposes, and the few anecdotal reports of high mortalities, it is assumed that many disease problems are not professionally investigated.

Public health aspects

In response to public health concerns, the Fish Spa Working Group developed and published the 'Guidance on the management of the public health risks from fish pedicures' (2011). This group consisted of experts from the Health Protection Agency (HPA), Health Protection Scotland, the Health and Safety Laboratory and Local Authorities. Many other agencies and individuals in the UK also contributed, including CEFAS, RSPCA, OATA and the Fish Veterinary Society. This detailed and practical document primarily discusses public health aspects but acknowledges that concerns about fish welfare also exist. Since fish spas involve the use of live fish, conventional sterilisation of the fish or environment is not possible without harming the fish. Consequently this 'special treatment' must be carefully monitored to ensure that staff and customers are protected from infections. At present, there is no national legislation that controls these treatments although some London boroughs are investigating local byelaws which could be used to allow licencing fish spas as 'bath treatments'.

The guidance highlights the various routes of transmission of infection from fish to person, from water to person, from person to person via water, and person to person via surface contact. The current lack of documented cases and limited scientific evidence is acknowledged and although the risk of infection is very low, it cannot be excluded. Several detailed recommendations are made to help spa owners limit the introduction or spread of infections including thorough inspection and cleaning of customers' feet before and after treatment. Despite this, fish spas have been banned in many US states and Canadian provinces on the grounds of sanitation and concerns about animal welfare. In Germany, extensive requirements include certified proof that customers are free of specific infectious viruses and bacteria, and that the spas have a specialist vet and an extensive quality assurance programme.

Several zoonotic bacterial infections of fish are reviewed in the guidance but one of the most common in ornamental fish is mycobacteriosis. This untreatable disease is often chronic in nature and difficult to diagnose in live fish, therefore screening is unlikely to be effective. Diagnosis of the disease in dead fish is equally difficult, often requiring histological examination of several organs since visualising characteristic granulomas with the naked eye is challenging in these small fish. Infection is transmitted to humans through minor abrasions in the skin but it may take weeks for clinical signs to appear

following exposure. Diagnosis in humans is also problematic and treatment can take several months, occasionally requiring surgical intervention. These difficulties highlight an important aspect of one zoonotic hazard in foot spas that could be exacerbated by husbandry stress (Ramsay *et al.* 2009).

Effective sterilisation, namely the destruction of all micro-organisms and resistant spores, in an aquatic environment is often limited and is potentially harmful to the fish. In addition to sterilising the water, sterilising the biofilm on all submerged surfaces is not possible without the use of chemicals that are toxic to fish. Equally, the use of heat sterilisation, a minimum of 70°C for one hour (HPA 2011), is harmful to the fish and the biological filter. Ultra violet (UV) sterilisers are commonly fitted to the pipework of filtration systems but these do not have any effect on microbes on the fish or in the biofilm. These units often use UVc, the most effective germicidal wavelength, but their sterilising capacity is influenced by several factors such as:

- water clarity
- water flow rate
- age of the UV light source
- UV source to pathogen distance
- power/intensity of the UV source
- physical properties of the pathogen
- cleanliness of the sleeve surrounding the UV source

In general, UV units must have a minimum rating of 15–25 watts to be considered effective for the 100litre tanks used in fish spas. In some cases, the units have a lower power rating and may give users a false sense of security regarding the level of sterility achieved in the facility. The UV units used to clarify the water in outdoor ponds are not effective at sterilisation.

The Fish Spa Working Group concluded that the risk of human infection as a result of fish spa treatment 'is likely to be very low, but cannot be completely excluded'.

Human psoriasis

Psoriasis is an autoimmune disease in humans that affects 2–3% of the population, and causes intense itching and flaky skin. The most common form (plaque psoriasis) appears as red and white scaly patches on the skin.

It can affect any part of the body, including the scalp, and may also affect the fingernails and joints. The disease is often chronic and recurring but not contagious. The cause is not fully understood but thought to have a genetic component and aggravated by environmental factors such as stress and seasonal changes. Severe cases have a negative physical and psychological impact on affected individuals, which affects their quality of life. At present, there is no cure and it is considered a life-long disease. There are several medical treatments used to control and manage the disorder, including phototherapy with controlled exposure to ultra violet radiation. There are two reports of fish spas used in the treatment of patients with psoriasis (Özcelik *et al.* 2000, Grassberger & Hoch 2006) in which improvement was noted but this may have been influenced by concurrent phototherapy and the effect of natural sunlight. However, advice from the Fish Spa Working Group is that sufferers are likely to be at an increased risk of infection and that this treatment is not recommended and should not be promoted to this group of patients.

Other areas of concern

There have been several commonly used statements made in advertising of fish spas that suggest medical benefits to users. Some of these are questionable and there is limited scientific evidence to support them. Some claims state that *Garra rufa* 'secrete a natural enzyme in their saliva called diathanol that helps new skin grow'. Although it is unproven that this species produces saliva, fish do not in general possess true salivary glands and are therefore unlikely to produce saliva, the main purpose of which is to moisten and lubricate food. Only a few species of animals, of which Man is one, secrete enzymes in their saliva. Diathanol is a redundant name used in German organic chemistry in scientific literature up until the 1960s: at the time of writing, the only references to the term when searched by Google appear on fish spa web sites.

Other claims made refer to the fish stimulating acupuncture points, helping to regulate the nervous system and improve circulation. Several fish spa web sites state that the fish in their systems 'cannot transfer any diseases to humans' although this route of infection is highlighted in the guidance published by the Fish Spa Working Group. Other misleading medical information is not uncommon despite there being a lack of clear evidence of any therapeutic benefit.

As with all animals, their care must extend over periods when the facility or shop is closed during weekends and public holidays. Equally some provision should be made in the event of electrical power supply failure due to their dependence on the life support systems, particularly when they are left unattended. In the UK, there is strict legislation controlling the disposal of mortalities which will be covered under hazardous or special waste regulations and is aimed at protecting public health and the environment.

The industry in 2012

Following the publication of guidance by the Fish Spa Working Group and subsequent national coverage in the media on 18 October 2011, the fish spa industry has had a lower public profile. Several fish spa salons have closed for various reasons including financial difficulties. This has led to further concern regarding the fate of the fish in these establishments and provisions need to be considered now.

The natural lifespan of *Garra rufa* is thought to be 5–7 years and due to the large numbers that were imported into the UK in the last 18 months it remains to be seen if the fish can be adequately rehomed within the industry. Prior to the interest in fish spas, *Garra rufa* were imported into the UK in small numbers for the ornamental trade. There are opportunities for the fish to be rehomed to private hobbyists or public aquaria although their relatively dull colours and peaceful behaviour may have limited appeal. Commercially, it is unlikely that these fish will be re-exported back to their country of origin, let alone be released to restock their natural environment, an action which could have major ecological consequences. Under the Wildlife and Countryside Act (1981) and Salmon and Freshwater Fisheries Act (1975) it is illegal for these non-native fish to be released into the wild in the UK, even though water temperatures are considerably lower than in their country of origin. The impact of illegal release of these fish into UK waters may need to be fully assessed.

The greatest concern relates to fish that may be neglected and left to die through starvation or deteriorating water quality since they have a low financial value but require a significant level of maintenance. It is not ethically acceptable to euthanase these fish on any grounds other than to avoid suffering but this issue may need to be addressed in some cases in the future. The method by which this is performed should only be by overdose with an acceptable fish anaesthetic and not by flushing live fish down the toilet or freezing them in a domestic freezer unit.

Conclusion

It has been interesting to observe the rapid development of the fish spa industry but several aspects of this novel business have given cause for concern, particularly in the areas of public health and fish welfare. However, these concerns should be addressed in a positive and pro-active manner so that we can develop a greater understanding of the issues involved through a detailed scientific approach. Despite the lack of legislation controlling the industry, the concerns about fish welfare are adequately covered under the Animal Welfare Act (2006) and similar legislation in other countries. It is important that Local Authority animal welfare officers visit and inspect all these establishments to ensure that the basic needs of the fish are being adequately met and seek specialist advice where necessary. Detailed written records of stock purchases, mortalities, water quality results and health problems must be kept by the business owners and be available for inspection. A greater degree of professional fish health investigation is now required so that we can avoid major problems and provide adequate support to the industry.

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