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Some considerations concerning the artificially colored aquarium fish trade

[1]Valentin O. Eşanu, [2]Claudiu Gavriloaie, [3]Ioan G. Oroian, [1,4]Philippe Burny

[1] University of Liege, Agro-Bio Tech Gembloux, Belgium; [2] SC Bioflux SRL, Cluj-Napoca, Romania; [3] University of Agricultural Sciences and Veterinary Medicine (USAMV), Faculty of Agriculture, Cluj-Napoca, Romania; [4] Walloon Center for Agricultural Research, Belgium. Corresponding author: V. O. Eşanu, esanuvalentin@gmail.com

Abstract. Humans kept ornamental fish in their homes from ancient times. During time, the ornamental fish industry became a profitable enterprise. Color, size and shape are important traits when we describe a fish as a phenotypically uniform line, strain or breed; a standardized color, shape and size describe better a fish population and thus it is promoted better on the market. Several varieties of fish are being artificially colored to improve marketability. Painted, dyed or tattooed fish are terms for a new variety of pet fish whose scales have been transformed from monochrome silver into vivid pigmentations using artificial colors or lasers. These practices produce many health problems for fish. We should not to put money above the life and welfare of any living thing. Education of the customers is a very important thing, because artificially colored fish continue to exist because of demand.
Key Words: tattooed fish, dyed fish, petshop, aquarium fish.

Introduction. The creations of nature have long been kept captive in human care, in simulated environments; concerning the fish, humans were interested in keeping ornamental fish in their homes from ancient times (Kaszony 1970). Gradually the freshwater aquarium became a popular and educational activity for humans of all ages (Petrescu-Mag et al 2013a). The beneficial effects of aquarium on human health and well being were demonstrated long time ago (Petrescu-Mag 2007). Currently, aquariums are a very useful and effective tool in some psychologically disorders treatment both in old people and orphan children (Petrescu-Mag et al 2013a). Aquarium fish trade has also a negative impacts on biodiversity (Burlacu et al 2009a, b; Păsărin & Petrescu-Mag 2011).

The aquarium industry became a profitable enterprise for many companies from all over the world and mainly for Southeast Asian companies of aquaculture (Ng & Tan 1997; Petrescu-Mag 2007). Color, size and shape are important traits when we describe a fish as a phenotypically uniform line, strain or breed; a standardized color, shape and size describe better a fish population and thus it is promoted better on the market (Petrescu-Mag et al 2013b). Several varieties of fish are being artificially colored to improve marketability. Painted, dyed or tattooed fish are terms for a new variety of pet fish whose scales have been transformed from monochrome silver into vivid pigmentations using artificial colors or lasers (Broome 2013). A comprehensive list of artificially colored fish species available on the market can be found on http://www.deathbydyeing.org/colormedead.htm.

In the present paper we will discuss about the main procedures used in artificially fish coloring and also about the negative effects of these unnatural processes upon the fish.

Methods of coloration. There are a number of methods for introducing artificial colour to fish, although specific information on methodology is sometimes scarce. The results of the coloring process varies depending on the type of fish and the method used. The most used varieties for coloration are the albino strains of various species.

Colour-enhancing foods. Many varieties of "colour-enhancing" foods for aquarium fishes are available to the consumer. Generally, these foods contain natural dyes, such as beta carotene, and are not harmful to fish, but the effect is temporary, because once they are no longer fed the treated food, fish eventually lose their color (Sharp 2006). There are some claims that colored food also contains unnatural dyes, which can negatively affect fish's growth and development (Hirte-Runtsch 2008).

Genetic modification. Aquarium fish genetically modified to fluoresce in different bright colours under white or ultraviolet light are now available commercially worldwide, under the trade name GloFish. Initially only zebrafish (*Brachydanio rerio*) was involved (Gavriloaie 2007), but some other species as *Puntigrus tetrazona* and *Gymnocorymbus ternetzi* followed (Curry 2012; Roberts 2013) (Figure 1). The technology was developed originally to produce a zebrafish capable of detecting environmental pollution, especially heavy metals (Gong et al 2003; Mag & Petrescu 2006). These fish are just as hardy and healthy as the regular varieties.

Figure 1. Some breeds of GloFish
(Source: http://www.glofish.com/about/glofish-display/).

The use of hormones. Usually fish are kept in water containing large amounts of artificial hormones, for several reasons. Most often this is done to make the fish breed, especially for species which are difficult to breed normally. Another reason is to make the young fish grow and mature more quickly. Finally, fish are „juiced" with hormones in order to obtain more intensive colours. This might also be used for making females of certain fish species look more colorful (Wiegert 2012). These aspects makes fish more tempting to buy. Unfortunately, the treatment will also make the fish sterile, the intense colour only lasts for a few weeks and then it fades to a very pale fish, and at worst it will greatly reduce the normal life span of the fish (http://www.thekrib.com/Fish/steroids.html thekrib.com).

Injection of dyes. The practice of dying live fish started in the late 1970s in Asian fish farms, with glasfish - *Parambassis ranga* (McMahon & Burgess 1998). These fish are injected with stripes of bright colored pigments along their dorsal and ventral lines (Figure 2). For this, needles are used to inject dye under the skin by many punctures in order to achieve the desired effect. The same needle is used to inject several fish. The size of the needle compared to the size of the fish means that there will be a significant tissue damage at the injection site (http://www.fishtanksandponds.co.uk/ethics/fish-keepings-hall-of-shame.html).

After the glassfish, other species followed. One of the most frequents is parrot fish, a hybrid cichlid species of still unknown origin. In some cases, this creates an all-over color change, and in others, it creates little pockets of dye (Hirte-Runtsch 2008).

The dyeing process cause a high mortality in fish, and the few surviving fish, most will die within the two months following the trauma (Sharp 2006). Anyway, the dye eventually fades within six to ten months (Wiegert 2013). Only about 10% of the fish that survive for sale will keep their coloration for any length of time (Sharp 2006).

The practice of painting these fish has nearly eliminated the availability of the unpainted variety in the pet industry (http://www.firsttankguide.net/painted.php).

Figure 2. Dyed glassfish - *Parambassis ranga*
(Source: https://fishcompetstore.files.wordpress.com/2013/11/dsc_6695.jpg).

Dipping. This process involves the fish being dipped in a caustic solution which removes the fishes mucus coat. Then the fish is dipped in a solution with the dye and finally it is placed in a solution which contains an irritating substance which causes the fish to regenerate its mucus coat (http://www.fishtanksandponds.co.uk/ethics/fish-keepings-hall-of-shame.html). This method is also very stressful to the fish, and has a high mortality rate (Sharp 2006).

Tattooing. There is a recent trend in the aquarium market for tattooed fish believed to bring luck and prosperity to their owners. Fish tattooing has spread to parrot fish (Figure 3), livebearers (Figures 4 and 5), goldfish and others (Adams 2011). The fish are tattooed with dye using a special "low intensity laser" which leaves a permanent mark (Clarke 2006).

Figure 3. Tattooed parrot fish: with Chinese characters - left, with flowers - right (Source: for the left image - http://www.odditycentral.com/pics/tattooed-fish-sold-as-lucky-charms-in-china.html; for the right image - http://www.practicalfishkeeping.co.uk/content.php?sid=829).

Figure 4. Tattooed livebeares
(Source: http://www.underwatertimes.com/news.php?article_id=01769543281).

Figure 5. Tattooed mollies with numbers (Source:
http://news.asiaone.com/News/AsiaOne+News/Singapore/Story/A1Story20080117-45461.html).

These fish are being laser-tattooed with intricate patterns like numbers, flags, hearts, flowers (http://www.aquariumlife.net/articles/ethics/dyed-fish/256.asp) or Chinese characters like “luck”, “happiness”, or “May your business boom” (Daub 2009). Using this technique, the words "I love you" are written on fish around Valentine's day (http://www.fishtanksandponds.co.uk/ethics/fish-keepings-hall-of-shame.html).

Health hazards to artificially colored fish. First of all, dyeing, dipping and laser tattooing cause a great pain to fish. Yes, fish do feel pain, they respond to tissue-damaging stimuli similar to stressed mammals (Weis 2011).

In the case of dyeing, using the same needle for a large number of fish greatly increases the risk of disease transmission (Hirte-Runtsch 2008). A fish’s immune system is seriously compromised through injection. Evidence can be found in the ratio of painted glassfish exhibiting lymphocystis to those left unpainted (Donston & Lass 2012).

Dyed fish can be very lethargic and unhealthy, unlike their normal counterparts. Many suffer from kidney failure (http://www.theaquariumwiki.com/Dyed_fish; MacMahon & Burgess 1998), skin disease or they may be vulnerable to attacks in the tank because of their unfamiliar look (http://hongkong.coconuts.co).

The dipping fish in dye solutions, though not as invasive as tattooing or injection, removes the fishes' first line of protection whcih is the mucus layer, affecting the gills as well, which affects then the respiration (Hirte-Runtsch 2008).

Tattooing seems to have a much lower mortality rate than injection, but it is still elevated above the unmodified fish rates, as is the frequency of disease (Wiegert 2012).

Conclusions and Recommendations. Fish are naturally beautiful the way they are, that is why they do not need to be painted or tattooed. We should not to put money above the life and welfare of any living thing. Education of the customers is a very important thing, because artificially colored fish continue to exist because of demand. A

good fish store should either label fish as dyed or tattooed. Since we live in a world of supply and demand, the consumers have the power to stop the trade with these unnatural colored fish. Every time someone buys a painted, dyed, or tattooed fish, contributes to the continuation of this practice. So, next time you visit a pet shop, think twice about buying unusually colored fish.

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Authors:
Valentin O. Eşanu, University of Liege, Agro-Bio Tech Gembloux, Belgium, e-mail: esanuvalentin@gmail.com
Claudiu Gavriloaie, SC Bioflux SRL, Cluj-Napoca, Romania, 54 Ceahlau Street, Cluj-Napoca 400488, Romania, e-mail: claudiugavriloaie@gmail.com
Ioan Gheorghe Oroian, Department of Environment and Plant Protection, Faculty of Agriculture, University of Agricultural Sciences and Veterinary Medicine, 3-5 Calea Mănăştur Street, 400372Cluj-Napoca, Romania, e-mail: neluoroian@yahoo.fr
Philippe Burny, Walloon Center for Agricultural Research, Belgium, e-mail: philippe.burny@ulg.ac.be

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