Poeciliid Research

Temporary red and permanent red: from masculine vigor to sensory trap

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We, poeciliid fish lovers, know how the male guppy fish, *Poecilia reticulata* Peters 1859, came to be attractive: the vivid coloring, the contrast of shades, especially the bright red (Figure 1). It seems that female guppies also find it attractive due to the same features and especially the red and orange of the male's body (Sandkam et al 2015).

How did this red come about and how did it become important? Scientists believe that this red first appeared on the skin of males due to the food rich in carotenoids (carotene-like pigments) that the guppy found in certain vegetables (Rodd et al 2002), or in the form of highly pigmented and nutrient-rich invertebrates. Thus, nature perceived red as an abundance of nutrients, health and vigor (Jayasooriya et al 2002). In the same way hobbyists today intensely pigment their guppies by feeding them foods rich in natural pigments similar to carotene.

Figure 1. The guppy, *Poecilia reticulata* (Original picture by Mircea Roșca).

From here, it was only a step until females perceived deep red males as vigorous and attractive, because sexual and natural selection tells us that the female will always choose the best-fit male so that its offspring will have the best chance to survive and reproduce. Thus, this intense red or orange of males was exacerbated in parallel with the female's preference for red and orange males.

Gradually, the males moved to the next evolutionary step: "if red is required, we will be red". Because carotenoid resources in the environment were limited, male pigmentation was also limited. Fish cannot produce carotenoids de novo (Karino et al 2005). Therefore, males have developed their own metabolic mechanisms to produce a red pigment of a different nature, but of the same shade. Specifically, over time, males have developed a sensory trap to attract red-responsive females (Sandkam et al 2015). In the same way, breeders today intensify the red on the body of males through artificial selection, obtaining very intensely red colored lines (Bisht et al 2022).

Thus, the red on the body of the fish can be temporarily and intensified by feeding food with carotenoids, but it can also be permanent, provided there is a permanent selection of individuals that excel in red coloring.

Conflict of interest. The authors declare no conflict of interest.

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