Are fancy guppies (*Poecilia reticulata* Peters, 1859) invasive?

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Abstract Guppies (*Poecilia reticulata* Peters 1859) have been introduced to Sri Lanka in the early 1970s to combat the menace of Malaria. Due to their rapid range expansion in natural waterways, guppies are labeled as an ‘invasive species.’ Guppies are also popular in the ornamental fish trade where a wide variety of ornamental guppy varieties with attractive colour and fin patterns have been produced through selective breeding; they are commonly known as ‘fancy guppies’ or ‘saree guppies’. Since there are some concerns over the invasiveness of these fancy guppies into natural water bodies in Sri Lanka, the potential invasiveness of two common fancy guppy varieties with long caudal fins viz. black guppies and yellow guppies, was assessed under laboratory conditions using their specific growth rates (SGR) and critical swimming speeds (U_{crit}). Results in the present study showed that the SGR of black guppies ($1.0\% \text{ g day}^{-1}$), and yellow guppies ($0.99\% \text{ g day}^{-1}$) were significantly lower ($p < 0.05$) than that of the wild guppies ($1.31\% \text{ g day}^{-1}$). Further, the U_{crit} of the black guppies (23.8 cm s^{-1}), and yellow guppies (26.8 cm s^{-1}) were significantly lower ($p < 0.05$) than that of the wild guppies (28.8 cm s^{-1}). Since the long caudal fins significantly reduced the swimming speed ($p < 0.05$: ANOVA) and hence the SGR of the two fancy guppy varieties, there is strong evidence for an inter-variety competition to occur among the wild and fancy guppies where the latter would be competitively eliminated by the wild guppies in terms of competition owing to their short tail. Therefore, the long caudal fin is a predicament to fancy guppies for both swimming and securing food in the water column. This study also challenges some views of all guppies being categorized as ‘invasive’ and demonstrated that the fancy guppies are unable to compete with their wild counterparts but are confined to ornamental displays in places such as indoor and outdoor fish tanks.

Keywords Invasive fish, SGR, U_{crit} , Exotic species, Ornamental fish

INTRODUCTION

Guppies (*Poecilia reticulata* Peters 1859; Family Poeciliidae) were introduced into shallow natural water bodies in Sri Lanka in the early 1970s as a biological controlling agent of malaria mosquitoes. Since the guppies voraciously feed upon the mosquito larvae, they were considered to be an excellent biological controlling agent to combat the menace of malaria (Marambe et al. 2011).

Since their introduction, the wild guppies have already expanded their range into more riverine areas and, are distributed throughout the northwestern, western, and southern provinces (Marambe et al. 2011), and the upper catchment areas (elevation $> 1000\text{m}$) of the “Mahaweli” and “Kelani” river basins in the central province of the country (Silva and Kurukulasuriya 2010). In addition to range expansion, guppies have also expanded their feeding habits posing a threat to the

local biodiversity in the country. For example, guppies have been affecting three native killifish species two of which viz. Day's killifish (*Aplocheilichthys dayi*) and Werner's killifish (*A. werneri*) are endemic to Sri Lanka (Sudasinghe 2016). The wild guppies also feed upon the native crustacean larvae (Shiranthi et al. 2008) and amphibian eggs (Marambe et al. 2011) in freshwater streams. Therefore, Bambaradeniya (2002), Shiranthi et al. (2008), Silva and Kurukulasuriya (2010), Marambe et al. (2011) and Sudasinghe (2016) are in the opinion that guppies are not only ‘exotic’, but also ‘invasive’ to Sri Lanka.

Guppies are also widely used in the ornamental fish trade. Although the wild guppy is small (2-4 cm SL) and dull greenish in body colouration, a wide variety of ornamental guppies with beautiful colour patterns and fin shapes have been produced through selective breeding; they are commonly known as fancy guppies (Deacon et al. 2011). In Sri Lanka,

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these fancy guppy strains are known as “Saree guppies” owing to their large trailing caudal fins, and have acquired a wide popularity among the fish hobbyists.

When in need of abandoning an aquarium, the fish hobbyists release the ornamental fishes into nearby wells or streams, or hand over them to their acquaintances (Pers. Comm.; C.K. Perera, aquarium owner). However, releasing ornamental species into natural environment, intentionally or unintentionally, has created some catastrophic effects on the local biodiversity. For example, Wijethunga and Epa (2008) have indicated the menacing effects of the accidental introduction of the tank cleaner fish (*Pterygoplichthys* sp.) into freshwater habitats in Sri Lanka. Kumudunie and Wijeyaratne (2005) and Shirantha (2016) also showed the devastating impacts of the accidentally introduced knife fish (*Chitala ornata*) into Sri Lankan water bodies. Similar undesirable effects on the local biota have also been observed by Kumara et al. (1999).

Because of range and feeding habit expansion of wild guppies, there are some growing concerns that fancy guppies are invasive to Sri Lanka. Nevertheless, there is a dearth of information of such

invasiveness into natural water bodies in the country. Therefore the objective of the present study is to determine the critical swimming speed (U_{crit}) and the specific growth rate (SGR) of two popular fancy guppy varieties viz. yellow guppies and black guppies, with respect to the length of their caudal fins and to assess their invasiveness, if any, compared to their wild counterparts.

MATERIALS AND METHODS

About 200 healthy male guppies of the same age (30 days) and size cohort (1 cm) belonging to the wild, yellow and black guppy varieties each (Plate 1) were purchased from an ornamental fish breeder and transported to the aquaculture laboratory of the University of Kelaniya in oxygenated polythene bags. They were then acclimatized for 24 hours under natural photoperiod. During the acclimatization period, none of the guppies were fed but the water was vigorously aerated while maintaining the water temperature at around 30°C.

(a)

(b)

(c)

Plate 1 The three guppy varieties tested in the present investigation; (a) Wild guppy (M x 3; Standard length is around 2 cm; Length of the caudal fin is around 0.5 cm), (b) Yellow guppy (M x 2; Standard length is around 4 cm; Length of the caudal fin is around 1.25 cm) and (c) Black guppy (M x 2; Standard length is around 3.5 cm; Length of the caudal fin is around 2 cm)

SGR of the guppy varieties when reared alone

A batch of 12 acclimatized wild guppies each were introduced into 4 replicate glass tanks (dimension of each tank: 15 cm x 30 cm x 35 cm) containing 15L of aged tap water each. The fishes in the tanks were fed twice daily with 5% of their body weight with a commercial fish feed “Trise300” for a period of 1 week. At the end of this feeding period, the fishes were weighed separately using an electronic weighing balance (Model; Citizen CTG 602-600) by the method described by Payne (2007).

The SGR of the wild guppies was determined using the above weight data by the following equation after Cook et al. (2000) and Lugert et al. (2016).

$$\text{SGR (\% body wt. gain/ day)} = \left[\frac{\ln W_t - \ln W_i}{t} \right] 100$$

where $\ln W_f$ = natural logarithm of the final weight; $\ln W_i$ = natural logarithm of the initial weight; t = time interval (days) between W_f and W_i .

The above procedure was repeated at the end of each week for a period of 16 weeks for the wild guppies until they were fully grown, where no further increase of the body weight was noted, and their SGR were determined separately. The entire procedure was repeated separately for the black and yellow guppy varieties simultaneously.

During the entire experimentation period water temperature, dissolved oxygen (DO) and pH in each tank were measured in triplicate readings at weekly intervals using a multi-parameter (Model; HQ40d). Further, the unconsumed food pellets and fecal accumulations at the bottom of each tank were siphoned out daily; the amount of water loss due to siphoning from each tank was immediately compensated by adding an equal amount of aged tap water.

SGR of guppies when reared together

The variation of the SGR between the three guppy varieties when they were reared together were also determined in the present investigation. In order to do so, four replicates of each of the following guppy combinations (C) were tested;

C1 = Wild guppy (n = 6) + Black guppy (n = 6)

C2 = Wild guppy (n = 6) + Yellow guppy (n = 6)

C3 = Black guppy (n = 6) + Yellow guppy (n = 6)

C4 = Wild guppy (n = 4) + Black guppy (n = 4) + Yellow guppy (n = 4)

The volume of water and the fish density in each replicate tank, frequency of fish feeding and feeding period (i.e. 16 weeks) were as above. Further, removal of unconsumed food and fecal matter, measuring the water quality parameters, and determination of SGR for each guppy variety were carried out using similar methods as described above.

U_{crit} of the three guppy varieties

The U_{crit} is the maximum velocity that can be maintained by an aquatic organism before fatigue (Plaut 2000). In the present investigation, the U_{crit} of the three guppy varieties were determined separately using a specifically designed “water flow chamber” (Plate 2) following Gordon et al. (2015). After the water flow chamber was supplied with a water flow, a wild guppy was introduced into the viewing channel and allowed to settle there for about 20 min. Later, the water flow speed was increased by 1.4 cm s⁻¹ at every 3 min by adjusting the water flow meter, until the fish could not swim against the water flow, fatigue and drift towards the water outlet. The time taken by the fish to become fatigue and to drift with the water flow was measured by a stopwatch, and the corresponding water flow speed was recorded. The U_{crit} for each guppy was determined by the method described by Gordon et al. (2015) using the above data;

$$U_{crit} = U_i + [(T_i/T_{ii}) \times U_{ii}]$$

where U_i = the highest velocity maintained by each fish (cms⁻¹); U_{ii} = the velocity increased in each interval (1.4 cms⁻¹); T_i = the time spent of the interval at fatigue velocity; T_{ii} = the time between velocity changes (3min).

The above procedure was repeated for 9 other wild guppies of the same size and age cohort at 2 weeks intervals for a period of 16 weeks.

The above procedure was also repeated simultaneously for the yellow and black guppies separately.

Plate 2 Water flow chamber used to measure the U_{crit} of guppies. This apparatus consists of a water inlet, water flow meter, transparent viewing channel and a water outlet. The 'water inlet' is connected to a waterline. The water flow speed along the 'water flow chamber' can be monitored by the 'water flow meter'. The test fish is introduced into the 'viewing channel' through its upper opening and its swimming behaviour could be observed. The 'water outlet tube' is connected to the rear end of the viewing channel. The opening of the 'water inlet' and 'water outlet' were secured with a piece of mosquito netting each to prevent the fish from being escaped. The dimension of the 'viewing channel' is 5 cm x 8 cm x 30 cm (width x height x length) with a cross-section area of 40 cm².

U_{crit} and SGR of fancy guppies after clipping the caudal fins

Changes of the U_{crit} and the SGR of the yellow and black guppies after clipping their fins to the mean caudal fin length of wild guppies were also determined in the present study. These two experiments were carried out when the fishes were about 2 months old. Before clipping the caudal fins, the test fishes were dipped in a 'Benzocaine' sedating solution for 10 min. and sedated. The sedating concentration of the Benzocaine (e.g., 35 mg/L) for the guppies were determined following Brown (1988).

After the fishes were sedated, the tip of caudal fin of each fish was clipped using a sharp sterilized surgical scissor to the mean caudal fin length of the wild guppies. Immediately after the caudal fins were clipped, the fishes were transferred into an isolation tank containing methylene blue (Concentration: 1 mg/L) for three days to prevent microbial infection, if any. After the fish behaviour became normal, they were fed with the commercial fish feed and the SGR

were determined at the end of each week for a period of one month as described earlier. The U_{crit} of the black and yellow guppies were also determined separately at one week interval by the method described earlier for a period of one month until their caudal fins grew into the initial size.

Data Analysis

The variation of the SGR between the three guppy varieties when reared alone was analyzed by one-way ANOVA followed by Tukey's pair-wise tests. The variation of the SGR between three guppy varieties when reared together for the 16 weeks experimentation period was analyzed by paired t-test (i.e. when test combination of 2 fish types together) or by one-way ANOVA (i.e. when in combination of all 3 fish types together) as appropriate. The variation of the U_{crit} between the three guppy varieties was analyzed by one-way ANOVA followed by Tukey's pair-wise tests. The SGR and the U_{crit} of the yellow and black guppies before and after the caudal fins were clipped were

analyzed separately by paired t-test. The variation of temperature, DO and pH between the replicate tanks were analyzed by one-way ANOVA. Before the statistical analysis, data were tested for normality, and all the percentage data were arcsine transformed. The data were analyzed by Minitab 14.2 for windows at $\alpha = 0.05$ level of significance.

RESULTS

SGR of guppies when reared alone

The variation of the SGR between the three guppy varieties are shown in Figure 1. It was observed that the SGR was initially high in all three guppy varieties, but it gradually decreased towards the latter part of the 16 weeks feeding period.

Fig. 1 The weekly variation of the SGR between the 3 guppy varieties. Mean SGR $\pm$ SE are presented. Experimentation period = 16 weeks, $n = 48$ in each guppy variety.

The SGR of the wild guppies was significantly higher than those of the black and yellow guppies ($p < 0.05$) (Fig. 2). However, the SGR between the black and yellow guppies were not significantly different from each other ($p > 0.05$).

SGR of guppies when reared together

The variation of SGRs of the guppies when reared together are shown in Figure 3. Both in guppy combination 1 and 2, the SGR of the wild guppies was significantly higher than those of the black

guppies and yellow guppies ($p < 0.05$). In fish combination 3, the SGR between the black and yellow guppies was not significantly different from each other ($p > 0.05$). In fish combination 4, the SGR of the black guppies was significantly lower than those of the wild and yellow guppies ($p < 0.05$). However, the SGR was not significantly different between wild and yellow guppies ($p > 0.05$).

Fig. 2 The variation of the overall SGR between the 3 guppy varieties. Experimental period = 16 weeks, $n = 48$ in each guppy variety. Mean SGR $\pm$ SE are presented. Different letters in the columns are significantly different.

U_{crit} of the three guppy varieties

The weekly variation of the U_{crit} of the 3 guppy varieties are shown in Figure 4. It was observed that the U_{crit} of both wild and black guppies gradually increased with the age. However, the U_{crit} of the black guppies increased until the 8th week, but continued to decrease towards the latter part of the experimentation period.

The U_{crit} of the wild guppies was significantly higher than those of the black and yellow guppies ($p < 0.05$; Fig. 5).

Fig. 3 The variation of SGR between the four guppy combinations. Combination 1: Wild guppy (n = 6) + Black guppy (n = 6). Combination 2: Wild guppy (n = 6) + Yellow guppy (n = 6). Combination 3: Black guppy (n = 6) + Yellow guppy (n = 6). Combination 4: Wild guppy (n = 4) + Black guppy (n = 4) + Yellow guppy (n = 4). Experimentation period = 16 weeks, n = 24. Mean SGR ± SE are presented. Different letters in the columns are significantly different.

Fig. 4 The weekly variation of the U_{crit} between the 3 guppy varieties. Experimentation period = 16 weeks, n = 10 in each guppy variety. Mean U_{crit} ± SE are presented.

Fig. 5 The variation of the U_{crit} between the 3 guppy varieties. Experimentation period = 16 weeks, $n = 10$ in each guppy variety. Mean $U_{crit} \pm SE$ are presented. Different letters in the columns are significantly different.

SGR of guppies

The weekly variation of the SGR between the black and yellow guppies after their caudal fins were clipped are shown in Figure 6.

The variation of the SGR between black and yellow guppy varieties before and after the caudal fins were clipped are shown in Figure 7. The SGR of each guppy variety significantly increased after their caudal fins were clipped ($p < 0.05$).

U_{crit} of guppy varieties

The variation of the U_{crit} of the black and yellow guppies before and after the caudal fins were clipped are shown in Figure 8. The U_{crit} of both the black and yellow guppies increased significantly after the caudal fins were clipped ($p < 0.05$).

Physico-chemical parameters of water

The DO, pH and temperature in water remained unchanged during the entire experimentation period ($p > 0.05$).

Fig. 6 The weekly variation of the SGR between the black and yellow guppies after the caudal fins were clipped. Experimentation period = 4 weeks, $n = 10$ in each guppy type. Mean SGR $\pm SE$ are presented.

Fig. 7 The variation of SGR in black and yellow guppy varieties before and after the caudal fins were clipped. Experimental period = 4 weeks and $n = 10$ each guppy type. Mean SGR $\pm$ SE are presented. Different letters in the columns are significantly different.

Fig. 8 The variation of the U_{crit} between the black and yellow guppies before and after the caudal fins were clipped. Experimental period = 4 weeks and $n = 10$ each type. Mean $U_{crit} \pm$ SE are presented. Different letters in the columns are significantly different.

DISCUSSION

According to the present investigation, the SGR of the wild guppies was found to be significantly higher than those of the other two fancy guppy varieties when they were grown separately. Further, the SGR of the wild guppies was also significantly higher than those of the two fancy guppy varieties

when they were reared together. These findings corroborate the observations made by Payne (2007) where the body weight of wild guppies became significantly higher than that of the other fancy guppy varieties tested. Further, the SGR of all three guppy varieties were initially high in the present study. This may be due to high metabolic rate when they were juveniles (Auer et al. 2011), but the SGR

gradually decreased when they grow older. The SGR eventually became zero after 5 months when they were fully matured.

The SGR of guppies is greatly influenced by the variation of the environmental temperature, and also by some other parameters such as age and sex etc. Therefore, every possible action was taken to maintain uniform environmental conditions within fish rearing tanks, and to select fishes of the same sex (i.e., males), age (i.e., 30 days) and length (i.e., 1 cm) cohort for the present study to minimize random variation.

Since the wild guppies are smaller and have short caudal fins, they are far better off carrying out swift swimming movements to secure food pellets efficiently than the yellow and black guppies who had larger bodies and longer caudal fins. The energy consumption for locomotion may be low in wild guppies due to less hydrodynamic drag imposed by their short caudal fins, so that they can invest a lot of food energy for their growth. Further, these wild guppies would not invest a lot of food energy to improve their body colour and length of the caudal fins as it would occur in the other fancy guppy varieties. The present investigation shows that while the yellow and black guppies are specializing in improving the beauty of the body *viz.* body colouration and length of the caudal fins the wild guppies are growing fast by maximizing their SGRs. Therefore it is not surprising to find significantly higher SGR in wild guppies, and them achieving the maximum body size sooner than the other two guppy varieties.

When different fish species are reared together, interspecific competition would certainly occur for food and space. In the present study too, the results indicated the occurrence of a similar interspecific competition (more specifically intra-variety competition) between these 3 guppy varieties. Payne (2007) showed that the guppies are a competitively more successful species so that they grow more rapidly than the other ornamental species tested against them. Further, Rodgers et al. (2013) showed that the fish were able to meet potential cost for colour change of the body and did not suffer negative consequences in terms of growth rate when food was freely available.

The present investigation showed that the wild guppies were competitively superior to both the yellow and black guppies in terms of growth performance. For example, when the wild guppies

were reared together with yellow and black guppies as in fish combinations 1, 2, and 4 in the present investigation, the wild guppies always achieved their maximum growth within a short period of time than the other guppy varieties.

The above inter-variety competition also occurred between the yellow and black guppies and revealed that the yellow guppies are competitively more successful than the black guppies. For example, the yellow guppies had higher SGR than the black guppies when they were reared together. While both these yellow and black guppies needed more food energy to maintain the length of their caudal fins and the body colouration, it is noteworthy that the yellow guppies have shorter caudal fins than the black guppies so that they would swim faster to secure more food pellets while the black guppies were heavily labouring to drag their long tails to such food pellets against the hydrodynamic force imposed by the water. Due to logistic reasons, the number of replicate fish tanks in the yellow and black guppies together had to be made to 04, but a significantly convincing result could have been obtained if the number of replicate fish tanks was increased adequately.

In the present investigation, the variation of the SGR between the yellow and black guppies with the caudal fins intact, and cut to the length of the wild guppies were also tested. For the caudal fin clipping procedure Benzocane was used as an anesthetizing agent at a concentration of 35 mg/L to sedate the fish. It is possible that experimental removal of a part of the caudal fin tissues makes the guppies vulnerable to opportunistic bacterial and fungal infections. In order to prevent such infections, the tail clipped guppies were immediately transferred to a fish tank containing methylene blue, an antifungal that is commonly used in ornamental fish culture. Correct concentration and correct exposure time to methylene blue were used in this experiment to minimize the stress to the fish and to ease their growth.

In yellow guppies, soon after the caudal fins were clipped, the SGR was found to be elevated than that of their caudal fins intact yellow counterparts. However, this elevation continued only until the second week, but thereafter it began to decrease, and eventually became indiscernible with that of the non-clipped counterparts. This variation may be due to the shorter length of the caudal fin and its remarkable ability to regenerate to its original size.

It is noteworthy that the caudal fin of the yellow guppies is only slightly elongated than that of the wild guppies where the mean lengths are 0.5 cm and 1.25 cm respectively. For the present experiment only a small portion of 0.75 cm was clipped from the tip of their caudal fins. Immediately after the fin was clipped, the short fin might have dramatically reduced the hydrodynamic drag imposed by the fin and facilitated the fish to move freely to secure food pellets more effectively so that the SGR was elevated. However, the small lost portion of the caudal fin was fully regenerated within a short period of time (i.e. 04 weeks), thereafter troubling the fish again with laboured swimming and making it difficult to secure food pellets ineffectively resulting reducing their SGR.

The above scenario was in contrast difference in the long tailed black guppies where a much bigger portion of 1.5 cm was removed from their very long (i.e. mean length 2.00 cm) caudal fins. These guppies would have been securing food pellets more effectively so that the SGR was increased as expected. However, unlike in yellow guppies, this increase continued even until the end of the experimental period of one month. This may be due to the long time taken to regenerate the full length of the severed caudal fin. Therefore, a result similar to yellow guppies would have also been obtained for black guppies, if there was a prolonged experimental period. Kolluru et al. (2006, 2007) also showed that the fin regeneration in guppies is possible even in the presence of natural stressors such as predators and infectious agents, and they regrew more fin tissues when the food level was raised.

Hockley et al. (2014) have shown that the swimming speed of guppies is affected by the hydrodynamic drag imposed by their fins. Therefore, swimming speed is an important parameter to assess the fitness of the fish where the critical swimming speed helps to find out the maximum velocity that a fish can tolerate. According to the results of the current study, the wild guppies had the highest swimming speed while the black guppies showed the lowest. The results of the present study also showed that the variation of this swimming speed is directly related to the length of the caudal fin. The swimming speed of the black guppies may have substantially hindered by the hydrodynamic drag imposed by their more

elongated and larger caudal fins, so much as that the fish became easily fatigued against the water flow. Similar observations have been made by Karino et al. (2006) where the guppies with longer tails have exhibited poorer swimming performances than those with shorter tails.

Karino et al. (2006), in addition to showing that the guppies with longer tails exhibiting poorer swimming performances, have also shown that these long-tailed guppies are restricted into low water flow velocity microhabitats in streams. The investigation of Hockley et al. (2014) also support the above findings of Karino et al. (2006). All these findings suggest an interesting ecological phenomenon of 'habitat partitioning' (Hutchinson 1959) among the wild, yellow and black guppies if they were allowed to co-occur in streams. It would appear that the black guppies with long tails to restrict into much safer and secure microhabitats with very low water velocity (i.e. water pockets in streams), while the wild guppies with the very short tail to live in all parts of the stream including its middle region where the water speed is a little high there.

Although the total lengths of both yellow and black guppies were more or less similar to each other, their standard lengths and caudal fin lengths were different. For example, the yellow guppies had higher standard length than that of the black guppies. Hockley et al. (2014) showed that guppies with increased standard length were more active and spent more time in areas of both high velocity and low velocity water flow. Although longer fins serve as secondary sex characteristics in guppies, the larger fins increased the hydrodynamic drag compared to smaller fins. Therefore, this long caudal fin could have been the major reason for black guppies to decrease their swimming speed.

Plaut (2000) observed that the swimming speed of the wild type short-tailed zebra fish was significantly higher than that of their long-tailed zebra fish counterparts. In the present experiment too, it was observed that the swimming speed of the tail severed fancy guppies were significantly higher than that of the tail intact guppies. Immediately after the caudal fins were clipped, the swimming speed of both the black and yellow guppies were significantly increased compared to their tail intact guppy counterparts. However, the swimming speed decreased when the caudal fins regenerated to their

original size. These results suggest that elongated caudal fins reduce the swimming speed of the guppies, which in turn interfere with their growth rate in the natural environment. With elongated and large caudal fins the hydrodynamic drag imposed by the water is increased, a reduction in swimming speed was resulted. Therefore, it appears that the caudal fin of guppies plays a major role in achieving success in the natural environment; a large and long caudal fin associated with the reduction of swimming speed will certainly put the fish under the trial of nature causing it to decrease the ability to gather food effectively. The long tail also will make them more vulnerable to potential predators. It is noteworthy, however, that guppies with elongated fins and bright colour patterns are extremely popular among fish hobbyists and in the ornamental fish industry.

As a whole, the above evidence and arguments do not support the claims that guppies, particularly the fancy guppies, are invasive (e.g., Bambaradeniya 2002; Silva and Kurukulasooriya 2010), although they are exotic to Sri Lanka (Marambe et al. 2011). The present laboratory investigation vehemently demonstrates that having a long tail is a failure to the fish in a natural environment where this long tail would bring some definite disadvantages to their very survival there. Fancy guppies are only an ornamental fish type, but they would never be a threat to the local biodiversity; where under natural conditions they will soon perish due to their inability to swim fast and that their colourful body attire attracting to potential predators. This study therefore suggests to take extreme caution when listing exotic species under of the “invasive” category.

CONCLUSION

The current study demonstrated that the length of the caudal fin significantly reduced the swimming speed and hence reduce the SGR of the fancy guppies. There is also a possibility to occur an inter-variety competition among the wild and fancy guppies. In an evolutionary point of view, the long caudal fin is a predicament to the fancy guppies as it makes the fish extremely weak competitors for both swimming and securing food in the water column. As such it is unlikely that fancy guppy varieties would become invasive when they occur in natural habitats.

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