

Remnants of the rainbow trout (*Oncorhynchus mykiss*) stock in Kodaikanal hills, Western Ghats, South India

The European settlers found the coldwater streams of the Western Ghats of South India suitable for trout fisheries¹. Trout farming was first practiced in Ooty, Tamil Nadu, in 1863, followed by Munnar, Kerala, in 1909 (ref. 2), both regions located in the Western Ghats of South India. In 1943, rainbow trout were introduced in Kodaikanal by the Palani Hills Game Association. But no published data or record (e.g. creel census data, newspaper information, and other scientific resources) regarding trout catches^{3,4} and their presence in the Kodaikanal hills are available. This could be due to a lack of knowledge of the availability of rainbow trout in the forest streams of Kodaikanal. However, there are evidences regarding the availability of trout in Gundar Stream³ (10° 21' 60.3"N, 77° 42' 87.4"E), situated 9.9 km away from Kodaikanal, Tamil Nadu. This feral trout stock did not gain much attention since its introduction, and therefore no solid evidence of their stock status is available so far.

In 2016 (i.e. 73 years after the introduction of rainbow trout), we assessed the current status of the rainbow trout stock in Kodaikanal by carrying out an angling survey and interviewing the localities. The local villagers were amateur anglers (whose hobby is fishing) and revealed that the Gundar Stream was a tourist site with poaching activities. The rainbow trout were mainly caught using live bait because of their delicacy and, therefore, the villagers practiced blast fishing or dynamite fishing for maximum catches, which completely devastated the spawning grounds. Since the fish they caught did not meet their daily food requirements, the local community started fishing large carp species in nearby water bodies (such as Berijam Lake). However, these poaching activities stopped after 2000, which was a relief to the wild rainbow trout stock in the Gundar Stream. In 2016, an angling survey was carried out for the first time in Gundar Stream to examine the stock structure, and the survey data showed that a total of 43 fish were

caught from 2016 to 2019. The highest number of catches was recorded in 2019, with 23 fish in a single visit, whereas the lowest number of catches was in 2016 and 2018, with 7 fish in two angling visits for both years and in 2017, with 8 fish in two angling visits. The catches measured from 12.8 to 31 cm in length and weighed 30 to 335 g. The angling survey showed significant differences in fish size (i.e. the fish caught belonged to different stages, from juvenile to adult) but no significant differences in weight, which could be attributed to the paucity of natural food and other environmental conditions. The fish were morphologically examined and subjected to conservation genetic studies in the laboratory. The results showed that the rainbow trout stock in this location has become stable and adapted to the coldwater conditions and montane environment of the Kodaikanal forests.

We found that the trout stocks are currently endangered, and proper conservative measures are to be carried out to preserve them. Various factors affect the growth and abundance of these trout in this region. Habitat destruction (which occurs while collecting drinking water) in farther downstream regions is a major issue that affects the survival of trout stock in this region. Overfishing is another significant issue. Appropriate conservative measures, such as prohibiting tourists from visiting the stream site and warning the local villagers to stop poaching activities, were taken to conserve the existing trout stock from regional extinction. Regular stocking, continuous monitoring of stock, habitat protection and construction of a hatchery in the Gundar Stream may increase the number of existing trout stocks. But enormous funds and human resources are needed to implement the above measures. In summary, the rainbow trout stocks in the Gundar Stream of Kodaikanal are endangered; however, no poaching activities are recorded currently. Although no freshwater fish species have been listed⁵ under the schedules of the Indian Wildlife

(Protection) Act, 1972, conservation strategies should be planned and implemented to protect freshwater fish and their environments⁶. The forest department now protects this endangered rainbow trout stock in the Kodaikanal forests. Trout farming in this geographical location can be a boon to the rural communities, and experts like fisheries specialists, scientists and government officials should involve in educating people of hilly regions about trout fisheries, which can help in the conservation of these fisheries in the long run.

1. Gopalakrishnan, A., Lal, K. K. and Ponniah, A. G., *JCLARM Q.*, 1999, **22**(3), 16–19.
2. Mackay, W. S. S., *J. Bombay Nat. Hist. Soc.*, 1945, **45**(3 and 4), 352–373; 542–547.
3. Sehgal, K. L., In *Fish and Fisheries at Higher Altitudes: Asia* (ed. Petr, T.), FAO Fisheries Technical Paper No. 385, FAO, Rome, 1999, p. 304.
4. Kuruppan, In Proceedings of the National Workshop on Research and Development needs of Coldwater Fisheries, Haldwani, 1989, abstr. no. 12.
5. Sarkar, U. K., Pathak, A. K. and Lakra, W. S., *Biodivers. Conserv.*, 2008, **17**, 2495–2511; <https://doi.org/10.1007/s10531-008-9396-2>
6. Pinder, A. C. and Raghavan, R., *Curr. Sci.*, 2013, **104**, 1472–1475.

ACKNOWLEDGEMENTS. We thank the Palani Hills Conservation Council of Kodaikanal, along with the Forest Department of Kodaikanal, for information on the Rainbow Trout stock in Kodaikanal. The financial assistance from University Grants Commission, New Delhi, is acknowledged.

WALTER DEVAA
U. RAMESH*

*Department of Molecular Biology,
School of Biological Sciences,
Madurai Kamaraj University,
Madurai 625 021, India
*e-mail: ramesh.biological@mkuniversity.
org*