

PP-18**Aquaculture and Indigenous Fish Species Management: The Valley Hatchery**

Massimo Pascale, Arianna Longarini, Claudio Massa, and Indira Sharma Bhandari*

ELC Electroconsult S.p.A., Via Marostica 1, 20146 Milan, Italy
Zoology Department, Tribhuvan University
Kirtipur, Kathmandu, Nepal
bhandariindu37@gmail.com

The use of aquaculture in fish and fisheries management presents potential risks and challenges to the conservation of natural fish populations, particularly those already threatened by anthropogenic activities such as dam and barrage construction. While hatchery-reared autochthonous fish are frequently introduced into wild populations, this practice can have detrimental long-term consequences to wild fish populations if fundamental genetic, evolutionary, and ecological principles are neglected.

Key risks associated with aquaculture practices for indigenous species, such as *Tor* species and other migratory species, include genetic risks caused by domestication selection, interbreeding between hatchery-raised and wild fish, inbreeding depression, and outbreeding depression. Ecological risks involve increased competition, predation, disease transmission, and the introduction of non-native species or genetically distinct populations. Furthermore, demographic risks such as reduced survival rates, low reproductive success, and diminished fitness of wild populations further exacerbate these challenges.

Despite the substantial financial and logistical investments in stocking programs intended to enhance wild fish populations, these efforts often produce the opposite effect. Documented cases of successful increases in natural fish production through supplemental stocking are rare, if not entirely absent, on a global scale.

Given these risks, alternative mitigation strategies should be prioritized when constructing high-impact infrastructure like dams and barrages. These strategies include the development of functional fish ladders and the implementation of biodiversity (fish) offsets. Another viable solution is the construction of small-scale hatcheries, known as "Valley Hatcheries," to mitigate fish production losses.

Originally designed to produce larvae and fingerlings of salmonids species (*Salmo marmoratus*, *Salmo ghigii*) and some cyprinid species (*Barbus* spp., *Chondrostoma* spp.) in Europe (Italy), the "Valley Hatcheries" concept can be adapted for breeding cyprinids such as *Tor* species in Nepal. These small-scale facilities aim to support wild fish populations while addressing the challenges associated with traditional hatcheries. "Valley Hatcheries" avoid problems of large-scale hatcheries by focusing on native species and populations, maintaining genetic diversity, using low-density rearing, and minimizing ecological disruption through targeted releases. Their goal is to produce natural target fish species for introduction into watercourses, thereby compensating for the reductions in fish productivity and biodiversity losses caused by anthropogenic activities such as fishing and dam construction.

A "Valley Hatchery" is currently under construction in Byas as a key mitigation measure for the Tanahu Project in the Seti Basin. Other proposed measures include the implementation of a "catch and haul" system and the development of a biodiversity offset in the Madi River.