

APPLICATION OF AQUATIC HABITAT IMPROVEMENT TECHNIQUES AT TA-CHIA RIVER IN TAIWAN

CHING-HAO TUAN¹, CHAO-HSIEN YEH² and SHAOHUA MARKO HSU³ (*invited*)

¹Professor, Department of Soil and Water Conservation,
National Chung Hsing University, Taiwan

²Associate Professor & Correspondence Author, Department of Water Resources
Engineering, Feng Chia University, P.O. Box. 25-123, Taichung 400, Taiwan
(Tel: +8864-2451-0824, Fax: +8864-2451-5827, e-mail: chyeh@fcu.edu.tw)

³Professor, Department of Water Resources Engineering, Feng Chia University, P.O. Box.
25-123, Taichung 400, Taiwan
(Tel: +8864-2451-0390, Fax: +8864-2451-4318, e-mail: shhsu@fcu.edu.tw)

With characteristics of river continuum, stream ecosystems have diverse components and environments from upstream channel to estuarine area. Therefore, the habitat requirements and composition of conservative object should be well understood before applying any improvement measure. In this paper, the causes of stream habitat changes were first illustrated along with the categories and principles of habitat restoration methods defined by various researchers. The structural restoration techniques of fishery habitat improvement utilized by the authors for one three-year research project starting at 1990 were then presented (Fig. 1). At the central part of Taiwan, Ta-chia River is a well-known natural scenic and fish habitat area for its convenient transportation, beautiful scenery, and plentiful water resources. However, several reservoirs and dams constructed on Ta-chia River for electricity generation also have increased the impacts on stream habitats. With the experiences of field investigations and several visits to advanced countries in this field, four planning and construction principles for downstream fishery habitat improvement were concluded. Various structural techniques (Photo 1 to Photo 8), including rock weir of partial width, rock deflector, tire weir with opening, channel dredge, concrete deflector with rock pavement, and riverine recreation zone, were designed and constructed based on the restoration functions of techniques and social-economic considerations of construction sites. To verify the environmental and ecological effects of these channel improvement techniques, series investigations of habitat condition and surveys of fishery population were applied at the same time from 1990 to 1993. The analysis results indicated that only partial and mild change on stream hydrology and water quality was discovered after the construction of these measures. In general, the reaches with rock deflectors or rock weirs of partial width not only had lower landscape impacts but also had better overall improvements on fishery community and habitat complexity (Table 1).

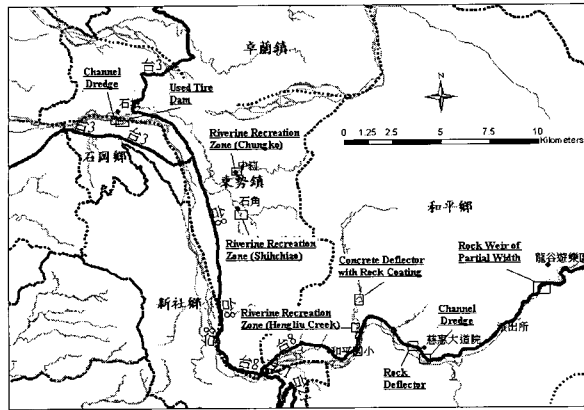


Fig. 1 Locations and techniques of habitat improvement applied at downstream area of Ta-Chia River



Photo 1. Rock weir of partial width



Photo 2. Rock deflector



Photo 3. Tire weir with opening



Photo 4. Channel Excavation



Photo 5. Concrete Deflector with Rock Coating



Photo 7. Riverine recreation zone #2

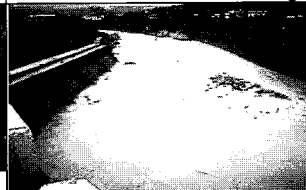


Photo 8. Riverine recreation zone #3



Photo 6. Riverine recreation zone #1

Table 1. Habitat analysis of habitat improvement sites at downstream Ta-Chia River

	Rock weir of partial width	Rock Reflector	Used Tire Weir	Riverine recreation zone #1	Riverine recreation zone #2
Landscape Environment	Harmony	Harmony	Not Harmony	Not Harmony	Harmony
Channel Environment	Mild changes	Mild changes	Huge changes	Mild changes	Huge changes
Flow Regime	Increase of pools, riffles, & backwaters	Increase of pools, riffles, & backwaters	Increase of pools, deep flows, & backwaters	Increase of pools, riffles, & backwaters	Increase of bank slow runs & deep flows
Habitat Complexity	Increase Obviously	Increase Obviously	Increase	Increase Obviously	Increase
Catch Per Under Effort	Increase 3~14 times	Increase 1~15 times	Increase 5~19 times	Increase 0.6~2.3 times	Increase 2~8 times
Catch Density	Increase 11~48 times	Increase 4~68 times	Increase 15~38 times	Increase 1.6~4.7 times	Increase 18~35 times

Source: Wang, C.M. 1998. Ecological Assessment for the Fish Habitat Improvement Project Conducted in Tachia River of Taiwan. In: *Proceedings of Chinese-Japanese Symposium on Ecological Conservation of Streams*, pp. 151-186 (in Chinese). National Taiwan Normal University, Taipei, Taiwan.