

Protect Rare Animals through EIA Process – Hong Kong Case Studies

(Reviewed Paper)

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Abstract

A city of 7 million people, Hong Kong is a cosmopolitan metropolis on a land mass of 1100 km² on the southern coast of China. Surprisingly, this small piece of land supports both a large human population and a rich variety of flora and fauna in a wide range of habitats in the sub-tropical climate of Asia. For instance, there are over 3,100 species of vascular plants; over 500 species of birds; about 80 species of reptiles and more than 20 amphibian species. Insect diversity is also very high with more than 230 species of butterflies and around 115 species of dragonflies to name just two indicators; with new species or new records frequently reported. However, with an ever increasing human population, GDP, urbanization and climate change, these un-replaceable natural values are under escalating pressure. With enforcement of Hong Kong EIA Ordinance in the mid-1990's, ecological impact assessment and mitigation play a role in the preservation of natural habitats and wildlife on a project basis. This paper presents two drainage projects applying mitigation measures to protect a rare fish, *Acrossocheilus parallens*, and a newt, *Paramesotriton hongkongensis*, and discusses the effectiveness of such measures.

1 Introduction

- 1.1 A city of 7 million people, Hong Kong is a cosmopolitan metropolis on a land mass of 1100 km² on the southern coast of China. Surprisingly, this small piece of land supports both a large human population and a rich variety of flora and fauna in a wide range of habitats in the sub-tropical climate of Asia. For instance, there are over 3,100 species of vascular plants; over 500 species of birds; about 80 species of reptiles and more than 20 amphibian species. Insect diversity is also very high with more than 230 species of butterflies and around 115 species of dragonflies to name just two indicators; with new species or new records frequently reported. However, with ever increasing human population, GDP, urbanization and climate change, these un-replaceable natural values are under escalating pressure.
- 1.2 With an increasing population in most of the rural areas in Hong Kong, many of the village houses were built in seasonal flooded areas along streams and rivers. Floods quite often caused problems for properties and even endangered human life. To reduce the flooding

risks, intensive drainage works were undertaken by the Drainage Services Department of Hong Kong in the last thirty years. Streams and rivers, as part of wetland habitats, generally supported high biodiversity and were sometimes inhabited by rare or protected animals. Common fauna groups found in Hong Kong streams include birds, reptiles, amphibians, fish, and a variety of invertebrates, such as mollusks and insects.

1.3 In order to improve drainage functions, drainage works normally involve straightening, widening, and deepening of existing drainage channels, which temporally devastate wildlife in these habitats. With enforcement of the Hong Kong Environmental Impact Assessment (EIA) Ordinance (HKSAR, 1998) in the mid-1990's, EIAs are required for designated projects, including most of the drainage works. During the preparation of the EIA report, relevant ordinance, regulations, and guidelines in relation to animal protection must be discussed. When rare or protected animals are predicted to be affected by a project, relevant mitigation measures are required during construction, post construction and operation periods. EIA findings and recommended animal protection measures must be written in the tender documents for the projects. Once contracts are awarded for a construction project, wildlife protection measures will be enforced and construction of ecologically friendly designed channels will be audited. In recent years, the EIA process became more transparent by introducing public participation in Hong Kong. Green Groups and other NGOs have been actively involved in some ecological sensitive projects, resulting in positive effects on ecology protection.

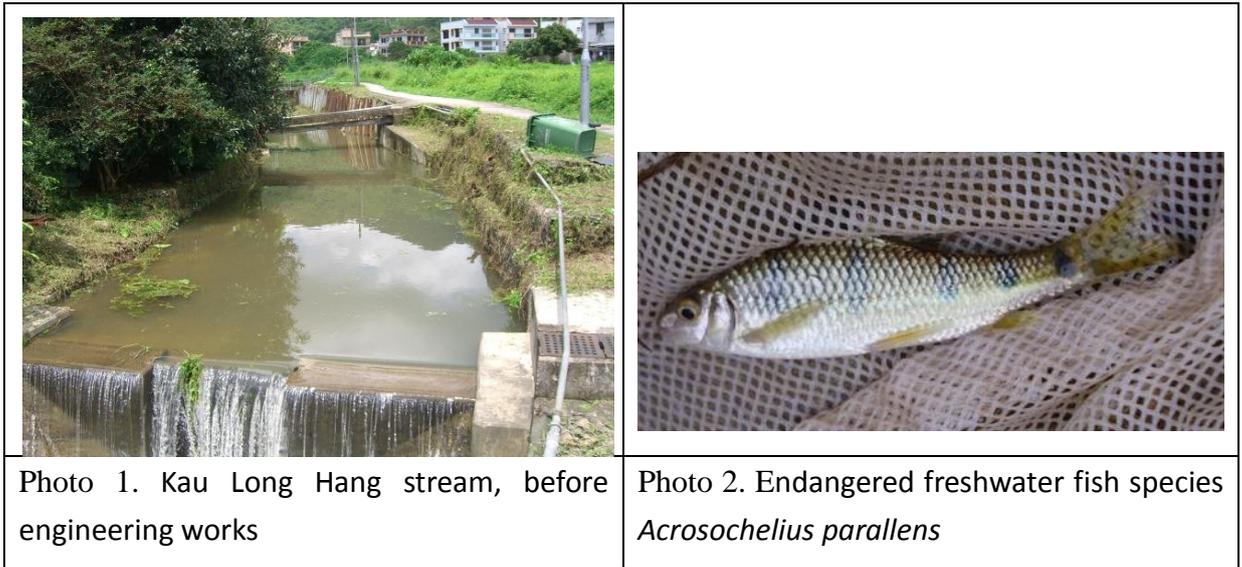
1.4 This paper presents two drainage projects that involved fish and newt protection measures.

2 Case A: A Rare Fish Protection

2.1 The Drainage Improvement Works in Kau Lung Hang, Yuen Leng, Nam Wa Po and Tai Hang Areas and Construction of Ping Kong Drainage Channels will affect stream fauna including a fish species of conservation interest (**Photo 1**). When the project commenced, it was required to carry out recommended mitigation measures and a monitoring program.

2.2 The fish species of concern is a locally endangered freshwater fish species (*Acrossocheilus parallens*) (**Photo 2**), which is an endemic species to Southern China, with limited distribution in streams of Hong Kong (Chong & Dudgeon, 1992.). The fish was reported present in five stream tributaries of the stream system within the project area during the environmental review stage of the project. The stream habitats with the endangered fish were considered to have conservation value. As a condition for an environmental permit (EP), mitigation measures to reduce adverse impacts on the fish were required to be undertaken by the contractor. Major ecological mitigation measures have been undertaken for the project including ecologically friendly design of the stream channel, and capture and

holding of fish in tanks until they can be released back to the stream after construction is complete.



- 2.3 Fish (*A. parallens*) capture was performed in August 2008 with various methods including fish live traps, fish net and hand netting before construction. The captured fish were transferred gently to the aerated fish containers and then released to the temporary fish holding tanks (**Photo 3**). The fish tanks were fenced and locked for security. In total, some 380 fish (*A. parallens*) were captured and maintained in the fish tanks in August 2008.
- 2.4 The concrete fish tanks were built at the upper stream reach where no construction activity would occur and supplied with piped and pumped stream water where the target fish (*A. parallens*) were held. The pH values of the fish tanks were measured weekly after the water pipe was installed and the pH values decreased from approx. 9 to 6.5 (minimum) after subsequent months. pH values of 6.5-8.5 were measured in the natural stream beside the fish tanks. Water temperature in the fish tanks was generally 0 to 3 °C(Degree Celsius) differed from those recorded for the natural stream water depending on measurement time and weather conditions. Some stream stones and wood were laid in the fish tanks to provide microhabitats for fish hiding and foraging. Aquatic floating plants were introduced to the fish tanks to provide shade and microhabitats for invertebrates which could be potentially provide food for the fish.
- 2.5 Fish maintained in the fish tanks have been monitored regularly and the fish have been in good condition as indicated by various behaviors such as feeding, foraging and swimming. A few dead fish were observed outside the fish tanks in September 2008 and January 2009, likely as a result of fish jumping out of the tanks. A few fish were captured by hand net from the nearby stream and released to the fish tanks to compensate for the lost fish. Smaller-sized mesh nets were placed over the tanks to prevent fish from jumping out. As of March 2013, a population of over 300 fish has been successfully maintained in the

temporary fish tanks built next to the upper Kau Lung Hang stream since 2008. The fish kept in the temporal fish tanks will be released to the new stream channel after completion of drainage improvement works and the habitat condition became suitable for fish (**Photo 4**).



Photo 3. Temporal fish holding tanks



Photo 4. Kau Long Hang stream with ecology friendly design, after engineering works

3 Case B: Protection of Hong Kong Newt

3.1 The Hong Kong newt, *Paramesotriton hongkongensis*, belongs to the salamander family of amphibians, is endemic to Guangdong, including Hong Kong, China, and is protected by Hong Kong law under the Wild Animals Protection Ordinance of Hong Kong (Karsen *et al.*, 1986; Fei, *et al.*, 2005) This species was distributed in the upper Lam Tsuen River where major river improvement works for reducing flood risk to residents in Lam Tsuen River Valley took place. To minimize potential ecological impacts, it was recommended that all individuals of the newt species be captured prior to the commencement of construction works in the river channel, and relocated two kilometers upstream of the construction site in the same river. Capture-surveys of amphibians were determined to be one of the practical measures that would prevent direct injury or loss to the newt species during the construction phase.

3.2 Methodology: Hong Kong Newts in the Upper Lam Tsuen River within the construction site were captured using hand nets in each dry season from 2008 to 2012. One suitable relocation site was identified in an upper stream tributary where the habitat will not be affected by the river improvement works. The captured newts were carefully transferred to containers with powered aeration provided and then transported to the selected relocation site and released within four hours. During the capture survey, two ecologists and eight trained technicians in two teams performed the newt capture along 2.8 kilometers of river channel.

3.3 A summary of the results from the newt capture survey carried out from 2008 to 2012 is provided in Table 1. The densities of newt were higher during the dry season from November to March. Water depth was lower in the dry season, which made it easier to capture the newts. The capture survey was performed before engineering works started in each dry season. No newt deaths were observed at the relocation site after newt translocation.

Table 1. Summary of newt capture survey carried out from 2008 to 2012.

| | 2008 | 2009 | 2010 | 2011 | 2012 | | |
|--------------------------|-------|-----------|------------------|--------------|--------------|-------|-------|
| Capture survey dates | Nov 1 | Oct 27-28 | Oct 15 and Nov 9 | Oct 4 and 20 | Jun 4 and 27 | Oct 3 | Nov 2 |
| Number of newts captured | 235 | 162 | 259 | 132 | 5 | 335 | 229 |

4 Discussion

- 4.1 The fish (*A. parallens*) maintained in captivity are considered in fair condition as indicated by their vigorous feeding and swimming behavior, although occasional natural deaths occur. The captive fish will be released to the new river channels to help restore the fish population after the river improvement works are completed and the new river habitat has been re-colonized by river flora and fauna. It is proposed that the release of the fish to the new stream channel will occur in three subsequent exercises with the first release planned for the end of summer, 2013. The fish population will be monitored for six months following the release. This is the first time for drainage project in Hong Kong that species have been held in captivity as a project mitigation measure and the effectiveness of this mitigation will be monitored following the release.
- 4.2 The number of Hong Kong newts captured from 2008 to 2012 did not decrease though the number was quite variable across years due to construction activities. Comparing with baseline survey results (by survey transects) from late 2007 and early 2008, it is suggested that the population at the construction site was restored from the relocated upstream population during the rainy season (April to October) when river works were on hold (required by EP permit of the project as part of mitigations).
- 4.3 These two case projects demonstrate that mitigation measures for rare and protected animal species enforced as conditions in the EP permits issued under the EIA Ordinance of Hong Kong can play a significant role for wildlife conservation.

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