

Appendix 8: Freshwater Fishes Sub-group Report August 2014

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1. Overview of status and trends

- 1.1. Lowland species are at greatest risk. Many aquatic habitats (lowland streams, lowland marshes) have already been seriously degraded or have disappeared entirely, and at least two lowland fish species (Lin's Minnow 林氏細鯽, White Cloud Mountain Minnow 白雲山魚) are apparently locally extinct. Some lowland species that were common in the past, like Whitespotted Walking Catfish (塘虱), Paradise Fish (叉尾鬥魚), etc., can now be considered to be Near Threatened or even classified among the threatened categories. This of course is due to a combination of urban expansion, pollution, channelisation, impacts from invasive species and water over-abstraction.
- 1.2. Many fish species considered to be threatened/ Near Threatened appear in Country Park Enclaves (e.g., HK Paradise Fish 香港鬥魚, Rice Fish 弓背青鱗, Giant Marbled Eel 花錦鱔, Three-lined Catfish 三線擬鱔). The streams, ponds and marshes (and their surrounding riparian zones) in these Enclaves should be protected from development and associated pollution, as well as channelisation, drainage works or construction of dams and weirs.
- 1.3. Many Ecologically Important Streams (EISs) recognised by the AFCD as well as some recommended to become EISs are habitats for many fish species of

conservation concern (e.g., Thick-lipped Barbs 光唇魚, Chinese Rasbora 斯氏波魚). They should be protected from development and associated pollution, as well as channelisation, drainage works or construction of dams and weirs.

- 1.4. Many diadromous species (migrating between the sea and streams) have decreased in abundance and/ or are present in fresh water at low densities (e.g., Japanese Eel 白鱧, Ayu Sweetfish 香魚). These species and their habitats should be protected, following a holistic approach (e.g., the whole stream (and the riparian areas) should be protected as they need to move back and forward between the river mouth and the middle or even the upper sections). In particular, fragmentation of streams by dams and weirs can create impassable barriers for migratory species.
- 1.5. Some species only appear at several localities outside protected areas; they and their known habitats require protection from development and associated pollution, as well as channelisation, drainage works or construction of dams and weirs.
- 1.6. Although species living in hill streams seem to be relatively stable (both in terms of habitat occupancy and population trends), because they are within Country Park boundaries, some species occur at only a few sites and are isolated in separate drainages. A precautionary approach should be adopted for these species as localised events (e.g., landslides, or dewatering due to aggressive water extraction) can greatly reduce the size of the sub-population.
- 1.7. Some species seem to be widespread but are usually in low abundance (e.g., Small Snakehead 山斑). These species and their habitats should also be protected from development and associated pollution, as well as channelisation, drainage works or construction of dams and weirs.
- 1.8. Many channelisation projects have been carried out (and completed) by the DSD in Hong Kong and the effect of this on Hong Kong's stream/ river ecosystems, especially those lowland ones, is disastrous. Once destroyed, natural stream/ river systems and their complex biotic communities are very difficult if not impossible to be fully restored.

- 1.9. In rural areas with human settlement but without proper sewage system, rivers and streams can become polluted with detrimental impacts on native fishes. In addition, sediment run-off arising from work sites (small houses, roads, and so on) can degrade stream or wetland habitats and impact fishes. Another source of pollution for streams might be ‘cocktails’ of pharmaceuticals from septic tanks, that are known from studies elsewhere to have effects on aquatic organisms (e.g., oestrogens from contraceptive pills feminizing male individuals).
- 1.10. Some non-native (or alien) invasive species such as the North African Catfish (北非塘虱), as well as Tilapias (各種金山鯽) and Mosquito Fish (食蚊魚), can impact aquatic ecosystems and associated native fishes. Invasive species with predatory habits (e.g., various exotic Snakehead species 各種外地生魚/ 鱧魚) are likely to have strong impacts, but possible effects of aggressive competitors (e.g., Mosquito Fish 食蚊魚) that occupy a similar niche to native species (e.g., Rice Fish 弓背青鱗) should not be disregarded (e.g., see 1). Furthermore, invasions seem to be especially successful in habitats that have already been altered by humans (e.g., by channelisation) so that native species are subject to the combined impacts of these invasive species and other stressors. The species of aliens mentioned here are among the 100 world’s worst invaders².
- 1.11. Releasing of animals into streams, reservoirs and other aquatic systems does not seem to be controllable, thus there is a constant source of exotic species posing potential threats to native species in Hong Kong’s fresh waters.
- 1.12. Hong Kong streams draining Country Parks are used as a source of drinking water and WSD has created an extensive network of dams, weirs, tunnels, channels and reservoirs to collect and store this water. However, no consideration is given to the environmental water needs of channels downstream of extraction points, and aggressive over-extraction of water is ecologically damaging. Unregulated, informal extraction of water for farming or domestic needs puts further stress on stream systems,

¹ <http://www.annualreviews.org/doi/pdf/10.1146/annurev.ecolsys.39.110707.173451>

² <http://www.issg.org/database/species/search.asp?st=100s>

particularly during the dry season when channels may be entirely dewatered or lacking any surface flow.

2. Major threats identified

- 2.1. Main threats affecting Hong Kong's freshwater fishes are as follows: urban expansion/ village expansion/ haphazard development leading to the permanent destruction of aquatic habitats (e.g., filling of marshes, culverting of streams), development along riparian zones, channelisation, pollution, dams and weirs, water extraction by authorities or by local inhabitants and competition with and predation from invasive species. Sedimentation and farming activities would also affect the quality of aquatic habitats (e.g., homogenise the stream bed structure; impacts from soil erosion and addition of fine sediments to fresh waters; inputs of fertilisers and pesticides) and thus affect some fish species. In most cases, these threats do not occur in isolation so that, at a given stream or wetland site, fishes may experience multiple interacting threats that act synergistically to impact populations.

3. Existing measures/ laws protecting freshwater fishes

- 3.1. Currently, all fishes living outside Country and Marine Parks are not protected in Hong Kong.
- 3.2. The Fisheries Protection Ordinance specifies that destructive fishing practices should not be conducted but, with the exception of electrofishing or the use of fish poisons, this is not particularly relevant to freshwater fishes.
- 3.3. The Environmental Impact Assessment (EIA) Ordinance and the Town Planning process may sometimes help to protect important fish habitats. However, many important fish habitats still cannot be protected due to inappropriate zonings (e.g., the Lin Ma Hang Stream SSSI is established, in part, because of the richness of the fish assemblage there, but its riparian zone is largely covered by 'Green Belt' (GB) only (the problem of GB will be discussed below)) and the lack of sufficient information (and understanding) on the aquatic system (and species) being assessed. Also, these ordinances

usually cannot tackle localised problems such as impacts arising from non-designated projects, impacts in areas not covered by DPA plan, or activities (e.g., water extraction for informal domestic use) that are insufficiently regulated.

- 3.4. The Water Pollution Control Ordinance is intended to control water pollution, but in many rural areas it does not seem to be really enforceable. River/ stream pollution remains severe (and common) in rural areas with dense human settlements, and this fact is recognised by the Government³. Such pollution, of course, greatly affects aquatic faunas including fishes.
- 3.5. The existing EIS list (in Technical Circular (Works) 05/2005) would provide some guidance during the land use planning process. But the list was formulated nearly ten years ago and updating is needed.

4. Major knowledge gaps to be filled

- 4.1. In Hong Kong, freshwater fishes have been studied, on and off, for many years; thus our knowledge on this group is relatively good, as compared to others (e.g., certain invertebrate groups). We know quite well where the fish species of conservation importance appear/ would appear and we also know the status of their habitats. What we really and urgently need to do now is to ensure these known important sites and other potential sites would not be further degraded.
- 4.2. However, it does not mean that we do not need to carry out further monitoring. Indeed, we do not have much knowledge on the population trends of most species. This implies a systematic monitoring programme, which seems to be lacking, is needed. We are also lacking knowledge on fishes in many areas in which no systematic and comprehensive studies have been carried out so far (e.g., western New Territories, Frontier Closed Area). This suggests that we should extend the monitoring programme to these areas. We could also explore the possible effect of alien fish species (e.g., poeciliids, Tilapias) on natives.

³ <http://www.legco.gov.hk/yr04-05/english/counmtg/hansard/cm0126ti-translate-e.pdf>

5. Priority Species

Priority	Species (with Local Red List Category)	Justifications for being listed as priority species
Very high	<i>Acrossocheilus parallens</i> Thick-lipped Barb (CR), <i>Anguilla japonica</i> Japanese Eel (EN), <i>Glyptothorax pallozonus</i> (CR), <i>Plecoglossus altivelis</i> Ayu Sweetfish (CR), <i>Pseudobagrus trilineatus</i> (CR), <i>Rasbora steineri</i> Chinese Rasbora (CR), <i>Stiphodon imperorientis</i> Akihito Neon Goby (CR), <i>Stiphodon multisquamus</i> Scaly Neon Goby (EN)	No significant rescue effect can replenish the local population and qualified for at least two criteria below: <ul style="list-style-type: none"> - Distribution highly restricted (appearing at less than 5 sites) - Habitats usually not within protected areas - Mature individuals estimated to be usually less than 250 - Considered to be threatened in the global IUCN Red List assessment -
High	<i>Acrossocheilus beijiangensis</i> Beijiang Thick-lipped Barb (EN), <i>Anguilla marmorata</i> Giant Marbled Eel (NT), <i>Awaous melanocephalus</i> Largesnout Goby (VU), <i>Clarias fuscus</i> White-spotted Walking Catfish (NT), <i>Kuhlia marginata</i> Spotted Flagtail (VU), <i>Kuhlia rupestris</i> Rock Flagtail (VU), <i>Macropodus hongkongensis</i> Hong Kong Paradise Fish (NT), <i>Macropodus opercularis</i> Paradise Fish (EN), <i>Mastacembelus armatus</i> Zig-zag Eel (VU), <i>Metzia formosae</i> Taiwan Lesser Beam (VU), <i>Metzia lineate</i> Lesser Beam (VU), <i>Oryzias curvinotus</i> Rice Fish (VU), <i>Rhodeus ocellatus</i> Rose Bitterling (VU), <i>Schistura incerta</i> Inmacular Loach (VU), <i>Stiphodon atropurpureus</i> Purple Neon Goby (VU)	Qualified for at least one criterion below <ul style="list-style-type: none"> - Distribution restricted (appearing at less than 10 sites) - Mature individuals estimated to be less than 1000 - Habitat quality/ abundance greatly reduced in the recent decade, or predicted to be reduced in the future due to known potential threats
Moderate	<i>Channa asiatica</i> Small Snakehead (NT), <i>Rhinogobius leavelli</i> Li's Goby (VU)	Distribution restricted (less than 20 sites) and generally uncommon

6. Recommendations (in order of priority)

In situ habitat protection (Relevant Aichi Targets: 1, 2, 3, 5, 11, 12, 14)

6.1. As mentioned above, most water bodies (streams, ponds, marshes) in Country Park Enclaves and EISs (existing or recommended) provide habitats for many fish species of conservation concern. But, unfortunately, they are usually not appropriately protected at present. Indeed, many of these sites are located in lowland areas, and lowland habitats are well known to be

under-represented in the HKSAR protected area system (e.g., see 4). The riparian zones of many of these streams/ water bodies are taken up/ threatened by haphazard development, and many of these zones are not protected by enforceable or appropriate zonings. Many of these areas are zoned 'Green Belt' (GB) but New Territories Exempted Houses are allowed to be built in GB through planning applications. Furthermore, in some regions without Development Permission Area (DPA) plans, the planning ordinance is not enforceable, and dumping and land filling seriously threaten important fish habitats/ EISs in these areas. Immediate actions are required to rectify this undesirable situation and they are listed below:

- Streams/ rivers/ marshes/ water bodies important to fishes, and their surrounding areas (e.g., riparian zones), should be identified and protected by incorporating them into Country Parks/ Special Areas so as to establish a protected area system with a comprehensive and connected coverage of different habitat types, wildlife communities and biodiversity. Water bodies (and their surrounding areas) already known to be important to fishes but not yet appropriately protected should be preserved urgently.
- Aquatic habitats such as streams (many are already EISs or recommended to be), marshes and ponds within Country Park Enclaves, and their riparian zones, should be well protected by effective conservation zonings (i.e., Country Park, Special Area, SSSI, Conservation Area, Coastal Protection Area, GB (1)). GB cannot provide sufficient protection.
- For EISs (existing or recommended) in areas that currently lack any enforceable zoning plans (e.g., Tung Chung, Pui O, Sham Wat) or outside protected areas, appropriate and enforceable zoning plans/ measures for their protection should be put in place (e.g., through the gazette of appropriate zoning plans, re-zoning, publication of new practice notes to guide land use planning/ application, incorporating these habitats into the Country Park system). Protection of these habitats should also

⁴ Yip, J.Y., Corlett, R.T. and Dudgeon, D. 2004. A fine-scale gap analysis of the existing protected area system in Hong Kong, China. *Biodiversity and Conservation* 13, 943-957.

- involve establishment of appropriate buffer zones; in particular, protection of stream riparian zones should be mandated.
- In the planning of the protective zonings, a holistic view should be applied as many diadromous species appear in these areas; for instance, the whole stretch of the watercourse (e.g., from the estuarine area to the upper section) should be protected.
 - The EIS list should be revised as soon as possible, preferably within 2015, and the freshwater fish Red List should also be finalised as soon as possible. Both of these lists should be made effective in guiding the formulation of land use plans and development proposals, as well as all development decisions that would affect fishes and their habitats, through appropriate statutory/ non-statutory procedures.
- 6.2. In large-scale development projects such as NENT NDA, North NT NDA, Yuen Long South NDA, etc., natural streams/ semi-natural streams/ freshwater marshes should be protected as far as possible through appropriate land use planning (i.e., integrating natural streams, rivers and riparian zones with new town development through appropriate land use designation, urban design, and drainage management to maintain their biodiversity value and outlook) beyond the current practice and in accordance with Aichi Targets (this is also related to 5.6 and 5.7 below).

Pollution control (Relevant Aichi Targets: 1, 2, 3, 5, 8, 11, 12, 14)

- 6.3. In places where it is not possible for residences to connect to the communal sewerage system, such as some isolated sites (e.g., Enclaves completely surrounded by Country Parks), the planning/ land use authority should limit the development potential in these areas (e.g., designating a smaller Village Type Development zone; not to allow houses to be built along the riparian zone, and strictly limit the number within each catchment area).
- 6.4. For stream/ river pollution in rural areas, the DSD and the EPD should investigate how to extend the communal sewerage system to remote villages, and should also take steps to increase the connection rate of private sewerages to communal sewers.

- 6.5. For large-scale development proposal like “the Development of the Tung Chung Remaining Area” and those NDAs mentioned above, relevant authorities should explore innovative ways to collect and discharge surface runoff which could give rise to water pollution (e.g., not to discharge this runoff into nearby streams).
- 6.6. The effectiveness of the Water Pollution Control Ordinance should be reviewed (i.e., in relation to stream/ river pollution).

Regulation on channelisation (Relevant Aichi Targets: 1, 2, 3, 5, 11, 14, 15)

- 6.7. Stream channelisation should be avoided wherever possible; if channelisation is proven to be necessary, the channel should be designed in a real eco-friendly way. DSD or the department(s) carrying out channelisation, AFCD and relevant parties such as Environmental NGOs should liaise with each other over each project, as mitigation measures can be highly site-specific. In addition, a formal liaison mechanism regarding channelisation and also stream maintenance works should be established; in that regard, informal liaison is already ongoing between DSD and Environmental NGOs, and this should be formalized and the membership expanded to include AFCD, etc.
- 6.8. DSD is now very keen to restore channelised streams; regarding this, the AFCD (and relevant authorities) should give DSD more support (both technical and political). The authorities (e.g., DSD, AFCD) should also identify opportunities for habitat enhancement at existing river channels that will make a significant contribution to biodiversity conservation, and provide ecologically friendly measures for new stream/ river improvement works. A pro-active and well-funded program is required for restoration of channelised watercourses and clear biodiversity objectives is needed to guide such work.

Habitat management (Relevant Aichi Targets: 1, 2, 3, 5, 11, 12, 14)

- 6.9. Minor river/ stream maintenance works (e.g., desilting, weeding) are always creating problems; stream stone removal works by the Food and Environmental Hygiene Department would also affect the integrity of streams. The conservation authorities, in consultation with relevant

stakeholders such as Environmental NGOs and local experts, need to suggest some solutions/ guidelines with an aim to improve these works to minimize ecological impacts, and the relevant authorities should follow.

- 6.10. Important stream/ aquatic habitats (and their water quality), as well as species of conservation concern, should be regularly monitored.
- 6.11. There is a need to establish and implement environmental flow regimes for Hong Kong streams (i.e., a minimum flow that must be maintained below water extraction points so that the capacity of the downstream habitat to support fishes (or other organisms) is not impaired by water extraction). This would require the use of eco-hydrological relationships to determine the amount of water that can be extracted in each season (dry vs wet) in order to ensure that downstream communities of native species are not compromised. In practice this could be implemented by relevant authorities such as WSD, DSD and AFCD by setting a cap on the percentage of stream flow that can be extracted in each season (or, the percentage of flow that should remain in downstream sections). This measure would need to be accompanied by restriction and enforcement of controls upon informal and unregulated extraction of water from streams by any parties other than the authorities.

Species management (Relevant Aichi Targets: 1, 2, 3, 9, 12)

- 6.12. Urgent action, which may involve legislation and/ or executive means, is needed to address the unregulated release of exotic species, including mercy releases for religious reasons. The possible effect of exotic species on the natives should also be monitored/ studied. Plans to remove exotic species should also be formulated.
- 6.13. All freshwater fish species of conservation concern should be included into the Wild Animal Protection Ordinance (e.g., to control capture and over-exploitation). This measure costs nothing, but it ensures that these species must be considered when the potential environmental impacts of development projects are assessed.

6.14. The conservation authorities, in consultation with relevant stakeholders such as Environmental NGOs and local experts, need to start developing species-specific action plans and the feasibility or desirability of conservation interventions such as relocation, translocation and *ex situ* breeding facilities. The last of these actions may be an important 'avenue of last resort' if gravely threatened fishes (e.g., Chinese Rasbora 斯氏波魚, Taiwan Lesser Beam 台細鯿, Rose Bitterling 高體鯿) present at only one or a few localities are in danger of becoming locally extinct due to – for instance – unavoidable development of their habitats.