

A BIODIVERSITY SURVEY OF HONG KONG

Executive Summary Prepared for ACE

1. Abstract

The Biodiversity Survey is coordinated by Associate Professor Richard Corlett and Professor David Dudgeon of the Department of Ecology & Biodiversity at The University of Hong Kong. The major source of funding is a HK\$3.8 million grant from the Hong Kong Government's Environment and Conservation Fund. The project consists of a systematic survey of terrestrial and freshwater biodiversity in Hong Kong, with the basic aim of identifying sites and species of special conservation value. The information obtained will be useful to Government planners, conservation managers, environmental consultants and researchers in a variety of fields.

2. Introduction and Context

2.1 Historical Impacts and Conservation Potential

Despite massive human impacts over the last several centuries, Hong Kong still has a diverse flora and fauna. The SAR supports more native species of plants, mammals, reptiles, amphibians, freshwater fishes and insects than Britain. There are also species endemic to Hong Kong. Species new to science are regularly discovered. Nevertheless, wildlife habitats are increasingly under threat. This can be attributed, in part, to increased urbanization of the lowland New Territories and the associated habitat loss.

2.2 Is Current Protection of the Biota Adequate?

Legal protection of biological diversity in Hong Kong is aimed either at areas (such as Mai Po Marshes) or individual species (such as the Leopard Cat, *Prionailurus bengalensis*). Apart from preserving wildlife, protected areas can also provide for other needs, such as water catchments, education and recreation. The major disadvantage is that protected areas are usually chosen by default - the areas not immediately wanted for anything else - and may thus omit many important habitats and species. Hong Kong's current protected area system illustrates these points.

Protected-species lists are useful supplements to protected-area systems, and enable the conservation of species which occur partly or exclusively in unprotected areas. However, listing provides no direct protection for particular species against habitat destruction which is the major threat to wildlife in Hong Kong.

2.2.1 Country Parks

Although more than 40% of Hong Kong is covered by Country Parks. The Country Parks system is deficient from a conservation viewpoint in at least two respects:

- i) The absence of a clear, long - term conservation management policy. Apart from the control of recreational impact, conservation management is limited to fire prevention and the planting of trees which are mostly exotic.
- ii) Country Parks are unable to protect some of the important habitat types. Wildlife habitats such as *fung shui* woods and wetlands are found mainly in valley bottoms and on lower hill-slopes but such areas are usually excluded from the Country Parks in order to respect the traditional rights of indigenous villagers to use these lands. Development currently threatens many such wildlife habitats.

2.2.2 Other Protected Areas

Other protected areas such as Sites of Special Scientific Interest (SSSIs) and Restricted Areas under the Wild Animals Protection Ordinance have been designated in an *ad hoc* fashion. In the absence of a systematic survey of the whole of Hong Kong, we cannot simply assume that all sites worthy of protection have been identified already or will be identified before they are committed for development.

2.2.3 Protected Species

A protected animal species list is included in the Wild Animals Protection Ordinance. The list probably includes most of the species that could be threatened by trapping or collecting. However, the list provides no direct protection against the more insidious threats of habitat destruction and, for aquatic species, pollution.

Plant species currently receive protection under the Forestry Regulations of the Forests and Countryside Ordinance. The list of protected plant species is far less effective than the protected animal species list of the Wild Animals Protection Ordinance, because it covers a smaller proportion of the Hong Kong species, and includes largely plants of high-altitude areas which are almost all in Country Parks.

2.3 Conclusion

It is clear that Hong Kong's protected species legislation is out of step with modern Hong Kong, and that the protected area system, whilst very valuable, has some serious deficiencies. These problems are a result of lack of information more than a lack of will. A coherent and effective approach to the conservation of species and their habitats in Hong Kong must be based on a knowledge of local patterns of biodiversity. Currently, this knowledge is lacking for all but a small minority of well-studied groups in a very few, often-visited, habitats.

A comprehensive survey of the biodiversity of Hong Kong is thus an essential first step towards developing a conservation strategy for the SAR. This project, entitled *A Biodiversity Survey of Hong Kong* and financed by a grant of HK\$3.8 million from the Environment and Conservation Fund (ECF) of Hong Kong Government, constitutes a systematic survey of terrestrial and freshwater biodiversity in Hong Kong. A biodiversity inventory is needed for the ratification and implementation of the United Nation's Convention on Biological Diversity to which China is a signatory.

3. The Survey

3.1 Aims and Objectives

The aim of this proposal is to undertake a systematic survey of biodiversity in Hong Kong; to identify sites and species of special conservation value; and, to produce a ranking and classification system which will serve to prioritise future conservation activities in the SAR.

The results of this survey will allow Government to design more effective and more efficient conservation strategies. The data could be made available to NGOs, private developers, environmental consultants, and other interested parties to allow assessment of the potential ecological damage arising from development proposals. Representative sites in all non-

marine habitats (i.e. areas above the high-tide mark) have been included in the survey. The results are being incorporated into a computer-based GIS (Geographic Information System) database and mapping facility.

It has not been feasible to include every group of organisms in the survey. The groups that are being surveyed currently include representatives from a range of phyla: vascular plants, mosses, mammals, birds, reptiles, amphibians, freshwater fishes, freshwater invertebrates, spiders, butterflies and moths (i.e. *Macrolepidoptera*), ants and a variety of other insect groups. We have deliberately chosen groups which contrast in their lifestyles and habits so as to obtain as wide an ecological coverage as possible. In order to supplement information on particular groups of animals, special attention has been paid to threatened habitats (such as freshwater wetlands) and those habitats we believe are likely to contain rare or endemic species (montane forest and larger *fung shui* woods).

The survey output will consist of two parts. The first part will consist of the GIS database, including species distribution data for the major groups of organisms in terrestrial and freshwater habitats in Hong Kong. The second main output will be a comprehensive report in book form which will give an account of the main findings of the study, characterize the patterns of biodiversity in Hong Kong, interpret them in an ecological framework, and place these data in the context of local conservation needs and goals. The book will probably follow a habitat-based approach, and will provide a frame of reference for subsequent investigations of human impacts on the Hong Kong countryside. In particular, we expect that our analysis of the data will facilitate the ecological element of the EIA process by providing a point of comparison through a set of 'anchor sites' and by identifying a 'predictor set' of taxa (families, etc.) that can indicate the diversity of the overall assemblage of organisms found in non-marine habitats. These findings will make an important contribution to Government's commitment to sustainable development in the context of Sus Dev 21.

3.2 Methods

3.2.1 Data Collection

A considerable amount of data already exists for some of the groups which are being surveyed, but this information is not in a form suitable for direct inclusion into the GIS system. Thus an initial aim of the survey has been to supplement existing or ongoing surveys of the biota, to put such data into a form which can be entered into the GIS, and to initiate new work on species groups which have not been investigated previously. Some of the early stages of this work has involved liaison with local naturalists and conservation groups, including World Wide Fund for Nature (WWF) Hong Kong and the Hong Kong Bird-Watching Society, as well as the Agriculture & Fisheries Department of Hong Kong Government. We have worked particularly closely with the Kadoorie Farm & Botanic Garden, who have provided us with much-needed logistical support. The initial ECF grant for the Biodiversity Survey has been supplemented by Hong Kong University funds used to support graduate students working on various aspects of the survey (currently including moths and mosses, etc.).

Survey methods must be different for each group of organisms, but some general principles have been followed:

- a) The Survey aims to be geographically comprehensive, including the major sections of the New Territories and non-urban Kowloon, all the major islands, and a representative sample of the smaller islands.
- b) Within each area, sampling has been habitat-based. Species lists for defined habitats have far more predictive value than lists for areas including several habitats. Where appropriate, the same sites have been used for sampling different groups of organisms so that between-group comparisons are facilitated.
- c) Survey efforts have focused upon those local habitats which show the least evidence of recent human impact as it is in these sites that we would expect to find the most diverse communities; e.g. mature secondary forest. Botanical sampling effort has been concentrated in woodlands and closed shrubland because experience has shown that it is these habitats which have both the most diverse floras and the greatest abundance of rare species.

A wide range of standard sampling methods exist for different groups of organisms, and - for brevity - these will not be discussed in any detail here. Not all sampling methods are appropriate for every habitat, and emphasis is being placed on comparability of results within habitat types. This is, to some extent, confounded by seasonal variations in the abundance of many animals (e.g. migratory birds) in the Hong Kong countryside, but information collected by year-round monitoring of the fauna at a reference site will be used to help 'control' for such changes. Between-habitat comparability is more difficult to achieve but a consistent standardised approach to sampling in each of the different habitat types should allow sites within the same habitat category to be ranked according to species diversity and conservation value, and thus permit qualitative comparisons between habitats.

3.2.2 Data Analysis

The data arising from the survey is (as has been mentioned above) being stored and manipulated using GIS software. While the raw data can be included directly, assessment of conservation value of sites, and ranking sites within habitat types on the basis of their species composition, will require statistical treatment of the raw data once the field-work component of the survey has been completed. Furthermore, interpretation of the observed biological patterns in terms of environmental variables will make it easier to extrapolate the survey results to unsurveyed sites. Appropriate analytical tools and computation methods will be employed in the study. These include multiple regression, and multivariate ordination and classification techniques such as detrended correspondence analysis, principal components analysis, non-linear multidimensional scaling, and cluster analysis.

3.2.3 Preliminary Findings

We now have a vast amount of raw data but, until all information has been collated and the final analysis has been completed, any conclusions are tentative. Nevertheless, one major result is clear already. Hong Kong still supports far more species of plants and animals than would be predicted from its long history of human impact. Who would expect to find, for instance, 390 native tree species or 230 types of butterfly? We have found many species which have not previously been recorded in Hong Kong, including several which are new to

science. Not all groups are doing so well; however, and we have confirmed the local extinction of both the Large Indian Civet (*Viverra zibetha*) and the South China Red Fox (*Vulpes vulpes hoole*). Moreover, for several groups, such as the dragonflies, frogs and certain types of vegetation, as well as freshwater wetland habitats, many of the most diverse sites are in the unprotected lowlands, and are thus highly vulnerable to development. There are some obvious biodiversity 'hot spots' in the SAR: they include montane forests, *fung shui* woods, freshwater wetlands, some lowland streams, and certain offshore islands. Their actual extent is rather small, and we estimate that preservation of these sites would involve extending the existing protected-area system by around 1%.

4. Project schedule

Field surveys and data collection began in late 1995, and progress has been good. Field work is now largely concluded, but processing of collections and organisation of accumulated data is still ongoing. To date, over 90 plant species new to the Hong Kong flora have been recorded, as well as some insects new to science. Many locality records for the Hong Kong biota have been added, and our knowledge of the distribution of plants and animals across the SAR is increasing. The first stage of project completion is anticipated around the end of 1998 when we intend to present the GIS database to the Government (i.e. ECF). Government Departments (and interested parties as the Government sees fit) will be able to interrogate or supplement the database and use it to incorporate conservation or ecological data into planning and development strategies. Subsequently (in 1999), Corlett and Dudgeon will publish a book - provisionally titled *The Biodiversity of Hong Kong* - setting out our analysis of the database and providing a conservation evaluation of the Hong Kong countryside.

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