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REPORT FROM THE WORKSHOP „BIRD POPULATIONS AND THEIR HABITATS" GUIDELINES FOR LONGTERM MONITORING

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INTRODUCTION

An increase in interest in the role of waterfowl in aquatic ecosystem is evident from the formation of a working group of SIL in 1992, and from the international conferences on „Aquatic Birds in the Trophic Web of Lakes", held in Sackwille, New Brunswick, in 1991 (Kerekes and Pollard, 1994) and on „Limnology and Waterfowl - Monitoring, Management and Research", held in Sopron, Hungary, in 1994. This report incorporates recommendations from a workshop on limnological monitoring and waterfowl, held at the latter conference. The workshop arose partly from fundamental scientific needs, and partly from concerns about the lack of information on how waterfowl may be affected by major changes to aquatic ecosystems resulting from human activity, such as eutrophication, water abstraction and reclamation, acidification, and organic and other pollution.

The objective of the workshop was defined as being to prescribe a minimal set of limnological variables that is desirable to measure in conjunction with waterfowl monitoring programmes, with the ultimate objectives of developing predictive models for the abundance and role in ecosystem function of waterfowl species. Such models might be derived for individual waterbodies, or for individual species or wider taxonomic groupings, over all or part of their geographical ranges. The questions addressed were thus, broadly:

1) What is an appropriate minimum set of limnological variables to monitor in relation to waterfowl populations?

2) How should waterfowl populations be monitored, and in what units should their abundance be expressed for purposes of relating them to limnological variables?

The recommendations are to be regarded as preliminary. There is little reason to believe that the relationship between limnology and waterfowl are simple, and information gathered from continuing or future monitoring programmes may well lead to their revision. It is nevertheless expected that monitoring of these limnological variables will allow a preliminary assessment of whether major long term changes to the waterfowl populations of a particular water body are related to changes within the system, or to causes outside it. Catastrophic effects, such as outbreaks of avian botulism or incidences of other forms of toxic poisoning are not considered, and require specialist study.

Any monitoring programme should have its own, specific, clearly defined objectives, which will ultimately define what is to be measured, and how often. Supplementing these measurements with the limnological measurements listed below is likely to be useful, both for individual monitoring studies, and for future synthesis. The adoption of standard units for expressing waterfowl population densities is essential for any synthesis to become possible.

It is accepted that management of water bodies should not normally be directed primarily to maximisation of waterfowl populations,a s there may often be more important wider ecological considerations. An appropriate general management strategy is therefore to manage for a suitable environment for waterfowl can be considered satisfactory.

LIMNOLOGICAL VARIABLES

Methods

Given the wide range of methods available for many limnological measurements, no specific methods are recommended. The normal scientific criterion of describing methods in sufficient detail for the study to be repeated should be observed.

Frequency of monitoring

The desirable frequency of monitoring is related to the level of precision required, and the temporal and spatial variability of the habitat under investigation. Among the many

problems that may be encountered are those relating to the local influence of inflows, the pathiness of surface blooms of algae, short term variations caused by wawe disturbance of the sediment in shallow lakes, and the influence of floods in streams. Specialised texts on chemical and biological monitoring should be consulted before any monitoring programme is begun, and attention should be paid to defining the precision of estimation. A minimal programme of open-water chemical sampling might involve taking duplicate vertically intergrated samples taken with a weighted hose pipe at a single centrally located station at monthly intervals, after preliminary investigation of the variability of the system.

The water body, morphology and climate

Type of the water body* *. Location, with latitude and longitude. Area (ha) and mean depth (m). For some benthivorous species the area of habitat within feeding reach may also be relevant. Range of variation in water level, and seasonal regime. Length of shoreline. Range of surface temperatures. Period of ice cover if relevant. Stream discharge and velocities for lotic studies. Human use of the drainage basin. Human recreational and economic use of the lake (for example for hunting boating, fishing) with reference to potential disturbance of waterfowl. Published sources of limnological information.

Physical and chemical measurements

Surface temperature, pH, Secchi disc transparency (supplementary readings with an all-black disc can be related more directly to inherent optical properties of water). Salinity or conductivity. Total and inorganic suspended solids. Total fixed nitrogen, and the inorganic forms NH_4- and NO_3-N. Total phosphorus and dissolved reactive phosphorus. In addition to these routine measurements, a survey of the nature and organic content of the sediment is recommended.

The International Waterfowl and Wetlands Research Bureau (Address) provides a form „Waterfowl count site form: Western Palearctic" with a classification of habitats that is recommended for use.

Biological measurements

Phytoplankton chlorophyll a. Dominant phytoplankton taxa. Nature of marginal vegetation, nature and extent of emergent vegetation. Distribution, dominant species, height, and depth limit of submerged aquatic vegetation, with biomass estimates if possible. (It was noted that the loss of submerged aquatic macrophytes is a critical stage in the eutrophication of shallow lakes, marked by sharp discontinuities in several major limnological variables, but little is known of its effects on waterfowl.) Survey or monitoring of biomasses of zooplankton, benthic fauna or fish may also be directly relevant for many omnivorous or carnivorous species of aquatic birds.

Waterfowl impacts

The effects on waterfowl on the systems that they inhabit, through feeding, exretion, or other activities, should be expressed in units consistent with those for other limnological measurements. Thus the recommended units are g m^{-2} $time^{-1}$, or g m^{-3} $time^{-1}$.

Waterfowl populations

Species present, abundance, and uses they make of the water body (e.g. roosting, feeding, breeding). It is recommended that the population densities be expressed as No ha^{-1} for the entire water body, and for the area occupied when use is localised. Estimates of the mean weight per bird, either from the literature or by sample measurement, will allow ready conversion to more standard limnological units (for example g m^{-2}).