Extinction risk assessment of threatened species

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Introduction

It is impractical to avoid all kinds of ecological risk. Risk assessment is becoming common in a wide range of natural and social sciences, but the extinction risk of threatened species is usually based on inadequately known factors. We should develop a conservation program for threatened species as soon as possible, even though we need much more time to investigate the extinction risks of these species. Uncertainty is a significant aspect of environmental problems, global warming, the effect of endocrine-disrupting chemicals, and ecosystem management. Risk is a probability, based on some uncertainties.

IUCN (the World Conservation Union) determined five quantitative criteria for classification within the threatened categories (IUCN 1994). Among these, criterion E directly refers to extinction probability. However, it is difficult to apply this criterion to data-poor situations. For most of the threatened species that are not commercially exploited, we rarely know the population size. Therefore, IUCN's criterion A is solely based on the population decline rate, no matter how large the population size. This criterion is applied to any species, including commercially exploited marine species, despite the fact that extinction risk depends on the rate of decline, its variation, and the absolute size of the population (Lande and Orzack 1988).

In 1996, 118 threatened taxa of marine fishes belonging to 40 families and 18 orders were listed in the Red List. Among these, 83 taxa are ranked as critically endangered (CR), endangered (EN), or vulnerable (VU) solely by criterion A (IUCN 1996). For example, the southern bluefin tuna, Thunnus maccoyii, is ranked as CR because the estimate of population decline rate is about 90% within the past 30 years. The southern bluefin tuna has more than 40,000 mature individuals and is managed under international conservation conventions (Matsuda et al. 1997, 1998). Mrosovsky (1997) questioned the IUCN's credibility for applying the criterion concerned with the decline rate to apparently secure species.

We need to know (1) the current status of threatened species, (2) the methods of extinction risk assessment, and (3) how to evaluate the magnitude of harvesting impacts on exploited biore sources. For these reasons, the International Workshop on Extinction Risk Assessment of Threatened Species was held at Komaba Campus, University of Tokyo, Japan, January 14–15, 1999. This workshop was divided into three sessions (see also Reynolds and Mace 1999). In the first session, speakers introduced the status of various groups of threatened species in the world. In the second session, several new methods to evaluate the extinction risk of a local population were proposed and applied. In the third session, speakers discussed problems of Red List criteria used for exploited marine and freshwater species.

IUCN began to review the IUCN Red List criteria 2 years ago, and organized a series of workshops for this purpose. A workshop on marine species was held in Tokyo, January 16–17, 1999. Most of the speakers in the Risk Assessment Workshop participated in the IUCN Workshop. Most of the invited participants in the IUCN Workshop shared the results of the Risk Assessment Workshop.

The present special issue on extinction risk assessment of threatened species consists of selected papers from the proceedings of the Risk Assessment Workshop. Because of space considerations, this issue does not include several speakers' presentations which will appear elsewhere.

In Japan, Izumi Washitani, Tetsukazu Yahara, Masakazu Shimada, and Yoh Iwasa founded the Society of Conservation Ecology in 1996. They have coordinated symposia on various aspects of conservation biology in annual meetings of the Japanese Ecological Society since 1993. They are interested in the application of scientific research to actual conservation measures. Also in the Society of
Population Ecology, a special symposium for extinction risk of natural populations and phenotypic trait evolution took place in Okinawa in 1997 [see special feature in *Researches on Population Ecology* 40(3)]. During these meetings, many fruitful discussions have been held.

The Japanese traditional education system has emphasized description and identification of species. As a result, there are more than 400 professional and amateur taxonomists who can identify by taxonomic name almost all (∼7000) vascular plants in Japan. Tetsukazu Yahara and the Plant Taxonomists Group surveyed the distribution, abundance, decline rate, and factors of habitat loss of more than 1500 species of vascular plants throughout Japan. The Japan Red List of vascular plants was published in 1997, based on a simple quantitative method of extinction risk assessment (see Yahara et al. 1998).

From these research projects and application experiences, we conclude that (1) current methods of extinction risk assessment, such as population viability analysis (PVA), are rarely applicable in data-poor situations, and (2) current IUCN criteria, especially criterion A, often lead incorrectly to Red Listing of apparently secure taxa. It is useful to develop methods that estimate extinction risk of a threatened taxon or population from limited data. Red Listing should encourage us (1) to monitor threatened species and other species that interact with threatened species through ecosystem processes, (2) to put in place effective conservation measures or management planning, and (3) to respect economic and educational limits, especially in developing countries.

To promote the conservation of biodiversity and its elements, we need to develop a more unified view of biodiversity. Conservation biology, sustainable harvesting, and pest control are based on population management. These share many common bases of mathematical modeling, uncertainty, and decision theory (Shea and the NCEAS Working Group on Population Management 1998). Epidemiology also shares these bases. We should take account of risk assessment in conservation biology, risk control in conservation measures, and risk communication in the decision-making process. Please read the papers that make up this special feature as a resource for ideas in the future development of conservation ecology.

References

IUCN (1994) IUCN Red List Categories. IUCN, Gland, Switzerland, pp 1–21