論文 (*Article*)

Biodiversity and Endangered Species Conservation in Japan and Canada

マイケル・ヒーリー／郭 美吟／山崎 優美子
Michael Healey, Mei-Yin Kuo, and Yumiko Yamasaki

Both Canada and Japan have ratified the United Nations Convention on Biodiversity (CBD). In this article we compare legislation and policy for biodiversity conservation in the two countries. We focus on protected areas for biodiversity conservation and programs to restore endangered species. Canada has protected about 8% of its land base but has made little progress in establishing marine protected areas. Japan has protected about 14% of its land base and has established 64 marine protected areas. Unfortunately, the protected areas do not protect the majority of endangered species in either country. Canada began assessing species status in 1977 but did not pass a national endangered species act until 2003 and has recovery plans for only 24 of 292 species at risk. Japan published its national red data book of endangered species in 1991 and passed endangered species legislation in 1992, however, Japan has restoration programs for only 37 of 2389 species at risk. Japan's programs for restoring endangered species are better integrated across levels of government and engage the public more directly than those in Canada.

Key Words : Biodiversity, Endangered species, Conservation, Canada, Japan, Comparison

Introduction

At the earth summit in Rio de Janeiro, Brazil, in 1992, world leaders adopted the Convention on Biodiversity (CBD), a plan and a commitment for sustaining the ecological diversity on earth. Biodiversity is defined as the variety of plants and animals and other organisms in a region, including their genetic diversity, and the natural communities, ecosystems and landscapes within which they occur. Nations that ratified the convention acknowledged that human economic activity was causing a rapid, worldwide, loss of biodiversity and that the long-term consequences of this loss for humanity were severe. Ratifying nations committed to achieving a significant slowing of biodiversity loss by the year 2010.

Both Canada and Japan are signatories to the CBD. Canada ratified the Convention in December 1993 and Japan in May 1993. The two countries face different problems in meeting their commitments under the Convention. Japan is a small country with a large population and most ecosystems of Japan have been altered by human activity at some time in Japan's long history. Japan is also an island nation with many unique species. Conservation International has identified Japan as a biodiversity hot spot (see: www.biodiversityhotspots.org/xp/Hotspots/japan/). Canada, by contrast is a very large country with a small human population and much of Canada is relatively unchanged by human economic activity. However, Canada is also an arctic nation whose northern ecosystems are being increasingly altered by long distance transport of pollutants and global climate change (Ajots 1991). Japan has a centralized governance system and the national government can adopt legislation and policies that address biodiversity issues throughout Japan. Canada is a federation of provinces and the national government must negotiate with the provinces about appropriate legislation and policies for biodiversity conservation.

In this article we compare the legislation and policy of Canada and Japan for biodiversity and endangered species conservation. We examine how each nation approached biodiversity conservation

prior to ratification of the CBD and what changed when each country ratified the convention. We focus our analysis on two particular areas of legislation and policy; the establishment of protected areas as a means to conserve biodiversity and programs to restore endangered species. We will assess progress in Japan and Canada toward meeting their obligations under the CBD.

History of Biodiversity and Species Conservation in Japan and Canada

Biodiversity and species conservation began in Japan and Canada well before the CBD was ratified. In Canada, the first national and provincial parks were established in the late 1800s. Although these parks were intended to protect scenic beauty rather than biodiversity, they have become an important element in natural area conservation. Early in the 20th century the Dominion Parks Branch (established in 1911) actively created new parks so that by the time the National Parks Act was passed in 1930, Canada had 12 national parks. The first official parks policy was proclaimed in 1964 and made the protection of ecological processes a primary objective of the parks system. Today, Canada has 39 national parks and national park preserves totaling almost 245,000 km^2 in area (2% of Canada's land mass). Parks Canada has identified 39 Canadian Natural Regions with unique ecological characteristics and its long-range objective is to have a national park in each region. At present, there are national parks in 26 of the 39 regions (Canadian Encyclopedia On Line: National Parks, www.thecanadianencyclopedia.com).

Most Canadian Provincial and Territorial parks were created after 1930 and today there are over 1200 such parks. These parks vary greatly in size and purpose but many offer some degree of protection for natural ecosystems. According to the National Conservation Areas Database, there are over 3500 protected areas in Canada covering about 800,000 km^2 (includes both national and provincial protected areas, 8% of the landmass) (Environment Canada 1995).

Japanese have long had an interest in and concern for the natural environment. However, establishment of national parks did not begin until the 1930s. These parks are now administered under the Natural Parks Law, passed in 1957. The main purposes of parks are to conserve scenic areas and their ecosystems, promote human use and enjoyment of the parks, and contribute to the health, recreation, and environmental education of people. Japanese parks are of three types: national parks, which are areas with of great natural scenic beauty and ecosystems of national significance; quasi-national parks, which are areas of great natural scenic beauty at the district-level and adjacent to the national parks; and prefectural natural parks, which are areas of prefectural-level importance and are designated by the prefectural governor. In 1970, the Natural Parks Law was amended to allow for the creation of marine zone parks (areas of the sea with important characteristics) adjacent to national parks or quasi-national parks. Japan presently has 28 national parks (20600 km^2) and 55 quasi-national parks (13400 km^2) that together protect about 9% of the land base. In addition there are 308 prefectural parks (19400 km^2) that protect about 5.4 % of the land base (Ministry of Environment nd) and 64 marine parks distributed from Hokkaido to Okinawa protecting 2754 ha of coastal marine ecosystems. Nine new marine parks have been established since Japan ratified the CBD. Numerous other small, protected areas totaling a little over 1000 km^2 of land have been established under the Nature Conservation Law (enacted 1972) and the Wildlife Hunting and Protection Law (enacted 1918).

After 1970, the pace of enacting environmental legislation and policy affecting biodiversity and endangered species increased in both countries. In Canada, the Department of Environment was created in 1971. In 1977, the Wildlife Ministers' Council of Canada (a federal-provincial committee of ministers responsible for wildlife) established the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC is responsible for assembling and assessing information on the status of species in Canada and advising the federal and provincial governments concerning species' status. To restore the abundance of threatened and endangered species identified by COSEWIC, the Wildlife Ministers' Council established the RENEW (Recovery of Nationally Endangered Wildlife) strategy in 1988. Thus, Canada had taken some steps toward protecting rare and endangered species prior to ratifying the CBD. Japan also initiated a number of legislative and policy actions to conserve biodiversity and species well before ratifying the CBD. In 1971 Japan created the Environment Agency and, in 1972, passed the Nature Conservation Law to allow conservation of outstanding natural environments in Japan. Under this law, Japan began a national survey of its natural environment in 1973. The survey was the first, scientifically based, inventory of Japan's natural environment and provided a basis for natural area conservation. The survey is repeated approximately

every 5 years and each new survey has expanded the scope of the database. For example, the 5th survey, between 1993 and 1999, included a "biodiversity survey" (initiated in 1994) and a "national survey of the marine natural environment," (initiated in 1997). In 1980 the CITES and Ramsar conventions came into force in Japan, committing Japan to address any traffic in endangered species and conserve significant wetland areas. Like Canada, therefore, Japan had taken significant steps to conserve biodiversity and endangered species before the CBD came into force.

Biodiversity and Species Conservation since 1992

After the 1992 Earth Summit, Canada moved quickly to ratify the CBD but then progress slowed dramatically. Provinces had to be consulted and encouraged to participate in a national program of biodiversity and species conservation. Despite the groundwork laid through COSEWIC and RENEW, it took several years to reach accord on endangered species protection. In 1995, Environment Canada published the Canadian Biodiversity Strategy (Environment Canada 1995) and in 1996, Canada and all the provinces and territories accepted the Accord for the Protection of Species at Risk. Under the Accord, the governments recognize that intergovernmental cooperation and complementary legislation and programs are essential if species at risk are to be protected throughout the country. In 1998, the governments established the Canadian Endangered Species Conservation Council (CESCC), which provides general direction on species assessment, recovery strategies and action plans. The CESCC also coordinates the governments' activities in protecting species at risk. Yet, it was not until 2002 that Canada enacted national endangered species legislation (Boyd 2003). The Canadian Species At Risk Act (SARA) protects nationally endangered species on federal lands. Through the Accord on the Protection of Species at Risk and the CESCC, the federal government also pushes provinces to conserve threatened species within provincial boundaries.

Although Canada has made progress in protecting species at risk, establishing protected areas for biodiversity has not progressed. Since 1992, Canada has created only one new National Park (Vuntut in the Yukon) and has negotiated agreement with territorial and provincial governments to establish 3 National Park Reserves (Parks in waiting). Although Canada is responsible for a very large marine zone (5th largest in the world), little attention has been devoted to protecting marine species or habitats. In 1997 Canada passed the Oceans Act, which commits Canada to establishing a network of Marine Protected Areas. However, Canada has formally designated only 5 marine protected areas, 4 in the Atlantic and 1 in the Pacific (totaling < 3000 km^2).

In 1986 the Ministry of Environment of Japan established the Wildlife Protection Division within the Nature Conservation Bureau and initiated a study on threatened flora and fauna in Japan. The results were published in 1991 as the "Red Data Book of Japan", which identified 2662 threatened species in Japan. Japan passed the law for the conservation of endangered species of wild fauna and flora in 1992, a decade in advance of Canada. The intent of this law is to protect endangered species in Japan and contribute to the conservation of natural surroundings. Under the law, Japan designates species as Domestic Endangered Species (DES, listed in the Red Data Book of Japan) or International Endangered Species (IES). IES are dealt with as prescribed by CITES. Hunting, damaging or killing of DES as well as transportation of DES or their body parts is prohibited unless specifically authorized by the Minister of Environment. The Minister of Environment also has the authority to designate DES habitats as Natural Habitat Conservation Areas. Such areas can be either "protection zones", where human activities are restricted to help protect the species or "monitoring zones", which are buffer zones around protection zones. If necessary, the Minister of Environment can initiate natural habitat rehabilitation under the Law for the Promotion of Nature Restoration.

Japan has also passed new legislation to strengthen biodiversity conservation. In 2003 the Natural Parks Law was revised to conform to the National Strategy on Biodiversity. To strengthen wetland conservation, Japan increased its Ramsar sites to 33 in November, 2005 (up from 11 in 1999). Japan's protected wetlands now include waterfowl habitats, tidal flats, coral reefs, mangroves, seagrass beds, and alpine wetlands. The Law for the Promotion of Nature Restoration came into force in 2003 and a number of active restoration programs have been initiated, including two areas of coral reef. The Law Concerning the Conservation and Sustainable Use of Biological Diversity through Regulations on the Use of Living Modified Organisms became effective on February 2004, formalizing Japan's commitment to the Cartagena protocol on biosafety. The import and keeping of invasive alien species is banned and existing damage by invasive species is to be mitigated under the

Invasive Alien Species Act, passed in 2005 (Ministry of Environment 2005). In terms of legislation and policy to protect biodiversity, therefore, Japan has progressed much further than Canada.

Evaluating the Status of Species in Canada and Japan

Designating a species as endangered is a multi-step, multi-level process in Canada. COSEWIC is responsible for conducting the scientific assessment of species status. COSEWIC assembles whatever data are available on a species and makes a scientific judgment about its status based on criteria such as current abundance and trends in abundance, distribution, degree of habitat fragmentation and threats to both abundance and habitat (Table 1). At the present time, COSEWIC assesses species in 11 broad taxonomic groups.[1] COSEWIC recommends to the Minister of Environment that species be added or deleted from Canada's endangered species list. The Minister publicizes his comments on COSEWICs recommendations and forwards the list to the federal Cabinet (Governor in Council, GIC) for a final decision. The GIC can accept the list, reject any species on it, or refer species back to COSEWIC for further analysis. If the GIC fails to issue a decision within 9 months, however, the species automatically go on Canada's endangered species list. Thus, the federal Cabinet has ultimate authority over species' listing but must make a decision within 9 months.

Through this process, species are designated as extinct, extirpated in Canada, endangered, threatened or "of concern". By November 2004, COSEWIC had designated 292 species as either threatened or endangered (COSEWIC 2004). Two hundred and fifty-two of these designations have been confirmed by the GIC (www.sararegistry.gc.ca. schedule 1). Under SARA, a recovery strategy and action plan must be prepared for each listed species. A recovery strategy identifies what needs to be done to increase the abundance of the species and the action plan states how the strategy will be implemented. To date, only 7 recovery strategies have been completed (Species at Risk Act, Public Registry: www.sararegistry.gc.ca). Three of these are multispecies recovery strategies for Garry Oak (*Quercus garryana*) and associated ecosystems, an endangered ecosystem complex on Canada's southwest coast. No action plans have been prepared. However, 24 species recovery plans and 1 ecosystem recovery plan were prepared under RENEW before SARA was passed and these continue to be implemented. In relation to the number of threatened and endangered species, however, the progress in recovery planning is very slow (~10% of listed species).

Each province has its own endangered species list. These do not necessarily conform to the federal list nor do provinces use the same process for classifying species. Ontario, for example, has its own review committee (Committee on the Status of Species At Risk in Ontario or COSSARO). This committee reviews the COSEWIC assessments and recommends whether the Minister of Natural Resources in Ontario should adopt the COSEWIC or some other classification. Presently, Ontario classifies 25 of its 182 species at risk differently from COSEWIC (mostly at a higher level of risk). British Columbia assigns species to groups of similar conservation

Table 1. Criteria used by COSEWIC to assess the status of threatened and endangered species.

Criterion	Threatened	Endangered
Declining total population (Considering whether the causes of decline are understood, continuing, and reversible)	50-70%	30-50%
Attributes of Distribution:		
-- Extent of Occurrence	< 5000 km^2	<20000 km^2
-- Area of Occupancy	< 500 km^2	< 2000 km^2
-- Fragmented Population (number of sub-populations)	<= 5	<= 10
-- Fluctuation in distribution (orders of magnitude)	> 1	> 1
Small, declining breeding population (Considering rate of decline, habitat fragmentation and fluctuations in abundance)	< 2500	< 10000
Extremely small breeding population (Considering vulnerability to human activity)	< 250	< 1000
Probability of Extinction	20% in 20 yr or 5 generations	10% in 100 yr.

1 Mammals, birds, reptiles, amphibians, fish, mollusks, Lepidoptera, vascular plants, ferns, mosses, lichens.

risk using methodology developed by NatureServe (an International Organization based in the US). The BC Conservation Data Centre (with assistance by species experts) assesses the status of species based on 7 criteria and assigns them to three "lists": red, blue and yellow. Red list species are species designated as threatened or endangered under the BC wildlife act. Blue list species are not currently threatened but are of concern because of their low abundance or vulnerability. Yellow list species are not of immediate concern. Further information on provincial classification methods can be found on provincial web sites.

Japan's approach to assessing species status is also multifaceted and multilevel. Nationally threatened flora and fauna are listed in the "Red Data Book of Japan". In this document, species in 13 broad taxonomic groups[2] are assigned to one of 7 categories (extinct, extinct in the wild, critically endangered, endangered, vulnerable, near threatened, or data deficient). Japan lists 2662 species in these categories (2389 in the 3rd to 6th categories), more than 8 times the number in Canada. Japan has also evaluated species in more taxonomic groups than Canada. In preparing the original Red Data Book, Japan relied on species experts and subjective evaluation of variables such as abundance and distribution, rates of change in abundance, and threats to habitat to assign each species a status. Japan adopted the IUCN categories of species status for its original species classification and is considering whether to adopt the updated IUCN categories in its next revision of the Red Data Book. Japan is presently updating its Red Data Book, employing quantitative criteria where data are sufficient, as recommended by IUCN.

Regions and prefectures in Japan have also compiled their own endangered species lists using assessment criteria that are somewhat different from those used by the central government. For example, prefectures in the Kinki region assess bird species' status by assigned points to 3 variables (risk of habitat loss, population size and rate of change in population size). The point score a species receives is modified by two other variables (species distribution and quality of available information) to make a final judgment (Table 2). Species scores for each prefecture are averaged to make a regional assessment. Hokkaido, on the other hand, combines information from the national Red Data Book, other national information sources, the IUCN, and its own research to develop its endangered species list.

Restoring the Abundance of Endangered Species in Canada and Japan

Increasing the abundance and distribution of endangered species to the point that they are no longer endangered is the ultimate objective of endangered species legislation and policy in both Canada and Japan. The basic tools of species restoration are similar in the two countries; protection of critical habitat, improvement or restoration of habitat when necessary, prohibition of

Table 2. The system of evaluating species status* used by prefectures in the Kinki region.

Type of Data	Category			
	1	2	3	4
Quality of Information on Species	Low	Medium	High	
Distribution Pattern	Extremely Localized	Localized	Scattered Populations	Widespread
Risk of Habitat Loss	Very High (8 points)*	High (4 points)*	Some (2 points)*	None (1 point)*
Population Size	Single Digits (8 points)*	10-99 (4 points)*	100-999 (2 points)*	1000 or more (1 point)*
Change in Population Size	Declining Rapidly (8 points)*	Declining (4 points)*	Stable (2 points)*	Increasing (1/2 point)*

* Point scores for each species are multiplied together. Species status if determined from score (> 127 points, critically endangered; 32-127 points, endangered; 8-31 points, near threatened; < 8 points, no danger), considered in relation to quality of information and distribution.

2 Mammals, birds, reptiles, amphibians, brackish and freshwater fish, insects, inland and freshwater shellfish, spiders and crustaceans, vascular plants, bryophytes, algae, lichens, fungi.

capture or interference with listed species, control of invasive species that impact native endangered species, and, in special circumstances, establishing captive breeding programs for endangered species. Because of the more centralized character of the Japanese government, protecting habitat for endangered species in Japan is easier than in Canada. In Canada, the majority of endangered species occur in the southern part of the country, where most land is private or under provincial jurisdiction. Either the provinces must protect habitat or the federal government must negotiate some form of protection. By contrast, the Director-General of the Environment Agency in Japan is authorized to designate Natural Habitat Conservation Areas for the protection of endangered species. Captive breeding programs appear to be a more frequent aspect of endangered species conservation in Japan than in Canada. For example, Japan has had considerable success with captive breeding of the Oriental white stork, *Ciconia boyciana*, and the crested ibis, *Nipponia nippon*, both extirpated from Japan. Oriental white storks were recently reintroduced near Toyooka in Hyogo prefecture and preparations are underway to reintroduce the crested ibis to Sado Island in Niigata prefecture.

Both Canada and Japan regard public participation as an important component of endangered species recovery. Canada has created two funding programs to stimulate non-governmental involvement in species recovery, the Habitat Stewardship Program and the Endangered Species Recovery Fund, focused on habitat and species protection respectively. However, Canada's approach is still fundamentally elitist, with species recovery teams being composed mainly of government officials and experts. A typical example is the program to recover the Vancouver Island marmot (*Marmota vancouverensis*). This small, sub-alpine marmot is endemic to Vancouver Island on Canada's west coast. It was once distributed in numerous colonies along the mountainous spine of the island but is now found only on southern Vancouver Island and, in 1998, its total abundance was fewer than 100 animals. A recovery team, consisting mainly of BC provincial government wildlife experts, began implementing a recovery plan in 1995. This plan was reviewed and updated in 2000 (Janz et al. 2000). The recovery objective is to increase the number of marmots to 400-600 distributed in 3 distinct areas of Vancouver Island. The reasons for the decline in marmots are uncertain and may include increased predation, changes in habitat caused by high elevation logging, disease, or climate change. As a consequence, the actions needed to stop the decline are not clear. The recovery strategy includes 4 components: 1) research and monitoring to understand the dynamics of marmot colonies and their habitat; 2) captive breeding and translocation to increase the number and distribution of colonies; 3) protection and management of key habitat areas; and 4) public education and awareness. Since 1994, research and monitoring have significantly increased understanding of marmots and their habitats and more than 600 ha of habitat have been protected in two locations. However, marmot numbers have continued to fall. Captive breeding and reintroduction is the focus of the revised recovery plan. Program administration has also been expanded with the establishment of the Vancouver Island Marmot Foundation, a registered charitable organization dedicated to marmot recovery and fundraising. The Recovery Team retains scientific and technical control of the recovery program. A high level advisory committee, Friends of the Vancouver Island Marmot, advises the provincial government on the strategy for marmot recovery and helps with fund raising. Public engagement is mainly passive, through fundraising and information dissemination.

By contrast, recovery programs in Japan engage various levels of government and society in a more integrated way. The recovery program for the crested ibis or *Toki* (*Nipponia nippon*) provides an example. The crested ibis, a resident of wetlands and rice fields, was once common throughout Japan. Numbers began to fall rapidly toward the end of the 19th century and by the 1930s fewer than 100 birds remained in Japan. The *Toki* was designated a specially protected bird in Japan in 1952 and was internationally protected in 1960. The centre of *Toki* habitat in Japan is on Sado Island in Niigata prefecture. In the 1960s villages established feeding grounds there and the National government purchased a woodland as nesting habitat. Despite these measures, *Toki* became extinct in the wild in Japan in 2003. The national government is now successfully breeding *Toki* with birds obtained from China. The goal is to begin trial reintroduction in 2008 and to have 60 birds established in the wild by 2015. The recovery program consists of several components. Overall policy, research and captive breeding of *Toki*, are conducted by the central government, which also promotes the restoration goal to local communities and works with China on international conservation. Niigata prefecture encourages rice farmers on Sado Island to use fewer pesticides and to introduce dojo loach (*Misgurnus*

anguillicaudatus) into wet rice fields as food for *Toki*. The prefecture cultures dojo loaches to release in rice fields, protects nesting sites and enhances river wetlands for *Toki*. The prefecture also supports conservation activities by volunteers and education about *Toki*. Sado county has established a forest park to provide *Toki* nesting habitat and constructed a *Toki* museum for public education. Volunteers and NGOs provide the labour force for habitat recovery and act as ambassadors to encourage coexistence of people and birds on Sado Island. Thus, the recovery program for *Toki* engages people and institutions at all levels.

Conclusions

Both Canada and Japan have ratified the United Nations Convention on Biodiversity and have passed legislation and developed policy for biodiversity and endangered species protection. However, real progress in protecting and restoring species and ecosystems has been limited, particularly in Canada. In Canada, provinces have authority over land and resources where most endangered species are found and the provinces have not pursued biodiversity conservation aggressively. Both national and provincial governments point to their parks as the cornerstone of biodiversity conservation, however, most parks were not selected to protect biodiversity and many species and ecosystem types are not protected within any park. Less than 13% of threatened bird species are found in protected areas of British Columbia (Freemark et al. 2006) and national protected areas included no more threatened species than randomly selected areas, sometimes fewer (DeGuise and Kerr 2006). Few new conservation areas have been created since Canada ratified the CBD. Even in the marine environment, where the national government has full jurisdiction and national legislation mandates the establishment of protected areas, only five small protected areas have been established. Programs to protect individual species have also been slow to develop with recovery plans in place for only a small fraction of listed species. David Boyd (2003) describes Canada's performance as a national embarrassment and the Canadian Nature Federation awarded Canada a C grade in species protection in 2004 (grades for individual provinces and territories ranged from B- to F with most getting failing grades).

Japan has a better record of legislation and policy for biodiversity conservation than Canada. Japan passed endangered species legislation in 1992, after having identified 2662 species in need of special protection. Japan reviews and updates its species "Red Book" list about every 5 years compared to 10 years in Canada and also reevaluates the condition of its natural areas regularly. Japan also has a more integrated recovery strategy with different levels of government, NGOs and the public all involved in the recovery actions. However, Japan has developed rehabilitation strategies for only 37 species and natural habitats, no better than Canada. Like Canada, Japan regards its national parks and protected areas as a cornerstone of its biodiversity conservation program and has protected a much greater proportion of its terrestrial habitat than Canada (14% compared to 8%). Japan has also established 64 coastal marine protected areas, many more than Canada. Japan's parks, like Canada's, were selected for their scenic rather than their ecosystem values and probably do not protect many endangered species. But Japan's Minister of Environment has the authority to create protected areas to protect threatened species, authority that the Canadian minister does not have.

Overall, Japan is better equipped to meet its obligations under the CBD than Canada. In the long term, however, both countries biodiversity conservation is likely to be overwhelmed by the ecological devastation caused by global warming.

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