

**Conservation and Management Plan
for Sika Deer (*Cervus nippon*)
in Eastern Hokkaido**



Foreward

The island of Hokkaido is home to a diverse wildlife fauna characteristic of the northern regions. Prominent species include mammals such as the brown bear and sika deer, and birds like the Japanese crane and Blakiston's fish-owl. Although some species have declined in number and are threatened by extinction, others are thriving and their increasing numbers bring them into conflict with forestry, fishery, and other human activities. In order to promote the coexistence of humans and wildlife and the conservation of biological diversity, the Hokkaido government created Guidelines for the Conservation and Management of Wildlife in October, 1996. In addition to outlining general wildlife conservation policy, Hokkaido recommended the establishment of conservation and management programs for each of the major wildlife species.

In the late 19th century, sika deer numbers were greatly reduced by uncontrolled harvests and heavy snowfalls. Later restrictions on harvest and changes in habitat helped populations to recover, and in recent years expanding populations have caused increasing amounts of damage to agricultural and forestry products. In addition, bark peeling by deer has increased, causing sometimes dramatic changes in the natural forest ecosystems of eastern Hokkaido.

In order to promote the conservation and management of deer populations and to prevent agriculture and forestry damages, the government of Hokkaido and other stakeholders convened a Council on Sika Deer Management Policy in June 1997. In this text we have attempted to summarize the subsequently developed policies as well as provide an outline of plans for implementing management of deer numbers in accord with the Guidelines for the Conservation and Management of Wildlife

With this Conservation and Management Plan, the Hokkaido government will pursue the multiple goals of regulating deer numbers, ensuring habitat quality, and minimizing the conflicts between deer and human activities. We hope for the cooperative participation of all parties interested in a coexistence of people and sika deer.

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Contents

| | | |
|-----------|---|----|
| Chapter 1 | Development of the Conservation and Management Plan for Sika Deer | |
| 1 | Background | 1 |
| 2 | Purpose | 2 |
| 3 | Characteristics | 2 |
| Chapter 2 | Population management | |
| 1 | Basic concept of population management | 4 |
| 2 | Methods of population management | 4 |
| 3 | Implementation of management methods | 8 |
| Chapter 3 | Field Research Surveys | 10 |
| Chapter 4 | Toward a consensus on the Conservation and Management Plan | |
| | | 11 |
| | [References] | |

Chapter 1 Development of the Conservation and Management Plan for Sika Deer

1 Background

Sika deer, one of the prominent elements of Hokkaido's rich and diverse natural environment, were greatly reduced in number due to overexploitation and heavy snowfalls in the early days of the Meiji era. In 1888, hunting was banned throughout Hokkaido, helping the species return from the verge of extinction. In 1900 the ban was withdrawn, but because numbers again declined rapidly, hunting was prohibited throughout Hokkaido a second time in 1920. The subsequent gradual increase in deer numbers became increasingly apparent in damage to agriculture and forestry. Beginning in 1957, limited hunting of male deer was allowed in some districts. Since then, the hunting and no hunting districts have been subject to review and revision every three years.

Despite the gradual relaxation of hunting regulations, favorable changes in deer habitat have allowed deer numbers and distribution to increase, and substantial damages to agriculture and forestry have arisen in recent years. Estimated total damages attributed to deer in Hokkaido amounted to over 5 billion yen (30 million US dollars) in fiscal 1996, of which the Abashiri, Tokachi, Kushiro, and Nemuro subprefectures (hereafter referred to as "eastern Hokkaido") accounted for 4.2 billion yen.

In response to such heavy damages, hunting regulations were relaxed even further. Beginning in 1994, the harvest of female deer, which had been banned nationwide, was allowed in some districts, and hunting of deer was allowed in a previously protected wintering area near Lake Akan in 1995. As a result the total harvest of deer, including both sports hunting and damage control actions, increased dramatically. In fiscal 1996, the total reached 46,000 of which 40,000 were taken in eastern Hokkaido. Unfortunately, this still did not contribute much to the reduction of damages to agriculture and forestry, and in the native forests understory plants have declined and larger trees have been damaged by bark peeling deer.

Since 1984, the Hokkaido government supported research projects to assess population distribution, age and sex structures, and nutritional condition of harvested deer. This fundamental data on the ecology of the sika deer has become the base from which the decision to allow the harvest of females and other aspects of the management plan were developed. The following are examples of research findings:

- Sika deer are widely distributed in central and eastern Hokkaido. Eastern Hokkaido, where snowfall is limited and there is an abundant supply of Miyakozasa (*Sasa nipponica Makino*) and Kumaizasa (*Sasa senanensis*) is the heart of sika deer range.

- The estimated number of sika deer inhabiting eastern Hokkaido is approximately 120,000 ($\pm 46,000$ 90%CL) (as of March 1994).
- Sika deer migrate widely with the seasons, gathering in wintering areas where snow-fall is limited and coniferous forests offer good thermal cover
- The sika deer of eastern Hokkaido exhibit the characteristics of an expanding population: there are many young deer, fertility is high, and nutritional condition of the deer is good.

By clarifying the ecological needs of sika deer, the results of this research effort have made it possible to carry out a coordinated conservation and management program.

2 Purpose

This management plan is designed to promote a coexistence between sika deer and people in eastern Hokkaido, the heart of deer range on the island. This will be accomplished by minimizing the conflicts between human activities and sika deer, managing stable deer populations to ensure the long term availability of high quality habitat, and implementing conservation of the deer as a natural resource of the people of Hokkaido.

3 Characteristics

As a measure to implement coordinated conservation and management of major wildlife species of Hokkaido, this management plan is based upon the Guidelines for the Conservation and Management of Wildlife in Hokkaido (established October, 1996). The plan describes the basic approach and proposed means of managing sika deer numbers in eastern Hokkaido.

This plan builds upon the work of the Hokkaido government-sponsored “Council on Sika Deer Management Policy,” convened in 1997 to consider and recommend options for a comprehensive deer conservation and management plan. The council reviewed proposals to prevent damages to agriculture and forestry, and to encourage use of the deer as a renewable natural resource. Specific attention was given to the monitoring and regulation of deer numbers, the erection of fences to prevent deer access to farm lands, the application of deer repellants in plantation forests, and the development of a distribution system and market for venison.

This plan proposes a target level for deer population management in eastern Hokkaido, to be coordinated with other comprehensive measures for the management of sika deer.

This plan will be implemented with the cooperative input of the national and local government interests and the people of Hokkaido. It will be reviewed and revised as necessary in accordance with the results of further research and monitoring efforts.

Chapter 2 Population Management

1 Basic concept of population management

To manage sika deer population numbers, population indices based on trends in agriculture and forestry damage and deer harvest characteristics will be used as feedback systems to adjust harvest rates.

Although sika deer populations can increase rapidly in favorable habitats, they can also crash under bad environmental conditions such as heavy snow. Accordingly, deer populations will be managed with attention to these ecological characteristics, based on previous research results and a growing body of science. Under this plan, efforts will be made to minimize conflicts between deer and human activities, and population numbers will be managed by hunting and damage control harvests to ensure the persistence of stable and healthy populations.

For effective wildlife management, in addition to knowing population numbers, life history information (life span, survival and reproductive rates) becomes important, but there are no wildlife species for which such complete information is available. With that in mind, population indices, or measures of population status based upon available research results, will be used to monitor and manage sika deer. Under a “feedback management system” observed changes in these indices will be used to recognize when populations are increasing or declining, and to signal a need for adjustments in harvest pressure.

2 Methods of population management

As a basis for feed-back management, a population index standard of 100 was assigned to the conditions reported in 1993 field surveys and the March, 1994 estimate of 120,000 deer in the four eastern subprefectures of Hokkaido. Harvest pressure will be adjusted based upon the comprehensive monitoring of these indices.

Population status will be described in one of three general conditions, based upon the relative level of the indices: critical threshold (5 %), irruption threshold (50%), or optimal level (25%). One of four management responses will be applied annually according to population status: an emergency culling, gradual population reductions, gradual population increases, or a ban of hunting.

(1) Population includes

Population indices were derived from data collected in helicopter and spotlight surveys, records of catch or observation per unit effort, levels of agriculture and forestry damage, the occurrence of collisions between trains and deer, and other measures.

The estimated number of sika deer inhabiting eastern Hokkaido in March, 1994 (120,000 \pm 46,000) was assigned as the reference population size for the index standard of 100.

(2) Monitoring trends of the population indices

The population indices are based on results from the following surveys:

1: Helicopter census

In March of each year, a helicopter is used for an aerial count of deer in the Shiranuka foothills study area (Akan town, Shiranuka town, Onbetsu town), a major wintering grounds for sika deer in eastern Hokkaido.

2: Spotlight census

Nighttime vehicle spotlight counts of deer numbers are made in Tokachi subprefecture study area (Rikubetsu town, Ashoro town, Honbetsu town, Urahoro town) and Kushiro subprefecture study area (Kushiro city, Teshikaga city, Shibechea town, Akan town, Shiranuka town, Onbetsu town, Tsurui village)

3: Catch per unit effort

Records of number of hunting days, hunting area, observations, and harvests of deer are collected from hunter surveys and used to estimate catch per unit effort and frequency of observation.

4: Value of agriculture and forestry damage

Estimates of agriculture and forestry damage caused by deer are gathered from the annual Wildlife Damages Statistics report.

5: Number of railway accidents involving the deer

The number of collisions between deer and trains are estimated from surveys by JR Hokkaido railway.

(3) Three levels of management standards

1: Critical threshold

In its guidelines for managing species threatened with extinction, the IUCN (International Union for Conservation of Nature and Natural Resources) recognizes a population of 1000 animals as the critical size below which genetic diversity declines.

On Hokkaido, heavy snow years that have been associated with herd losses as high as 50% recur once every twenty years. Recognizing the possibility of two consecutive harsh winters, this management plan establishes a critical population index threshold (Index = 5) equivalent to an estimated population of 6,000 deer.

2: Irruption threshold

A population index of 50 (60,000 deer) is considered to signal a potential population irruption. This level is thought to represent the number of deer in the area in 1985, when damage by deer to agriculture, forestry, and natural forests approached levels that raised broad public concern.

3: Optimal level

The optimal level represents an intermediate target for managing deer numbers in the range between the critical threshold and the irruption threshold. Recognizing that sustaining a stable population of any wildlife species can be difficult, and that weather conditions and other factors can cause dramatic changes in population sizes, the optimal index level of 25 (30,000 deer) is designed to ensure that the population does not approach the critical threshold.

(4) Four management responses

1: Emergency culling

Emergency culling will be carried out when the current population indices are well above the irruption threshold. Liberal harvests by hunting and control kill actions will be encouraged to reduce populations to levels below that of the irruption threshold. It is recognized, however, that the effects of liberal harvests may not be apparent in lower birth rates until several years later, and that persistently high harvest rates become excessive. For that reason, emergency culling will only be carried out over the course of a few years.

2: Gradual population reductions

In cases where the preceding year's snowfall was normal but the current population indices are above the optimal level, harvest pressure will be increased to bring about a gradual decline in deer numbers.

3: Gradual population increases

In cases where the preceding year's snowfall was normal but the current population indices are below the optimal level, harvest pressure will be decreased to bring about a gradual increase in deer numbers

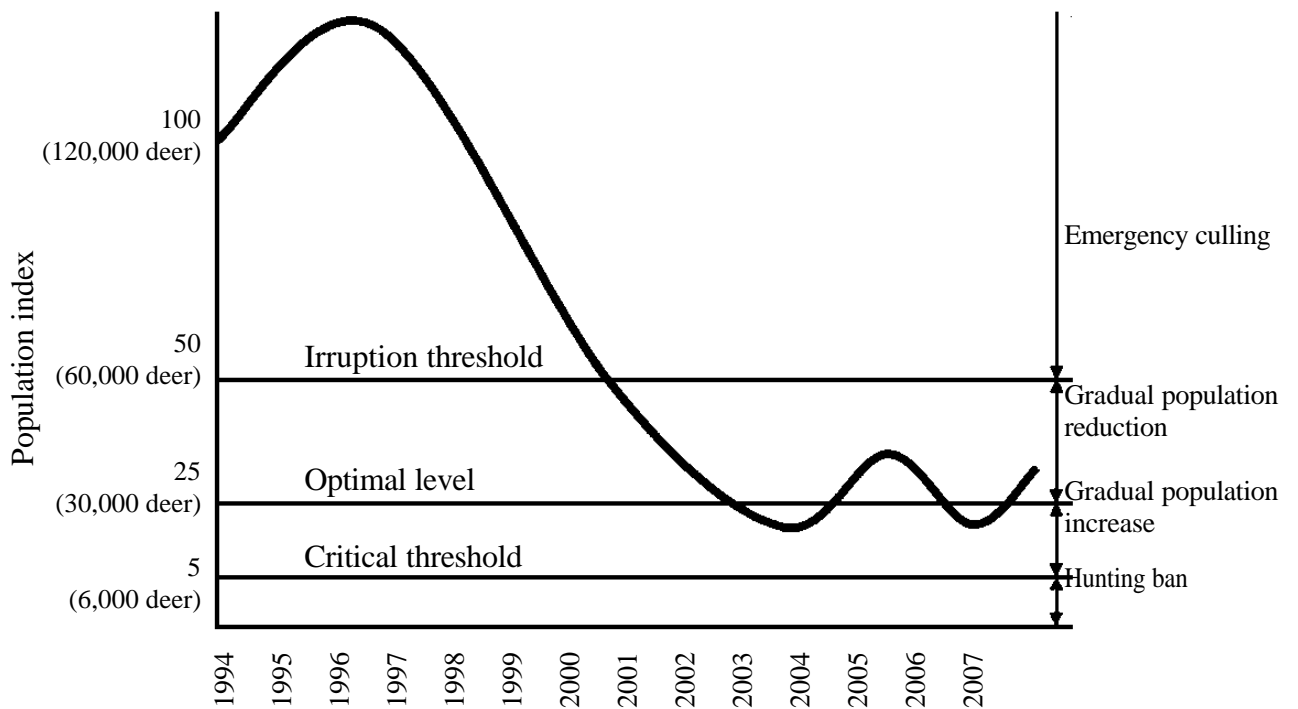
4: Hunting bans

In cases where the current population indices are below the critical threshold, hunting will be prohibited, and damage control harvests will be minimized to allow the deer population to increase. Furthermore, for the year following a heavy snowfall, trends in the population indices of recent years will be noted, and the need for a ban on hunting will be considered.

Four Management Responses

| Classification | Population Index Range | Remarks |
|--------------------------------|---|-----------------|
| 1:Emergency culling | 50 (60,000 deer)< Population index | Approx. 3 years |
| 2:Gradual population reduction | 25 (30,000 deer)< Population index 50 (60,000 deer) | |
| 3:Gradual population increase | 5 (6,000 deer)< Population index 25 (30,000 deer) | |
| 4:Hunting bans | Population index 5 (6,000 deer) | |

Concept Diagram for the Management of Population Size



3 Implementation of management actions

Sika deer population size in eastern Hokkaido will be managed by encouraging hunting and proactive damage control harvests. During emergency culling and gradual population reduction periods, emphasis will be placed on female harvest, which has a strong influence on the adjustment of population numbers. Emphasis on the harvest of male deer during periods to promote gradual population increase will lead toward a stable harvest. Because the current population indices of sika deer in eastern Hokkaido are well above the irruption threshold, three years of emergency culling will be carried out. Based upon observed changes in the population indices in the following years, harvest rates will be adjusted to bring population size near the proposed optimal level.

In fiscal 1997, the population indices of sika deer in the eastern district of Hokkaido were 101 by spotlight census and 108 by helicopter census. As these indices are well above the irruption threshold, emergency culling will be carried out for three consecutive years.

Implementation of this plan depends upon the understanding and cooperation of hunters and those called upon to carry out damage control kills. By increasing female harvest pressure, the plan seeks to reduce population numbers to a level below the irruption threshold..

(1) Implementing an immediate emergency culling

In order to promote higher harvest rates, more hunting areas will be open to female harvests and hunting seasons may be extended. Further, a request will be made to the national government for an exception to the standard bag limit of one deer per hunter per day.

Support will also be provided to the cities, towns, villages, and hunters' associations whose cooperative support will be needed to implement damage control harvests and ensure the success of such an emergency culling.

(Summaries of harvest data from the four subprefectures of eastern Hokkaido and the results of previous research surveys used in the development of this plan are appended in Reference Materials).

(2) Appropriate guidance on hunting

Increasing the number of areas open to hunting and extending the hunting season will likely attract a large number of hunters to the region. The Hokkaido government will cooperate closely with local governments and the police to provide information and guidance and to prevent accidents and respond to illegal activity that may arise. Also, hunters will be encouraged to handle and remove harvested animals properly.

Chapter 3 Field Research Surveys

With the adoption of a feed-back management system, a firm grasp of population indices becomes indispensable. Under the current plan, the impacts of hunting and damage control harvests on the deer population will be monitored continually.

Moreover, to improve the understanding of sika deer life history traits, research will be conducted to ascertain age distribution, fecundity, seasonal movements, and favored habitat characteristics.

(1) Survey of trends in population indices :

Helicopter and spotlight census activities will be continued to provide measures of the population indices that are the bases for feedback management.

(2) Analysis of harvested deer

Lower jaw bones and other parts collected from harvested deer will be analyzed for information on age distribution, nutritional condition, and reproduction. This information will then be used to consider population trends.

(3) Telemetry marking survey

Sika deer seasonal movements, causes of mortality, and other ecological characteristics will be assessed by capture, mark, and release radio telemetry studies.

(4) Habitat surveys

Measures of carrying capacity, derived from studies of vegetation condition and food availability, will be incorporated in plans to conserve forested habitats.

(5) Harvest surveys

Surveys of hunter effort and success will be conducted to gather information used in the adjustment of hunting district boundaries and season lengths.

(6) Survey of impacts on agriculture and forestry

Surveys will be conducted to assess the relationship between sika deer population status and impacts on agriculture and forestry.

Chapter 4 Toward a Consensus for Conservation and Management

For this management plan to proceed, it will be essential to elicit the understanding and cooperation of local residents and the Hokkaido public at large. Toward this end, the relevant governments, organizations, and individuals will work closely toward a consensus on the implementation of each measure. Promptly reported research and monitoring survey results, combined with the findings of the Council on Sika Deer Management Policy and local public input, will be used in the establishment of hunting seasons and damage control efforts deemed necessary to manage deer populations appropriately. Furthermore, research specialists and management professionals will be consulted in the periodic review of these research and monitoring surveys.

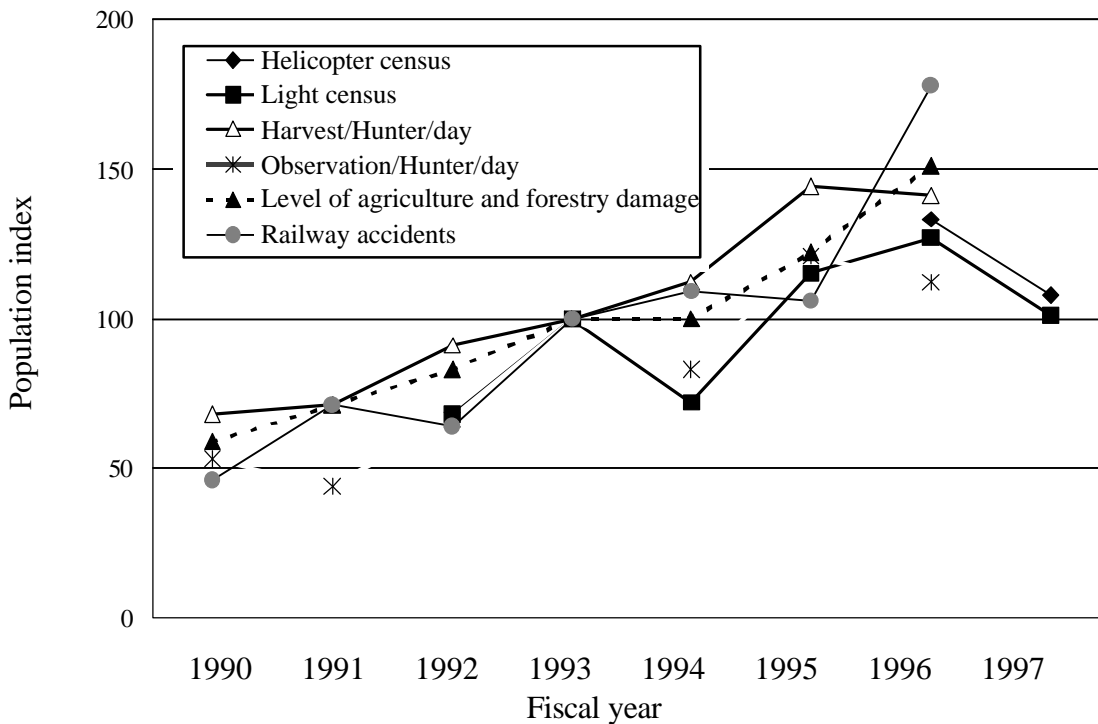
Reference Materials

Areas Included in the Conservation and Management Plan For Sika Deer in Eastern Hokkaido



Changes in Population Index Values for Sika Deer in Eastern Hokkaido

| Population. Index | FY 1990 | FY 1991 | FY 1992 | FY 1993 | FY 1994 | FY 1995 | FY 1996 | FY 1997 |
|--------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Helicopter census | - | - | - | 100 | - | - | 133 | 108 |
| Spotlight census | - | - | 68 | 100 | 72 | 115 | 127 | 101 |
| Harvests/Hunter/day | 68 | 71 | 91 | 100 | 112 | 144 | 141 | |
| Observations/Hunter/day | 53 | 44 | 66 | 100 | 83 | 121 | 112 | |
| Level of agriculture/forestry damage | 59 | 71 | 83 | 100 | 100 | 122 | 151 | |
| Railway accident | 46 | 71 | 64 | 100 | 109 | 106 | 178 | |

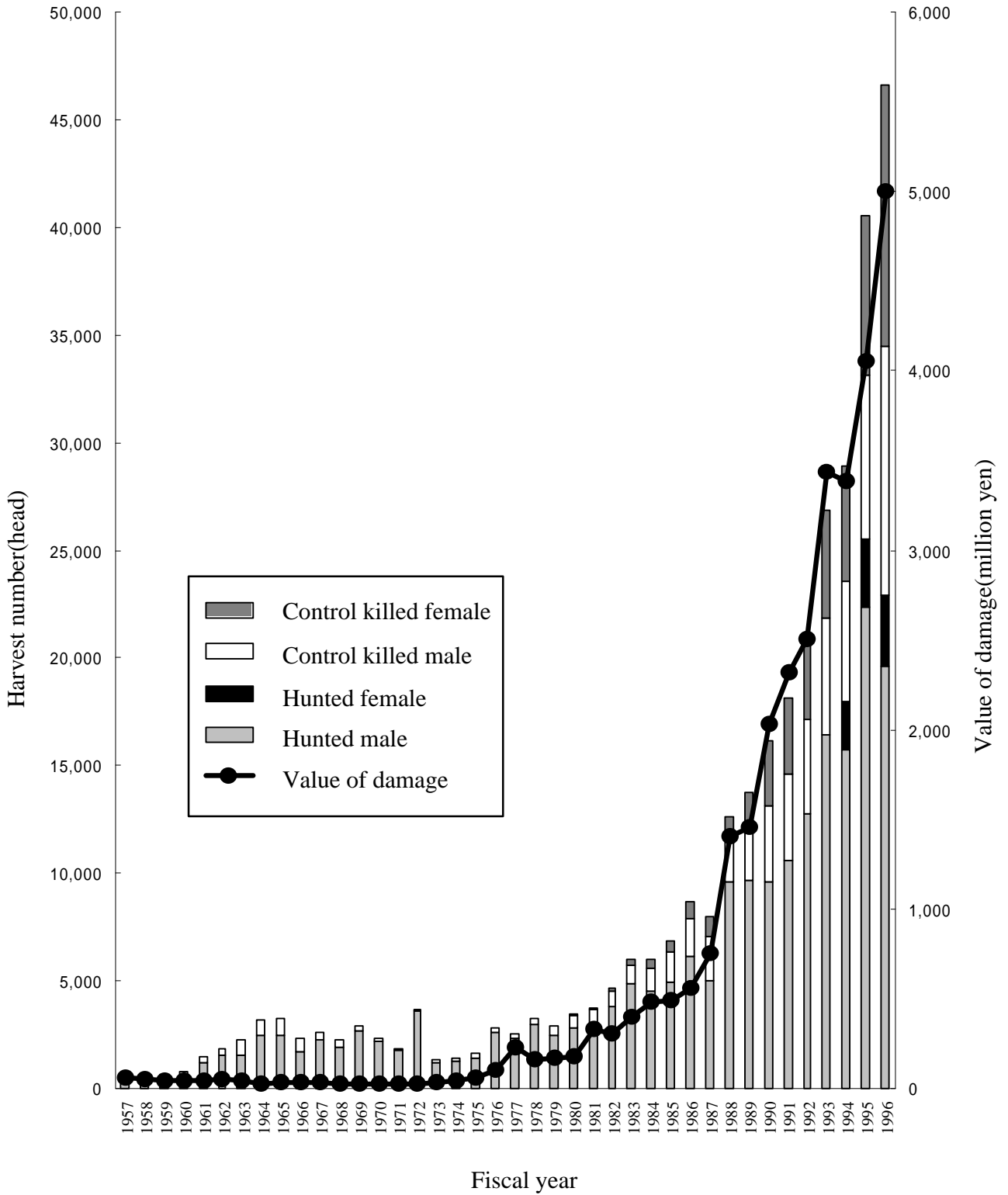


Proposed Female Harvest Levels and Projected Population Index Response

| Fiscal year | Proposed level of female harvest | Projected population index | Remarks |
|-------------|----------------------------------|----------------------------|---|
| FY 1998 | 26,000 - 36,000 | 60 - 90 | Life history characteristics used in the calculation of proposed harvest levels 1 Mean survival rate Male Female Fawn Ordinary snowfall year 0.85 0.90 0.70 Heavy snowfall year 0.20 0.45 0.20 (Heavy snow accumulates once in 20 years) |
| FY 1999 | 22,000 - 24,000 | | |
| FY 2000 | 16,000 - 18,000 | 40 - 60 | 2 Pregnancy rate 0.90 3 Female fawn per doe ratio: 0.425 4 Adult sex ratio Male : Female = 4 : 10 |
| FY 2001 | 10,000 - 15,000 | | |

Proposed harvest levels will be adjusted annually based upon previous years' harvests.

Changes in Sika Deer Harvests and the Value of Damage



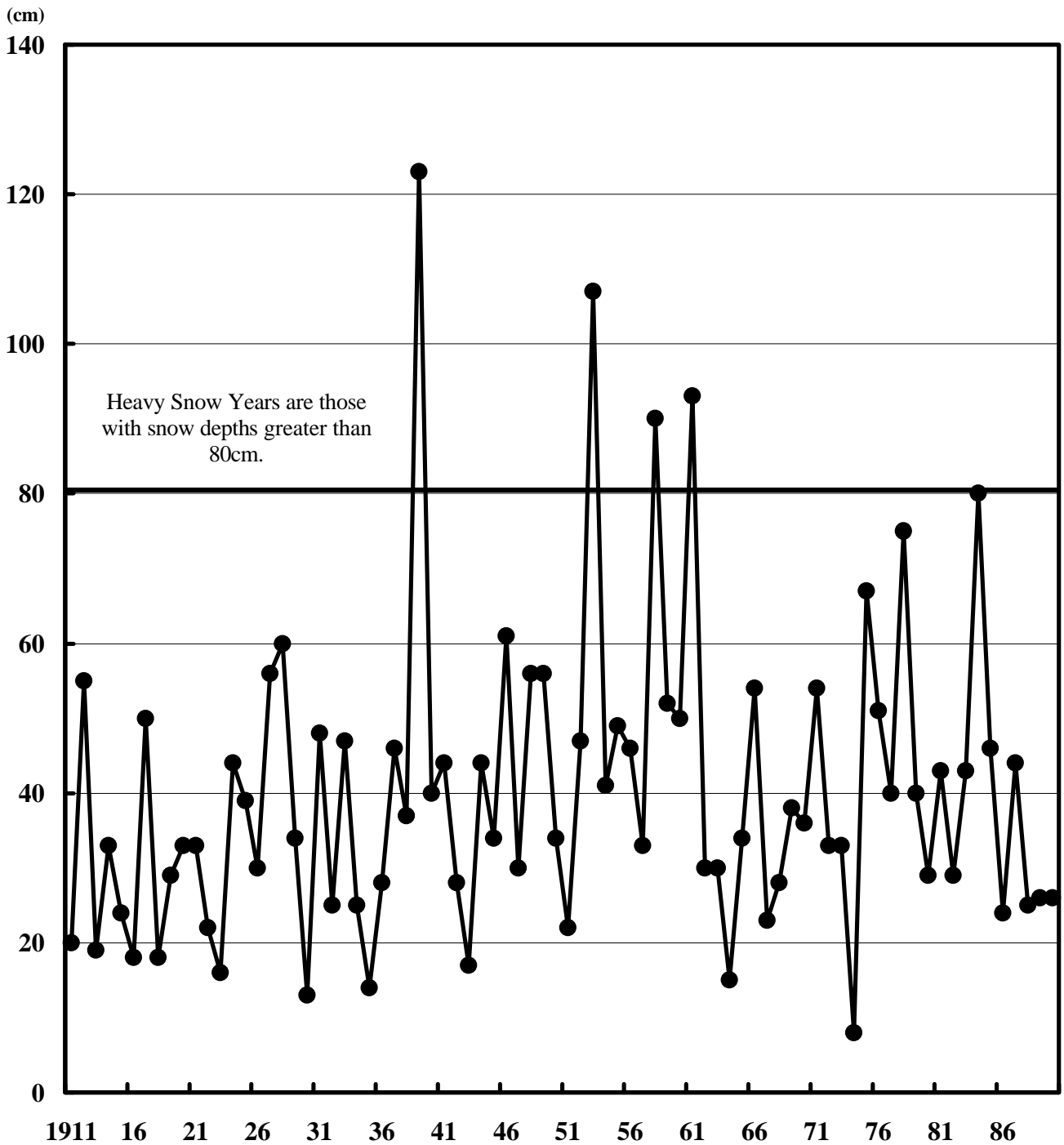
Total harvest = hunting harvest + control kill harvest.

Sika Deer Harvest and the Value of Damage to Agriculture and Forestry

| Fiscal year | Hunting | | | Damage control kills | | | Hunting + control | | | Value of damage (million yen) | Remarks |
|-------------|---------|--------|--------|----------------------|--------|--------|-------------------|--------|--------|-------------------------------|--|
| | Male | Female | Total | Male | Female | Total | Male | Female | Total | | |
| 1957 | 278 | | 278 | 142 | | 142 | 420 | | 420 | 62 | Male hunting season reopened. |
| 1958 | 372 | | 372 | 189 | | 189 | 561 | | 561 | 48 | |
| 1959 | 434 | | 434 | 229 | | 229 | 663 | | 663 | 39 | |
| 1960 | 552 | | 552 | 211 | | 211 | 763 | | 763 | 42 | |
| 1961 | 1,170 | | 1,170 | 333 | | 333 | 1,503 | | 1,503 | 39 | |
| 1962 | 1,528 | | 1,528 | 301 | | 301 | 1,829 | | 1,829 | 48 | |
| 1963 | 1,526 | | 1,526 | 722 | | 722 | 2,248 | | 2,248 | 41 | |
| 1964 | 2,503 | | 2,503 | 656 | | 656 | 3,159 | | 3,159 | 26 | |
| 1965 | 2,494 | | 2,494 | 737 | | 737 | 3,231 | | 3,231 | 31 | |
| 1966 | 1,688 | | 1,688 | 658 | | 658 | 2,346 | | 2,346 | 34 | |
| 1967 | 2,225 | | 2,225 | 407 | | 407 | 2,632 | | 2,632 | 33 | |
| 1968 | 1,876 | | 1,876 | 392 | | 392 | 2,268 | | 2,268 | 22 | |
| 1969 | 2,693 | | 2,693 | 215 | | 215 | 2,908 | | 2,908 | 23 | |
| 1970 | 2,175 | | 2,175 | 130 | | 130 | 2,305 | | 2,305 | 29 | |
| 1971 | 1,772 | | 1,772 | 41 | | 41 | 1,813 | | 1,813 | 24 | |
| 1972 | 3,563 | | 3,563 | 113 | | 113 | 3,676 | | 3,676 | 22 | |
| 1973 | 1,207 | | 1,207 | 99 | | 99 | 1,306 | | 1,306 | 30 | |
| 1974 | 1,279 | | 1,279 | 115 | | 115 | 1,394 | | 1,394 | 42 | |
| 1975 | 1,415 | | 1,415 | 173 | | 173 | 1,588 | | 1,588 | 56 | |
| 1976 | 2,577 | | 2,577 | 239 | | 239 | 2,816 | | 2,816 | 103 | Subprefectures given authority to allow control kill of males. |
| 1977 | 2,340 | | 2,340 | 231 | | 231 | 2,571 | | 2,571 | 229 | |
| 1978 | 2,959 | | 2,959 | 306 | | 306 | 3,265 | | 3,265 | 163 | |
| 1979 | 2,495 | | 2,495 | 372 | | 372 | 2,867 | | 2,867 | 168 | |
| 1980 | 2,839 | | 2,839 | 550 | 80 | 630 | 3,389 | 80 | 3,469 | 179 | |
| 1981 | 2,989 | | 2,989 | 644 | 124 | 768 | 3,633 | 124 | 3,757 | 327 | |
| 1982 | 3,816 | | 3,816 | 698 | 134 | 832 | 4,514 | 134 | 4,648 | 307 | |
| 1983 | 4,855 | | 4,855 | 847 | 308 | 1,155 | 5,702 | 308 | 6,010 | 397 | |
| 1984 | 4,515 | | 4,515 | 1,072 | 380 | 1,452 | 5,587 | 380 | 5,967 | 485 | |
| 1985 | 4,961 | | 4,961 | 1,399 | 451 | 1,850 | 6,360 | 451 | 6,811 | 487 | |
| 1986 | 6,149 | | 6,149 | 1,741 | 769 | 2,510 | 7,890 | 769 | 8,659 | 557 | |
| 1987 | 4,989 | | 4,989 | 2,084 | 892 | 2,976 | 7,073 | 892 | 7,965 | 753 | |
| 1988 | 9,579 | | 9,579 | 2,018 | 1,008 | 3,026 | 11,597 | 1,008 | 12,605 | 1,408 | |
| 1989 | 9,676 | | 9,676 | 2,204 | 1,897 | 4,101 | 11,880 | 1,897 | 13,777 | 1,459 | Subprefectures given authority to allow control kill of females. |
| 1990 | 9,607 | | 9,607 | 3,528 | 2,999 | 6,527 | 13,135 | 2,999 | 16,134 | 2,028 | |
| 1991 | 10,596 | | 10,596 | 4,002 | 3,521 | 7,523 | 14,598 | 3,521 | 18,119 | 2,323 | |
| 1992 | 12,758 | | 12,758 | 4,350 | 3,998 | 8,348 | 17,108 | 3,998 | 21,106 | 2,505 | |
| 1993 | 16,402 | | 16,402 | 5,445 | 4,996 | 10,441 | 21,847 | 4,996 | 26,843 | 3,439 | |
| 1994 | 15,723 | 2,272 | 17,995 | 5,568 | 5,359 | 10,927 | 21,291 | 7,631 | 28,922 | 3,384 | Female hunting season reopens |
| 1995 | 22,342 | 3,197 | 25,539 | 7,603 | 4,401 | 15,004 | 29,945 | 10,598 | 40,543 | 4,056 | |
| 1996 | 19,610 | 3,312 | 22,922 | 11,540 | 12,172 | 23,712 | 31,150 | 15,484 | 46,634 | 5,005 | |

Major damaged crops: pasture, beet, wheat.

Maximum Snow Depth on the Kushiro Plains



Snow depth on the Kushiro Plains is below 80cm in a typical year. Heavy snow years, defined by depths of 80cm or more, are expected to occur once in twenty years.

Source: Weather in Hokkaido Hokkaido Branch, Japan Weather and Meteorology Association (1991)

Changes in the Distribution of Sika Deer



1978

1984



1991

1997

: Areas where signs of deer presence were observed.

Conservation and Management Plan for Sika Deer in Eastern Hokkaido

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