

# WOLVES

Proceedings of the First Working Meeting of Wolf Specialists and of  
the First International Conference on Conservation of the Wolf

Sponsored by the Survival Service Commission of IUCN  
and held in conjunction with the XI International Congress  
of the International Union of Game Biologists  
at Stockholm, Sweden  
5-6 September 1973  
and with the financial support of the  
World Wildlife Fund

Edited by  
**Douglas H. Pimlott**



W O L V E S

Proceedings of the First Working Meeting of Wolf Specialists and of  
the First International Conference on the Conservation of the Wolf

Sponsored by the Survival Service Commission of IUCN  
and held in conjunction with the XI International Congress  
of the International Union of Game Biologists  
at Stockholm, Sweden,  
5 - 6 September 1973

and with the financial support of the  
World Wildlife Fund

Edited by

Douglas H. Pimlott



International Union for Conservation of Nature and Natural Resources

Morges, Switzerland, 1975



FOREWORD

The place of the wolf in the development of human cultures is interesting and complex. There are few large wild animal species still existing today which figure so prominently in legend and folklore over so wide a geographical area and which have been the subject of so much misunderstanding—and persecution. Over much of its previous range the wolf has now been exterminated or greatly reduced in number, while two of its subspecies, the Northern Rocky Mountain Wolf and the Red Wolf, are endangered.

In 1970 the Survival Service Commission of IUCN established a Wolf Specialist Group to examine the conservation status of the Wolf under the following terms of reference:

"To preserve wolves as a viable species in holarctic environments of the world in perpetuity for scientific, educational and economic purposes and to improve the understanding and appreciation of wolves as important and useful elements of natural ecosystems, so that people gain enjoyment and satisfaction as a result of their presence in wild communities."

Recognizing that some of the remnant wolf populations in Europe are under the greatest threat, the Chairman of the Wolf Specialist Group, Dr. D. H. Pimlott, made systematic preparations for the holding of a meeting which would take account of all elements contributing to their present conservation status, devise guidelines for conservation action and where possible propose specific projects for implementation.

The impact of this meeting, the first one of the Wolf Specialist Group, was greatly enhanced by being held in conjunction with the 11th Congress of the International Union of Game Biologists. The World Wildlife Fund and its National Appeals in Europe provided financial support, and the Swedish Society for the Conservation of Nature provided organizational and secretariat services for the meeting.

IUCN wishes to express its appreciation to all those who contributed to and assisted the preparation and holding of this meeting.

FIRST WORKING MEETING OF WOLF SPECIALISTS  
AND INTERNATIONAL CONFERENCE ON WOLF CONSERVATION

CONTENTS	Page
List of Participants	... 7
Notes on the Working Meeting: the Conservation of the Wolf in Europe	... 9
Manifesto and Guidelines on Wolf Conservation	... 12
The Conference Papers:	
A. Status and Preservation	
1. The Wolf in Europe in 1973. D.H. Pimlott.	... 17
2. The Wolf in the U.S.S.R. D.I. Bibikov.	... 28
3. The Wolf in Fennoscandia. Bertil Haglund.	... 36
4. The Wolf in Poland. P. Suminski.	... 44
5. Wolves in Yugoslavia with special reference to the period 1945-1973. Dušan Bojović & Dušan Colić.	... 53
6. Status, Distribution and Problems of Protecting Wolves in Slovakia. Slovak Institute for the Care of Monuments and Nature Conservation.	... 62
7. Status of the Wolf in Italy. Luigi Boitani & Erik Zimen.	... 73
8. Data on the Situation of the Wolf in Romania, 1973. Commission on Nature Monuments, Academy of the Romanian Socialist Republic.	... 79
9. The Kill of Wolves in Greece, 1964-1972. Section of Game Economy, Ministry of National Economy.	... 81
10. The Status of the Wolf in the United States - 1973. L.D. Mech & R.A. Rausch.	... 83
11. Wolf Management in Canada Through a Decade of Change. John B. Theberge.	... 89

CONTENTS (continued)	Page
B. Education and the Future of the Wolf.	
1. Protection of the Wolf in Spain - Notes on a Public Awareness Campaign. Felix Rodriguez de la Fuente.	... 103
2. Influence of Education Programs on Wolf Conservation in Canada. Allan Murray.	... 113
3. The Nordic Wolf Project. Mats Segnestam.	... 120
C. Scientific Research.	
1. Current Techniques in the Study of Elusive Wilderness Carnivores. L.D. Mech.	... 123
2. A Review of Methodology and Relative Merits of Techniques used in Field Studies of Wolves. L.N. Carbyn.	... 134
Appendix	
Minutes of a meeting of a Committee of the Wolf Specialists Group convened to discuss projects for funding by an International Appeal	... 143

FIRST WORKING MEETING OF WOLF SPECIALISTS

Participants

- Dr. Douglas H. Pimlott (in the Chair)  
65 Centre St.  
W. Richmond Hill,  
Ontario, Canada.
- Mr. Mats Segnestam (Convener),  
Swedish Society for the Conservation  
of Nature,  
Riddargatan 9, 11451 Stockholm, Sweden.
- Mr. A.J. Mence (Secretary),  
Survival Service Commission, IUCN,  
1110 Morges, Switzerland.
- Dr. D.I. Bibikov,  
Central Laboratory on Nature  
Conservation,  
Znamenskoye-Sadki,  
P.O. Vilar 142790  
Moscow Region, U.S.S.R.
- Dr. Nicolas Boev,  
Bulgarian Academy of Sciences,  
Committee for the Protection of Nature,  
2 Gagarin Street, Sofia 13, Bulgaria.
- Professor Bertil Haglund,  
Bergavagen 1,  
18400 Akersberga, Sweden.
- Dr. D.L. Mech,  
U.S. Fish and Wildlife Service,  
North Central Forest Experiment  
Station,  
Folwell Avenue,  
St. Paul, Minnesota 55101, U.S.A.
- Mr. Allan Murray,  
323 Montgomery Ave.  
Winnipeg R3L 1T6, Manitoba, Canada.
- Dr. Svein Myrberget,  
Norwegian State Game Research Institute,  
1432 Vollebekk, Norway.
- Professor John C. Ondrias,  
Zoological Laboratory,  
University of Patras,  
Patras, Greece.
- Mr. Carlos M. Paixao de  
Magalhaes,  
Instituto Superior de Agronomie,  
Tapada de Ajuda,  
Lisboa, Portugal.
- Mrs. Jelena Popovic,  
Studentski trg 5,  
11000 Belgrade, Yugoslavia.
- Dr. Erkki Pullianen,  
Department of Agricultural &  
Forest Zoology,  
University of Helsinki,  
Viikki, 00710, Helsinki 71,  
Finland.
- Dr. Piotr Suminski,  
Instytut Badawczy Lesnictwa,  
ul. Wery Kostrzewy 3,  
Warszawa 22, Poland.
- Dr. Franco Tassi,  
Parco Nazionale d'Abruzzo,  
Pescasseroli, Italy.
- Others attending
- Mr. Earl Baysenger  
Dr. Luigi Boitoni  
Dr. Dusan Bojovic  
Dr. Castroviejo  
Dr. Dusan Colic  
Dr. Raymond F. Dasmann  
Dr. H. Jungius  
Dr. Klein  
Mr. Ronald Novak  
Mr. Walter Parker  
Dr. Rodriguez de la Fuente  
Dr. Erik Zimen

## NOTES ON THE WORKING MEETING

### CONSERVATION OF THE WOLF IN EUROPE

What is the possibility of conserving the wolf over large areas of Europe? Does the wolf constitute a serious hazard to man? Can the presence of wolves be tolerated in areas where the production of domestic livestock is an important economic activity? Questions of this nature have been widely discussed in Europe this year. Activities of the Wolf Specialist Group of the Survival Service Commission have provided the focal points for these discussions.

The Group convened its first major meeting on 5-6 September in conjunction with the 11th Congress of the International Union of Game Biologists which was held in Stockholm, Sweden, from September 2nd to 7th. The meeting of the Wolf Group was sponsored by the IUCN-WWF Joint Project Operation and by the WWF National Appeals of Canada, Finland, Italy, Norway, Sweden and USA. A high point of the meeting was the development by the Group of a Manifesto on the conservation of the wolf. The statement embodies a declaration of important principles and a series of recommendations on wolf conservation.

The technical session of the wolf meeting was entitled "The Conservation of the Wolf in Europe" and papers were presented or submitted by representatives of Canada, Bulgaria, Czechoslovakia, Italy, Poland, Spain, USA, USSR and Yugoslavia. In addition, a single paper was presented on the wolf in Finland, Norway and Sweden. The technical session also included papers on research methods and on educational aspects of wolf management programmes.

The technical session was conducted as an open meeting and was attended by almost 100 people.

Both the technical session and the business meeting of the Wolf Specialist Group were dynamic "events". In addition to being well attended, it was evident that the participants were keenly interested in wolves and determined that they should not be exterminated in Europe. The sessions were widely reported in the press and received front-page coverage in several Swedish papers.

For three months prior to the meeting, Dr. Douglas Pimlott, Chairman of the Wolf Specialist Group, travelled widely in Europe visiting countries which still have wolves. He drew on this experience, and on material prepared for the technical meeting by members of the Wolf Group, in a review of the present status of the wolf in Europe, except for Albania and the USSR. Dr. D.I. Bibikov of the Central Laboratory on Nature Conservation in Moscow reviewed the current status of the wolf and government policies on wolf control in the USSR.



Dr. Pimlott suggested that in terras of the present status of the wolf, Europe could be divided into four categories: countries where wolves are extinct (11), virtually extinct (3), endangered (6), and those where viable populations still exist (3). The wolves in Finland, Norway and Sweden are in the virtually extinct category. Those in Bulgaria, Czechoslovakia, Italy, Poland, Portugal and Spain are endangered; Greece, Rumania and Yugoslavia appear to still have viable low populations.

Professor Bertil Haglund of Sweden reviewed the situation in Finland, Norway and Sweden where wolves are virtually extinct. He summed up by stating: "The total number of wolves in the two countries can hardly exceed half a dozen". The situation he outlined for Finland is not much better with no more than about 15 animals still existing in the country. The remaining wolves are protected in Norway and Sweden but they are still completely unprotected in Finland and can be shot anywhere in the country, even in national parks.

Papers on wolves in countries where they are endangered were submitted to the technical session by Dr. Nicolas Boev of Bulgaria, by the Slovak Institute for the Protection of Historical Monuments and Nature Conservation for Czechoslovakia, by Dr. Luigi Boitani and Dr. Erik Zimen for Italy and by Dr. Piotr Suminski for Poland.

It is evident that international co-operation will be needed if wolves are to be preserved because in most cases many of the remaining wolves exist largely in border areas. This is true of Bulgaria, on its borders with Yugoslavia, Greece and possibly Rumania; of Czechoslovakia and Poland which share borders with each other and each separately with the USSR; and of Portugal and Spain. Only Italy is in a position to deal with wolves as a national conservation problem.

Premiums, called bounties in North America, are still paid for the killing of wolves in Czechoslovakia, Bulgaria and Poland. They are classified as game animals in Spain, protected by law in Italy, until the end of 1973, and can be killed at any time by any method in Portugal.

In his paper on the wolf in the USSR, Dr. D.I. Bibikov reported a rapid increase in wolves during the war, at the end of which the population was estimated at 150,000-200,000 animals. In 1946 62,700 were killed in the USSR and 40,000 to 50,000 animals were killed each year for the next 15 years. A marked reduction of wolves became apparent in the late 1950's. During the past decade, the kill has been approximately 15,000 a year.

Dr. Bibikov concluded his paper with a number of important points. (1) The wolf has been treated as a pest animal and this is understandable considering the real damage it has caused. (2) It is reasonable to eliminate them entirely from livestock breeding territories and from highly populated agricultural and industrial areas. Wolf control, not wolf conservation, is still most needed in the USSR.

(3) The wolf populations in the Baltic, Byelorussia, Ukraine and the central region of Russia are considered to be optimum. (4) There is no threat from extinction of any subspecies of the wolf in the USSR in the near future. He indicated that the European tundra subspecies (Canis lupus albus) is closest to being in the endangered category. (5) He stated the belief that the republics would not agree to the elimination of their wolf populations.

The First International Meeting on the Conservation of the Wolf reflected fundamental changes occurring in attitudes toward the wolf and its future. These changes are perhaps best epitomized by two specific items: (1) The presentation by Mr. Mats Segnestam of Sweden on The Nordic Wolf Project which seeks to develop co-operation between Sweden, Norway and Finland to maintain northern wolves in captivity and to eventually convince people and governments that they should be reintroduced into wild areas; (2) The development of the Manifesto on wolf conservation. This Declaration of Principles on Wolf Conservation which it contains has been analyzed and the recommendation section is being given a final review by members of the Wolf Group. The statement is a positive one and it will help to bring into perspective the balance that should exist between wolf protection and wolf control as dual parts of wolf management programmes.

The first principle in the Manifesto states a case for the wolf that has rarely been expressed in the past:

"Wolves, like all other wildlife, have a right to exist in a wild state. This right is in no way related to their known value to mankind. Instead it derives from the right of all living creatures to co-exist in a manner unhampered by man as part of natural ecosystems."

## MANIFESTO AND GUIDELINES ON WOLF CONSERVATION

### Manifesto

#### Declaration of Principles for Wolf Conservation

1. Wolves, like all other wildlife, have a right to exist in a wild state. This right is in no way related to their known value to mankind. Instead, it derives from the right of all living creatures to co-exist with man as part of natural ecosystems.
2. The wolf pack is a highly developed and unique social organisation. The wolf is one of the most adaptable and important mammalian predators. It has one of the widest natural geographical distributions of any mammal. It has been, and in some cases still is, the most important predator of big-game animals in the northern hemisphere. In this role, it has undoubtedly played an important part in the evolution of such species and, in particular, of those characteristics which have made many of them desirable game animals.
3. It is recognized that wolf populations have differentiated into sub-species which are genetically adapted to particular environments. It is of first importance that these local populations be maintained in their natural environments in a wild state. Maintenance of genetic purity of locally adapted races is a responsibility of agencies which plan to reintroduce wolves into the wild as well as zoological gardens that may provide a source for such reintroductions.
4. Throughout recorded history man has regarded the wolf as undesirable and has sought to exterminate it. In more than half of the countries of the world where the wolf existed, man has either succeeded, or is on the verge of succeeding, in exterminating the wolf.
5. This harsh judgement on the wolf has been based, first, on fear of the wolf as a predator of man and, second, on hatred because of its predation on domestic livestock and on large wild animals. Historical perspectives suggest that to a considerable extent the first fear has been based on myth rather than on fact. It is now evident that the wolf can no longer be considered a serious threat to man. It is true, however, that the wolf has been, and in some cases still is, a predator of some consequence on domestic livestock and wildlife.
6. The response of man, as reflected by the actions of individuals and governments, has been to try to exterminate the wolf. This is an unfortunate situation because the possibility now exists for the development of management programmes which would mitigate serious problems, while at the same time permitting the wolf to live in many areas of the world where its presence would be acceptable.

7. Where wolf control measures are necessary, they should be imposed under strict scientific management, and the methods used must be selective, highly discriminatory, of limited time duration and have minimum side-effects on other animals in the ecosystem.

8. The effect of major alterations of the environment through economic development may have serious consequences for the survival of wolves and their prey species in areas where wolves now exist. Recognition of the importance and status of wolves should be taken into account by legislation and in planning for the future of any region.

9. Scientific knowledge of the role of the wolf in ecosystems is inadequate in most countries in which the wolf still exists. Management should be established only on a firm scientific basis, having regard for international, national and regional situations. However, existing knowledge is at least adequate to develop preliminary programmes to conserve and manage the wolf throughout its range.

10. The maintenance of wolves in some areas may require that society at large bear the cost, e.g. by giving compensation for the loss of domestic stock; conversely there are areas having high agricultural value where it is not desirable to maintain wolves and where their introduction would not be feasible.

11. In some areas there has been a marked change in public attitudes towards the wolf. This change in attitudes has influenced governments to revise and even to eliminate archaic laws. There is a continuing need to inform the public about the place of the wolf in nature.

12. Socio-economic, ecological and political factors must be considered and resolved prior to reintroduction of the wolf into biologically suitable areas from which it has been extirpated.

#### Guidelines

The following guidelines are recommended for action on wolf conservation.

##### A. General

1. Where wolves are endangered regionally, nationally or internationally, full protection should be accorded to the surviving population. (Such endangered status is signalled by inclusion in the Red Data Book or by a declaration of the Government concerned.)

2. Each country should define areas suitable for the existence of wolves and enact suitable legislation to perpetuate existing wolf populations or to facilitate reintroduction. These areas would include zones in which wolves would be given full legal protection, e.g. as in national parks, reserves or special conservation areas, and additionally zones within which wolf populations would be regulated according to ecological principles to minimize conflicts with other forms of land use.

3. Sound ecological conditions for wolves should be restored in such areas through the rebuilding of suitable habitats and the re-introduction of large herbivores.

4. In specifically designated wolf conservation areas, extensive economic development likely to be detrimental to the wolf and its habitat should be excluded.

5. In wolf management programmes, poisons, bounty systems and sport hunting using mechanized vehicles should be prohibited.

6. Consideration should be given to the payment of compensation for damage caused by wolves.

7. Legislation should be enacted in every country to require the registration of each wolf killed.

#### B. Education

A dynamic educational campaign should be promoted to obtain the support of all sectors of the population through a better understanding of the values of wolves and the significance of their rational management. In particular the following actions are advocated:

(a) Press and broadcast campaigns;

(b) Publication and wide distribution of information and educational material; and

(c) Promotion of exhibitions, demonstrations, and relevant extension techniques.

#### C. Tourism

Where appropriate, general public interest in wolf conservation should be stimulated by promoting wolf-related tourist activities. (Canada already has such activities in some of its national and provincial parks.)

#### D. Research

Research on wolves should be intensified, with particular reference to:

(a) Surveys on status and distribution of wolf populations;

(b) Studies of feeding habits, including especially interactions of wolves with game animals and livestock;

(c) Investigations into social structure, population dynamics, general behaviour and ecology of wolves;

(d) Taxonomic work, including studies of possible hybridization with other canids;

(e) Research into the methods of reintroduction of wolves and/or their natural prey; and

(f) Studies into human attitudes about wolves and on economic effects of wolves.

#### E. International Cooperation

A programme of international cooperation should be planned to include:

(a) Periodical official meetings of the countries concerned for the joint planning of programmes, study of legislation, and exchanging of experiences;

(b) A rapid exchange of publications and other research information including new techniques and equipment;

(c) Loaning or exchanging of personnel between countries to help carry out research activities; and

(d) Joint conservation programmes in frontier areas where wolves are endangered.

Wolf Specialists  
First Meeting  
Paper A.1

THE WOLF IN EUROPE IN 1973

Douglas H. Pimlott  
Chairman, Wolf Specialist Group, Survival Service Commission, IUCN  
University of Toronto, Toronto, Canada

During the past summer (June, July, August and September, 1973) I had an unprecedented opportunity to gain perspective on the wolf in Europe. In the course of the summer I visited 12 countries which still include wolves in the list of mammals which occur within their borders. The only "wolf" countries which occur, entirely or partly, in Europe which I did not visit were Albania, Turkey and the U.S.S.R.

In an article, The Wolves of the World, which I wrote for Nature in Focus (1973, No. 15), the Bulletin of the European Information Centre for Nature Conservation, I described the purposes of my work as follows:

- (1) to have an opportunity to meet and work with members of the Wolf Specialist Groups and to demonstrate some of the methods which are used in North America to study wolves;
- (2) to become well informed about wolves in different parts of the world so that I may provide more effective leadership to the Wolf Group;
- (3) to gain more understanding of the problems which are caused by wolves so that solutions can be developed that do not involve extermination of the wolf;
- (4) to assist in the development of knowledge and understanding of the wolf among the peoples of Europe.

In the majority of cases the work was planned so that I spent one week in each country. The most common pattern of my activities in a country was to meet with officials of the government to describe the work of the Wolf Specialist Group and to obtain information on the wolf in the country. I usually participated in some public activities related to wolves such as seminars, television interviews and press conferences. Whenever it could be arranged, I spent a few days in regions where wolves still exist, with the national member of the Wolf Specialist Group, or with a member, or members, of the government whose work was most closely related to the wolf.

I am very grateful for the assistance which I received during the course of my work in Europe. I regret that it is not possible for me to identify by name very many of the people or the organizations which

assisted me. The reason is that the list is very long. In some instances the organization of my activities had been worked out so thoroughly that I had very little to do but to be at a particular place at a designated time. Usually details of my accommodations and travel were arranged or provided by sponsoring agencies. Sometimes I received noteworthy assistance from as many as 10 to 15 individuals and organizations in a single country.

The Canadian Wildlife Service of the Federal Ministry of the Environment loaned me a print of the film on the wolf, The Death of a Legend, for use during my work in Europe. The film was made by the National Film Board of Canada on the instigation, and with the financial support, of CWS. It was usually the highlight of the public activities in which I participated. It was very valuable to the part of my work which related to the development of a greater understanding of the wolf. I am grateful to CWS for having made a print available to me, free of charge, for use in my work.

The Canadian Appeal of the World Wildlife Fund provided the funds for the various aspects of my work in Europe, including travel. I am very grateful to the Fund.

After I had visited three countries, Portugal, Spain and Italy, I spent a week at Morges, headquarters for IUCN and WWF. During that time, and in subsequent travels, I made many demands for assistance of members of the staffs of the two organizations and particularly on Dr. Hartmut Jungius of WWF. In all cases my needs were met and my problems were solved. I am grateful to them as I am to all who assisted me during the summer.

#### The Distribution and Status of Wolves in Europe

Wolves occurred throughout Europe in earlier years, however during the past 300 to 400 years they have been gradually and progressively exterminated. An objective of the Wolf Specialist Group is to document the present status and distribution of the wolf in Europe with a view to determining if the species can be preserved on the continent.

The present situation is that breeding populations of wolves still occur in eleven countries. These are the U.S.S.R., Poland, Czechoslovakia, Rumania, Bulgaria, Yugoslavia, Albania and Greece in Eastern Europe, and Italy, Portugal and Spain in the western Mediterranean area. Wolves are still considered as being part of the fauna in Finland, Norway and Sweden; however, as Dr. Haglund brings out in his paper on the wolf in Scandinavia, it is questionable if there is a single viable breeding pack in the three countries.

In considering the wolf in Europe it might be logical to attempt to make a rough classification as a means of illustrating the present



situation. The classes I will use are: (1) Wolves Extinct; (2) Virtually Extinct; (3) Endangered or Low Populations; (4) Viable Breeding Populations.<sup>1</sup>

Wolves Extinct: Eleven countries: Ireland, Great Britain, France, Belgium, Netherlands, Denmark, West Germany, East Germany, Switzerland, Austria, Hungary. The wolf has been extinct in all the countries listed, except Hungary, for a long time.

Wolves Virtually Extinct: Three countries: Finland, Norway and Sweden. Each of these countries has had one or more "wolf watchers" (Pullainen, 1965; Myrberget, 1969; Haglund, 1970) who have documented the progressive decline of wolves, particularly during the post-war period. There seems little doubt that the process has reached the point where the three countries should be included with the eleven countries listed in the first category. The situation may not, however, be quite as serious in Finland as in the other two countries, since there are still some wolves in contiguous areas of the U.S.S.R. Dr. Pullainen believes that Finland periodically receives some wolves from this source.

Wolves Endangered or Low Populations: Seven countries: Portugal, Spain, Italy, Bulgaria, Czechoslovakia, Poland and the U.S.S.R. (Western republics of Estonia, Latvia, Lithuania, Ukraine and the Russian Federation).

The present situation in Portugal is not very clear. It is obvious that there are breeding populations of wolves in north and northeastern parts of the country, particularly in areas contiguous with Spain. There appears to be an increasing number of reports of wolves killing livestock in several areas of the country. However, documentation is lacking on whether wolves or dogs are involved in these incidents. Flowers (1971) reported on the kill of wolves from 1933 to 1957, but there are no recent data. There is a need for a research programme in Portugal to obtain more understanding about the status and distribution of wolves.

The wolf situation in Spain has been kept under observation by Dr. José A. Valverde. He has reported on the progressive decline in numbers in two recent popular articles entitled, El Lobo Espanol and El Lobo Una Historia de Tragedia en los Montes de Espana (Valverde, 1971 and 1973). Dr. Valverde states that the decline has been particularly rapid during the past 20 years. Wolves in Spain now occur primarily in Galicia and Castilla Leon (contiguous areas in northwestern Spain) and in two small isolated areas, Salamanca and Sierra Morena. Dr. Valverde, who is a member of the Wolf Specialist

---

1. Readers will realize that in some cases the classification is based on preliminary information and may prove to contain some misconceptions because of the existing paucity of research data.

Group, recommended in his articles that wolves be exterminated in Galicia because he believes that they are innate killers of children and, in the situation in which they exist in the province, dangerous to local inhabitants. He also suggested that the wolf population in the Sierra de la Culebra mountains of Castilla Leon be maintained at a low level by controlled sport hunting. His recommendations have given rise to a heated debate in Spain. Dr. Rodriguez de la Fuente, a prominent conservationist and television personality has argued strongly against Dr. Valverde's proposals. Dr. de la Fuente's paper (B.1) describes the public awareness campaign which he has been waging to improve the understanding of the wolf in Spain.

Italy also has had scientists who have attempted to obtain understanding of the status of the wolf by drawing together available information from a range of sources. Dr. Franco Tassi reviewed what he learned by this method in a paper entitled, The Status of the Wolf in the Central Apennines (Italy) (Tassi, 1973). He suggests that the population of wolves in peninsular Italy is somewhat more than 200 animals. However, a recent preliminary research programme sponsored by the Italian Appeal of W.W.F. and conducted by Dr. Boitani and Dr. Zimen suggests a total population of approximately 100 animals (see Paper A. 7). There are many complexities involved with the conservation of the wolves in Italy. I will deal with some of them in a later section.

Information on wolves in Bulgaria is being assembled by Dr. Nicolas Boev of the Bulgarian Academy of Sciences. The data on wolves is collected by the Bulgarian Forest Service. Dr. Boev advised me that the data indicate that the wolves occur primarily in the mountainous regions of northwestern and southwestern Bulgaria. During the past 20 years the annual kill had declined from approximately 1,000 animals in 1954 to between 100 and 200 a year since the late 1960's. Dr. Boev stated that the present kill of approximately 125 animals is about equal to the population (based on estimates by the Forest Service). The belief is that a considerable number of the wolves killed in Bulgaria originate in Yugoslavia, Greece and Rumania.

The wolf appears to be very close to extinction in Czechoslovakia. For more than 100 years the species has occurred only in the Slovak Republic. Wolves were considered to be very harmful to game during the post-war period when an intensive effort was being made to restore populations of large mammals following major declines which occurred during the war. A bounty was established in 1954 and increased to 2,000 Crowns (\$175.00) in 1959. It is the highest bounty I have ever known about. It must have made wolf killing a very attractive proposition.

The data on the kill of wolves was first reported by Josef Voskar (1971) in an article entitled Some Thoughts on the Wolf in the East of Slovakia. He was the pioneer who has made Slovakia aware of the plight of its wolf population. A report on the wolf in Slovakia is included in the Proceedings (Paper A.6).

The report on the Wolf in Poland, prepared for this conference by Dr. Suminski (Paper A. 4) shows that there has been a marked change in both the distribution and the numbers of wolves during the past 20 years. In the late 1950s the number of wolves killed annually varied from approximately 250 to 425 animals. The kill dropped to approximately 190 in 1960 and to 59 in 1971. The wolf was classified as a game animal until 1954 but since that time it has been legal to kill it by any means available. A bounty of 500 Zloty for pups and 1500 for adults (about U.S. \$ 15 and 45) is paid. For a number of years wolf control officers were appointed to organize control activities in the provinces. However, only one of these officers is still employed. The continued decline in the number of wolves killed and the reduction of the range occupied by wolves by 50 to 66% within two decades suggests that the wolf in Poland should be considered as an endangered species. I hope that the government of Poland will recognize the dangers of continuing to pay a bounty for the killing of wolves under these circumstances.

As stated earlier, I did not visit the U.S.S.R. during my recent work in Europe but hope to have an opportunity to visit wolf areas there in the future. Dr. D.E. Bibikov's paper (A. 2), however, presents quite a detailed preliminary review of the status of the wolf in both the European and Asiatic portions of the U.S.S.R. It indicates that the wolf has been greatly reduced in the European sector, but the data suggest that the situation is not as serious as I once believed. I hope that one of the first objectives of further research will be to verify these preliminary population estimates. Making estimates of wolf numbers is a very difficult and complicated matter. I believe that there is nearly always a tendency to overestimate numbers. This seems to be particularly true, when the data are based on many different surveys conducted by different people in many areas. Meanwhile, I am encouraged by Dr. Bibikov's statement that no sub-species is threatened by extinction at the present time. I am also pleased that the Central Laboratory on Nature Conservation in Moscow has assumed the role of stimulating and coordinating wolf research and management in the U.S.S.R. The absence of research on wolves has represented a great lack and I find it gratifying that the situation is being rectified. While I naturally have some doubt about the wisdom of further reductions of wolf numbers and range, I do not yet have the knowledge on which to make an objective judgement.

In Canada, there is no national effort on research and management work on large carnivores, like the wolf. The wolf comes under the jurisdiction of seven different provinces and two territories. Each one is autonomous and, in effect, conducts its programmes as if it was a separate country.

A similar situation exists in Czechoslovakia and Yugoslavia where the individual republics have the responsibility to deal with wolves. I find that I do not yet understand the nature of the relationships which exists between the U.S.S.R. and the individual republics in wolf research and management programmes. I hope to learn more about this because, in large countries, coordination of effort can often be very important in

conservation work. As John Theberge points out, in his paper on wolf control in Canada (A. 11), this situation has resulted in the continuation of the bounty system in the Northwest Territories long after it was justified. I wonder if jurisdictional problems of this nature arise in wolf work in the U.S.S.R. or if they will in the future.

#### Viabile Breeding Populations of Wolves

The information provided me in Greece, Rumania and Yugoslavia suggested that viable populations of wolves still exist in these contiguous countries. My appraisal is based on detailed data on the kill of wolves in Greece from 1969 to 1971 and data on total kills from 1964 to 1968 (the data were provided by the section of Game Economy of the Ministry of National Economy); on a brief report, entitled, Data on the Situation of the Wolf in the Socialists Republic of Rumania, provided me through the Commission for the Conservation of Nature of the Rumanian Academy of Science; and on discussions in Yugoslavia. The paper on the latter country (A. 5) provides some useful documentation on the present status of wolves. In addition, I have had the opportunity to make a field trip in each of the three countries and to gain an appreciation of the wolf habitat in one or more areas.

I was quite amazed by the data on the kill of wolves in Greece. The reported annual kills from 1964 to 1971 were 567, 584, 848, 485, 586, 846, 810 and 874. Approximately 70% of the wolves were killed in the northern province of Macedonia during the three years for which detailed data were available. A bounty for the killing of wolves is paid by the Ministry of National Economy.

The report on wolves in Rumania (A. 8) does not give detailed information on the present distribution or status of the wolf. It does, however, state that the wolf occurs over an area of approximately 40,000 km<sup>2</sup> or approximately 15% of the area of the country. The kill of wolves has varied between 2,400 in 1950 and 1,030 in 1972. A bounty of 300 lei is paid for the killing of an adult wolf and 150 lei for a pup (about U.S. \$60 and 30).

In completing this review of the wolf in Europe, I am not able to determine in which category the wolves of Albania should be listed. However, considering the general status of wolves in that part of Europe, it seems likely that they should be listed as in either category (3) or (4).

#### Reflections on Needs for the Future

The above review, together with a number of the papers in these Proceedings, shows that the wolf is either extinct or is an endangered species in many countries in Europe.

Because of this, there does not seem to be much doubt about what the first priority of members of the Wolf Specialist Group of the Survival Service Commission should be. It should be to try to find ways and

means of helping the people of Europe to understand much more about what kind of an animal the wolf really is. I think that we need to show what kind of a role it plays in ecosystems and what kinds of dangers and threats it poses to people. In all of these things we should be very honest.

When I first began to study the wolf in Ontario, Canada, the natural history museum in Algonquin contained a wolf exhibit. The descriptive material on it stated that the wolf lived mainly on mice and other small animals. We soon learned that this was not true. In fact, the wolves were living to a large extent on the white-tailed deer and on beaver. The poster was soon changed so that it told the truth about wolves. The people who visited the park are much more interested in deer than in mice so it seemed that our research would make it more difficult to conserve the wolf. But, it was not the case. We 'introduced' people to wolves in many different ways and there was a great increase in the interest in them. Our work in Algonquin Park made an important contribution to an improvement of interest in the wolf in Ontario, and to the discontinuation of bounty payments which had been made continuously since 1793.

Educational programmes, to increase public awareness of the wolf, should have many components. The use of television and radio are particularly important but I am certain that the need goes beyond that. Popular articles in newspapers and magazines and material which is readily available to school children are all important. In Canada, the Canadian Wildlife Service publishes articles on wild animals called "Hinterland Who's Who". The one on the wolf and another published in Manitoba by Mr. Murray's organization, which is called "The Wild Dogs of Manitoba", illustrate the kinds of material I mean. Allan Murray discusses educational programmes in his paper (B. 2) and, although I must confess I do not agree with everything he says, I think that educational programmes did a great deal to create public awareness of wolves in Canada, much of it in very simple and informal ways.

Turning to Dr. Rodriguez de la Fuente's paper (B. 1), there is no doubt that more has been done in Spain to create an awareness of wolves than in any other country in Europe. An educational programme, with many similar elements, is also underway in Italy. In both cases the World Wildlife Fund is deeply involved. I hope that many other countries will undertake educational work that relates to their individual needs. One aspect of this is to be discussed at a business meeting of the Wolf Group after the Conference (see Appendix to the Proceedings for a brief report).

I visited Portugal and Italy very early in my work this summer. The understanding I gained was very important to me because it helped me to realize how behaviour of the wolf in Europe compares with that of the wolf in North America. In both countries wolves are closely associated with human settlements and in both it seems certain that they depend to a considerable degree on domestic animals, garbage and carrion for their livelihood.

In Italy considerable emphasis is being placed on the restoration of large mammals. I consider that it is an important endeavor both in its own right and in terms of wolf conservation. However, the work poses both challenges and problems: Dr. Franco Tassi and Dr. A.M. Simonetta have thought a great deal about them in their efforts to reintroduce roe deer into the Abruzzo National Park in the Central Apennines of Italy. An important question is: If a large mammal has been reintroduced to an area where wolves exist, what can be done to divert predation by wolves during the period that the prey animal is being reestablished? In Abruzzo Park, emphasis is being placed on the establishment of feeding places for the wolves, particularly during the winter. Carcasses of dead animals are placed at these sites. There will be a need for experimentation with this and with other methods to determine what is effective and necessary and to decide when such programmes can be discontinued.

In eastern and northern Europe, the problems are quite different. All the countries I visited have well established populations of large game mammals. The problem in these countries, is to keep predation on livestock within acceptable limits and to convince game management agencies, hunters and landowners that the wolves have a 'right' to a percentage of the game animals. Both Poland and Czechoslovakia (Slovakia) are examples of eastern countries where a sharing principle could apply. The three Fennoscandian countries also have substantial base populations of large game mammals.

In my travels in Europe I heard a great deal about rabies and about fears associated with this disease. In Rumania my hosts took me into a small village where a rabid wolf had made an attack in 1948. Even though they received treatment more than 20 people died. Fear of wolves will undoubtedly persist in that village for a very long time. Undoubtedly, the story of that community has been told very widely in Rumania.

I believe that either the Survival Service Commission or the Wolf Specialist Group, as an arm of SSC, should become involved in things pertaining to rabies. We need to understand exactly what the present situation is with rabies in Europe; we should determine how it is influencing wolf conservation and we should learn what can be done to deal with threats which it may pose to wolves and other carnivores.

Although I was generally aware of the situation before I went to Europe this summer, I was very impressed with the discontinuity of European wolf populations. I now think much more about what this could mean in terms of the 'wolf gene pool'. I believe that the Wolf Group should seek the advice of a geneticist to determine whether or not any specific investigations are warranted. The Fennoscandian members of the Wolf Group are considering the question as it pertains to captive populations. Perhaps they could develop a project which deals with the genetics of both captive and of isolated populations.

I consider that there should be a comprehensive study made of the taxonomy of the European wolf. It is of much more than academic interest. Is the wolf of the Apennines a significantly different animal than the wolf of the Iberian Peninsula, Yugoslavia, Greece or Czechoslovakia? The answer to this question could influence decisions about the intensity of efforts that are made to preserve animals in particular areas and influence decisions about obtaining stock for captive breeding programmes aimed at maintaining wolves for future reintroductions into European ecosystems.

I am pleased with the organization of national wolf groups in Finland, Norway and Sweden. I am impressed with the initiative that these groups are taking to develop public understanding of wolves, to promote research and to develop and maintain breeding populations of wolves in captivity, particularly in cooperation with zoos. I hope that the idea of establishing national wolf groups will spread and become a dynamic form of activity for wolf conservation in other countries of Europe.

During the time I spent in Fennoscandian countries, I thought a great deal about the concept of maintaining captive breeding populations of wolves. The reason was that I was involved in many discussions of the question with members of either the SSC or of national wolf groups. On several occasions I was asked to express an opinion on what I thought about it. In response I said things such as the following:

(1) Captive breeding programmes for future reintroduction of wolves represent the last resort of conservation programmes. They should only be considered when everything else has failed. I consider that this situation exists in Norway and Sweden. It does not seem that there are any other alternatives or options in these countries. However, I feel some uncertainty about whether or not it would be the right course of action for Finland. Wolf conservation work appears to be developing rapidly in the U.S.S.R. so there is increased hope that natural processes could result in the re-establishment of wolves in Finland as a result of immigration.

In addition, it is conceivable that arrangements could be made with the U.S.S.R. to obtain stock from the wild if approval is eventually given for the reintroduction of wolves into some areas of Finland. It is my hope that the Wolf Specialist Group of the SSC will be able to promote international cooperation of this nature - if programmes for the re-establishment of the wolf become a reality.

(2) I hope that the Nordic countries will expand the concept of their captive breeding programme to include one or more enclosures. I think that it would be desirable to have these enclosures a minimum area of 1,000 hectares of varied terrain and habitat. I also consider that: (i) some of the food which is provided the wolves in these areas should be in the form of live prey so that learned elements of hunting behaviour can be maintained; (ii) that the population of an enclosure should be allowed to establish its own limits, so that forces of natural selection can continue to influence the development of the gene pool; (iii) that such areas should be developed so that they can make a contribution to

educational programmes. They could, for example, provide opportunities for the production of films which could be used on television, theatres and schools. It is possible that the revenue could contribute substantially to the support of the facility.

I have grave reservations about Dr. Valverde's recommendations for the complete extermination of wolves in Galicia, one of the three ecological groups of wolves which he identifies as existing in Spain. I saw some of the documentation of attacks by wolves on children in the region and do not doubt that attacks have occurred. However, I consider that an intensive effort should be made to determine if the problem can be solved by selective control rather than by extermination of the population. The wolves in nearby areas of Portugal live very close to people, but there is very little fear of them and there is no recent history of wolves attacking people. Similarly wolves occur in many parts of Eastern Europe in similar circumstances and few problems are reported. It seems to me that the general circumstances associated with wolf-human interactions in Europe warrant the development of a hypothesis that the problem in Galicia was caused by only a few animals in the population. If so, it could be solved by a programme of selective control of wolves which seem particularly prone to live close to villages. I consider that the situation warrants an intensive study of the behaviour of the wolves in Galicia to obtain the background knowledge on which rational decisions can be based.

The need for research on wolves in many different parts of Europe has caused me to think a great deal about the possibility of international cooperation in research. It takes a long time to establish research programmes and particularly to learn how to study wolves. I consider that the scientists who have studied wolves intensively in North America could do a great deal to assist scientists in Europe who are initiating research programmes. My suggestion is that arrangements should be worked out to permit scientists from North America and Europe to work together for limited periods of time when research programmes are being established.

#### REFERENCES

- Flower, Eric, 1971. Lobos em Portugal (Wolves in Portugal), 1933-1957. Secretaria de Estado da Agriculturas, Direcção - Geral dos Serviços Florestais e Aquícolas. Lisboa, 70 pp.
- Haglund, Bertil, 1970. History and Status of the Wolf in Scandinavia. In Proceedings of a Symposium on Wolf Management in selected areas of North America. Bureau of Sport Fisheries and Wildlife, U.S. Department of the Interior.



Mybergerget, Svein, 1969. Den norske besta av ulv (The Norwegian Population of Wolf). Meddelelser fra statens Viltunderskelser. Series 32; 17pp.

Pimlott, Douglas, 1973. Wolves Around the World. Nature in Focus, Bulletin of the European Information Centre for Nature Conservation 15: 18-21.

Pullianen, Erkki, 1965. Studies on the Wolf in Finland. Ann. Zoolog. Fennici 2: 215-259.

Tassi, Franco, 1973. The Status of the Wolf in the Central Apennines (Italy). Translated and reprinted from: Il Lupo nell'Apennino Centrale: in Parco Nazionale d'Abruzzo: Importanza biogeografica e probleme de conservazione. Lavori della Società Italiana de Biogeografia, Nuova serie, Vol. II, Siena, 1971.

Valverde, José A. 1971. El Lobo Español (The Spanish Wolf). Montes 159: 229-241

Valverde, José A. 1973. El Lobo - Una Historia de Tragedia en los Montes de España. Trofeo 4(33).

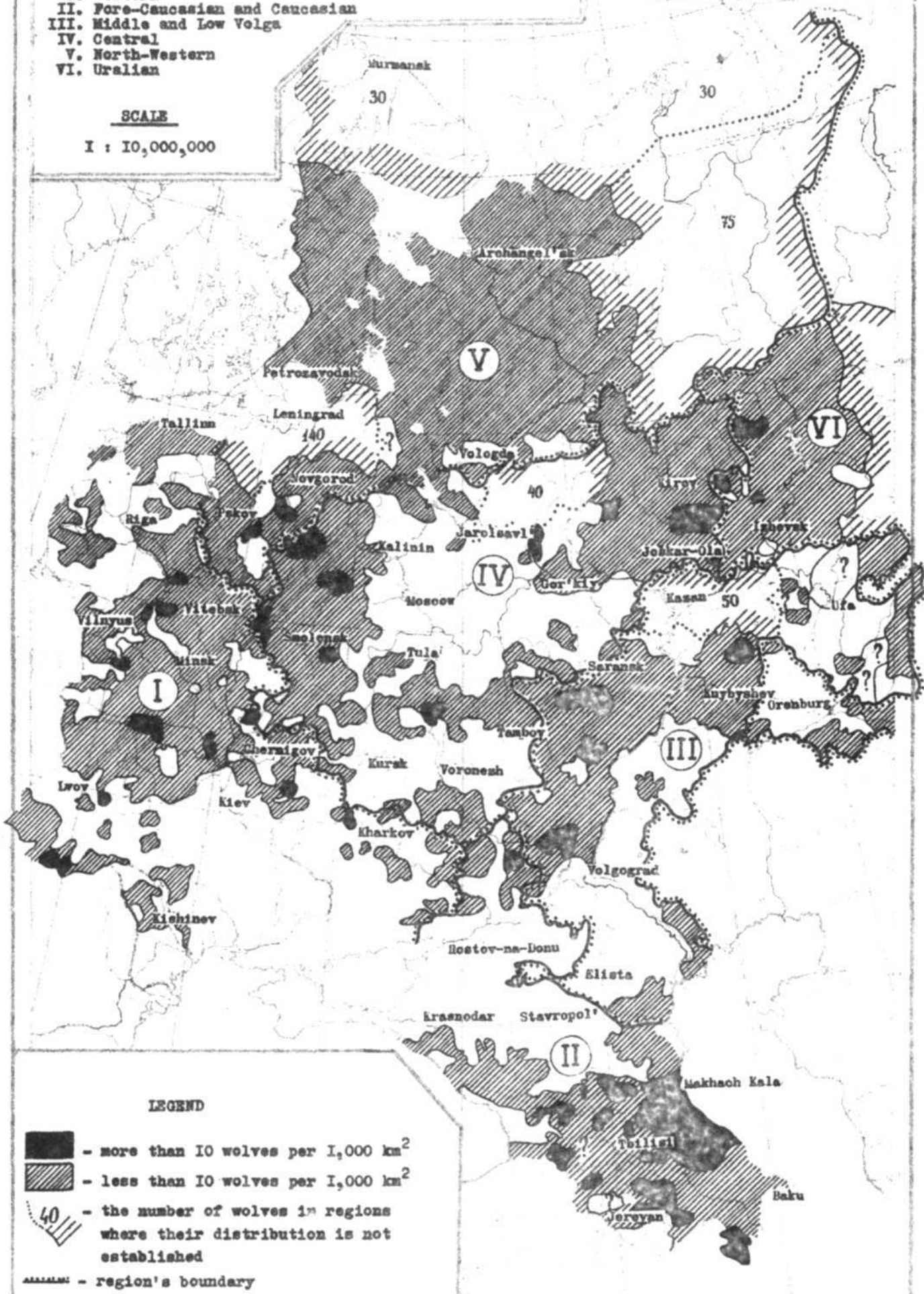
Voskar, Josef, 1971. Restrospektívy a perspektívy vlka na východnom Slovensku (Some thoughts on the wolf in the east of Slovakia). Ochrana Přírody 4.

THE DISTRIBUTION OF THE WOLF POPULATION (CANIS LUPUS)  
IN THE EUROPEAN PART OF THE SOVIET UNION  
REGIONS





- I. Western
- II. Fore-Caucasian and Caucasian
- III. Middle and Low Volga
- IV. Central
- V. North-Western
- VI. Uralian

SCALE

1 : 10,000,000



LEGEND

-  - more than 10 wolves per 1,000 km<sup>2</sup>
-  - less than 10 wolves per 1,000 km<sup>2</sup>
-  - the number of wolves in regions where their distribution is not established
-  - region's boundary

Wolf Specialists  
First Meeting  
Paper A.2

#### THE WOLF IN THE USSR

Dr. D.I. Bibikov  
The Central Laboratory of Nature Conservation, Ministry of Agriculture,  
Moscow, U.S.S.R.

#### INTRODUCTION

The wolf is distributed widely, in all Union Republics and geographical regions of the Soviet Union. It ranges from the arctic tundra to southern deserts and mountains. It is absent or rare in the deep snow areas of the taiga region, where it is difficult for it to travel in winter in search for food.

In this century the wolf population in the country fluctuated considerably. Two rapid increases coincided with World War I (1914-1918) and World War II (1941-1945). When World War II ended, i.e. by 1945-46, the number of wolves had doubled and the population was estimated at 150-200 thousand animals. As the population grew the damage caused by wolves to cattle-breeding and game herds increased rapidly. In some regions there were cases noted of wolves attacking men. To cut down the losses caused by wolves to the livestock industry some measures were taken by the State on wolf control. In 1946, 62,700 were killed. For the next 15 years the number of wolves killed in the country was maintained at a level of 40-50 thousand per year.

The effect of the wolf control was not evident until the late 1950's when a marked reduction in wolf numbers became apparent, although there had been no change in the amount of money (50 roubles) paid by the State to encourage the destruction of wolves. During the last decade the number of wolves killed in the USSR has, on the whole, become stable and about 15,000 have been killed annually.

The most common methods of the wolf destruction and control are the removal of pups, and occasionally of adults, from dens, driving them into enclosures, trapping and snaring. Different regions are characterized by the prevalence of the particular methods used. In the RSFSR, during the period 1956 to 1965, about 10% were killed by using poison baits (fluorine-acetate of barium) and 21% were killed from aircraft. In other regions of the country (e.g. open tundra landscapes) the overwhelming majority of wolves were killed by these two methods. At the present time, however, these are only important in the Asian part of the USSR.

## WOLF POPULATIONS

Our data are based on special questionnaires distributed to hunting organizations. The ecological picture of the population is more complete for the European part of the Soviet Union. Knowledge of the wolf in the Asian part of the USSR is still fragmentary and a wolf distribution map cannot yet be drawn for this large region.

### European part of the USSR (see Map)

#### I. The West Region

The population is estimated at 1,450 wolves (200 in the Baltic zone, 800 in Byelorussia and 450 in the Ukraine). About half the region is free from wolves and their range is being reduced continuously. The highest densities of wolves (above 10 per 1000 km<sup>2</sup>) are found in a number of areas of Byelorussia. They are the population centres and serve as a kind of breeding ground. It is believed that wolves disperse from them into the contiguous regions. Poisons and aerial hunting are not used in wolf elimination. However, the populations are being controlled by sport-hunting methods.

#### II. The Pre-Caucasus and the Caucasus

The population approximates to 4,500 wolves. The wolf has been eliminated on the steppe and semi-desert landscapes of the Pre-Caucasus. For example, only about 50 wolves are thought to survive in the Rostov region and 20 wolves in the Kalmyk ASSR. However, wolves are still numerous in the Caucasian mountains and, in spite of a continued control program, their numbers are increasing. The maximum wolf density is in East Georgia, Dagestan and Azerbaijan. In these areas the population averages 10 animals per 1000 km<sup>2</sup> and reaches 30-40 animals per 1000 km<sup>2</sup> in a number of places. This density equals the most densely populated wolf territories of Alaska and Canada (1 wolf per 25 km<sup>2</sup>). It should be noted, for instance, that quite recently the density of the wolf population in the Caucasian Preserve averaged one wolf per 15-20 km<sup>2</sup>. About 1,700 wolves are taken per annum in the region, of which pups constitute no more than 20%.

#### III. The Volga Region

About 600 wolves remain in this region. The former population is partially exterminated and the wolf range is greatly reduced. Areas of high wolf density are almost absent.

#### IV. The Central Russian Region

Wolves are found primarily in the provinces in the west and north of the region. The population is estimated at 1,150 and density exceeds 10 per 1000 km<sup>2</sup> in only a few areas. For instance, wolf density in the Smolensk province as a whole averages 3-4 per 1000 km<sup>2</sup>. The number

is declining in all areas except Lipetsk and Kirov provinces, where it is fairly stable. On the average 500 wolves are killed in the region annually.

#### V. The North-west Russian Region

Approximately 1,300 wolves survive in this region. They are distributed as follows: Karelian ASSR: 300 (2.5 wolves per 1000 km<sup>2</sup>); Novgorod Province: 150 (1.6 per 1000 km<sup>2</sup>); Vologda Province: 200 (1.4 per 1000 km<sup>2</sup>); Arkhangelsk Province: 300 (0.5 per 1000 km<sup>2</sup>). Wolves are widely dispersed but areas of high density and areas where wolves are absent are both rare. The wolf is most numerous in tundra. The average annual wolf harvest is about 500, but the number killed has decreased in the last few years and the population has become stable.

#### VI. The Urals Region

This region contains about 800 wolves, more than half of which are in the north-western sector. The populations in Perm Province and Udmurt ASSR are estimated to be 400 and 140, respectively, with average densities of 2.5 to 3.9 wolves per 1000 km<sup>2</sup>. The population is increasing in these areas. Elsewhere, very few are left, densities vary from 0.2 to 1.0 wolves per 1000 km<sup>2</sup> and the wolf range is broken up. Hunting has been intensive in the region with an average annual kill of 500 wolves (385 in 1972). All methods of control, except aerial hunting, are used.

#### Asian part of the USSR

We can give only a general statement for this part of our country.

##### Kazakhstan.

This republic has the largest number of wolves in the USSR, with a population of approximately 30,000, including 7,500 animals in mountain areas, 17,000 in desert and semi-desert (5,000 at Ust-Urt and Mangyshlak), 4,000 in the steppe agricultural zone and 3,000 in other areas. The total wolf population has not yet been greatly reduced though in the immediate Post-War period about 10,000 were killed annually. The use of poisons and aircraft in wolf population control is fairly limited.

##### Central Asia.

There are no reliable data on the wolf population in this region. The annual wolf harvest in the last decade has averaged 1,500 to 2,000 and probably constitutes no more than one third of the population. This level of kill does not reduce the population which is estimated at 6-8 thousand. The greatest number of wolves is found in Kirghizia (3,000); Tajikistan, Turkmenia and Uzbekistan have the lowest populations in the region.

#### West Siberia.

Only about 800 wolves survive in the region, much of which has no wolves left while in other areas their number has been greatly reduced. A high population density occurs only in a few parts of the Altai, mainly in the mountains along the Mongolian border.

#### East Siberia.

There is an estimated population of 3,500 wolves in the region. The annual wolf kill is under 1,500. In the greater part of this extensive range, reproduction compensates for the number killed and the population is stable. The populations in tundra are broken up, but precise data are not known. High population densities, above 10 wolves per 1000 km<sup>2</sup>, occur in the south, in mountain steppe landscapes and along the Mongolian border.

#### The Far East.

Rather more than 2,000 wolves are believed to survive in the region (1000 in the Yakut ASSR; 150 in Kamtchatka; 300 in the Khabarovsk territory; 400 in the Amursky territory; and 250 in the Primorsky territory). About 800 wolves are killed annually. The number has been reduced in tundra and agricultural areas but is stable elsewhere. Highest densities occur in the Tuva ASSR (above 10 animals per 1000 km<sup>2</sup>) and in southern areas of Baikal.

#### Wolf Populations in the USSR: General Conclusions

Our review of the present situation and of changes in wolf numbers in the USSR has allowed us to draw the following conclusions:

1. In spite of general and intensive control, the wolf population in the USSR is still high and totals nearly 50,000. In many regions populations have been slightly reduced but no threat of extinction faces any of the subspecies in the near future. There is some fear concerning the tundra subspecies (Canis lupus albus), the numbers of which have been heavily reduced by hunting from aircraft. But in general, there is no wolf conservation problem in the USSR, and this is the reason why the legislative status of this predator has remained unchanged. What is more, on the whole, it is not conservation but wolf control which is needed in our country now.
2. The centres of high wolf density, with 30 animals or more per 1000 km<sup>2</sup>, are found in Kazakhstan, the Caucasian Republics, Central Asia and the mountain steppes of southern Siberia. Damage caused by the wolf to cattle-breeding is still too high in such areas and systematic measures to limit the population should be strengthened.

3. In the European part of the country, excluding the Caucasus, the West Siberian subspecies has been eliminated from about one-third of its previous range. Moreover, in the territory which is still occupied the population density is only about 1-2 per 1000 km<sup>2</sup> and the reproductive potential has been considerably reduced. It is quite possible that if the existing control program is maintained for several years, the range will become even smaller and extend over not more than about one-third of the former range.

#### Wolf Control and Management

While damage caused by wolves to cattle-breeding has been reduced to a fraction of its magnitude during the periods of high densities, it is still considerable. So the task of eliminating the wolf entirely from the cattle-breeding and highly populated agricultural and industrial areas is reasonable.

It should be realized, however, that the Republics of the Union would not agree with total elimination of the wolf population on their territories. They recognize the need for nature conservation and they take into account the useful role of wisely managed predator populations in the ecosystem. They wish to preserve the wolf as a fur species and as an object of battue-hunting which is also of importance.

The state of the wolf population which is considered to be optimum is the one reached in the Baltic, Byelorussia, Ukraine and the Central regions of Russia. It is due to the presence in these territories of low population densities that a number of isolated local populations, centred on Byelorussia, will be defined. The task will be given to the hunting organizations to control and manage the populations in these areas. To our mind, optimum population indexes for these territories, based on normal wolf productivity, should be first worked out on a scientific basis before such arrangements are made with the organizations.

In the North-west and the northern parts of the Central and Ural regions, which are on the whole abundantly populated by wolves, the existing elimination pressure will be continued for the next few years. It will probably result in reduction of wolf range, and in the isolation of distinct wolf populations by the end of the present decade. Probably the necessity to preserve large local wolf populations will appear later on. In the case of the tundra subspecies, the numbers of which have been greatly reduced by means of aerial hunting in the north of the European part of the country, some urgent measures are seemingly required to arrive at a reliable estimation of numbers and to evolve means of preserving this wolf from complete extinction.

In the South-east of Russia, the Volga region and the steppe and forest-steppe, wolf populations and range are greatly reduced. Control is, in this case, the most reasonable way of eliminating the wolf

completely from cattle-breeding areas. The problem of preserving a few local wolf populations in forest areas along the Middle Volga and the South Urals, each of which extends over about 30,000 to 50,000 km<sup>2</sup>, remains to be discussed.

As already mentioned, wolf numbers still need further control. Based on censuses and a thorough study of the wolf's role in ecosystems, we should present scientific justification for a different approach towards the wolf in each of the Caucasian Republics or in their various separate sectors.

The wolf has, on the whole, always been treated as a pest animal. This is quite understandable considering both the scientific data and the real damage caused by its predations to this day. As might therefore be expected, the investigations of many Soviet scientists concerned primarily with ecological problems have been generally directed towards the improvement of predator control methodology. The damage done by wolves was also the reason for the development of social attitudes towards them. There are, however, far too little scientific data on the selective impact of the wolf on ungulate populations. Accordingly, much fundamental research is now being organized in the USSR to obtain a better understanding of the part played by the wolf in the ecosystems.

The main direction of the work on wolves comprises:-

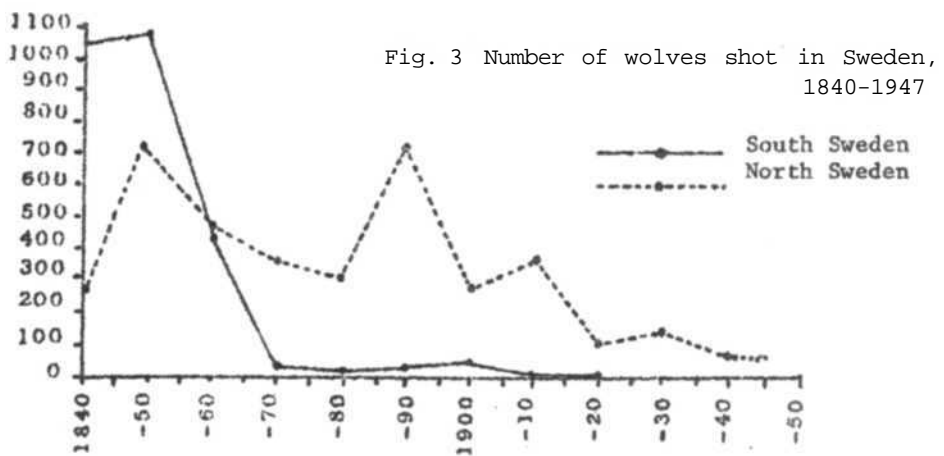
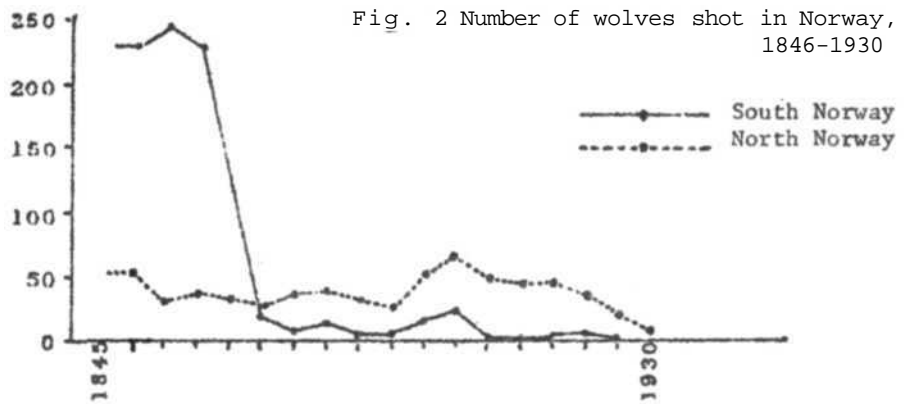
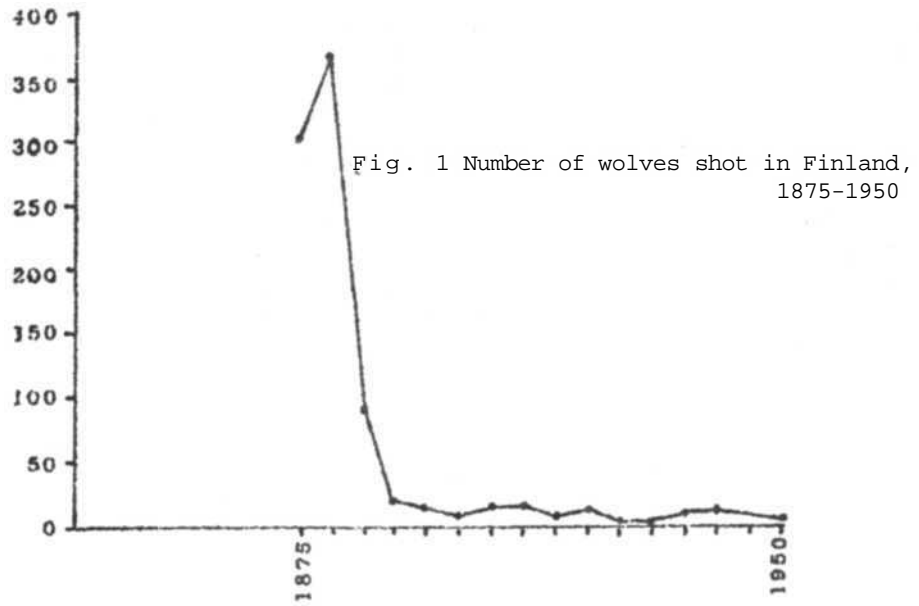
1. Improvement of the organization for making censuses and collecting data generally; preparing maps of wolf distribution on the basis of data on wolf population dynamics;
2. Organization of stations for the study of wolf ecology at different population levels and in different landscapes. This will include investigations on establishing indicators of the optimum correlation in predator-prey complexes (for instance, the wolf and the reindeer in the tundra; the wolf and the elk or wild boar in the forest zone; the wolf and the saiga in the desert);
3. Division of the territory of the country into districts, which take proper account of the economic activities of man and damage done to cattle-breeding by the wolf. The purpose of this will be to identify the areas in which the wolf should be preserved, and those in which it should be controlled or eliminated.
4. Establishment of a basis for recommendations on the management of wolf populations in various regions of the USSR.

In the organization and implementation of these programs, means of coordinating the activities of the various different Institutions, Departments and Union Republics involved should be developed. In addition the network of Reserves which have been established should be used for the purposes of the research.



In this connection, I should add a remark about the status of wolves in the Reserves since the War. During the period when predator numbers exploded, wolves were under intensive control in the Reserves also. But it has become clear that, at the present time, control is justifiable only in certain Reserves. What should now be the aim of research work is to establish the optimal numbers of both predators and prey.

It may also be added that, under existing conditions, it is very difficult to solve wolf conservation problems at game farms. There are many convinced wolf haters, anti-wolf people, among hunters and specialists. We think that wolf control in game farms should depend on the result of the research on the wolf which will now be undertaken.



Wolf Specialists  
First Meeting  
Paper A.3

THE WOLF IN FENNOSCANDIA

Bertil Haglund  
Bergavagen 1, 184 00 Akersberga,  
Sweden

Fennoscandia is defined here as Finland, Norway and Sweden. Because similar conditions have prevailed and still prevail in the three countries with regard to the situation concerning the preservation of the wolf, all three will be dealt with in the following account. Papers have been published previously on the wolf in the three countries by Haglund (1968), Myrberget (1969), and Pullainen (1965).

THE DECIMATION OF WOLF POPULATIONS

There is no reason to dive too deeply into the history of the wolf in Fennoscandia, which, from the wolf's point of view, must be regarded as tragic. However, there are some aspects of interest. One of these is the exceptional efficiency with which the plentiful wolf populations were decimated in the three countries at roughly the same time during the last century (Figures 1 to 4). The species was then forced to withdraw to the remote wilderness, often to the mountains or to tundra-like territory, where it depended for its food almost entirely on the Lapps' reindeer herds.

An example of the decline of the wolf from Sweden:

	<u>Southern Sweden</u>	<u>Reindeer herding areas</u> (Norbotten, Vasterbotten, Jamtland)
Average number killed per year during the period 1856-1860	86	88 wolves
Fifteen years later, 1871-1875	1	45 wolves

During the same period of time, the number of wolves killed in Norway declined from 290 - at that time the country experienced a "wolf period" - down to about 40. Contrary to the situation in earlier times, most of this number were killed in the northern part of the country. Norway was the first country to almost completely exterminate the wolf.

In the area of Hammastunturi (south-west of the Lake Inari and not far from the Norwegian border), far in the north of Finnish Lapland, there are about two or three wolves. Along the eastern frontier there are about ten wolves that cross the frontier into the USSR often, perhaps daily. Only one or two wolves have been observed in south-eastern Finland. In addition, there may be some wandering wolves still living in central Finland. Thus the total number of wolves in the country is about 15. According to kill statistics, there is a preponderance of males in the sparse wolf population in the eastern frontier area.

#### PROTECTION SITUATION

The wolf has been accorded total protection in Sweden since December 1965 and in Norway since 1971. Owners of domestic animals have the right to defend their property against attacks by wolves. However, from the time that protection was extended, the paying of bounties for wolf-killing was discontinued. Compensation is paid in Sweden and in Norway for domestic animals, including, of course, reindeer which are killed by wolves.

The wolf is still unprotected in Finland. It can be shot or killed anywhere in the country, even in the national parks. The government pays a bounty (55 FMK) from the national treasury. A township in Finnish Lapland paid 2000 FMK (500 dollars) for the carcass of a wolf that had been killed. According to proposed plans, the wolf will within the near future be protected outside the reindeer-herding area (and, in fact, since the Spring of 1974, it has been protected everywhere to the south of the Finnish Lapland border). The government compensates the owners in full for losses of domestic animals (cattle, etc.) and reindeer killed by large predators. However, the government does not yet pay compensation for reindeer that are killed by wolves, unless the remains are found.

If the wolf is to be reestablished in Fennoscandia, we must in all probability carry out a reintroduction program. But in order to do this, we need the permission of the authorities and the assent of public opinion and, particularly, of the population in the areas where the wolves are to be reintroduced. We, who are gathered here, know that the wolf is a highly developed animal, perhaps one of those animals that best fit into nature's scheme of things. We think that it has a place even though it sometimes interferes with the way mankind exploits nature. But I am not certain that the decision-makers and the people who could be troubled by the wolves have the same opinion.

If we are to protect the large predatory animals, we must be sure that we can provide them with suitable food, including a suitable prey. We know that the wolf generally lives on populations of hoofed species, and that these constitute the chief food of wolves in most areas. The problem in Scandinavia as well as Finland is that the wolf has for a long time been living on animals owned by people. This is so, even

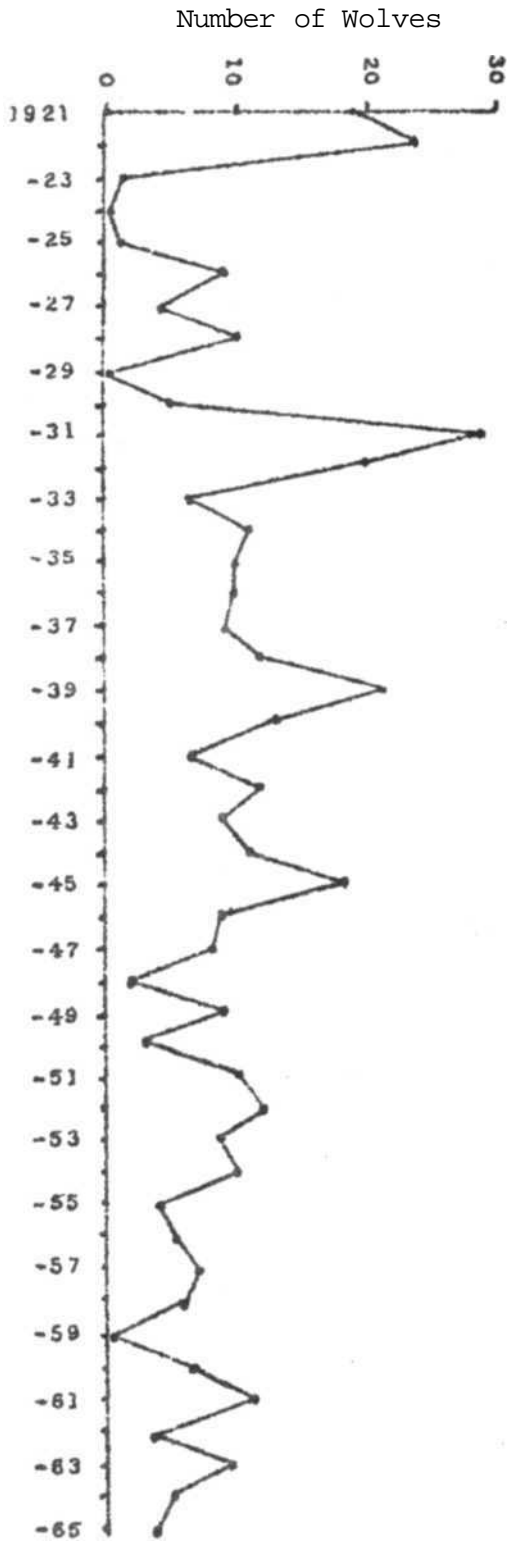


Fig. 4  
The Death-Battle of the Scandanavian WOLF (kill statistics from the province of  
Norrbotten 1921-1965)

today. The Lapps own 200,000 "tame" reindeer that graze in northern Sweden, and of which perhaps a few thousand fall prey to large predatory animals each year. In Norway, there are two million sheep that run free in the mountains during the summer, that is for half the year, a considerable number of "tame" reindeer, and also a significant population of wild reindeer. Reindeer herding is carried on intensively in northern Finland, and to a greater extent than in Sweden.

Referring only to Sweden, I must say that I consider the possibilities of our being allowed to carry out a re-introduction in the areas where "tame" reindeer are of economic importance are limited at present. In other parts of the country, on the other hand, the wolves must live on moose, which are in good supply in both Sweden and Norway. The moose is a big animal but the wolves have no choice. I assume that they would adapt even if there were problems involved in getting young introduced wolves to learn to hunt moose. Roe deer are also found in the tracts in question, but I have strong doubts about the ability of the animal to survive in winters of deep snow under pressure applied by the wolves. We have no other wild species of deer in the areas where re-introductions might be undertaken.

It is probable that a proposal concerning the re-introduction of wolves in Sweden and Norway will meet strong opposition from many of the people who live in the affected areas. I presume, however, that the wolf would only have to be found a home in true wilderness areas, where it would be a shy and rarely seen link in a natural ecosystem, with a natural prey-fauna at its disposal.

Considerable pressure, however, is presently being applied in Sweden and Norway for the saving of our large predatory animals, including the wolf. Authorities have, through the extension of total protection, sanctioned the idea. Environment and nature are topics of current interest in the Nordic countries, and activities on behalf of wolves will certainly receive support from many quarters.

As far as I know, there is a very strong popular opinion against wolves in eastern Finland and Lapland. In contrast, the general opinion in southern Finland is slowly changing in favour of the wolves.

The Nordic group that has been formed (with headquarters in Sweden) for the protection and preservation of the wolf, is anticipating extraordinarily intricate and difficult problems, but it is also looking forward to an interesting task. Director Segnestam will later describe how far we have come in the program. Let me just say that information, education and research are of great importance, in that they are the primary means of increasing the possibilities of our retaining this, in many ways so charming and talented, animal within the boundaries of Fennoscandia.

The decimation of wolves in Finland came a couple of decades later, but it was carried out with the same degree of effectiveness. In one decade the kill went down from about 400 to around 20 animals.

In all the three countries there were reasons for this attempt to exterminate the wolf. At that time, there were great numbers of horses, cattle, goats and sheep grazing freely in the forests. The wolves must have exerted considerable pressure. It soon became apparent that the only "protection" that could save the wolf from the hate of mankind was that which the wilderness and its inaccessibility could provide.

The remaining part of the story of the wolf on the road to extinction is also interesting. How has the sparse wolf population that was left in northern Scandinavia been able to survive for such a long time with such a small population base? It would probably have survived even today if the snowscooter had not come in as the deciding factor - and this in spite of the very high bounties and the continual persecution.

The statistics for the wolf kill in the province of Norbotten provide the basis for estimates of the size of the population in recent decades. This is Sweden's northernmost province, the one where almost all of the Swedish wolf population has lived during the last thirty-five years. We can say the last stronghold of the wolf. The kill statistics are probably generally correct, since the bounties were high and since killing a wolf always were seen as something of an achievement. The curve (Fig. 4) that I call "The Swedish Wolf's Death-Battle", portrays practically the entire Swedish kill of wolves since 1940. Since the Norwegian kill during the same time was very low, only six wolves have been killed since 1960, the trend in the curve can be seen as representing the Scandinavian kill.

The Norbotten figures show that a yearly kill of between two and twelve animals, an average of about eight, has been able to hold the population down, and has even brought it to the edge of extinction. It is probable that the number of wolves in Norway and Sweden during these years hardly ever exceeded, let us say, 40 animals, and that the number of litters which survived can never have been greater than two or three. Three different attempts to estimate the size of the wolf population, in the years 1945, 1957 and 1965, resulted in the figures of 18, 35 and 10 animals. Then came protection. The last two estimates were probably somewhat overestimated. Actually, the wolves have been so closely observed and reported on that the occurrence of real packs, which indicate litters, is practically always noted. And this small population of wolves has been spread over an area of 50,000 km<sup>2</sup>. It can be considered a biological wonder that the species was able to survive for so long a time (30-40 years). However, other examples of the wolf's capacity to survive in very weak populations have been reported from various parts of the world.

I have only briefly referred to the wolf in Finland. Each year a number of wolves undoubtedly migrated from the USSR to Finland, across the long, continuous boundary with the Soviet Union. For a time this

gave Finland a source of 'immigrant' wolves. At present, this border is carefully patrolled so the number of predatory animals crossing in the winter is known. The immigration has probably had little or no influence on wolf populations in Norway or Sweden because it either took place too far to the south or the wolves were soon killed in the reindeer ranges.

Migration of wolves from Finland to Sweden can, of course, occur, and has in all probability occurred in the past, but to a very limited extent. In Sweden it has often been possible to follow closely the movements of individual wolves, wolf pairs and wolf groups in the mountain areas. However, there have been very few reports of wolves crossing the border from and to Finland. On the other hand, there are many known cases of movement between Norway and Sweden.

#### PRESENT NUMBERS OF WOLVES

Today there are only a few scattered individuals in Norway and Sweden. In the last two years, only tracks of individual wolves have been observed, and they are widely spread over the whole of the Scandinavian peninsula. During the most recent winter and spring (1972-73) two or possibly three different wolves have been sighted. The total number of wolves in the two countries can hardly exceed half a dozen. In November 1973 near Jokkmokk (Norrbotten, Sweden) two wolves, assumed to have come from Finland, were sighted chasing and killing some reindeer.

The last wolf litter born in Sweden probably saw the light of day in the early summer of 1964. The litter was almost completely exterminated during the following winter. It is probable that the members of a wolf pack of eight or nine animals that appeared in the Karesuando areas of the north-westernmost corner of Sweden in November, 1962, were born in Norway, if so, it would be the last litter born there. The pack included some pups born the same year. Some of these were shot later in Norway.

In Finland, the last den of the species was found in 1963. In 1969, wolf pups were killed in Kuhmo, Kainuu. The home den might have been either in Finland or in the USSR. In the winter of 1972/73, two wolf pups born during the spring of 1972 were killed near the boundary between Finland and the USSR in Northern Karelia, having just come from the USSR.

In Finland in the winter of 1972/1973, a number of wolves wandered into the southern provinces of Häme and Uusimaa and into the province of Central Finland. They were all killed, with the possible exception of one. Wolves were also seen in the province of Northern Savo. They were driven back and nearly all of them were killed but at least two survived. In 1972/1973 a total of about ten wolves were killed in Finland. In the hunting of wolves, all possible methods (for example, pursuit by snowscooters and cars), including some that are prohibited, were used.



REFERENCES

Haglund, B. 1968. De Stora rovdjurens vintervanor II. Viltrevy 5(6): 213-361.

Myrberget, S. 1969. Den Norske bestand av ulv. Meddelelser Fra Statens Viltundersokelser, Series 2, No. 32.

Pullainen, E. 1965. Studies of the Wolf in Finland. Annal. Zoolog. Fenn. 2: 215-259

Wolf Specialists  
First Meeting  
Paper A.4

#### THE WOLF IN POLAND

Piotr Suminski  
Instytut Badawczy Lesnictwa,  
ul. Wery Kostrzewy 3, Warszawa 22, Poland.

As in other countries in which they occurred, wolves in Poland had the reputation of being terrible, blood-thirsty predators, dangerous to all living creatures, including man. Lack of understanding of the role of predators in biocoenoses, lack of knowledge of their biology and ecology and wild fanciful stories, widely accepted as truth by both peasants and educated people, all contributed to their bad reputation.

Only recently, as other species of animals which are much more dangerous to humans began to be protected against extinction, have human attitudes toward the wolf begun to change. However, the wolf was not as rigorously persecuted in Poland as in some other countries. For example, during the latter part of the last century Germany initiated a campaign which resulted in the extermination of the large predators. However, Poland, which also had a very strong hunting tradition, did not adopt the idea, so wolves have persisted for a much longer time than they did in Germany,

Hunters were the people who were mainly interested in wolves in Poland. As a result of their work, wolf biology has been known in a general way; however, as far as I know, no scientific research on the wolf has been conducted in Poland up until now.

#### HISTORY OF WOLVES

Wolves inhabited the whole of Poland within historical times. They were most abundant in the eastern provinces which had the greatest proportion of land under forest.

In the period between the two World Wars the wolf was classified as a game animal, although there was no closed season. Hunting was mostly restricted to winter. It was usually done by shooting over baits or by a system in which beaters drove the wolves into an area which was encircled by red flags hung on ropes. This kind of hunting was usually restricted to winter.

Estimates of the number of wolves were only made on State Forests, which comprised about 30% of all the forests of the country. Numbers

were not high and wolves occurred mainly in the north-eastern, eastern and south-eastern regions of Poland, some of which are now part of the USSR.

During and shortly after World War II, the numbers of wolves increased strongly. They spread over almost the entire area of the country. In 1955, the wolf was removed from the list of game animals. People were encouraged to kill them by every available means. This included firearms, poison and traps. A bounty system was established and 500 to 1500 zlotys were paid for each wolf killed. Wolf Control Officers were named for all provinces. Their duties included the organization of hunting and poisoning and the certification of animals that had been killed, so that the bounty money could be paid. One province still has a Wolf Control Officer. The other posts were discontinued as the wolf population declined.

The bounty system requires the presentation of the skull and the pelt, however since there are no definite criteria for positive identification of a wolf from that of a big dog, there is no certainty that some of the animals killed are not large dogs.

#### DATA ON WOLF BIOLOGY AND ECOLOGY

The nominate subspecies of the wolf, Canis lupus lupus Linnaeus, was taken in 1758 in Poland. Before the last war, hunters believed that there were two subspecies in the country. The 'horse' wolf inhabited mountainous areas and was less abundant, bigger and lighter in colour than the 'sheep' wolf which was considered to be the common wolf of Poland.

I believe that the following to be the principal prey of the wolf in Poland: Cervus elaphus, Capreolus capreolus, Sus scrofa and Lepus europaeus. I believe that, as has been shown for other areas, they also take some small mammals and birds. Sheep and geese are the principal domestic animals taken. There are no post-war records of wolves attacking cattle or horses. In winter some dogs are killed - even when they are tied near houses. There is one recent record of an attack on a human but the wolf was suffering from rabies.

The average number of wolf cubs per litter, estimated on the basis of embryos and of young found in dens, was 5.1. Wolves occur in definite regions, often considered to be territories, and mostly in packs of 2-6 animals. Less frequently packs of 8-11 are observed. These are usually considered to be comprised of a single or double family unit.

The high reproductive potential of wolves is evidenced by the fact that in spite of persistent persecution for the past 18 years, wolves have still managed to survive.



Fig. 1 : The Occurrence of Wolves in Poland from 1954-1963



Fig. 2: The Occurrence of Wolves in Poland from 1964-1972

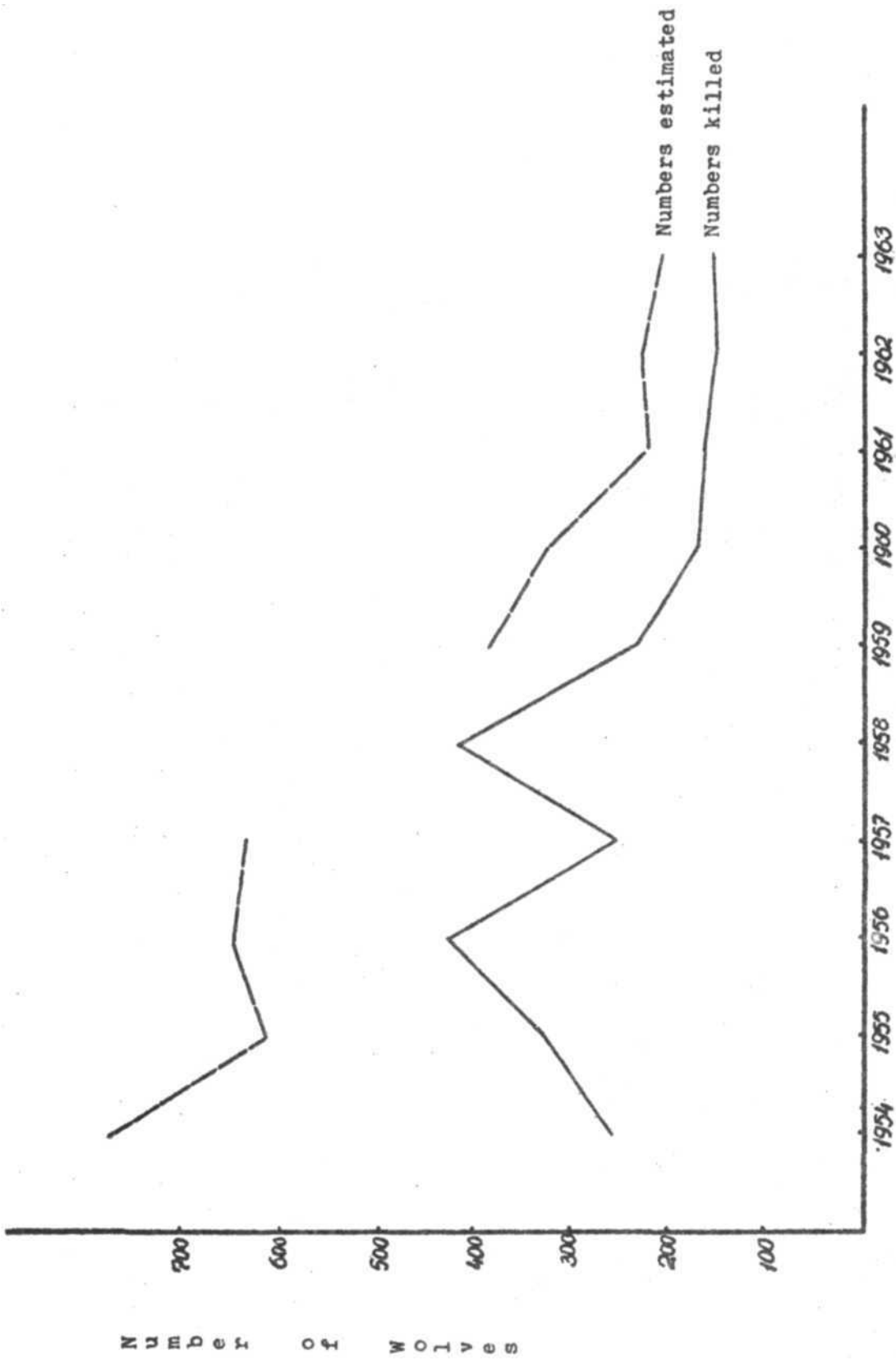


Fig. 3: Estimated Population and Kill of Wolves from 1954 to 1963

## NUMBERS AND DISTRIBUTION

Since interest in the wolf has not been of a scientific nature, no reliable method of estimating numbers has been developed. The method currently used is based on counting tracks in the snow. It has many errors inherent in it, so the numbers which are cited can only be considered as approximations. However, they did serve a purpose for the Wolf Control Officers, who wanted an estimate of the maximum number of wolves in their areas.

Data are also available on the number of wolves which were killed, but these also may contain errors because some of the wolves submitted for bounty may have been raised in captivity, while others may have been stray dogs rather than wolves.

Information on both population and kill were obtained in part from the Wildlife Department of the General Board of State Forests and in part from Ing. W. Lipko, Head of the Wildlife Section, Ministry of Forestry and Woodworking Industries. Ing. Lipko collected them from county authorities. Data from the first source are incomplete, since they were not collected in a province after the termination of the post of Wolf Control Officer.

Poland is divided into 17 provinces and these, in turn, into several counties. The total area of the country is 31,378,000 hectares, approximately 25% of which is forested.

The data on the population and kill of wolves are divided into two periods, the first period extending from 1954 to 1963 and the second from 1964 to 30 March 1972. During the first period (Fig. 1) the cumulative totals for the two categories were 4,072 and 2,579 respectively. The highest population estimate was approximately 800 individuals in 1954, declining to approximately 225 in 1963. The kill ranged from two peaks of approximately 425 animals, in 1956 and 1958, and declined to just under 200 from 1960 to 1963.

In the second period (Fig. 2), no wolves were recorded during the first six years in Gpole Province and no more than six recorded or killed in Gdansk, Katowice, Łódz, Poznan, Szczecin, Wroclaw and Zielona Gora. Because of the rarity of wolves in these provinces, I have assumed that the animals recorded were transients and, in the Map, the provinces concerned are left blank.

During the second period the cumulative totals were 1,153 and 737 for the population and kill respectively. The maximum number recorded was 196 in 1967, and the number declined to 58 in 1972. The numbers killed ranged from 108 to 118 during the first half of the period. It had declined to 59 in 1971, the last year for which data were available.

In Fig. 3 estimated total numbers of wolves and the number killed in the first period are illustrated in Graph form, and the same figures for the second period are presented in tabular form in Table I.

TABLE 1: Estimated Nunfcers and Kill of Wolves in Poland - 1964 to 1972

Province	1964 No. Kill	1965 No. Kill	1966 No. Kill	1967 No. Kill	1968 No. Kill	1969 No. Kill	1970 No. Kill	1971 No. Kill	1972 No. Kill					
Bialystok	14	23	32	23	7	7	12	6	26	9				
Koszalin					3	2			5	2				
Krakow	15	19	12	16	13	14		7						
Lublin	10	18	22	74	68	22	9		18					
Olsztyn		9		16	15	9			5	2				
Rzeszów	74	84	94	67	69	54	44	42	39	31	45	26		
Comparative totals (other sources):-														
Source 1*	113	147	160	196	150	121	60	94			58			
Source 2**	114	108	171	113	116	110	93	123	87	100	57	127	59	58

\* General Board of State Forests

\*\* Ministry of Forestry and Woodworking Industries



#### LOCATION OF WOLF SPECIMENS

Since there is an increasing demand for wolf specimens for scientific studies it may be useful to list the locations of specimens in Poland:

The Forest and Wood Museum at Rogow near Skierniewice has one stuffed female wolf (1,954), one male cub (1955) and a skull of a female (1965).

The Museum of the Forestry Faculty, Agricultural University, Warsaw, has one entire male (1954), 1 male cub (1955) and 6 animals of unknown sex, collected since World War II.

The Institute of Mammal Research, Polish Academy of Sciences, Bialowieza, has the following: with complete data, 37 male and 23 female skulls; without data on sex, 11 skulls; and about 100 skulls, all known to have been collected since World War II, but with no other data.

The Zoological Museum, Polish Academy of Sciences, Krakow, has 1 stuffed individual with no data; 2 pelts and skulls with data (1887); and two skulls and 1 skeleton of unknown origin (1962).

The Higher Agricultural College in Krakow has one male (1963).

The Museum of the Jagiellonian University has 2 adults and 1 juvenile (1859) and 1 skull of unknown origin.

The Museum of the Polish Hunters Association, Warsaw, has 1 whole male and 1 juvenile female (1958).

In addition, many pelts and skulls are owned by private hunters. Information on these could be obtained by advertising in hunters' magazines.

#### CONCLUSIONS AND RECOMMENDATIONS

It is evident that the wolf in Poland has been almost exterminated. It is now time to protect the species for at least 2-3 years. When it is no longer in danger of extinction it should again be classified as a game animal with a closed season during the period when the young are being raised. I have made such a suggestion on several other occasions (Suminski, 1962, 1965, 1969, 1970 and 1971).

It would seem to be feasible to tolerate the presence of wolves in the following provinces: Bialystok, Koszalin, Krakow, Lublin, Rzeszow and Warszawa. Their numbers could be easily controlled by a planned harvest which was taken by hunters.

REFERENCES

- Suminski, P. 1962. Proba ustalenia hierarchii nisz siedliskowch naszvch krajowych drapieżnikow - Carnivora. (Tentative determination of the hierarchy of the site niches of our native predators). Carnivora/Przeegl. zool. 6(1): 55-65
- Suminski, P. 1965. Ssaki drapieżne w Polsce, ich znaczenie i przyszłość. (Predatory mammals in Poland, their importance and future). Chronmy Przvr. ojcz. 4: 14-27.
- Suminski, P. 1969. Wilk czy Pies? /czy można odróżnić czaszki wilka od czaszki psa/. (Wolf or dog? - or whether one can tell wolf skulls from dog skulls). Low. Polski 20: 12.
- Suminski, P. 1970. Jeszcze raz w obronie wilka. (More about the protection of the wolf). Chronmy Przvr. ojcz. 5: 59-61.
- Suminski, P. 1971. Die Auswertung der Wolfs - und Wilkatzenschadel in Konfrontation mit der Wissenschaft. (International Scientific Conference on the World Exhibition of Hunting in Budapest.)

Wolf Specialists  
First Meeting  
Paper A.5

#### WOLVES IN YUGOSLAVIA

With Special Reference to the Period From 1945 to 1973

Dušan Bojović  
Institute for Forestry and Wood Industry, Belgrade  
and  
Dušan Colić  
Institute for Nature Conservation, Belgrade

In terms of biogeographic features, Yugoslavia belongs to the Holarctic Kingdom. Three sub-kingdoms join and are represented in the country. They are the Mediterranean-European, Irano-Turanic and the Arctomountain. The Mediterranean-European is the largest and most complex. It contains areas which are characteristic of more than one biogeographic province or sub-province. The result is that the country is characterized, to a substantial degree, by heterogenous ecological conditions and by complex and diversified flora and fauna. In fact, Yugoslavia has the most complex fauna of continental Europe. Some groups of animal species are particularly characteristic of certain provinces or sub-provinces. However, migration results in very interesting situations where species typical of a particular region occur in other regions where ecological conditions exist which are just within their range of tolerance. Some of these are particularly associated with food-chain relationships. These complexities apply especially to the ecological niche of the wolf in Yugoslavia.

#### THE DISTRIBUTION OF WOLVES IN YUGOSLAVIA

The wolf is particularly characteristic of the deciduous forest communities of the Balkan-Middle European sub-province, which comprises the largest part of the European province. Wolves are widespread in forested areas in Macedonia, Bosnia and Herzegovina, and in Croatia. It can also be seen from time to time in other parts of the country. Seasonal migrations to and from regions which are ecologically suitable are characteristic of the species. For example, high mountains are widely used in summer but the wolves usually migrate to lower elevations in winter.

The range map (Fig. 1) shows that there is a broad area which is permanently populated by a low-density population of wolves and a smaller area of higher density. There are no reliable population data so the map has been based on the kill of wolves between 1954 and 1972.

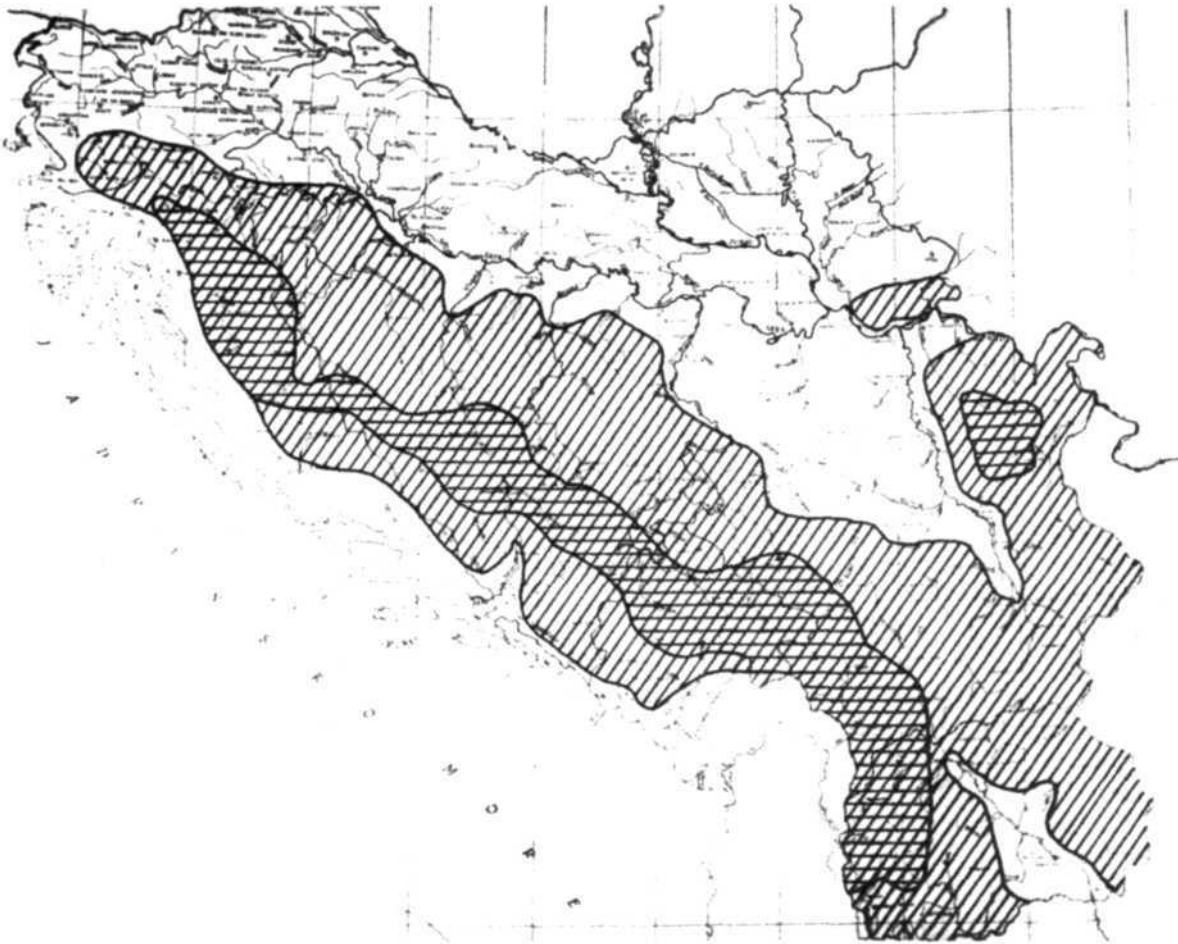


Figure 1. The Distribution of Wolves in Yugoslavia.

The dark, or cross-hatched, area represents a kill greater than 0.1 wolf per km<sup>2</sup>.

The light diagonal lines represent a kill less than 0.1 wolf per km<sup>2</sup>.

There are no established wolf populations in the rest of the country.

The area of higher density is represented by a kill greater than 0.1 wolf per km<sup>2</sup>; the low density area is less than 0.1 wolf per km<sup>2</sup>. The unmarked areas fall outside normal wolf range, but wolves do sometimes occur in this region, particularly, of course, close to the borders of the occupied range. In the north, near the frontier with Hungary, Austria and Italy wolves have not occurred for a few decades. In addition, there are no wolves in the narrow littoral nor on the islands along the Adriatic Sea. This area is occupied by the Jackal (Canis aureus L.), which is common in the south of Macedonia.

Finally, we should mention the micro- and macro-migrations of wolves in the border regions between Yugoslavia, Bulgaria, Greece and Albania. These are normal occurrences since these areas are within the occupied wolf range. A slightly different situation exists on the border with Rumania. It is the only part separated from the central range of the Yugoslav wolf. The emigration of wolves to this area from Rumania occurred mainly during World War II.

#### DATA ON WOLF POPULATIONS FROM 1945 TO 1972

Because of the lack of reliable population data, we have again used an indirect indicator, the number of wolves killed in the various Republics (Figs. 2-10 and Table I). These data are quite reliable, since they are based on the number of wolves for which bounty payments were made. A specially appointed professional commission was responsible for the identification and marking of the wolf pelts which were presented by applicants for bounty. This made it impossible for them to be presented more than once.

The payment of a bounty started in different Republics at different times; however, data do exist for all Republics from 1954. The data show a distinct variation in the numbers of wolves killed in 1969 and 1970. This phenomenon was particularly evident in the central part of the range in Croatia and to a lesser extent in Bosnia and Herzegovina. The very large increase in the kill in Croatia (from 237 in 1968 to 1303 and 728 in 1969 and 1970 respectively) was not quite real; rather, it occurred as a result of an interesting human phenomenon.

The bounty paid for wolves is not the same in all Republics. At present it is 300 ND (approximately \$20 U.S.) in Bosnia and Herzegovina, 500 ND (approximately \$33) in Serbia and Macedonia and 1000 ND (approximately \$66) in Croatia and Slovinia. In 1968, when the number of wolves started to increase, the bounty in Bosnia and Herzegovina was raised to 200 ND, in Croatia to 1000 ND. The next year, at the peak of the increase, a great number of hunters from Bosnia and Herzegovina took their pelts to Croatia, where they received five times as much for them. The practice continued in 1970, but in 1971 the Commission in Croatia requested a certificate from hunters stating the origin of the pelt. At the same time, the bounty was increased to 500 ND in Bosnia and Herzegovina. At that price, the risk of transferring pelts to the other Republic was not worth taking and the practice ceased. The total kill

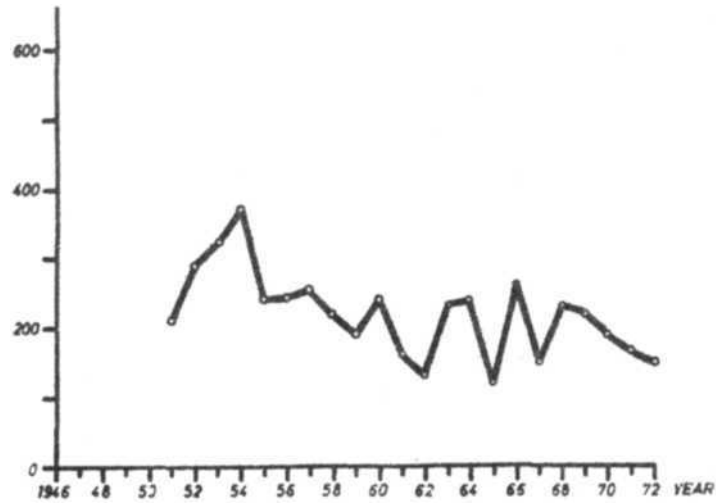


Figure 2. The Kill of Wolves in Macedonia, 1951-1972.

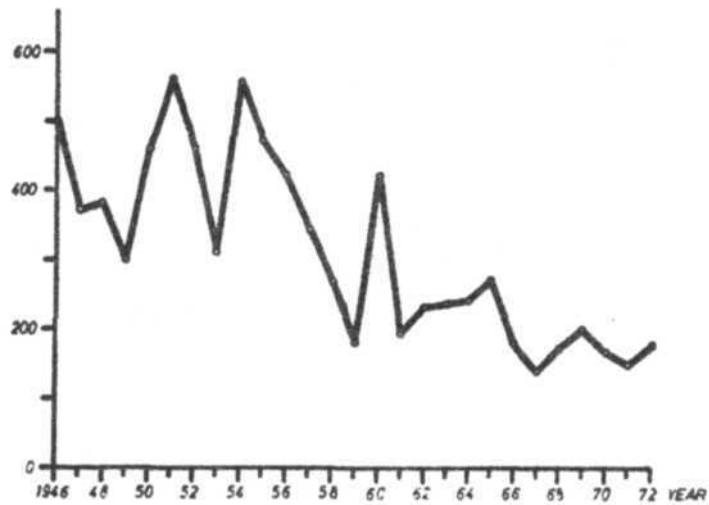


Figure 3. The Kill of Wolves in Bosnia and Herzegovina, 1946-1972

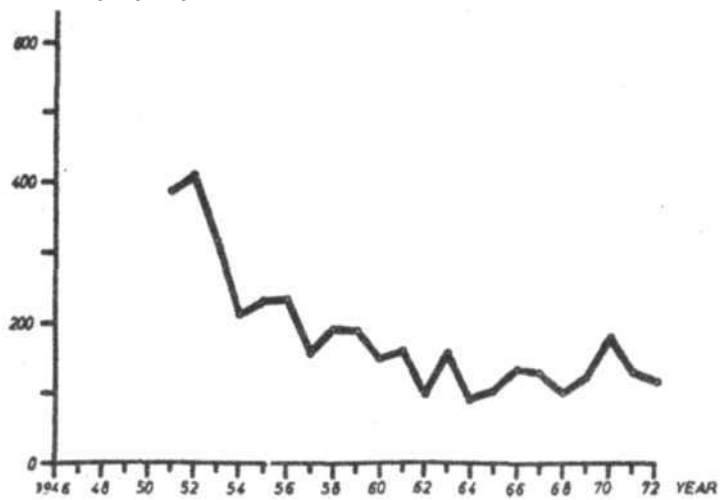


Figure 4. The Kill of Wolves in Serbia. 1951-1972

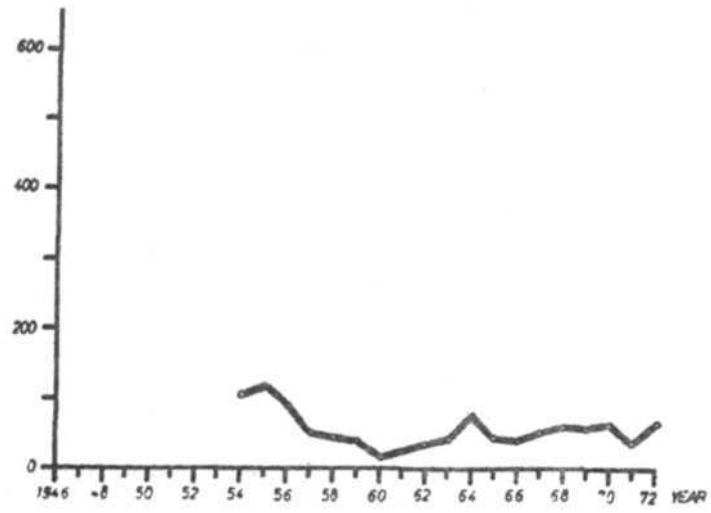


Figure 5. The Kill of Wolves in Montenegro, 1954-1972

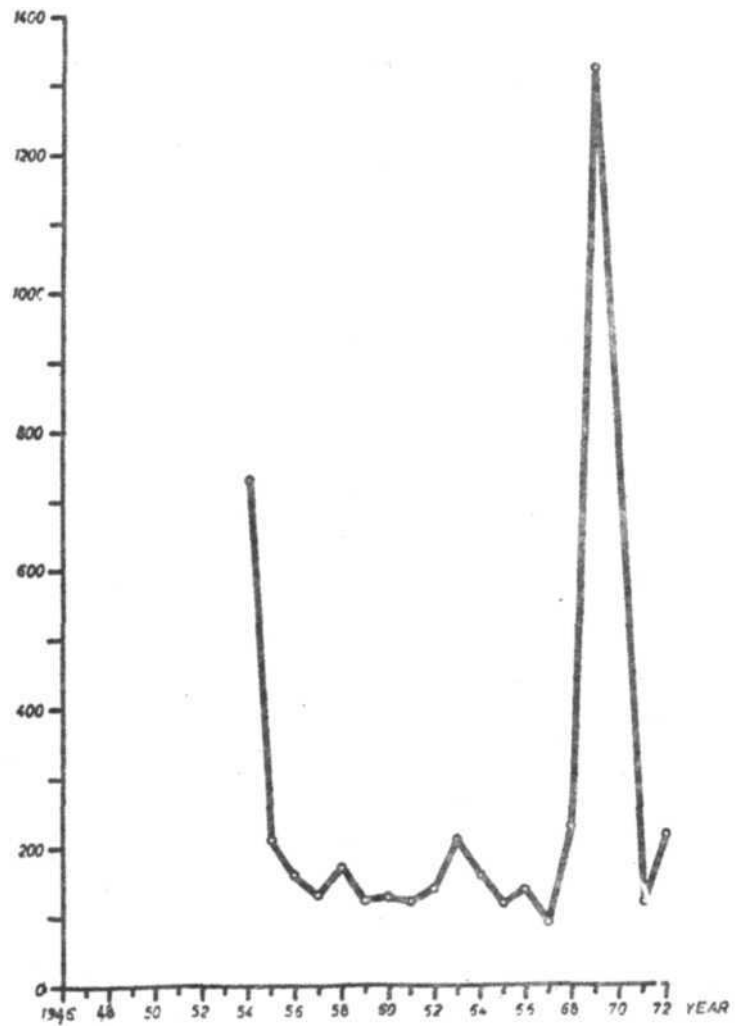


Figure 6. The Kill of Wolves in Croatia, 1954-1972

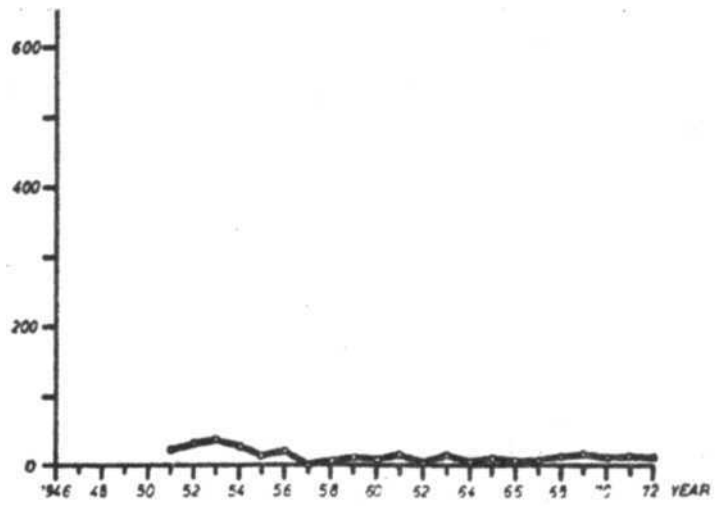


Figure 7. The Kill of Wolves in Slovenia, 1951-1972.

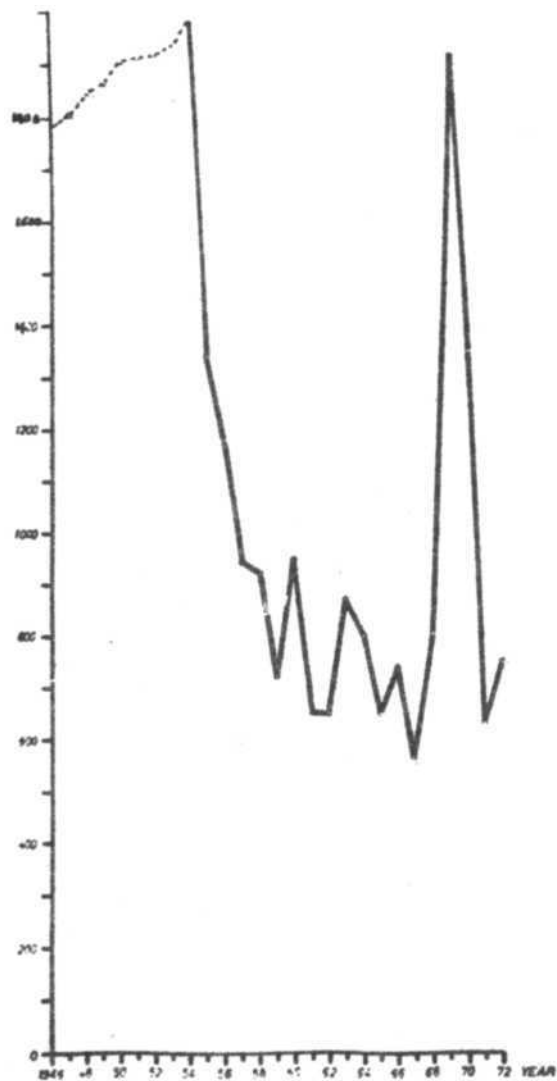


Figure 8. The Kill of Wolves in Yugoslavia, 1954-1972



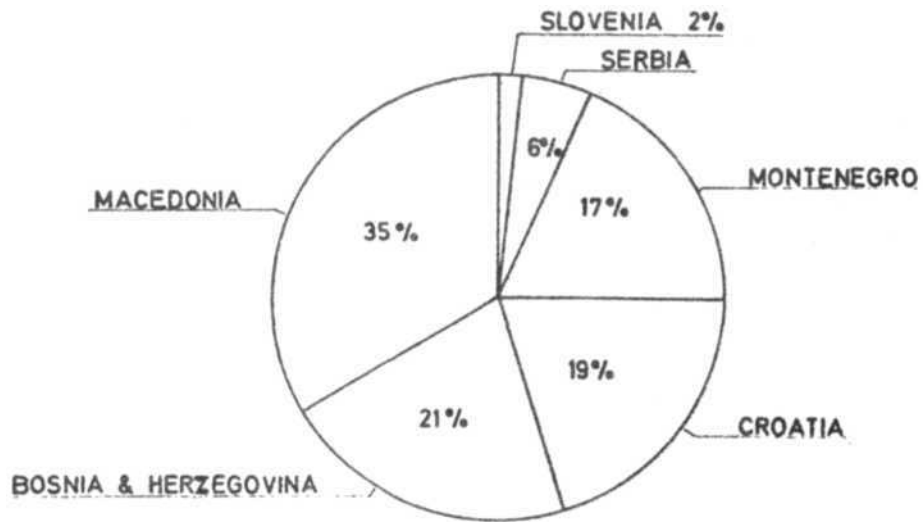


Figure 9. The Percentage Distribution of the Kill of Wolves in Yugoslavia, 1954-1972

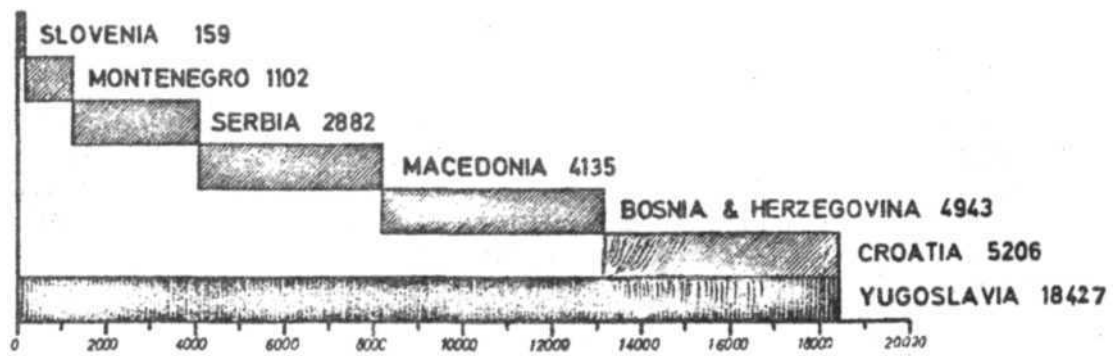


Figure 10. The Kill of Wolves in Yugoslavia by Republics

for the country was not affected by the practice. The population peak shows a more than 2-fold increase in 1969; there was a decline the following year and a return to kills of average proportion by 1971.

There is not very much data on wolf populations between 1944 and 1954. However, we know that wolves were much more numerous than before the war. This was evident in Slovenia where wolves had been rare for many decades. For a period of 10 years before the war only 20 wolves were killed and none at all in 1932 and 1936. However during the first 10 years after the war 169 were killed. One old saying of our people seems to be appropriate, it is: "The wolf is war's brother".

#### THE POLITICS OF WOLVES IN YUGOSLAVIA

In mountainous regions where cattle-raising is a strong tradition, there is a very strong feeling that the wolf is an extremely harmful creature. These feelings resulted in definite attitudes and approaches toward the species which were given official recognition.

The wolf was declared an 'outlaw' a 'wanted' animal, and a reward was posted for its pelt. The law demanded that the wolf should always be destroyed when it was encountered.

In recent years, devoted people from the nature protection service and professionals in the field of game management have worked to change public attitudes about predator-prey relationships, and also to influence the official approach. There is evidence that changes are occurring; consequently attitudes are also changing about the wolf.

This process of change has influenced both the theory and practice of game management, and even game legislation. This change is particularly important. For example, the poisoning of wolves, which was widely practised after the war, is becoming less and less popular. Although poisoning is not prohibited by law, traffic in poisons is prohibited in three of the six Republics. A law, which will come into effect this coming fall, will prohibit the use of poisons to kill wolves in Slovenia. A similar amendment to the law is also being made in Serbia. The same law will terminate the payment of a bounty for killing a wolf.

#### SUMMARY AND CONCLUSIONS

Before World War II the wolf population was maintained at a tolerable level in mountainous regions where intensive animal husbandry was practised. The population increased during the war but it was reduced by the killing of an average of 1000 wolves a year over a period of 20 years.

Now in two of six Republics poisoning is prohibited and the bounty system has been abolished. When similar legislation is introduced in the other Republics the survival of the wolf population in Yugoslavia will be ensured. This goal is stressed by the societies for the conservation of nature and by game biologists.

Table 1. The Kill of Wolves in Yugoslavia, 1946-1972

Year	Macedonia	Serbia	Bosnia & Herzegovina	Montenegro	Croatia	Slovenia	YUGO SLAVIA
1946			500				
1947			369				
1948			379				
1949			300				
1950			461				
1951	211	388	554			21	
1952	288	404	462			33	
1953	322	321	307			36	
1954	367	205	542	106	731	28	1979
1955	272	233	469	135	207	16	1332
1956	266	234	420	88	160	18	1186
1957	279	153	330	51	130	-	943
1958	253	187	270	45	169	4	928
1959	197	192	178	37	119	8	731
1960	240	151	415	17	125	8	956
1961	155	162	193	25	115	9	659
1962	133	102	224	33	136	3	631
1963	237	154	232	43	204	9	879
1964	245	38	229	82	151	2	797
1965	123	101	258	45	118	4	649
1966	253	134	174	40	140	3	744
1967	148	129	145	50	90	4	566
1968	226	95	170	61	237	7	796
1969	219	124	196	61	1303	10	1913
1970	195	181	171	70	728	9	1354
1971	173	135	151	36	123	9	627
1972	154	122	176	77	220	8	757
<u>1954-1972</u>							
Total	4135	2882	4943	1102	5206	159	18427



Figure 1. Wolves killed in the years 1945-1950.  
Each dot represents one wolf shot.

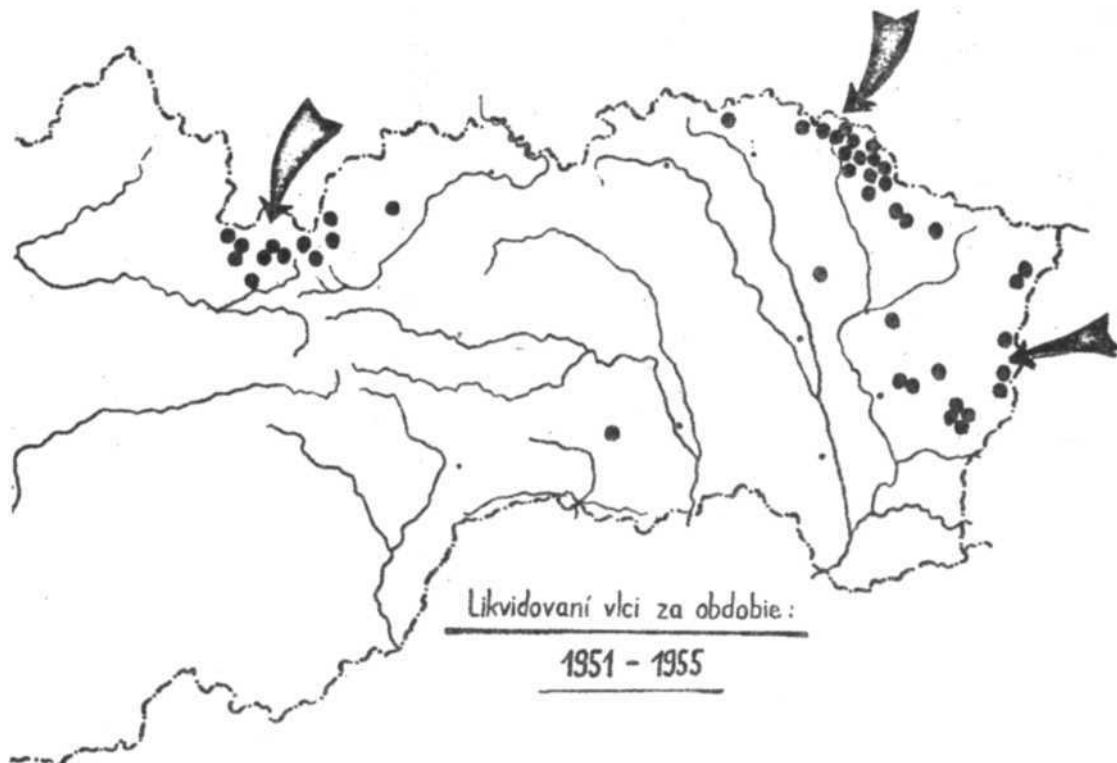


Figure 2. Wolves killed from 1951-1955.

Wolf Specialists  
First Meeting  
Paper A.6

#### STATUS, DISTRIBUTION AND PROBLEMS OF PROTECTING WOLVES IN SLOVAKIA

Slovak Institute for the Care of Monuments and Nature Conservation,  
Presov, Czechoslovakia.

The evolution of wolf populations, their numbers and occurrence during the last two centuries have been affected by several important human factors. The result is that Slovakia is virtually the western boundary of wolf range in the central portion of Europe, a situation which compels us to take special initiatives for their protection in our country. This responsibility is now being hesitatingly recognized, even by hunting organizations. Their recognition is partly the result of the increased interest in wolves as trophies at international game exhibitions. A Czechoslovakian wolf recently won a Grand Prize at the World Game Exhibition at Budapest.

#### WOLF POPULATIONS IN THE 20TH CENTURY

A detailed survey of the occurrences of wolves will provide a better understanding of 'wolf problems' and show why we are deeply concerned about the future of wolf populations in our country.

Wolves were formerly widespread in central Europe, including the whole of the Czechoslovak Socialist Republic. However, they have been exterminated in the Czech Republic for more than 100 years. But, owing to several biotic and abiotic factors, they are still members of the fauna of the Carpathian Mountains. Indeed, until the last half of the 19th century, the wolf inhabited all the areas of continuous forest in Slovakia. At that time intensive hunting and poisoning began. Consequently the species became restricted to isolated areas of range. It was completely exterminated in Bohemia and Moravia (where it is now represented only in heraldry) and in the western part of Slovakia. Individual wolves or small packs still entered the country from Poland or the USSR, but returned whence they came or were eliminated.

After World War I, the population increased and spread and occupied more mountainous areas, particularly in the north-eastern districts of Humenné, Medzilaborce, Svidnik, Bardejov and Poprad. In spite of the increase, the number of wolves killed was relatively low. After the end of the fighting in World War II, food conditions were excellent for wolves. This resulted in the spread of wolves and an increase in the population which had to be suppressed. This was achieved by the introduction of a high bounty for the killing of wolves. Eighty-three

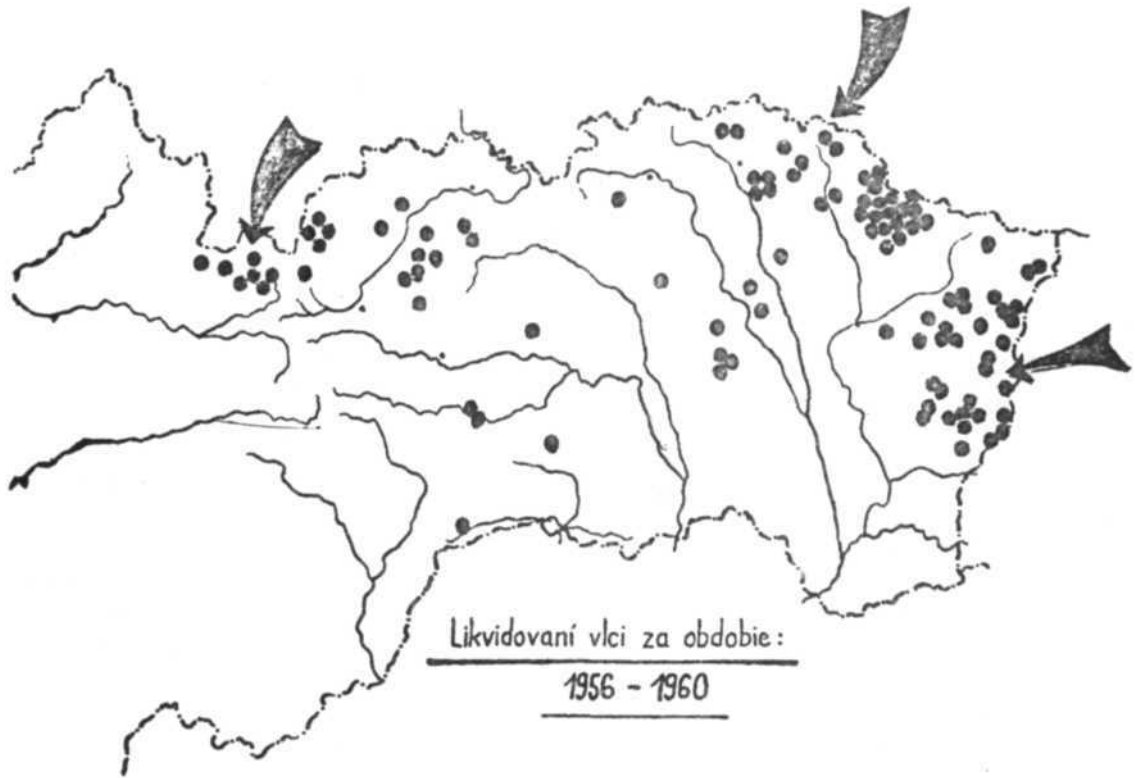


Figure 3. Wolves killed from 1956-1960.

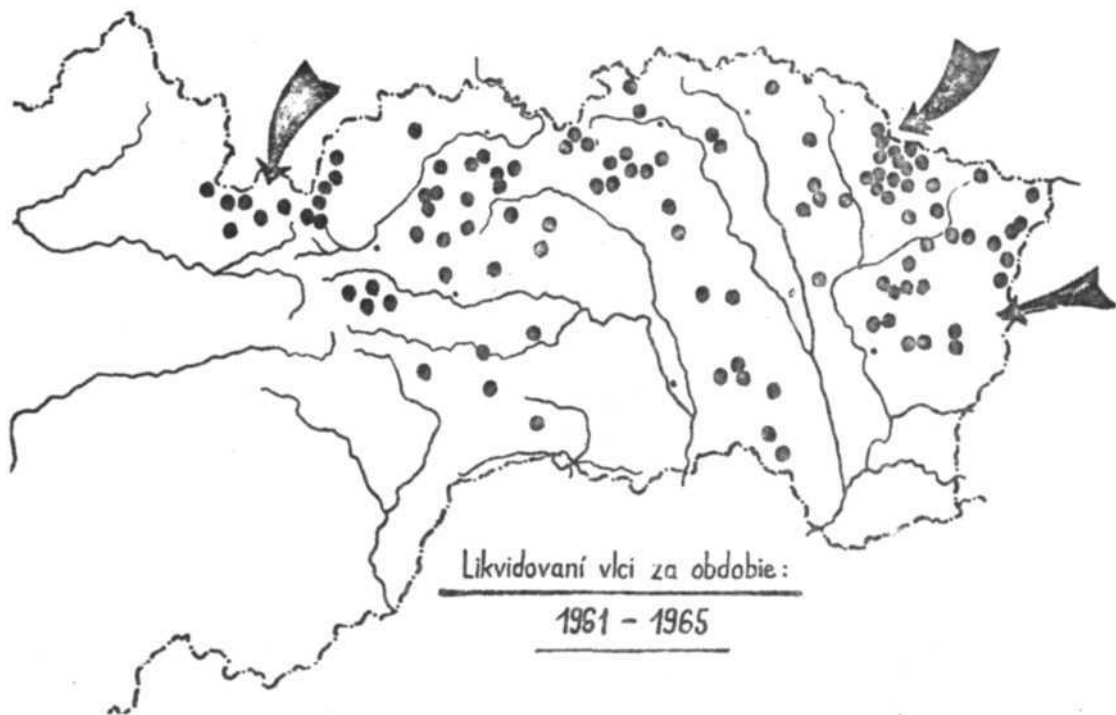


Figure 4. Wolves killed from 1961-1965.

wolves were killed in 1960-61 and the kill continued to be high throughout the decade. During these years, the central Slovakian wolf population was exterminated along the frontier with Poland. Similarly, the population in the south Slovakian Karst, the region of Silicka Planina along the boundary with Hungary, was exterminated. The last individuals were also shot in the Crava, the upper Hron Valley and in the Low Tatra mountains. The high kill, until 1970, quickly reduced the population.

The localities where wolves were reported to have been killed between 1945 and 1972 are shown on maps in Figures 1 to 8. On the first five maps the data are presented for five-year periods between 1945 and 1970. No data were obtained, however, for the second half of 1970. The last three maps show the entire kill of wolves for 1970 (40), 1971 (23) and 1972 (12).

According to our statistics, a total of 426 wolves were killed between the end of World War II and 1972. 66% were killed by individual hunters from hides or lookouts, 13.4% were killed in common hunts where dogs were used, 12.4% were poisoned with strychnine, 4.7% were caught in traps, 2% were young taken from dens and 1.5% were killed by all other means, including automobiles.

The data on the kill are not complete for the post war period prior to 1970, nevertheless they give an indication of proportionate changes in the population in terms of space and time. Although the distribution of the wolves killed is not a reliable method of determining the number of living animals, it at least allows us to make reasonably objective recommendations regarding hunting exploitation and protection in the future.

The sharp decline in the kill between 1970 and 1972 (for which complete data exists) is a warning and suggests that wolves are an endangered species in our country. The recent data are particularly impressive when the detailed maps are examined. One may see how in certain localities a complete family or a pack is exterminated and then no further wolves are killed in the area the next year.

Two other things provide evidence of a declining population: the percentage of young killed has decreased sharply showing that the production of young in our territory is falling off. Likewise we have ascertained that, in two families, all the young killed, some 4 or 5 specimens, were females.

Data on the size of the wolf population have also been collected periodically by hunting organizations which are located over much of the Republic. According to these statistics, the wolf population for the whole of Slovakia, including Tanap (the Tatra National Park) was 207 animals 1 October 1963 and 226 on 1 March 1966.

We do not believe that these statistics are very accurate because counts of the wolf are very difficult to make and are often subject to distortions. These distortions result in an overestimation of the

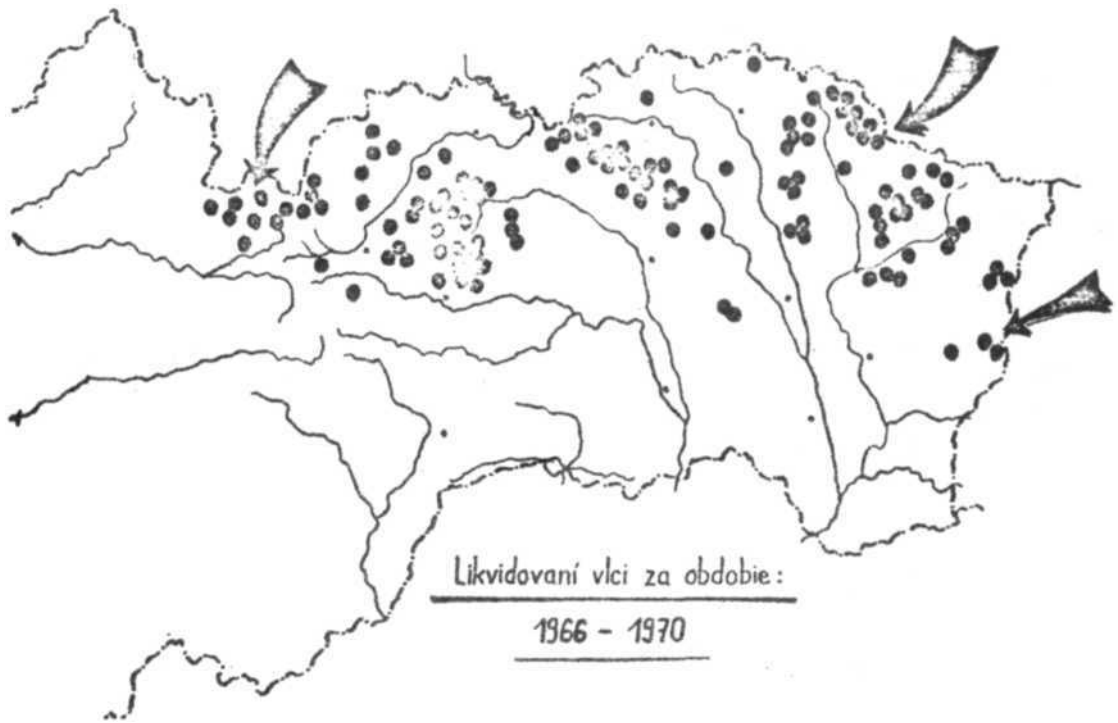


Figure 5. Wolves killed from 1966-1970.  
(no data for the last half of 1970)



Figure 6. Complete map of wolves killed during 1970.



population because several neighbouring hunting associations make reports of the same pack. An example will show the problem: the mean size of our hunting grounds is approximately 3,500 to 4,000 hectares. The Vilkova Hunting Association, near Presov, reported 20-25 wolves on its grounds in 1969 whereas the Tanap reported only 3-4 individuals on its entire territory. To conclude, we consider that it is difficult to get an accurate estimate of the numbers of wolves from either censuses or from the data on the kill. We consider that there must be less than 100 wolves still remaining in all of Slovakia.

#### CONTROL AND PROTECTION OF THE WOLF

The principal cause of the decrease of the wolf population is the division of game into useful and harmful categories. These have become established in legislation. The overall attitude towards hunting of game was based on this traditional division; therefore it is no wonder that the final effect, with the added effect of an increasing number of hunters, was unfavourable to the stocks of wolves in our territory. Another factor was the influence of the legends of wolves which have come down to the present day.

Purely economic considerations in the exploitation of hunting grounds stimulate hunters to eliminate or drastically diminish the influence of natural factors which impede the growth of stocks of 'useful' animals.

The expansion of wolf range after World War II brought it into many new hunting areas. For a time, not much concern was felt about the importance of the wolf as a predator of the Artiodactyla, especially deer. However, as a result of economic considerations the wolf became the subject of increased interest from the point of view of hunting economy, particularly in mountainous hunting grounds.

An attempt to stop the expansion and increase of the wolf population started in 1954, with the establishment of a bounty of 300-1000 kcs (about \$60-200). This was increased in 1959 to 2000 kcs for each wolf killed. Since the same bounty was paid for blind pups as for adult animals, there was an incentive to find dens with young. In one case a hunter received 18,000 kcs for a litter of 9 pups dug from a den. From 1970, the bounty was reduced to 1000 kcs for unweaned individuals, while 2000 kcs continued to be paid for adults. In 1973, the bounty was reduced to 500 kcs, regardless of age.

The declining trend of the Slovak wolf population in the last three years has caused the officers of the Nature Conservancy to insist on the abolition of the bounty for killing wolves. This should also be associated with more rigorous protection of wolves. The comparison of the size of the populations of bears and wolves also favours the arguments for wolf protection. The bear which is strictly protected throughout the year all over Slovakia has a population of 350-380 while the population of the wolf is less than 100 animals.

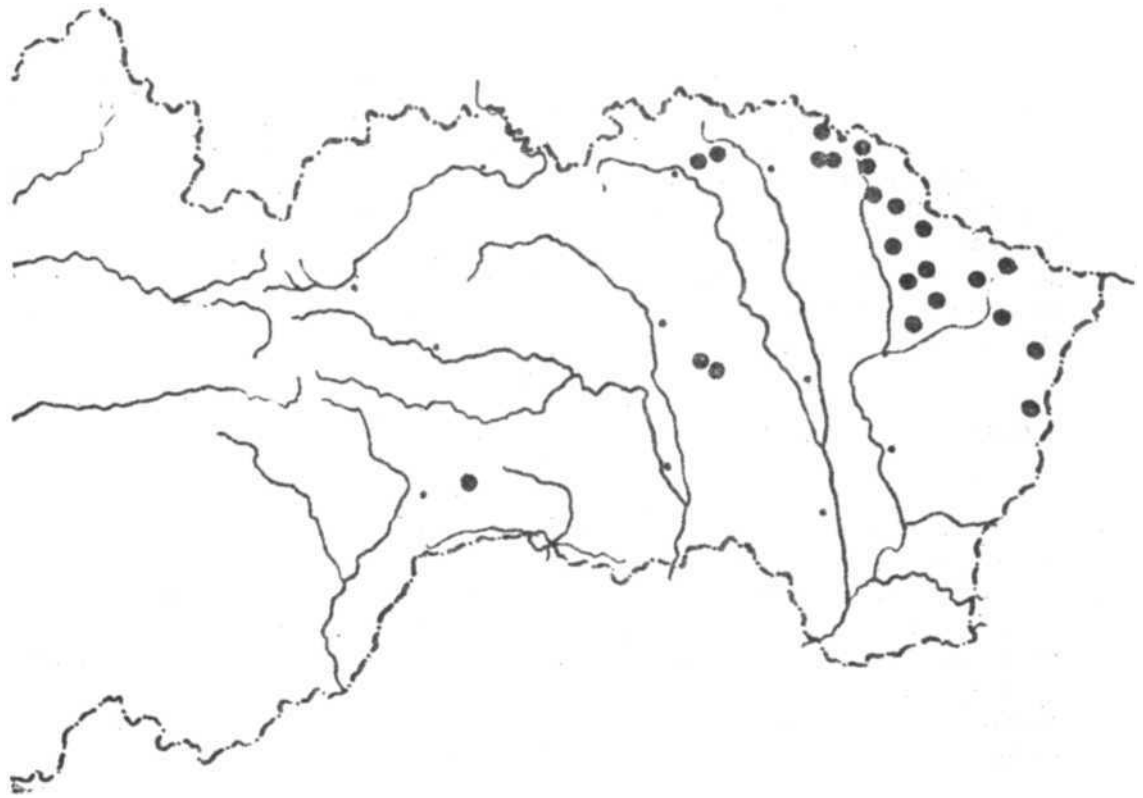


Figure 7. Complete map of wolves killed in 1971

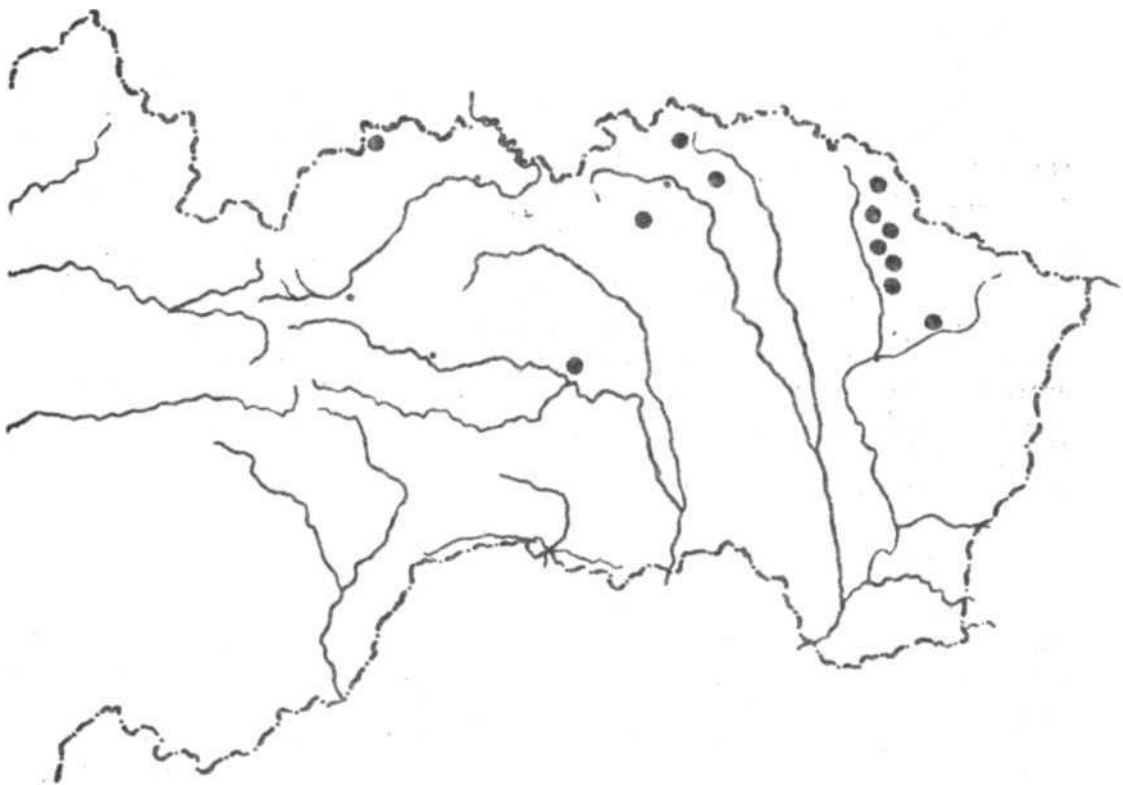


Figure 8. Complete map of wolves killed during 1972.

These are the reasons why nature conservation organizations try to get wolves protection, at least during the time of reproduction and when the pups are being raised. They consider that this is the minimum that is necessary to save the wolf in Slovakia- But the hunting organizations generally maintain the idea that wolves should be killed during the whole year, because of their very dynamic reproductive potential. We consider this opinion as superficial.

Almost no attention has been devoted to the need for complex ecological research on wolves. Some work has been done in the National Park of Tatra by Boris Chudik who studied the damage caused by big-game animals, deer mainly, and the influence of big carnivores on these animals. Their study provides the only basis for an objective appreciation of the importance of the wolf, not only in protected territory, but everywhere in Slovakia where wolves still occur.

There is a need for the State Nature Conservancy to acquire information on the ecology of the wolf; also to undertake educational work which will change the distorted opinions of hunters and dispel the fear in the minds of the people which stems from the wolf legends.

Some progress is already evident. The most noteworthy is reported by the Forest Administration in Michalovce which, in the past, had the largest population of wolves. That report shows that systematic control resulted in the rapid decline of the wolf population. However, the administration now proposes to partially protect wolves in the mountains of Slovakia.

Since the wolf is very adaptable to anthropogenic influences such as the mechanization of forestry, tourism and other human activities, we consider that the principal threat to the species is intensive persecution and killing by hunters, particularly shooting. And since we consider the state of wolves in Slovakia as critical, we urge organizations with authority to introduce the following measures:

A. Legal Measures:

- (i) to completely abolish the undesirable stimulus of bounties for the killing of wolves.
- (ii) to protect wolves during the period of reproduction and rearing of young, at least from 1 March to 30 September.
- (iii) to protect cubs, which have no value as trophies, up to the end of the first calendar year.
- (iv) to protect bitch wolves with young.
- (v) to make shooting the only legal means to kill a wolf and absolutely forbid the use of traps and poisons.

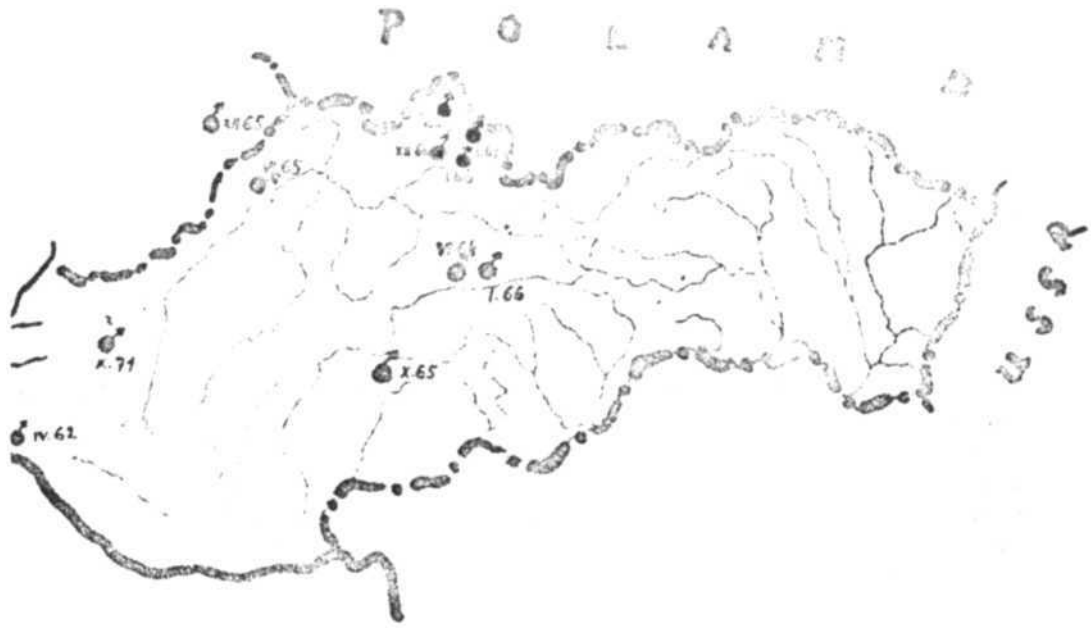


Figure 9. Last registered wolves killed in Central and West Slovakia. (One was shot in Moravia near Sumperk in December 1965.)



Figure 10. Wolf distribution in Eastern Slovakia in 1971 according to Forest Districts. (dark - established populations; dotted - transitory; white - absent)

B. Educational Measures:

- (i) increase the publications and broadcast of informative articles and information, especially in hunting journals, daily papers and on radio.
- (ii) to make maximum use of television to re-educate the population about wolves. Films on the way wolves live, like the one produced in Canada, should be stressed.

C. Research Measures:

- (i) make a census of wolves in Slovakia.
- (ii) classify hunting areas according to game populations and their ability to carry stocks of wolves.
- (iii) make available all research on wolf distribution and ecology.
- (iv) develop a plan for wolf preservation in Slovakia within a broad context of cooperation with Poland and the USSR.

RECENT PUBLICATIONS

Bališ, M. 1970a. Účasť vlka na stratách raticovej zveri. Poľovníctvo a rybárstvo 22(7).

Bališ, M. 1970b. Účasť veľkých šeliem na stratách divožijucich párnokopytcoŧ v TANAP. Národné parky - bohatstvo civilizácie. Priroda.

Bubeník, A. 1966. Vliv rysa Lynx lynx L. a vlka Canis lupus L. na struktúru populácií srnčí a jelení zverě Capreolus capreolus L., Cervus elaphus L. Lynx, Mus. Nat Praha, new series No. 6.

Chudík, I. 1972. Vplyv veľkých šeliem /vlka a rysa/ na raticovú zver /jeleniu a srnčiu/ vo vztahu k poškozovaniu lesných porastov TANAP. Československá ochrana prírody No. 13.

Hell, P. 1972. Príspevok ku kranio-metrickému štúdiu vlka obyčajného Canis lupus L. zo západných Karpát. Lynx. Mus. Nat. Praha, new series No. 13.

Hell, P. & Sládek, J. 1972. Polovnícke obhospodarovanie veľkých mäsožravcoŧ Carnivora na Slovensku. Poľovnícky zborník II.

Mituch, J. 1963. Príspevok k poznaniu helmintofauny vlka obyčajného euroazijského *Canis lupus* L. v ČSSR. Čsl. parasitologie 10.

Voskár, J. 1970. Likvidovat, ci racionálne využívat. Poľovníctvo a rybárstvo, No. 12.

Voskár, J. 1971. Retrospektívy a perspektívy vlka na východnom Slovensku. Ochrana prírody No. 4.

Wolf Specialists  
First Meeting  
Paper A.7

STATUS OF THE WOLF IN ITALY

Luigi Boitani  
Istituto di Zoologia-Università di L'Aquila,  
L'Aquila- I, Italy

and

Erik Zimen  
Max-Planck-Institut für Verhaltenphysiologie,  
8131 Seewiesen, Germany.

INTRODUCTION

The entire range of the wolf in Italy is now restricted to the central and southern part of the Apennine Mountains. During this century they have been exterminated in the northern Apennines and from the Italian Alps. Tassi (1973) recently published a report on historical aspects of the wolf in Italy and included some preliminary information on the present situation in the Central Apennines.

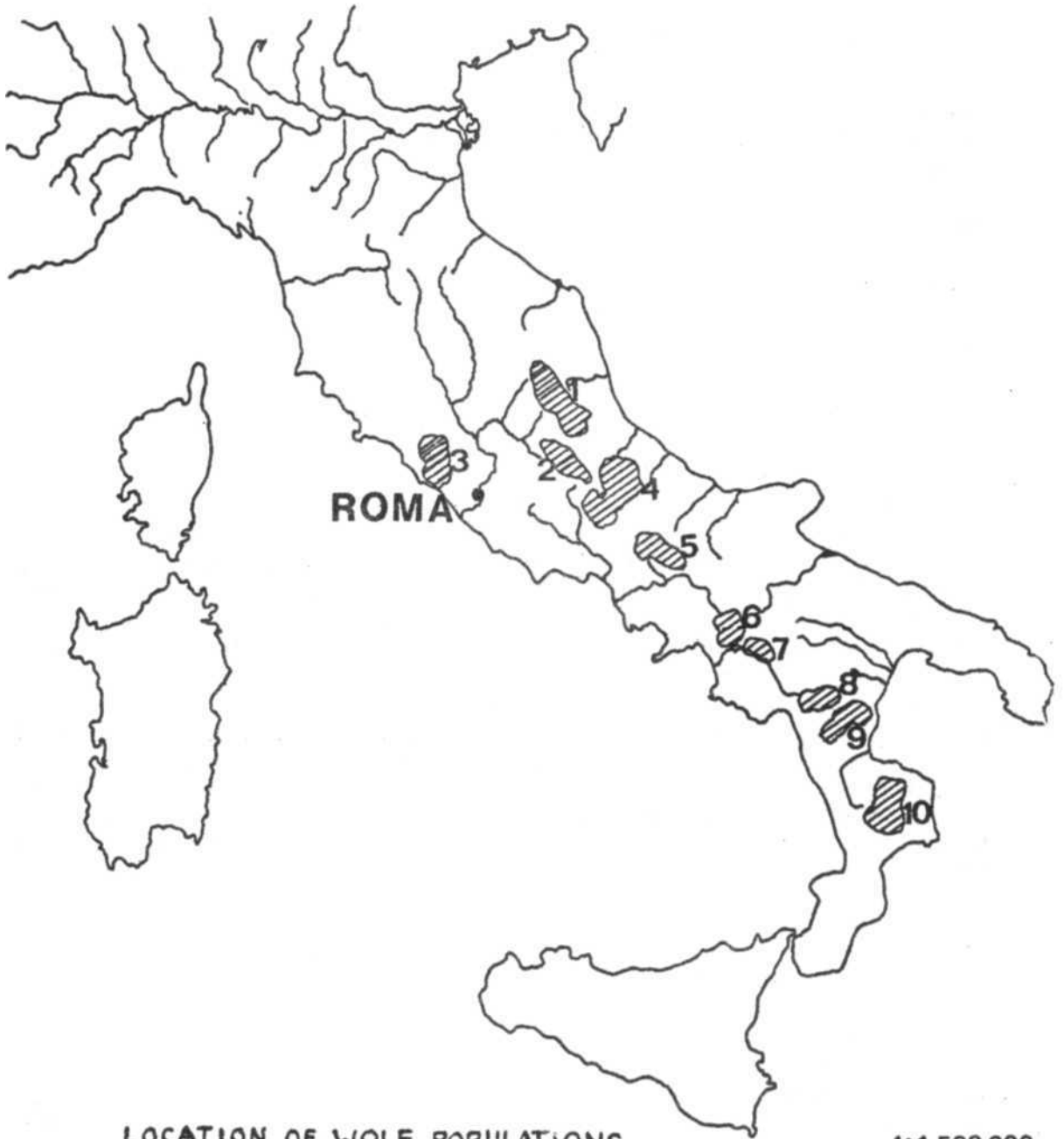
The World Wildlife Fund in Italy is waging a strong campaign to promote the preservation of the wolf in Italy. As part of this project, it is sponsoring a research program to obtain a better understanding of the present status of the species. It is also expected that this study will provide knowledge and understanding of the steps which can be taken to preserve the species. The study which is presented here was carried out on the basis of being the first part of that overall program.

METHOD

An indirect census appeared to be the only possible method which could be used to give quick answers to two primary objectives of the study: to determine where wolves still survive in Italy and to determine approximate numbers of wolves in each area. It was decided to conduct a direct field census in a special study area to test the reliability of data obtained by the indirect method.

The indirect census was carried out by:

- 1) getting information by interviewing as many people as possible in those areas where wolves may still survive;



LOCATION OF WOLF POPULATIONS  
IN ITALY  
as listed in Table 1

1:4.500.000 K  
0 100 200



- 2) checking the reliability of any report of sightings, killings and damage supposedly caused by wolves;
- 3) becoming familiar with the ecological conditions of the areas and making comparisons with the requirements of the estimated number of wolves.

The areas studied and results obtained in the indirect census (which was carried out by Boitani) are shown in the Table below.

Table 1: Range and Number of Wolves in the Central Apennines

	Approximate size of the area (km <sup>2</sup> )	Possible number of wolves
1) Sibillini - Laga	1900	8
2) Altopiano delle Rocche-Velino - Sirente	750	5
3) Tarquinia - Tolfa	650)	7)
	) 1100	) 12
Campagnano - Agro Romano	450)	5)
4) Maiella - Piano di Cinque Miglia - Parco d'Abruzzo	1500	22
5) Matese	400	3
6) Cervialto - Polveracchio		
Terminio	300	8
7) Alburni	120	4
8) Sirino - Raparo - Alpi	280	4
9) Pollino - Catena Costiera	650	12
10) Sila	1650	25
Total	8650	103

The direct census was conducted in an area of approximately 1500 km<sup>2</sup> in the Maiella-Parco d'Abruzzo range, approximately 100 km south-east of Rome. The indirect census had suggested that there were 20-25 wolves living in the area.

The study area comprised the Maiella area (400 km<sup>2</sup>), the Cinque Miglia area (500 km<sup>2</sup>) and the Parco d'Abruzzo area (600 km<sup>2</sup>).

The direct census was conducted from 10 to 18 March 1973. There were heavy snow falls on March 11 and from 1200 hrs. on the 14th to 2000 on the 15th. The field party consisted of 10 men in addition to the authors. The majority of these were members of the World Wildlife Fund and workers from Grand Paradiso and Abruzzo National Parks. An additional 10 wardens assisted in the census of Abruzzo Park.

Data on numbers and movement were obtained by searching for and following tracks in the snow, by imitating wolf howling (in three cases wolves were located by this method) and by direct observation (a pack of six wolves was sighted on one occasion).

The workers travelled by skis, snowshoes and, where roads went through important areas, by cars. All members of the party were equipped with binoculars; in addition, two telescopes were used in the course of the study.

## RESULTS

Wolves occur in 10 areas of the Central and Southern Apennines (Table 1). These areas correspond to different mountain groups. They are generally separated by deep valleys which have a high human population density. Although each area has, to some extent, distinctive ecological characteristics, it is still possible to identify two major groups of areas. The first group (areas 1 to 5 in Table 1) comprise the areas north of Naples while the second group (7 to 10) includes the areas south of it.

In the northern areas, wolves live in packs comprising as many as 7 animals. Hunting pressure is lighter than in the south. Winters are more severe and the snow lasts longer. Sheep are the principal livestock and the people's attitude toward the wolf is "milder".

In the southern, or second group of areas, wolves tend to be scattered and are rarely seen in groups of more than two or three animals. Cattle are the principal type of livestock. Area 6 (Cervoalto-Polveracchio Terminio) has rather intermediate characteristics.

The direct census in the central Abruzzo region found evidence of at least 16 and a most probable number of 22 wolves living in the region. This corresponds well with the results of the indirect census done earlier, which suggested 20-25 wolves to be the most probable number. The wolves in this region seem to live in packs of 3-7 wolves during the winter.

Most of the wolf tracks in the snow were found around high mountain villages. During the day the wolves stayed in the beech forest or in other areas humans have difficulties in reaching. At night they came down to the villages obviously looking for eatable things.

In the Abruzzo, as well as in all the other areas, it seems that the wolves mainly are scavenging on the garbage dumped in large quantities around the mountain villages. In the northern areas some damage is done by wolves to the big sheep herds grazing in the mountain regions during summer and fall. In the south there are few reports of wolves killing cattle. In all areas wolves sometimes kill and eat dogs and other smaller domestic animals like pigs, sheep, goats, calves, young horses and poultry, in and around the villages, if these are not fenced or locked in during the night.

#### DISCUSSION

The data from this census must be considered only a rough indication of the actual number of wolves present in the various areas. At any rate, the total number of wolves is considered to be very low. Probably there has been a strong decrease, both in number and distribution, in the last few decades. There has been no good census of the wolf population in Italy in past years, but people easily recall differences in the numbers of wolves. The following factors have contributed to the decline and could contribute to a further decline of the Italian wolf population:

- The isolation of the small occupied areas, which are possibly capable of supporting only a very low number of wolves.
- The disappearance of big herbivores, and a general impoverishment of the fauna.
- Hunting and poisoning which still occur, despite the fact that the wolf is completely protected in Italy.
- Decreasing number of livestock herds as a result of shepherds quitting their jobs.
- The high number of domestic dogs that roam free in the mountains out of any human control and apparently do more damage than wolves. Crossbreeding with dogs could also be a danger to the future of the wolf.
- The great number of foxes, which compete with wolves in feeding on garbage. Attempts to control them result in an indiscriminate use of poison almost everywhere.
- Extensive exploitation or development of the area the wolf still inhabits, exhibited especially by the building of new ski resorts.

We consider, then, that the following things are of importance to the conservation of the wolf in Italy:

- 1) Year round protection from hunting and trapping.
- 2) Protection of biotopes. There should be no further extensive settlements in areas inhabited by wolves.
- 3) Prohibition of the use of poison in fox management, at least in wolf areas.
- 4) Re-introduction and protection of big herbivores. Until big game populations have built up, artificial winter feeding of wolves should be considered for some areas.
- 5) Compensation should be paid to shepherds and farmers for any damage caused by the wolves.

#### REFERENCES

Tassi, Franco, 1973. The Status of the Wolf in the Central Apennines (Italy). Translated and reprinted from: *Il Lupo nell'Appennino Centrale: in Parco Nazionale d'Abruzzo: Importanza biogeografica e probleme di conservazione.* Lavori della Soeietá Italiana de Biogeografia, Nuova serie, Vol. II, Siena, 1971.

Wolf Specialists  
First Meeting  
Paper A.8

#### DATA ON THE SITUATION OF THE WOLF IN ROMANIA

Statement provided through the Commission on Nature Monuments,  
Academy of the Romanian Socialist Republic, 2 August 1973.

#### THE RANGE OCCUPIED BY WOLVES

The surface area of the Socialist Republic of Romania is 237,500 km<sup>2</sup>, of which 64,000 km<sup>2</sup>, or about 26%, are covered with forests.

The wolf is to be found in about 40,000 km<sup>2</sup> of hills and mountains where there are large forests; it is completely missing or rare in the plains or where the forests are only scattered or in small forests.

The greater part of the Carpathian Mountains is situated within Romania. The very large, undisturbed forests, far from any human settlement, create good habitat conditions for the wolf and protect it from the influence of man.

In the 40,000 km<sup>2</sup> range occupied by the wolf, its density varies according to the season: in summer the wolves follow the sheep and other domestic animals into the mountains; in winter they move down from the hills owing both to the reduction of food and to the thick layer of snow which hinders their movements.

#### POPULATIONS OF WOLVES

In the Socialist Republic of Romania the State owns the right of hunting over the whole territory of the country. Hunting areas are divided into biologic-economic units named "hunting funds". These are of various sizes, but over the whole country, average about 10,000 hectares each. Game is carefully administered, including the control of wolves, on every hunting area.

Owing to their mobility, the census of wolves is rather difficult to accomplish. In Romania the procedure is this: towards the end of the winter, a count is made of the tracks in the snow. When the data are reported to the Central Game Office by the hunting funds, the counts are reduced by 50% in order to reduce over-estimates caused by two neighbouring funds counting the same tracks. Recently there has been a tendency to make the census on two neighbouring areas on the same day.

The censuses, which are carried out in March, have indicated that the number of wolves in Romania has varied between 4500 in 1950 and 2000 in 1973.

#### THE KILL OF WOLVES

After the Second World War, the number of wolves was large and the number of deer was low. Wolf control was one of the management measures taken to improve this situation. All available means of controlling wolves were used. The number killed annually varied between 2400 in 1950 and 1030 in 1972.

Bounties were paid: 300 lei (about \$60) for an adult wolf and 150 lei (\$30) for a cub. The bounties are paid to compensate for the extra work done by those who work at night and in difficult conditions.

#### ATTITUDE TOWARDS THE WOLF PROBLEM

Although the number of wolves began to decrease in about 1950, damage by them is still recorded in summer especially to domestic animals (sheep, goats, pigs, cattle) and in winter to game (deer, roebuck and wild boar). Under the circumstances, the number of wolves have to be kept under control and reduced whenever necessary. Law No. 76 of 1953 makes it possible to control the numbers of any game species.

In recent years the use of toxic substances in the control of wolves has been discontinued. There is an increasing tendency to consider the wolf more as a hunting, or game, animal than one to be controlled. In Romania the hunting of wolves from motor vehicles or aircraft is excluded by the natural conditions which are quite unsuitable for such methods.

#### CONCLUSIONS

In the Socialist Republic of Romania, the wolf is not in danger of disappearing. The population is kept under observation and at any time the control can be discontinued if it is necessary to do so. Ecological conditions are favourable to the wolf in the area where it now occurs.

Wolf Specialists  
 First Meeting  
 Paper A.9

THE KILL OF WOLVES IN GREECE, 1969 To 1972.

Section of Game Economy,  
 Directorate of Forest Economy,  
 Ministry of National Economy, Athens, Greece.

PREFECTURE	FOREST SERVICE	1969	1970	1971	1972
<u>CONTINENTAL GREECE</u>					
Attika	Parnis	-	1	-	
Boeotia	Levadia	1	-	-	
Evritania	Karpenissi	-	1	1	
"	Fourna	-	1	-	
Aetolo-akarnania	Amfilohia	6	3	9	
"	Messolonghi	1	1	3	1
Fthiotis	Lamia	-	2	-	
Fokis	Lidoriki	-	-	-	1
Piraeus	Piraeus	-	-	-	1
Sub-total		8	9	13	3*
<u>EPIRUS</u>					
Jannina	Jannina	18	12	15	
"	Konitsa	-	6	5	4
Thesprotia	Igoumenitsa	7	25	38	
Arta	Arta	2	-	-	
Prevesa	Prevesa	4	2	2	
Sub-total		31	45	60	4*
<u>THESSALIA</u>					
Karditsa	Karditsa	2	1	2	2
Larissa	Larissa	16	10	30	12
"	Aghia	2	-	4	4
"	Ellasson	30	24	16	15
Magnissia	Volos	4	2	4	
"	Almiros	11	8	4	9
Trikala	Kalambaka	12	16	3	-
"	Trikala	14	38	79	54
Sub-total		91	99	142	96*

PREFECTURE	FOREST SERVICE	1969	1970	1971	1972
<u>MACEDONIA</u>					
Drama	Drama	50	47	72	91
Kavala	Kavala	46	30	49	66
Serai	Serai	30	58	77	106
"	Sidhirokastro	46	50	61	46
Kilkis	Kilkis	13	12	11	12
"	Youmenissa	11	15	14	
Thessaloniki	Thessaloniki	95	65	46	49
"	Langada	80	57	71	
Chalkidiki	Polygyros	37	63	44	
"	Arnaia	13	22	15	
Pierias	Katerini	16	14	8	11
Imathias	Veroia	12	14	13	
"	Naoussa	2	4	2	
Pellis	Aridhaia	9	4	1	15
"	Edessa	33	33	7	7
Fiorina	Fiorina	32	17	4	
Kastoria	Kastoria	13	9	12	
Kojani	Kojani	80	42	55	53
Grevena	Grevena	5	8	12	18
	Sub-total	623	564	574	474*
<u>THRACE</u>					
Evros	Alexandroupolis	32	35	33	
"	Didhimetihon	1	15	14	8
Rodhopi	Komotini	30	32	23	14
Xanthi	Xanthi	19	6	10	8
"	Stavroupolis	11	3	5	
	Sub-total	93	91	85	30
	GRAND TOTAL	346	808	874	607*

Numbers for the previous quinquennium:

Total for the years: 1964 - 567 wolves  
 1965 - 584 "  
 1966 - 848 "  
 1967 - 485 "  
 1968 - 586 "

\* The data for the year 1972 are incomplete.



Wolf Specialists  
First Meeting  
Paper A.10

THE STATUS OF THE WOLF IN THE UNITED STATES, 1973

L. David Mech  
Division of Endangered Wildlife Research, U.S. Fish and Wildlife Service,  
St. Paul, Minnesota

and

Robert A. Rausch,  
Department of Fish and Game,  
Juneau, Alaska

Although both the gray wolf Canis lupus and the red wolf Canis rufus have been exterminated from most of their former ranges in the United States, local populations of both still exist. Gray wolves inhabit most of Alaska, part of the Great Lake States region, and possibly parts of the Rocky Mountains; red wolves occupy parts of Texas and Louisiana. The subspecies of wolf in the Great Lakes region, known as the Eastern timber wolf Canis lupus lycaon, the Rocky Mountain wolf Canis lupus irremotus, and the red wolf are all on the U.S. Secretary of the Interior's list of Endangered Animals, and formal plans for promoting the security of these animals in the wild are being developed by Interior's Office of Endangered Species.

This paper summarizes what is known about the current distribution, population size, and legal status of wolves in the United States, and the scope of the wolf research being conducted in each area.

THE GRAY WOLF

Alaska

As a result of reduced ungulate populations in specific areas, wolf populations in Alaska may be leveling off following historic population highs. For example, the Nelchina caribou Rangifer tarandus herd which formerly was in excess of 70,000 animals, now is estimated at 10,000 to 20,000 head. In south-eastern Alaska, some black-tailed deer Odocoileus hemionus sitkensis populations have suffered similar declines as have individual moose Alces alces populations in the Nelchina Basin and other portions of interior Alaska. The exact role played by wolf predation in these population adjustments is somewhat conjectural. At a minimum it appears wolves accelerated and intensified population adjustments primarily brought about by the interaction of winter ranges limited by extremely severe winters and used by high populations of ungulates.

No accurate estimate of total numbers of wolves in Alaska is available. In the past a qualified estimate of 5,000 wolves was made; it has crept into the literature and has been arbitrarily lowered or raised to suit the individual viewpoints being expressed. The estimate of 5,000 probably is extremely conservative. Whatever the case, wolves continue to exist throughout their historic range at very high population levels in most areas.

Wolves are classified as big game and furbearers by regulation. Hunting by aircraft is now prohibited. Bounties were made optional in 1968, when the legislature transferred the authority for establishment of bounties to the Board of Fish and Game. Bounties have now been eliminated in all game management units, except in south-east Alaska (units 1, 2 & 3) where wolves remain most controversial. In fiscal 1973, however, the legislature did not provide funds for the payment of bounties. It appears that some funds may be available for fiscal 1974, but the amount is small and the exact use of these monies is not clear at this time. The skin of each wolf taken must be presented to the Department for inspection and sealing to provide an accurate count of the harvest.

#### Hunting Seasons

Game management units 5, 6 and 9 through 14, except that portion of unit 14C in Chugach State Park and units 16 through 25: open season, September 1 through April 30; bag limit, two wolves. Units 7, 14C in Chugach State Park, 15 and 26: no open season. Units 1 through 3: no closed season, no limit. (Wolves are not present on the islands that comprise units 4 and 8.)

#### Trapping Seasons

Units 1, 2 and 3: November 1 through April 30, no limit. Units 16 through 26: October 1 through April 30, no limit. Unit 7, 14C in Chugach State Park and 15: no open season.

Wolf Research in Alaska, conducted by the State Fish and Game Department (Rausch 1969), is in a period of reassessment. Robert Stephensoa's studies in the Brooks Range are due to terminate in about a year. He has concentrated on den site selections, Eskimo-Wolf relationships, prey selection and utilization, and wolf activities at den sites. Lesser activities have included observations on growth and condition and population age distribution. The studies in the Nelchina Basin, which were directed primarily toward the physical condition of ungulate prey, are also under review. More information about wolf and human competition for reduced ungulate populations will be sought.

In addition, 8 years of intensive study of the behavior and ecology of two wolf packs in Mount McKinley Park, Alaska, have been completed by graduate student Gordon Haber of the University of British Columbia (Haber 1973), and the results are now being analyzed.

## Michigan

The wolf is legally protected by the State of Michigan, and on Isle Royale by the National Park Service as well. On mainland Michigan, an estimated six wolves exist in the Upper Peninsula, living as scattered units of singles and pairs (Hendrickson et al. in press). If these wolves are breeding, either their productivity is low or poaching by coyote Canis latrans bounty hunters and trappers is preventing the establishment of packs.

On Isle Royale wolf numbers continue to fluctuate above and below approximately 20 animals as they have for more than 10 years (Durward Allen, pers. comm.).

Most research on Michigan wolves has been concentrated on Isle Royale. These studies, directed by Dr. Durward L. Allen of Purdue University Management Institute, and others, began in 1958 and are continuing (Mech 1966, Jordan et al. 1967, Wolfe and Allen 1973). In addition, Dr. Peter Jordan and his associates from Yale University have undertaken ecosystem studies on the island that will provide further insight into wolf ecology there.

Dr. William Robinson, of Northern Michigan University, in collaboration with the senior author and with the Michigan Department of Natural Resources, is planning an experimental transplant of a pack of radio-tagged wolves from Minnesota to Upper Michigan in winter 1973-74. The fates of these animals will then be followed as long as possible through aerial radio-trackings and hopefully information will be obtained that will be valuable in any future restocking efforts.

## Minnesota

The Minnesota wolf population is continuous with that of Canada. Wolves occupy approximately 12,000 square miles of primary range in Minnesota, and 12,000 more of peripheral range, with numbers tentatively estimated at 500 to 1,000. For the 4,200 square miles of the Superior National Forest, it is estimated that  $388 \pm 14$  animals were present in winter 1972-73 (Mech 1973). The Forest population is thought to be declining because of a declining white-tailed deer Odocoileus virginianus herd.

Federal lands within the Forest have been closed to the taking of wolves since October 1971, although considerable poaching still exists. On State and private lands within the Forest, and on all other lands in Minnesota the wolf is unprotected and, in local areas, wolves are taken by controllers at \$50 per animal, paid by the State of Minnesota.

Officials of the U.S. Fish and Wildlife Service, the Superior National Forest, and the Minnesota Department of Natural Resources developed a plan for the management of the wolf in Minnesota, subject to the approval of the State legislature. This plan would have established a sanctuary of some 2,300 square miles where no wolves can be taken, a 6-month closed

season in the rest of the State, registration of all wolves killed, and a carefully monitored total annual harvest of 150 to 200 animals. The plan was the subject of considerable controversy, being attacked by preservationist organizations as too liberal, and it was rejected by the 1973 legislature. Since then, the Federal Endangered Species Act of 1973 has been passed and its current interpretation is that wolves are completely protected in Minnesota, except that some provision may be made for selective removal of individuals which have become a menace to livestock.

Intensive research on the wolf in Minnesota that began in 1966, is being continued by the senior author and his student assistants and cooperators on a full-time basis in three areas of the State (Mech & Frenzel 1971, Mech 1972, Mech 1973). In addition, a masters thesis (Byman 1972) and a PhD thesis (Van Ballenberghe 1972) on wolf ecology on the Superior National Forest were recently completed.

The Minnesota studies have been supported by the U.S. Fish and Wildlife Service, the USDA Forest Service, the World Wildlife Fund, the Ober Charitable Foundation of St. Paul, the Big Game Club of Minneapolis, the National Rifle Association and the New York Zoological Society.

#### Wisconsin

The wolf is protected in Wisconsin by State laws, but the official view is that the species is extinct in that State (Keener 1970). However, because dispersing wolves in Minnesota have been found near the western Wisconsin border, and because some of Michigan's wolves live near the north-eastern border, there is the strong probability that wolves from these neighboring States may enter Wisconsin. Poaching by coyote hunters and trappers may prevent any colonization of the State by wolves, however.

#### Wyoming, Montana, Idaho

In the last few years, there have been an increasing number of reports of wolves from Yellowstone National Park, Glacier National Park, and the following National Forests in these States: Boise, Challis, Flathead, Gallatin, Helena, Kootenai, Salmon, Shoshone, and Targhee. The reports are based primarily on sightings and tracks, although one recent specimen from Montana has been confirmed. There are persistent rumors that the Yellowstone wolves are imported from Canada and released. Whatever the case, wolves are automatically protected in Yellowstone and Glacier National Parks, and inclusion of this subspecies on the Secretary of the Interior's Endangered Species list allows their protection in the National Forests, if it is so declared by the Forest Service. Because livestock interests are strong in these States, persecution of wolves, either official or private, can be expected on private lands.

The U.S. Fish and Wildlife Service is about to begin research on the Rocky Mountain wolf to determine its present status and management needs and to develop a recovery plan for it.

## THE RED WOLF

The true taxonomic identity of the red wolf is a subject of controversy among biologists, for the creature possesses characteristics of both the gray wolf and the coyote and freely hybridizes with the coyote (Riley & McBride 1972); it is not known whether the red wolf can interbreed with the gray wolf. Contamination of the red wolf gene pool by coyote genes is one of the major problems facing the survival of the red wolf today. According to Glynn A. Riley, Jr. (pers. comm.), U.S. Fish and Wildlife Service, there probably are less than 300 pure red wolves left today. They are found primarily in south-eastern Texas and in one parish of Louisiana (Paradiso & Nowak 1971), although there are indications that a few may survive in Arkansas (Pimlott & Joslin 1968). They are legally protected in Louisiana, but in Texas they are unprotected and are persecuted because of actual and/or potential damage to livestock. The U.S. Fish and Wildlife Service seeks to live-trap offending individuals and place them with zoos and with laboratories conducting research on them.

Research is being conducted on the ecology and movements of the red wolf by Yale University under the direction of Dr. Peter A. Jordan. Taxonomic studies are in progress by a number of scientists.

## CONCLUSION

In summary, wolf populations in the United States range from depleted in most areas to relatively intact in Alaska and northern Minnesota, with a few local populations struggling for survival in other areas. Considerable research is now in progress on all surviving populations, and attempts are underway to protect the species where it is threatened. A great amount of interest in the wolf has been demonstrated by conservation organizations, which appear to be helping to offset pressure from some unenlightened sportsmen and livestock farmers that still prefer extermination of the species (Mech 1970).

Probably the major problem facing government agencies managing the wolf today in the United States is that of striking the right balance in preserving the species where it still exists while minimizing its conflict with men, and, in doing so, dealing with biological realities while absorbing emotional pressure from public groups that either believe that no wolf should be killed or that all should be.

## REFERENCES

- Byman, D. .1972. Food habits and internal parasites of the timber wolf in north-eastern Minnesota. Ms. Thesis, U. of Minn., Mpls., 74 pp.

- Haber, G.C. 1973. Eight years of wolf research at McKinley Park, Alaska. Univ. Brit. Columb. Publ.: April 1973, 7-9, 52-54, 56, 57; May 1973, 43-45, 50, 53-56.
- Hendrickson, J.W., Robinson, L. & Mech, L.D. in press. Status of the wolf in Michigan, 1973. Am. Midland Naturalist.
- Jordan, P.A. 1967. Numbers, turnover, and social structure of the Isle Royale wolf population. Am. Zool. 7: 233-252.
- Keener, J.M. 1970. History of the wolf in Wisconsin. p. 4-5. In Jorgensen, S.E., Faulkner, C.E. & Mech, L.D. (Eds.). Proc. Symp. on wolf management in selected areas of North America. U.S. Fish and Wildlife Service, Region 3, Twin Cities, Mn., 50 pp.
- Mech, L.D. 1966. The wolves of Isle Royale. Mat. Parks Fauna Ser. No. 7. U.S. Govt. Printing Office, Wash., D.C. 210 pp.
- Mech, L.D." 1970. The wolf. Doubleday Publishing Co., N.Y., 384 pp.
- Mech, L.D. 1972. Spacing and possible mechanisms of population regulation in wolves. Am. Zool. 12: 9 (abstract).
- Mech, L.D. 1973. Wolf numbers in the Superior National Forest of Minnesota. U.S.D.A. For. Serv. Res. Paper NC-97, North Central For. Expt. Sta., St. Paul, Minn., 62 pp.
- Paradiso, J.L. & Nowak, R.M. 1971. A Report on the taxonomic status and distribution of the red wolf. U.S. Fish and Wildlife Service, Spec. Scientific Rept., Wildlife No. 145, Wash., D.C., 36 pp.
- Pimlott, D.H. & Joslin, P.W. 1968. The status and distribution of the red wolf. Trans. 33rd N. Am. Wildl. and Nat. Resources Conf., pp. 373-389.
- Rausch, R.A. 1969. A summary of wolf studies in south central Alaska, 1957-1968. Trans. 34th N. Am. Wildl. and Nat. Resources Conf., pp. 117-131.
- Riley, G.A. & McBride, R.T. 1972. A survey of the red wolf (Cards rufus). U.S. Fish and Wildlife Serv. Spec. Scientific Rept., Wildlife No. 162, Wash., D.C., 15 pp.
- Van Ballenberghe, V. 1972. Ecology, movements and population characteristics of timber wolves in north-eastern Minnesota. Ph.D. Thesis, U. of Minn., Mpls. 90 pp.
- Wolfe, M.L. & Allen, D.L. 1973. Continued study of the status, socialization and relationships of Isle Royale wolves, 1967-1970. J. Mammal. 54: 611-635.

Wolf Specialists  
First Meeting  
Paper A.11

#### WOLF MANAGEMENT IN CANADA THROUGH A DECADE OF CHANGE

John B. Theberge  
Division of Environmental Studies, University of Waterloo,  
Waterloo, Ontario.

#### INTRODUCTION

The wolf, one of the most interesting and controversial species of wildlife in Canada, is being exonerated from a reputation born of man's fear, superstition and outright hatred of the animal. Twelve years ago, D.H. Pimlott wrote: "The wolf poses one of the most important conservation questions of our time. Will the species still exist when the twentieth century passes into history?" A decade later, an answer appears to be emerging. Yes, the wolf will still exist. This answer emerges when we study the changes during the past decade in the policies, programs, and attitudes of the agencies responsible for managing wolves in Canada.

Wolves, like all species, even our national wildlife emblem, the beaver, represents both good and bad to man. This dual relationship with us argues for a broad range of management strategies. The initiation during the past decade of diversified programs, ranging from control to managed harvest to varying degrees of protection in all provinces and territories indicates that the days of "kill wolves at all costs" are gone forever.

What has happened to lead government agencies away from policies which, in some regions, called for the merciless slaughter of wolves? Foremost have been strong new voices of concern that scarcely existed ten years ago. In the 1950s, only trappers, hunters, guides, and outfitters expressed their attitudes about wolves, and their voices were mostly negative. Some of these voices are still negative, and sometimes for valid reasons; dealing with these complaints is still a part of all wolf management programs in Canada. But today, thousands of urban dwellers spend their holidays in our parks or northern wilderness lands, and many of these people are demanding an opportunity to see or hear wolves. For them, the wolf may symbolize a wild Canada that is fast disappearing. The voices of these people are loud. In the spring of 1972, more than 20,000 individuals in Ontario petitioned the provincial government to remove its wolf bounty; in 1967, an even greater amount of mail was sent to the Ontario Government condemning a recommended legislative policy to eliminate wolves, more than had been sent in response to any issue in decades. In 1969, Canadians contributed greatly to the flood of mail to Alaska, protesting that state's bounty

and aerial hunting program. In the late 1960s and early 1970s, thousands of people were attracted to organized "wolf howling nights" in Algonquin Provincial Park.

#### THE FRUITS OF WOLF RESEARCH

The rapidly growing concern in defence of the wolf stems to a large degree from the results of wolf research conducted in Ontario, Michigan, British Columbia, and the Northwest Territories. Books, articles, radio programs, television documentaries and commercial recordings have put into public hands many new biological facts gathered by researchers in the past decade. Some key facts, proving so useful in evaluating wolf management strategies, are: (1) The number of wolves in any given region will not increase indefinitely. Wolves have not been recorded to exceed one animal per ten square miles anywhere in North America, even with a superabundance of food (Pimlott 1967). (2) Where protected, wolves may limit bag game numbers, as on Isle Royale, Michigan, or may be a major mortality factor, as in Algonquin Provincial Park, Ontario. However, on Isle Royale "the wolves appear to have kept the moose herd within its food supply" (Mech 1966). Alternatively, in areas where big game densities are abnormally high, wolves may be unable to limit numbers of big game in plant communities altered by man to a stage of early succession (Pimlott 1967, Ont. Dept. of Lands & Forests 1970, Thompson 1952). Therefore, the effects of wolves on prey populations apparently differ with location. (3) The effects of wolf predation on the health of some prey populations are exactly opposite that of hunters. Instead of selecting the biggest and best, wolves kill the young and old and infirm rather than healthy animals in their prime of life. This has been shown for Dall sheep and caribou (Murie 1944), for moose (Mech 1966), and to a lesser extent for white-tailed deer (Pimlott et al. 1969). (4) Wolves can withstand considerable mortality and still maintain their population numbers (Thompson 1952).

These facts suggest that widespread wolf control programs are not scientifically valid unless supported by considerable knowledge of pre-predator-prey relationships in that locality. No longer should complaints of too many wolves be met with simplistic bounty programs or poison campaigns. A much more realistic and defensible approach to specific problems is that of specific solution - removal of the individual wolf or pack causing a problem with livestock or with wild ungulates in a critical wintering area.

#### STATUS OF WOLVES IN CANADA

Public concern over wolves stems partly from knowledge that wolves can be classified as endangered in Canada, or could be, at least, a few years ago. They are not rare, but they are endangered. Three facts put the wolf in this category. First, we have the means of eliminating wolves completely, as shown in the past by dropping poison baits from



aircraft and by snowmobile or aerial hunting. Even 50 years ago, before the use of aircraft, massive predator control in the United States did much to exterminate wolves in many parts of that country. So it can be done today. Second, we have a past prejudice; that this is changing is the sole reason for perhaps removing wolves from an imaginary endangered species list in Canada (our official list of endangered species includes only those species which are rare). Third, habitat change has effectively reduced the wolf range in Canada. Along our southern fringe, clearing of the land has created a habitat suitable for coyotes but not for wolves. Of these three facts, the latter is the least immediate threat at present, but some people have grandiose plans to develop mid-Canada and use entire valley systems for water storage, diverting rivers flowing into Hudson Bay into the Great Lakes. If these plans ever materialize, more than wolves may be endangered.

Today, wolves live all across northern and mid-Canada, from Ellesmere and Banks Islands in the Arctic to the edge of the boreal hardwood or prairie fringe in the south. In southern British Columbia and Alberta, where less land clearing has accompanied settlement, wolves are sometimes seen and they are coming back into Banff and Jasper National Parks. But, in general, wolves were eliminated from the south-west by the mid 1950s. On Vancouver Island wolves are nearly extinct and in the Maritime provinces there are no wolves.

About 90 per cent of Canada, then, still has wolves. Viewed in a continental context, with wolves in Alaska, remnant populations in Mexico, Michigan/Minnesota, and Texas/Louisiana (the rare red wolf), they occupy approximately half of their former North American range.

#### AN OVERVIEW OF WOLF MANAGEMENT STRATEGIES

With these facts on status, with new information on the biology of wolves and with greater than ever interest from the public, it is possible to arrive at a good understanding of the ways government agencies in Canada have altered their wolf control programs. And how well these alterations fit the times.

Ten years ago, Canada was in the early stages of discarding the bounty; it was gone in the mid or late 1950s from British Columbia, Manitoba, and the Northwest Territories. Professional biologists were preaching control only when and where necessary, and were suggesting fur-bearer and game status for the wolf, but their philosophies were not being translated into many actual programs. In the past decade, the bounty has almost disappeared, and varied programs have developed, including complete protection, control, and game or fur-bearer status.

The wolf is a valid fur-bearer in all regions, in that it can be legally taken by trappers. However, nowhere is its actual management as a fur-bearer enforced, in line with quotas set on the basis of

population numbers. The value of a wolf pelt varies across Canada, but is generally rising with the increased demand for long-haired fur. In the Northwest Territories, prime pelts bring up to \$150; medium and ordinary pelts are worth \$60 to \$70, making the wolf second only to the polar bear in value. In Ontario, the highest valued wolf pelt at the 1972 spring fur auction sold for £51.

Wolves are listed as big game animals (to be killed only by holders of a valid hunting licence) in British Columbia, Alberta and the Yukon Territory; the latter imposes no season and no bag limit. In the Northwest Territories, bounties on wolves can only be collected by holders of a hunting licence. Alberta sets a season from September to April. British Columbia is the only region in Canada where true game status for the wolf exists, with its implied actual management program.

All six provinces with wolf populations (British Columbia, Alberta, Saskatchewan, Manitoba, Ontario and Quebec), and both Territories, have some land where wolves are completely protected - national parks. In addition, most provinces protect wolves in at least one class of provincial parks. Exceptions are Manitoba, where trapping is allowed, and Saskatchewan, where both hunting and trapping are permitted in some parks.

Wolf control programs are conducted by all six provinces where wolves exist, and by both territories, in some areas of their jurisdiction. The reasons for control are varied. The protection of livestock is a stated rationale in all regions except the Northwest Territories where livestock is not raised; and the protection of big game is the reason given by all regions with the notable exception of British Columbia and Alberta. Annual Reports of the Alberta Department of Fish and Game since 1966 have stated: "No predator control for game management purposes was carried out as in no case was evidence found indicating that such was necessary."

Other reasons to control wolves include fur marauding and the effects on beaver numbers (Saskatchewan), and rabies. Regarding the latter, Saskatchewan presently intends to increase its wolf control if rabies, now a problem in skunks, spreads to wolves. However, there is little evidence of rabies in wolves in Canada, certainly never to epidemic proportions. Alberta's massive campaign against wolves between 1952 and 1956, because of rabies, when five thousand miles of trap and poison lines were maintained, was totally unjustified. The Veterinary Service of the Alberta Department of Agriculture, which directed this program, has on its records from those years right up to the present only one diagnosed case of rabies in wolves (in 1952). Despite this, in 1966 wolves were killed where "public safety was threatened", according to an Annual Report. Undoubtedly, isolated cases of rabies have occurred that remain unreported, but if wolves were common carriers, this fact would be documented clinically.

No specific predator control units exist in Canada; control is carried out as one of a number of responsibilities by different district offices. The last predator control unit with full-time responsibility to kill predators was disbanded in British Columbia in 1966. Since

1960, predator control efforts have been reduced in all regions of Canada. However, records are not sufficient to show details of the exact number of wolves killed through predator control in all regions.

Ontario repealed its bounty on December 15, 1972. Quebec dropped its bounty in 1961, re-established it in 1964, and repealed it again, for economic reasons, in 1971. The Yukon also repealed its bounty in 1971, stating that it was an ineffective tool for wolf control. The bounty in the Northwest Territories was re-enacted in 1965, against the scientific advice of the Canadian Wildlife Service. Territorial councillors with no scientific background disagreed with the Wildlife Service about the biological effectiveness of the bounty, and with added sociological reasons (more incentive for local people to harvest wildlife) placed a \$40 bounty on wolves. The Northwest Territories Game Branch, which administers the bounty, states that the bounty exists today only for sociological reasons.

In Ontario, similar non-biological reasons existed for the bounty:

"The payment of bounties as an incentive to take wolves and coyotes is still in vogue in Ontario, although it has never proved to be an effective means of control. Generally, only those animals that can be easily caught are submitted for bounty, while troublesome individuals frequently remain at large. Bounties have been paid in Ontario since 1793, but there is no indication that wolves are less numerous now than in former years" (Ont. Dept. Lands & Forests 1969).

Early in 1972, professional biologists, through the Ontario Chapter of the Canadian Society of Wildlife and Fisheries Biologists, adopted a strong statement advocating repeal of the bounty, and replacement with game status, specific control and complete protection in various areas. This coincided with the public petition, mentioned previously. In February 1972, the Ontario Government announced its intention to repeal the bounty, which it did ten months later. It has been replaced by the Wolf Damage to Livestock Compensation Act which provides for a cash payment to farmers whose livestock suffer from wolf predation. A wolf control program, to be discussed, is also in operation.

#### REGIONAL WOLF MANAGEMENT PROGRAMS IN TRANSITION

The greatest changes during the past decade in wolf management policies have taken place in British Columbia, Ontario, and the Northwest Territories.

##### British Columbia

Wolf management in British Columbia has progressed from a clear case of mismanagement in the 1950s to the most enlightened policy of all regions today. In the 1950s, extensive poisoning by the Predator Control Division backfired, especially in the Prince George District.

Moose numbers increased, to the detriment of the range. After eight years of poisoning, the following statement appeared in the 1958 Annual Report of the Department of Recreation and Conservation: "Winter ranges in most sections of the province continue to show excessive utilization. In the Prince George area, most ranges are severely overbrowsed and rapidly decreasing in productivity." Ironically, enlightened statements on wolf management strategies came from professional biologists in the province during the 1950s, but these philosophies were not translated into action (Pimlott 1961).

All that has changed. A drastic decrease in wolf control measures in British Columbia began about 1958 and continued until 1966, when the wolf was declared a game animal. In 1963, the first written evidence that the Department's policy was changing appears in the Annual Reports:

"It is apparent that the (Fish and Wildlife) Branch's predator experts can keep economic losses from wolves, coyotes and bears at a low level without depleting these animals in true wilderness areas ... Every opportunity is taken to promote the cougar and timber wolf as animals worthy of recognition as unique species. It is encouraging to note increasing interest in the northern timber wolf on the part of non-resident hunters. It is hoped that this species will eventually reach trophy status and take its place among B.C.'s rarer big game species."

Game status came with the new Wildlife Act in 1966. Initially it did little more than create a positive image for the wolf. Wolves were not managed and from 1966 to 1969 are not listed in the Tables of Game Harvests in the Annual Reports. However, attempts were made to determine numbers of wolves on a relative basis in northern British Columbia, and by 1969 efforts were made to assess the magnitude of the kill. Research was initiated in the Prince George District on the distribution and range of packs, on prey species, and on the condition and age of animals killed by wolves.

During 1968-69, first efforts were made to actually manage wolves as a game species. Vancouver Island, the Queen Charlotte Islands and other areas were closed to the killing of wolves, and still others had seasons imposed. The following year, bag limits first appeared in the hunting regulations (one wolf in some areas, three in others). In 1970-71, further closures, seasons and bag limits were set. Management, then, had become specific for specific areas.

These efforts to manage wolves in British Columbia have been successful. There is no evidence of adverse effects on big game. The 1968 Annual Report reads: "Despite these liberal seasons, poor hunting weather in the fall resulted in an under-harvest of moose in the northern regions, and the season was extended to the end of the year in an attempt to adequately crop the herd." Wolves, then, were not killing so many moose that hunters were left with nothing. Today, the Fish and Wildlife Branch receives fewer complaints about wolves from guide-outfitters. Some guides are now sponsoring wolf hunts. The total annual kill of wolves since game status was instituted is slightly greater than in the

years immediately preceding. The 1970-71 wolf harvest was as follows: resident hunters, 419; non-resident hunters, 64 (non-residents must pay an additional \$40 trophy fee if successful); trappers, 52; control, 15 (approximately). The total was 550.

British Columbia instituted a Committee on Predator Control in 1968, which provided a forum for the discussion of predator control strategies. The Fish and Wildlife Branch, the Department of Agriculture, the British Columbia Wildlife Federation and the British Columbia Beef Cattle Growers Association are each represented on the committee by one member. Such a committee is unique in Canada. It prepared an initial statement in 1969, relegating the continued control of wolves on both private and Crown Land occupied by livestock to the Fish and Wildlife Branch. While this statement added nothing new, the committee's very existence may have prevented head-on clashes between interest groups, a function it may still serve.

In November, 1971, the British Columbia Government announced its official predator control policy (Dept. of Recreation and Conservation release):

"Government policy towards predator control is one of minimal control. This means that control is not directed at predators in general, but at specific animals threatening human safety or legitimate human enterprise. Where wildlife is the prey involved, predator control is not practiced. This general policy applies throughout the province, including game sanctuaries and provincial parks. No bounties are paid on wildlife species by the provincial government .... Predator control is an activity of our Conservation Officer staff. Control is handled by each region and is the result of discussion between the Regional Supervision and the Regional Wildlife Biologist..."

With this policy, game status for wolves, and complete protection in all Class A and Class B provincial parks, British Columbia stands as a model for the rest of Canada. There are some problems, to be sure, such as illegal poisoning by some guides due to lack of enforcement, and protection not granted in all classes of parks. But these are of minor importance.

### Ontario

More research into the ecology of the wolf, directed toward wise management, has been done in Ontario than in any other province. The application of this research to management, however, has been slow. Initially, the reason for this was a need to find a workable replacement for the bounty, but when this was found and put into operation, the bounty was not removed. The rationale for the bounty seems to have been based on political, not biological, criteria. In the past 12 years, 16,461 wolves have been presented for bounty (an average of 1,371 per year). This is more wolves, by a factor of almost two, than any other province or territory. And, as mentioned before, this has apparently not reduced the total wolf population in Ontario.

A predator control unit was established in 1964 to bring about specific control and provide an alternative to the bounty, but the unit oversaw wolf control through an extension program rather than the unit itself controlling wolves. It still exists in name, but is not a functional control unit. During the past five years, 126 wolves (25 per year) have been killed, either by district staff or by the complainant who received instructions on trapping through the extension program. The program has provided workshop instruction on methods of catching wolves (poison is not used) to approximately 1,500 farmers and trappers', and 50 officers.

This kind of program is unique in Canada, and places the onus on the complainant to rectify his own problem. But it accomplishes its objective of specific control if people trained to kill wolves use their skill only when a problem occurs. However, with the bounty, which condones unrestricted killing, there has been no check; after the specific problem is solved, unnecessary additional killing can continue. The effects of this unfortunate spin-off should lessen now that the bounty has been repealed. However, not until game or fur-bearer status is invoked will all killing be strictly regulated.

Wolves are killed by Conservation Officers to protect big game in Ontario, particularly in conjunction with Ontario's deer range improvement program. The number killed is included in the average of 25 per year stated previously. Where the deer populations are considered to be below the local range capacity and where predation is considered a limiting factor, predator control is initiated.

This amounts to "rule-of-thumb" game management. To ascertain whether or not wolves are a limiting factor requires evidence that, without them, deer numbers will increase. There must be evidence that a well-known biological principle is not in effect; that deaths of deer due to predation are being offset by fewer deaths due to other causes or by an increase in the number of deer born in the year. Then, too, the fact that wolves may remove a significant number of weaker individuals from the deer population and thus strengthen the general health of the population must be considered. In short, the conclusion that wolves are limiting deer populations must be weighed in the light of detailed research in specific areas. Such may not be financially possible, and may be fraught with logistical problems. But the fact remains that without it, predator control for deer management cannot be easily defended. Its justification in Ontario rests with the insignificant number of wolves killed each year by Conservation Officers. The philosophy of wolf management in Ontario is:

"Predators, like other forms of wildlife, are an integral part of the fauna and should be managed on the same basis as other game animals. With specific reference to wolves and coyotes, this means control when and where needed, and freedom from control when it is not required. Proper management also involves the preservation of these species in wilderness areas or large parks where tourists, naturalists and others may hear and see them" (Ont. Dept. of Lands & Forests 1969).

In Ontario's Algonquin Provincial Park, the wolf is a main feature of the government's nature interpretive program. On specific evenings, park naturalists accompany large groups of people to areas of the park which wolves are known to frequent and try to elicit howling responses from the wolves. For many people, these "wolf howling nights" can be the highlight of a vacation. More than 6,000 people participated in this program in 1971. Other parks will likely institute such programs, and eventually the opportunity to hear wolves may become one of the unique features of many large wilderness parks in Canada.

In summary, Ontario has progressed with a partially successful program of specific wolf control, and protection of wolves in large parks where they are fostered as a tourist attraction. But the province has yet to establish a system of management of wolves as a game species that, in its philosophy, is desirable.

#### Northwest Territories

Besides a bounty, a predator control program operated in the Northwest Territories until 1970. From 1963 until 1970, it involved one full-time man setting poison (strychnine) lines. The program's total kill over the past ten years was 3,692 wolves (369 per year). The reasons for discontinuing the program are obscure, but contributing to the decision may have been changes in personnel and an increased number of wolves presented for bounty, which in turn may have stemmed from higher fur prices. Also, with more wolves bountied, the efforts of the poisoning operation may have appeared unnecessary. In 1970-71, 791 wolves were presented for bounty.

In 1961, Pimlott concluded that an intensive wolf control program in the Northwest Territories was justifiable, considering the reported drastic decline in barren-ground caribou numbers. However, several factors have changed since then. First, caribou are not declining any more. While conflicting reports exist about caribou numbers (Parker 1971, Theberge 1972), best evidence suggests that most herds are relatively stable (G.R. Parker pers. comm.). Second, those requirements of Native People once met by caribou have become less important. Although even in the late 1950s many native families lived off the land almost exclusively, requiring about 125 caribou per family per year, most of these people now live in settlements and are wage earners (A.H. Macpherson pers. comm.). Third, Parker, who has assessed the efforts of the intensive wolf control during the 1950s in the Northwest Territories, has kindly provided the following important information (Parker 1972): "Although hundreds of wolves were taken annually from within the range of the Kaminuriak barren-ground caribou population, the total wolf population apparently did not decrease as would be expected. The number of wolves killed per bait in 1953-54 was only slightly higher than the figure of 1958-59 (3.8 compared to 3.5), and this was after more than 3,500 wolves had been removed from the area (northern Manitoba and southern Keewatin). The reason for this may have been increased wolf productivity through the harvesting of adult animals, as suggested by Kelsall (1968)."

There is evidence, however, that wolves crop up to half the harvestable surplus of caribou over one year of age, and this had led A.H. Macpherson, Director of the Western Region, Canadian Wildlife Service, to concur with Parker that "predator control emerges as a potentially useful, although expensive, game management tool" (Macpherson pers. comm.). The expense supposedly arises from the necessity to achieve almost total annihilation to overcome natural increase in productivity of wolves, as demonstrated in the 1950s. However, since the present combined wolf and human kill of caribou is not causing a decline in caribou, there is little reason to implement such a program (Parker pers. comm., Macpherson pers. comm.).

Two factors may change this balance in future years. Commercial hunting of caribou is allowed in the Northwest Territories. To date, limited numbers of about 500 animals have been killed under this program. If in the future the program expands, pressures for predator control may emerge again. Perhaps counterbalancing this is the rising value of wolf pelts. The question may arise: Should we be raising caribou or wolves? Rather than predator control, perhaps a fur harvest scheme could emerge as a more valid use of the wolf resource. The philosophy of the Northwest Territories Game Branch, which is responsible for wolf control, is summed up by R.B. Hall: "The wolf is considered a threat to wildlife species in only a few cases. In all other areas, the wolf is considered to have no effect or to have a beneficial effect on other wildlife species" (R.B. Hall in litt.).

#### Other Regions

In Alberta, control has been much reduced and is carried out only to protect livestock on some northern districts. Even with no wolf control program to aid big game since 1965, big game populations have remained high. The 1969-70 Annual Report states: "Elk populations in northern Alberta appear to be extending their range along with a slow increase in total numbers. Mule deer in the north-west generally showed some increase over the past year. Northern Alberta moose populations continue unchanged for the third year in a row in the face of declining browsing conditions." Total annual kills (hunters, trappers and control programs combined) averaged 309 per year over the last five years. Alberta's policy is to "act only when & re-occurring depredation problem arises, and then only at the site of the depredation and on a strictly local basis" (G.R. Kerr pers. comm.).

The Yukon's predator control program accounted for an average kill of 32 wolves per year between 1960 and 1968. Poison baits are placed on lakes in winter by ground personnel. All baits are later retrieved and burned. Predator control is initiated primarily by complaints by outfitters about wolves near their horses. This problem arises because horses are allowed to range on non-fenced Crown land in the Yukon. Control has also been initiated to protect big game, specifically elk, which is an introduced exotic species in the Yukon and still uncommon. Despite this dubious reason to control wolves, an average kill of only 32 wolves by predator control is insignificant. Licensed hunters and



trappers take an additional 50-75 wolves each year, also of little consequence. The positive as well as the negative values of wolves are well recognized by the Yukon Game Branch. Wolves have complete protection in the new 8,500 sq. mile (22,000 km<sup>2</sup>) Kluane National Park.

Saskatchewan's program of wolf control did not change significantly until it was reduced in intensity in 1969. An average of 231 poison baits were set each year, and kills averaged about 172 wolves. In 1961, Pimlott raised a question about the extent to which Saskatchewan's wolf control was a "demand" program. This question seems still to apply. The 1968-69 Annual Report reads: "In response to requests for control action, a wolf control program was carried out in the northern fur conservation areas." Saskatchewan lists "damage to trapped beaver and other fur bearers" as a further reason for control. Since it is the only province to list such a reason, one wonders about the extent of the problem there. Might payment for damaged fur at full price of a prime pelt be a more realistic way of handling this problem?

Saskatchewan also controls wolves in the northern portions of the province to protect caribou, the same herd which migrates into the Northwest Territories where no control is felt to be justified. Control is also exercised where extensive reports of wolf-killed moose and other big game occur. However, "very little hard data is available on actual numbers of big game killed" (D.M. Taylor *in litt.*). Saskatchewan's philosophy is that "a control program shall be carried out for timber wolves where they are posing an actual threat to domestic livestock or placing unduly severe pressure on big game or fur-bearer populations" (Taylor *loc. cit.*). But, unfortunately, there is little to demonstrate that, in practice, demands do not actually dictate when and where wolf control is exercised.

Manitoba is divided into "northern lands" and "predator control areas" (all municipalities and lands south of the 53rd parallel) for purposes of predator control. In the latter, specific control is achieved through municipal-provincial agreements designed to handle each specific case. These are normally "\$10 agreements" whereby the municipality pays the province \$10 for the services of a Conservation Officer who destroys the individual animal concerned. Alternately, a municipality pays \$10 for each poison bait where more extensive measures are deemed necessary. Permits may also be granted for aircraft or snowmobile hunting in specific areas of Manitoba, but no wolves have been killed under aircraft permits since 1961, and snowmobile permits have virtually been eliminated due to unfavourable public reaction.

In the northern regions of Manitoba, predator control has been scaled down progressively throughout the 1960s from the 300 to 400 wolves killed annually in earlier years. Exact figures on the present kill and biological justification for northern control are not available. Trappers and hunters have taken a fairly constant 100 to 200 wolves per year. A \$10 bounty per wolf paid to Indians was discontinued in 1965, as was a special trapping program. The wolf is the official symbol of the Manitoba Department of Mines, Resources, and Environmental Management.

Quebec has, in 1972, replaced an antiquated system whereby game wardens poisoned wolves at their discretion with a new policy based on the principle that "any control should be local and temporary" (G. Moisan pers. comm.). Control is used to protect livestock and big game. In the case of livestock, if a complaint warrants control (determined by a qualified biologist), a trapper is hired by the Department of Agriculture. Under the biologist's supervision, the trapper either removes the wolf or wolves, or shows the complainant how to trap. In the case of big game, notably deer in winter yards, game wardens institute control measures with the advice of a biologist. In the winter of 1971-72, approximately 35 wolves were taken to protect deer yards.

More intensive control measures have been undertaken in Quebec in the winter of 1971-72, because of rapidly declining deer numbers in the southern part of the province. On September 17, 1972, a program was announced to include three phases: a trophy hunt open to holders of big game hunting licences (the lower jaw of the wolf killed by the hunter was to be encased in plastic and inscribed with the hunter's name); a trapping program; and a poisoning campaign - all to take place in the white-tailed deer range in south-western Quebec. Game branch officials who did not agree to phase one were unable to head it off. Public protest came from all parts of North America. The Canadian Nature Federation (1972) published an eight-page evaluation of the program to clarify the issue, deploring the trophy hunt and the use of poison and calling for a sound research program. The need for research was partly based on observations of the capacity of the wolf populations to withstand exploitation; unless a government program commits itself to a drastic decision to completely annihilate wolves, wolves may simply respond with increased productivity as in the Northwest Territories. Evidence that this can happen is available from white-tailed deer range in nearby Algonquin Park which is similar to deer ranges in Quebec (Theberge & Pimlott in prep.).

The Quebec Government later withdrew the poisoning phase of its program in direct response to public demand. The trophy hunt actually had little biological effect; only five coyotes and four wolves were killed. The whole event stands as a clear demonstration that methods used to manage wolves are of concern to the general public.

#### WOLF MANAGEMENT IN THE DECADE TO COME

Trends in wolf management emerge from the foregoing. British Columbia has demonstrated that the bounty can be replaced by a better system of wolf control. Ontario has demonstrated that training complainants to handle their own problems is effective. The Northwest Territories and Ontario have continued to show that the bounty is too general to be an effective tool of wolf management. And, the public has raised a loud voice against the ethics of the bounty. The result should be that the Northwest Territories repeal the bounty, ridding Canada of the most negative and primitive tool of wildlife management. If fur prices continue to rise, the wolf may reach true fur-bearer

status and be managed as such. And game status, with controlled harvest, will likely spread from British Columbia to other parts of Canada.

The wolf's further protection in park lands and its use as a non-consumable wilderness resource may spread, with Ontario's Algonquin Park setting the example. Perhaps due to economics, but hopefully for biological reasons, all regions will base their specific wolf control programs on well-documented evidence; if they do not, they open themselves to the criticism of many concerned citizens. Also, public concern is turning to the ethics of fair chase, demonstrated in strong expressions of displeasure with snowmobile hunting in Quebec, Ontario and Manitoba. Shooting wolves from aircraft is also being strongly disapproved of, and Ontario has responded by banning aerial hunting.

The wolf is no longer a symbol of evil in Canada. Its rapid transition to the status of a valued member of our famous fauna has been perhaps the most dramatic event in the history of wildlife management in Canada. There are still people who hate wolves, and they still clamour for extermination of the species. But, as Mech expressed it "(The wolf haters') narrow and biased attitude must be outweighed by an attitude based on an understanding of natural processes" (Mech 1970).

This is happening in Canada, and hopefully, it will go on in the 1970s until, ten years from now, the author of the sequel to this paper will have no nagging question in his mind, as I do: Is my optimism about a bright future for wolves in Canada unfounded?

#### REFERENCES

Canadian Nature Federation, 1972. Perspective on Wolf Control in Quebec. Special Publication No. 1; CNF National Bookstore, Ottawa.

Kelsall, J.P. 1968. The Migratory Barren Ground Caribou of Canada Canadian Wildlife Service.

Mech, L.D. 1966. The Wolves of Isle Royale. U.S. National Park Service Fauna Series, No. 7.

Mech, L.D. 1970. The Wolf; The Ecology and Behavior of an Endangered Species. Natural History Press, Garden City, New York.

Murie, A. 1944. The Wolves of Mount McKinley. U.S. National Park Service Fauna Series, No. 5.

Ontario Department of Lands and Forests, 1969. Wolves and Coyotes in Ontario.

Ontario Department of Lands and Forests, 1970. Research Review 69; 124-126.

- Parker, G.R. 1971. Trends in the population of barren ground caribou of mainland Canada over the last two decades; a re-evaluation of the evidence. Canadian Wildlife Service, Occ. Paper, No. 10.
- Pimlott, D.H. 1961. Wolf Control in Canada. Canadian Audubon 23(5): 145-152
- Pimlott, D.H. 1967. Wolf Predation and Ungulate Populations. American Zoologist 7: 267-278.
- Pimlott, D.H., Shannon, J.A. & Koenosky, G.B. 1969. The Ecology of the Timber Wolf in Algonquin Park. Ontario Department of Lands and Forests, Research Report (Wildlife), No. 87.
- Rausch, R.A. 1967. Some Aspects of the Population Ecology of Wolves in Alaska. American Zoologist 7: 253-265.
- Theberge, J.B. 1972. Northern Wildlife Resources: Will We Lose by Default? Nature Canada 1(3): 26-32.
- Theberge, J.B. & Pimlott, D.H. (in prep.). Recovery of a Timber wolf population in Algonquin Provincial Park.
- Thompson, D.Q. 1952. Travel, Range, and Food Habits of Timber Wolves in Wisconsin. J. Mammal. 33: 429-442.

NOTE

This paper was prepared for a meeting of the Wolf Specialist Group originally due to have been held in Prince Albert National Park in Saskatchewan in September 1972. It was published in Volume 2, number 1 (Jan. - Mar. 1973) of Nature Canada, the membership magazine of the Canadian Nature Federation, and is re-printed in these Proceedings with the approval of the President of the Federation.

Wolf Specialists  
First Meeting  
Paper B.1

PROTECTION OF THE WOLF IN SPAIN  
Notes on a public awareness campaign

Felix Rodriguez de la Fuente,  
Adena, Jose Lazaro Galdiano 4, Madrid 16,

As yet another example of the dramatic reduction of species of wild fauna throughout the world, we are faced with the rapid decrease of the wolf population in Spain. The problem seems to us particularly grave not only on the national scale but at world level as well, since the Iberian Peninsula is among the few parts of Western Europe which still has a wolf population able to survive without danger if a series of official and private measures were taken for its conservation.

To avoid the disappearance of the Spanish wolf in the near future, two types of measure seem essential.

1. To obtain a practical attitude on the part of the Administration which, by means of indemnities to private parties suffering economic damage through the activities of wolves and by means of firm and adequate legislation, will ensure the survival of the Spanish wolf population, at least in some of its present zones of distribution.
2. Concurrently with such pressure upon the Administration, an extensive and intensive campaign of popular comprehension would seem essential, to bring to the knowledge of the man in the street, first, the importance of conserving this species and, secondly, its real ecological and ethological role, which in many regions makes the wolf not only a necessary link in trophic chains, but also an extremely attractive animal through its beauty, its very varied and well developed social behaviour, and so on.

Obviously such a campaign of popular comprehension can also serve the very useful purpose of helping to convince Government representatives of the importance of the problem and the need for its urgent solution.

Very few articles and even fewer scientific reports on Spanish wolves appear to have been published in the last decade. One can say that, except for some general information contained in press reports, complaints from those who have suffered damage and various popular tales, no authentic sources are available from which one can obtain concrete and objective data about the density of the Spanish wolf population. The difficulty in getting a proper appreciation of the important details is derived from -

- a) the extreme exaggeration of popular accounts of wolf damage;
- b) the great impact that a small pack of wolves can make on public opinion when food is short, due to the undeniably large number of domestic animals they are capable of killing in the all too notorious "wolf raids";
- c) the presence in the Iberian peninsula of feral and savage dogs, which vastly complicates the issue in that it is precisely in those regions where the wolf has been exterminated and where ecological conditions were therefore suitable for its prosperity, that its place has been taken by wild dogs and they, it seems, are far more efficient predators on domestic cattle, as they have little fear of man and are quite familiar with anthropogenous areas;
- d) the very erratic character of at least some individuals of the Spanish wolf population, which are constantly on the move from one region to another, covering very many kilometres at a time. As they travel, these isolated and very mobile groups, generally doomed to destruction by some hunting party, can be responsible for slaughter on a scale which gives an erroneous idea of the density and distribution of the species.

In any case, naturalists, Government officials and the countryman alike are all in agreement that the diminution of Spanish wolves has become truly lamentable during the last 20 years. Dr. Valverde, in a paper published as a contribution to the International Hunting Congress on 24 May 1971, sets out with notable precision the facts about the distribution of the wolf in Spain; the species is represented by three more or less stable population groups based on (a) Castile-Leon, (b) Galicia and (c) Andalusia, respectively. The interested reader should refer to Valverde's work, since it is not our purpose here to assess the wolf density and distribution situation, although we are completely agreed that the diminution has been dramatic, and we have no hesitation in declaring that, if the situation continues as at present, wolves will disappear completely from Spain within the next 20 years.

Our aim here is merely to review the campaign of popular awareness that we have carried out throughout Spain during the last 7 years, since we believe that the results obtained can be illuminating for this type of operation. In brief the results have been:

- a) the birth of a great sympathy for the wolf in large areas of opinion;
- b) the typical descriptions of wolf-hunts and poisonings have become unpopular and regarded as anachronisms;
- c) and most important, a change of opinion on the part of the Provincial Governors, demonstrated when they met in the Cortes and decided to eliminate the wolf from the list of harmful animals and transfer it to the category of big game, protected by legislation which prohibits its hunting and capture during close seasons.

In Spain, as in the majority of civilized countries, the wolf has suffered the effects of a 'black legend' which presented it to the public as a cruel, treacherous, perverse animal, dangerous to man and his economy, against which war must be waged without quarter until it was totally exterminated.

The basic element of our campaign of comprehension was therefore to effect a complete change in the image of the wolf in the popular mind. For this purpose, we began by obtaining a litter of wolf cubs only a few days old, which were about to be killed by their captors. By means of a patient and laborious imprinting process, in which I was able to rely on the invaluable collaboration of my wife and a group of young biologists, we succeeded to such an extent that the cubs now show themselves absolutely dependent on the person concerned, maintaining a series of orderly interactions with him, treating him as a constituent member of the pack, accepting the presence of strangers without aggressiveness, playing with children and behaving at all times as completely opposite creatures to the cruel, man-eating wolf of the Little Red Riding Hood legend.

All stages of our work were fully explained to the public by means of a series of Television programmes, illustrated articles in the periodicals of widest circulation and every kind of press commentary in Madrid or provincial newspapers. An issue of a million large posters, produced by Adena W.W.F., carried the message to the whole country. The outcome of the campaign has been truly astonishing in the swiftness with which it has changed the opinion of the average Spaniard with regard to the true role of the wolf, which can be summed up as follows:

- (1) we can now assert that all Spanish children and young people, except perhaps in the very few rural areas which are particularly subject to harassment by wolves, consider this animal as a noble, intelligent and worthwhile creature, whom it is necessary to protect}
- (2) a favourable attitude to the protection of the wolf, which considers that hatred of it is a primitive and outmoded sentiment, has now been generally adopted by the intelligentsia;
- (3) quite a high proportion of Government officials now have a strong sympathy for the wolf and are open to any type of suggestion and solution which will help to avoid the uncontrolled persecution which could lead to its disappearance; and
- (4) Spanish zoologists as a whole, that is all students and professionals in the Natural Sciences, with very rare exceptions, are actively on the side of public opinion in favour of wolf protection. Any publicity campaign in favour of continuing the former persecution of the species is in danger of being severely criticized in the press by an accredited biologist or group of Natural Science students.

Although this at first sight looks to be a generally favourable and positive picture, we cannot hide the fact that there is a section of the Spanish population that not only has not abandoned its old anti-wolf

attitudes, but has reacted to our campaign of protection by a markedly aggressive attitude both towards the Administration, from whom it demands campaigns of destruction, and towards public opinion which it seeks to influence by articles in the press directed to speeding up the extermination of the wolf. The section of the Spanish population holds me personally responsible, at many levels, for the damage caused by wolves, and in some regions has even gone so far as accusing this author of having "devoted himself to letting loose wolves through the woods and mountains so that they may devour the sheep."

Among the most characteristic representatives of such adverse opinions we could cite:-

- a) rural populations directly damaged by undeniable attacks of wolves, which seem to us to constitute the most respectable sector of our opponents and we consider indispensable to indemnify for the damage suffered, if they are to be brought to a position of tolerance towards wolf protection;
- b) rural populations not suffering from damage by wolves, since they live in regions from which the animal has disappeared but who nevertheless still hold archaic points of view on the issue: in practice, children, young people and intellectuals among such groups have become favourably disposed towards the wolf, so it should not be too difficult to work towards a more understanding attitude generally;
- c) finally, and forming the group which has been most virulent and hostile to our campaign, certain journalists, who specialize on hunting and animal husbandry themes and who have hurled themselves into battle against the wolf with extraordinary aggressiveness and have certainly influenced opinion in some areas which were already predisposed in the wolf's favour, particularly of course among the readers of reviews on hunting and cattle as well as many active hunters.

In the remaining part of this paper some selected extracts of articles and press commentaries are given in chronological order, which may serve to give an idea of the characteristics of the campaign that we have been carrying out.

- (i) Blanco y Negro, 15 April 1967. Dr. Felix Rodriguez de la Fuente.

"For the first time in my life, I saw the possibility of clearing up a mystery that had been worrying me from childhood: Was the wolf an implacable assassin, cruel and revengeful or a noble and powerful hunter, calumniated and persecuted to the point of extinction? Konrad Lorenz had handed me the key which would permit me to penetrate into the unknown world of the wolf. If, by making himself the 'mother' of a wild gosling, the Austrian professor had got to know the language and customs of geese, I could try in the same careful way to



take the place of the dead she-wolf. If there was still time to subject my cubs to the psychological imprinting process, they would perhaps speak to me in their language, make me share in their way of life, just as if I were a member of their own clan".

- (ii) Blanco y Negro, 24 April 1967. Dr. Felix Rodriguez de la Fuente.

"After 2 years of living with ray wolves, of minute study of their behaviour and language, from lactation to first heat, I can now weigh up and compare their reasoning - "the reasoning of the wolf" - and that of my fellow-men. My first impression is as clear as noon-day: the shepherds, gamekeepers and hillsmen had told me a fantastic string of lies, whose only justification can be rooted in their total lack of knowledge of the real life of wild animals. On the other hand all that the wolves have told me is of an incontrovertible truth, of a justice which surely can only be found in Nature. In brief, the cruel wolf is very affectionate towards his fellows, the unconditional protector of the weak and females of his kind; the treacherous wolf is an animal of monolithic loyalty, capable of dying through fidelity to his leader; the murderous wolf is a hunter who has no alternative but to kill to eat, but detests violence and obeys without question the warning signs which avoid fratricidal war within his species.

The implacable persecution of which the wolf has been an object has a very simple explanation. The wolf robs man of his meat and the latter has the right to defend it. The shepherd and peasant try to expel the competitor from their territory by every means. But, over and above this territorial war, common enough among other animal species, there is a mythical, disproportionate hatred which has made the wolf the target of every human vice: cruelty, treachery, vileness ...

In Spain, although the wolf population has suffered a notable decrease in recent years, these beautiful animals are still present in almost all our sierras and steep moorlands ... Imagine what would have happened in the famous Serengeti or in the crater of the Ngorongoro if, on the plea of preserving the goats and antelopes, people had killed all the lions and leopards, as we have been doing here with the wolves and lynxes of Asturias, the mountains of Toledo and the mountain ranges of the south. What would have happened, of course, would quite simply have been that there would now have been fewer zebras, fewer antelopes and, moreover, that they would be diseased and degenerate. Naturally, not a single tourist would now be going to photograph these herds, so goodbye to a valuable source of foreign exchange.

The truth is that the wolf is a carnivorous animal which can balance the degenerating selective pressure that hunters exercise in the big game preserves. It has been proved time

and time again that wolves, slower-paced than any deer or antelope, always pick out injured or maimed individuals, the sick or old, which are the first to become exhausted in the chase. It is through this selective hunting, that the most vigorous breeding animals capable of maintaining the purity of genetic lines, are the ones that survive. Contrariwise, human hunters always pick out the finest specimens as trophies, thus eliminating the best males and unleashing a negative selection which, on many estates, has already given rise to generations of deer with small and misshapen horns. A total lack of wolves to compensate for this situation could be catastrophic. We should also remember the vast numbers of rats, mice and other rodents, which wolves devour in spring and summer, and the control they exercise over foxes, weasels and other small predatory animals. It is logical that in zones where it is proved that wolves cause damage to flocks, they should be persecuted and killed. But on estates and in big game preserves, their extermination would constitute and create a real imbalance in the biological communities,"

(iii) A.B.C., 29 October 1969. J.E. Casarifego.

"The wolf is a fierce, astute, bloodthirsty, perverse and cunning beast that not only kills to feed itself, carrying out a fatal biological law, but causes great destruction useless to itself. The wolf is, moreover, a repugnant and repulsive animal, practically incapable of domestication. Apart from some very exceptional cases, more spectacular than substantial, of apparent domestication in circus style, for the gallery, I know very many cases which prove absolutely the total incapacity of this animal to live in harmony with man and his domestic animals, to which it is substantially and radically hostile. As Ortega y Gasset says so well, the only logical and normal relation of man to the wolf is to shoot at him, a good shot, I would add, or a good dagger thrust, which will split him open, or a good trap which will put an end to his liberty and his assassin's life, his highwayman's existence and his attacks on peasant homesteads."

(iv) "ADENA" Poster. Dr. Felix Rodriguez de la Fuente.

"The article appearing on 29 October in the pages of A.B.C. and signed by J.E. Casariego, is as astonishing as it is sad. Astonishing, and even unusual, because in it are poured out phrases as anachronistic and harmful to our international prestige as 'a good dagger thrust which will split him open', 'a good trap which will put an end to his liberty', 'annihilation, extermination, implacable persecution'. Such language is no longer used in any civilized country. It is just such modes of expression and purpose that have caused the extermination of dozens of animal species in the world. This aggressive attitude to Nature has deprived human beings of some of the most beautiful creatures that have ever populated the mountains, woods and seas of the planet.

But the article is also both sad and inopportune, because Spain has reached a very appreciable international level in the preservation of Nature and the scientific control of its fauna.

Who can assert that wolves are practically 'incapable of domestication' when among the best known and most popular experiments in zoo-psychological imprinting carried out in recent times in North America, Europe and Spain are ones that have used wolves as protagonists? Is it possible that the author of the article can be so rash as to write about the wolf, when he is apparently unaware that the imprinting experiments I have carried out personally with a sample consisting of 7 wolves belonging to 3 generations, have been acclaimed by the most important reviews of the world, including Blanco y Negro, Paris Match, Betes et Nature and Das Tier, as well as the television channels of almost all Europe and U.S.?

We feel sure that those who are entrusted with the drawing up of the definitive Hunting Law will not let themselves be influenced by popular clamour or extermination demands by people so totally ignorant in the field of Zoology, but rather by the communications and the exact and detailed studies of biologists and ecologists who advise the organisms entrusted with watching over the integrity of our Zoological Patrimony".

\* \* \* \* \*

As a result of such full journalistic exposure of the subject and, we think, above all, the Television programmes to very full audiences, which we broadcast under the title of 'Fauna and Adventure', the members of the Spanish Parliament first became aware of the problems which would arise from the disappearance of the wolf in Spain. The Sessions of the Supreme Magistracy of the State in which the wolf theme was touched upon during the drafting stage of the new Hunting Law, turned out really outstanding, lively and in some cases even stormy. Fortunately the members defending the wolf dominated the detractors. The spirit that we had inculcated in public opinion over the last 5 years was present during these debates and, in a conclusion which we venture to consider historic for the preservation of fauna in Spain, the wolf was included among the big game which enjoy protective legislation. The next quotations show clearly how burning was the theme when it came before the Cortes and how interested in and passionate devotees of the wolf were many of the members.

(v) Pueblo 25 February 1970. Joaquín Aguirre Bellver

Activity returns to the Cortes:

"Serrats held forth in the evening. There are now several laws for which he bears the palm. Yesterday he told them 'The Story of the Wolf', the fact that one should not kill them, because the

whole of Nature can become disorganized and everything then has to be re-organized again .... But this is Felix Serrats de la Fuente, they say to me, while he is speaking. There were those who were not exactly Franciscans in this debate about Brother Wolf!"

(vi) Ya, 25 February 1970 A.J.G.M.

The Committee of Agriculture of the Cortes had a long discussion on whether the wolf should be covered by the big game legislation.

Marginal Notes at the Session:

"Is Spain a civilized country? That is the serious and distressing political and social problem that arose in the Committee of Agriculture studying the project of the Hunting Law ... The Conde de Mayalde expressed the opinion that Spain is not a civilized country. A terrible statement. And why is Spain not a civilized country? The Count of Mayalde, aristocrat and politician in the blood of his veins, says - because we are a country with wolves. In civilized countries, says the Count of Mayalde, there are no wolves. Let us look towards Europe. Where are there wolves? Let us look at the U.S. Where are the wolves? Spain, my friends and compatriots, is infested with bands of wolves. Spain, then, friends and compatriots, is not a civilized country according to the theory of the Count of Mayalde. An alarming revelation in the midst of our booming development. What are we going to do, make an end of all the wolves to be a civilized country? The session developed around this theme of the wolf.

But in the midst of so much patriotic anguish as the Conde de Mayalde sowed, like a legislative St. Francis of Assisi, Senor Serrats Urquiza (Don Salvador), asked permission and got up to speak. Why are we going to exterminate the wolves, he said. Why are we not going to protect Brother Wolf? Sr. Serrats Urquiza made a sensational revelation. The government of the U.S. has asked for a confidential report from the Spanish Government. Expectation in the Chamber. Some uneasiness before such an astonishing revelation. 'What is asked for in that confidential report?' Sr. Serrats Urquiza (D. Salvador) did not want to hide that political secret through patriotic emotion. The Government of the U.S. is asking the Spanish Government to tell them if it is certain that there are wolves in Spain. If there are any, as someone (perhaps some tourist) has said, Spain, friends and compatriots, would perhaps be the only country in the world that has wolves. If the existence of wolves on our soil is certain, the U.S. Government with unrestrained anguish, is making a request, a petition, a supplication, very very nearly a command.

And what is the U.S. Government asking the Spanish Government? It is asking that we should protect wolves, not kill them, that we should take them into national reserves to save a now almost extinct species. Spain, then, is a wolf power. And now the Conde de Mayalde wants to do away with a form of Spanish wealth and annoy the U.S. Government."

(vii) CAZA Y PESCA, 1 July 1973, El Pastor Poeta

"I have just read in the section 'See, Hear ... and Tell it' of the daily paper Ya the interview that the editor of the review TRIA, Don Xavier Zuloaga, had with the modern St. Francis of Assisi, defender of the criminal wolf, Dr. D. Felix Rodriguez de la Fuente, who in my modest opinion, is solely to be blamed for the damage that has been caused, in particular, to Spanish cattle and to all the big game of our game reserves. To deny that the said Doctor is a specialist in the science that deals with animal species would be tantamount to ignorance of the marvellous interpretation he gives of them in the well-documented work that he carries out on Saturdays in Planeta Azul on Spanish Television, studying with undeniable accuracy the life and customs of the wildlife populations of the world. In this field, I am his most fervent Admirer.

But to ignore the harm he has done to Spanish livestock and national cynegetics by the continual and systematic defence he puts up in favour of a terrible wild beast, would equally be equivalent to being a half-wit, and to ignoring the harm which he has done to the countryside in this respect, since it is due alone to the persuasive power of his evil cause that this savage animal enjoys impunity, through the absurd protection granted it by Article IV of the new Hunting Law, promulgated on 4 April 1970 to the shame and ridicule of former generations who with a true spirit of justice relegated to the brink of extinction these carnivorous quadrupeds."

(viii) ADENA Poster, Dr. D. Felix Rodriguez de la Fuente.

"ADENA, which has followed with deep interest the debates in the Cortes, led by the Committee of Agriculture, around the project of the new and highly desirable Hunting Law, extends its warm congratulations on the spirit of conservation which has inspired the new articles. Beginning from the first article by which the protection, conservation and stimulation of the national wealth in cynegetics are regulated, and going on to the third, by which wolves and lynxes are classified as big game, whose survival is threatened, all this is an anthem for nature protection.

Let no one doubt that through having conserved wolves Spain has taken a great step forward in civilization, since civilization does not only depend, as many people seem to think, on the importance and modernisation of our industries, but also on the concern for conserving our natural treasures so that future generations may be able to enjoy them."

In concluding this review, it can be stated that even if in practice the protection of the wolf is not as effective as could be desired if the danger of its extinction is to be finally removed, it is undeniable that, in only 7 years, we have witnessed a drastic and intense change of popular opinion with regard to this species. It is now for the specialists and members of the Institute for the Conservation of Nature to find adequate formulas of control of the Spanish wolf population, so that, at least at certain crucial points, its conservation shall remain absolutely assured. This is because we find that, despite the good intentions of the Government and Protective Legislation, people who have suffered damage by wolves have been authorized to go ahead with their mass slaughter, with the use of poison and with campaigns whose intensity can dislodge the wolf population from areas very suited to their protection and supervision. It must not be forgotten that the solution of the problem always presents difficulties, since there enters into play a considerable variety of interests related to simple popular economy arising from wolf depredations.

It is satisfactory, however, to be able to report to this meeting that in our campaign in favour of the wolf we have at all times enjoyed the excellent facilities from Spanish Television for the realization and broadcasting of programmes about the wolf, the support of the most important journals in the country, among which special mention must be made of Blanco y Negro and Actualidad Espanola and, fundamentally, the total support for our work on the part of Adena. We cannot end this report without also publicly thanking the members of the Cortes and of the Spanish Government who have intervened so surely and positively in the debates on the legal status of the wolf.

Wolf Specialists  
First Meeting  
Paper B.2

INFLUENCE OF EDUCATION PROGRAMS ON WOLF CONSERVATION IN CANADA

Allan Murray  
Dept. of Mines, Resources, and Environmental Management,  
Winnipeg, Manitoba.

There has been a considerable change of attitude in Canada toward predators and particularly toward wolves. This change is noticeable in a number of ways but most notably in a switch of provincial governments' regulations governing predator control. Bounties have been removed; in some jurisdictions wolves have been given game animal or fur bearer status; and in others there has been a general tightening up against people who harass or hunt from aircraft or snow vehicles. This is not to say that the wolf is out of trouble in Canada yet, if indeed it ever will be. But there is some cause for optimism.

What brought about this change? Why did governments start to behave differently toward wolves? If one believes the theory that governments generally represent the wishes of the people we would assume that the majority of Canadians favoured this new approach. What then caused so many Canadians to abandon their earlier anti-wolf attitude in favour of pro-wolf legislation? Most of us have been conditioned to believe that education is a key to changed attitudes. It follows then that somewhere in the Canadian scene there has been an educational program that caused us to favour wolves.

These thoughts ran through my head when I was asked to write this paper and I visualized little difficulty in describing the educational programs that caused the miracle. I may also have been influenced by Moira Warland's comment in June of 1972, in a memorandum to the IUCN Commission on Education. She said, referring to us in the Wolf Camp, "We should now begin thinking about possible approaches to developing education campaigns, particularly in the European and Asian countries involved. In Canada, such programs have reached an advanced stage and this country can be said to be by far the most enlightened in its attitude to the part wolves play in nature and in the aesthetic satisfaction of man."

I sent a questionnaire (see Appendix) to the wildlife directors in each provincial government in Canada asking them a series of questions about education campaigns, their influence on government wolf policy and about changing attitudes. Nine provinces and two territories replied. Wolf management in Canada is a provincial, not a federal responsibility, except in National Parks.

Only one Canadian province admitted to carrying out a public education program about wolves in the past ten years. That province was my own - Manitoba - and our campaign was neither high powered nor expensive. Three provinces said that private groups or individuals had carried out some kind of public education program on wolves but none of these could be described as highly organized, costly or sophisticated. In any event, only one of the three provinces where such a program was carried out, admitted that the program had any influence on government attitudes toward wolves. In the one case, however, the influence resulted in the government delineating its policy toward wolves and coyotes and launching a research study on wolf predation. So much for Canadian public education programs on wolves: only one provincial government admitted to such a program and only four out of twelve governments perceived a non-government education program.

On the other hand, eight provinces reported a change in the public's attitude toward wolves and five governments said their own attitudes had changed during the decade. I think it is fair to say, however, that more than five provincial governments experienced a change of heart during that period but to admit it would imply that their earlier attitudes were less than satisfactory. In fact, the questionnaire did reveal that eight governments could see a change in the public's attitude toward predators and all of them admitted to having helped nurture that change. Five governments felt that this general change in attitude toward predators did have an influence on wolves.

The lesson seems to be this: some government agencies, sensing a new receptiveness by citizens toward predators, immediately seized the opportunity to bring about restrictions that protected the animals in question. In one province the bounty was removed, in another severe restrictions were placed on issuing permits for hunting predators from aircraft.

How did this affect wolves? One province replied, "The changing posture of the department toward predator control (brought about by the public's new attitude toward them) has caused many people to question the necessity of widespread control programs in non-agricultural areas."

Another province said of the new public attitude: "Majority of general public less prone to condemning the wolf."

Some of the public's attitude was changing, and the alert, opportunistic governments read the public climate and brought about desirable changes. The question of what stimulated the change in public attitudes, however, remains to be answered.

Theberge in a paper prepared for the IUCN Survival Commission in August, 1972, attributed it to "a greater flow of unbiased and scientifically accurate information". And again, he says, "These new concerns stem largely from popular presentations of the results of wolf research .... Books, articles, radio programs, television documentaries, commercial records have put into public hands many biological facts that are displayed at even greater depth in the scientific literature of the



past decade," I wish I could endorse his easy solution to the problem; flood the public with popularly presented scientific facts and the public will respond with a new and enlightened attitude. There doesn't seem to be any evidence that this was the case in Manitoba,

Let us look briefly at Manitoba as an example. It has a population of one million people, half of whom live in the capital city. The province has two main daily newspapers although one is twice as large as the other. We searched the files of the larger paper going back ten years. During those years, it carried 43 news stories about wolves -- about four stories a year. For the most part, the stories are about isolated events and only three or four could be regarded as the kind which Theberge saw as educating the public with new scientific information.

During the same period, Canada's so-called national magazine carried three stories about wolves. Nature Canada -- a special interest publication aimed at nature lovers -- carried two stories, both of an instructional nature. Other publications about wolves have reached Manitobans during the past ten years but in total they fall far short of a concerted educational campaign. There has been some radio, TV and film exposure but that too hardly seems adequate to have caused a drastic swing in public opinion about wolves. I must assume that, with the possible exception of Ontario, all the other Canadian provinces fared no better than Manitoba in getting facts about wolves from the mass media.

The two most popular books about wolves -- The Wolf by Mech and World of the Wolf by Rutter and Pimlott have only sold a handful of copies in the province, although Farley Mowat's Never Cry Wolf has sold a number of thousand copies and presumably has had an influence.

The government carried out an additional campaign in Manitoba as part of its plan to have the wolf adopted as the departmental crest. This consisted primarily of publication of a booklet -- The Wild Dogs -- with attendant radio, TV and press coverage. To date we have distributed 72,000 copies of that booklet, mostly within the province. In addition, the departmental crest has appeared on all our publications, signs, advertisements and vehicles. If nothing else, it has made the public aware that the department stands four-square behind the wolf, although being the national symbol of the United States hasn't done much for the Bald Eagle.

I think the public has been educated in a way that has influenced its attitude toward wolves and predators. But this education, in my view, is largely a spill over from the great environmental movement that swept the United States a few years ago. The publications, films, books and news stories that arose from American concerns poured into Canada and found a ready audience -- an audience that was enjoying relatively good economic times, whose environment had not -- with few exceptions -- been as degraded as in the United States, and who took a somewhat righteous view of our stewardship compared to the Americans.

There has been an increasing trend to urbanization in Canada and it is generally thought that urban dwellers -- removed as they are from daily contact with nature -- have a more protective and perhaps more romantic feeling for wildness than do their country cousins. The cattle rancher whose steers are often prey to wolves does not take the same "Let Them Be" attitude toward wolves as does the city person.

When the TV film "The Wolf Man" was shown on U.S. television several years ago, most of the letters to the government -- on the wolf's side -- came from large cities where there hadn't been a wolf for decades.

The film, "Death of a Legend", has had a good showing across the country on National Television and a number of provincial governments distribute the film to the public. My own Department has two prints of it and last year we loaned it 40 times when it was seen by an estimated 1500 people. In my opinion, this film had a considerable influence on popular attitudes.

Before we published 'The Wild Dogs', we tried to get some idea about what effect it would have on readers so we ran a small experiment. A questionnaire was given to several classrooms of school children and to one large gathering of a local hunters club. They had not read the manuscript nor did they even know one had been written. Several days later we distributed copies of the text of 'The Wild Dogs', without the illustrations, to other groups of a comparable nature and after they had read the manuscript we gave them the same questionnaire. Some interesting differences were revealed.

Both the control groups and the test groups showed about a 50% response favourable to the wolf but the test groups, that is the ones who read the booklet, were about 10% points higher. In the responses unfavourable to the wolf the test groups were both below the control group. The scores seem to indicate that reading the booklet caused both hunters and students to be more favourably disposed to the wolf and to have fewer unfavourable responses.

In evaluating this statement on a continuum "Most of the popular stories concerning wolves are a mixture of myth, nonsense and slander", we found that only the control students were below the half mark, i.e. most of them disagreed with the statement. This seems to mean that a good many students believe that most of the popular stories about wolves are not a mixture of myth, nonsense and slander.

The student test group that read the book, however, showed a larger jump toward agreeing with the statement than did the hunters. Perhaps this means students can be more readily and significantly influenced by a publication like "The Wild Dogs".

All groups believed that wolves are a vital element in our environment but the test groups were more emphatic. All agreed that if wolves are to survive we must help them and here the two most emphatic groups were the control group students and the test group hunters.

When we come to attitude change, however, we face an odd response. The statement was: "one month ago, I would have rated my attitude toward wolves as". The test students averaged point five on the 1-10 continuum, the test hunters were about six point five and the control hunters were about six. However the control students were above point eight.

To the statement, "my attitude to wolves now is", the control students' concern dropped. That is, the students who did not read the booklet felt when they took the test that they were more concerned about wolves one month previously. We don't know why they would have felt that way.

Both test groups, however, showed a considerable increase in concern about wolves, after reading the book, and so did the control hunters group.

The result of this little survey again seem to indicate that both students and hunters can be influenced by a publication such as 'The Wild Dogs'. We don't know how lasting this change in attitude would be. but it obviously would have some longer term influence.

The results of 'The Wild Dogs' experiment and the intuitive judgement of the impact of 'Death of a Legend' certainly indicate that a public information program could have a considerable influence on the general public. But I cannot identify an organized public education campaign in Canada although there have been some good individual regional programs. On the other hand, the Canadian public has adopted a new position on the wolf. This new position was brought about by a combination of influences, not by wolf conservation programs. Government agencies, in some cases where the climate seemed suitable, took advantage of these circumstances and brought about new protective regulations or curtailed predator control programs that were threatening wolf populations.

Much more, of course, needs to be done in Canada and elsewhere if we hope to preserve the wolf. Let me say that I don't think we can save the wolf if we let the whales go, or the crocodiles, or the sparrows. Surely the only way we can save the wolves is by getting people to see that all creatures have a place. Once we place values on different species and say that a wolf is more valuable to mankind than a coyote, or two elephants equal one whale, we have started on the road to failure.

I think the long-term public education approach that will save the wolves and all other creatures was best expressed by Dan Saults of the U.S. Bureau of Fish and Wildlife writing in the Balance Wheel of October 1968: "We do need to educate a public, but not in the stamen and pistil, not in the coverts of wing primaries, not in the browse habits of desert big horns. It is enough to teach them that there are flowers growing outside gardens, that strange flying creatures cruise trackless skies, that life stirs on mountain peaks far from the massed cities and then we need to educate the public that there are guardians for these wild, free places, and things .... and we are the guardians. We do not "manage" them ... rather we live with these things, admiring and respecting them, guarding a heritage for absentee owners who pine for their birthright but probably will never see it."

APPENDIX

Questionnaire

1. Has your department carried out any kind of public education program about wolves in the past 10 years?
2. If so, what did it involve?
3. Has your department's attitude toward wolves changed over the past 10 years and if so how?
4. Has this changed attitude been reflected in dealings with the public so as to constitute a method of influencing public opinion?
5. Have any citizen organizations in your province conducted public education or information programs in your province about wolves?
6. What did they involve?
7. What influence did they have on government attitudes or regulations toward wolves?
8. A. Is there a general change in attitude toward predators (raptors, coyotes, etc.) in your province?  
B. Did you help to nurture this change and if so how?  
C. Do you think it had any influence on attitudes toward wolves?  
D. What?
9. Has any anti-trapping, anti-hunting feeling hit your province and if so, is it in any way responsible for a changed attitude toward wolves?
10. Did the showing on the CBC of the Death of a Legend result in your agency getting any increase in letters about wolves?  
For or against?
11. A. Do you circulate films to the public?  
B. If so, do you circulate Death of a Legend?  
C. If A is Yes and B is No, why?
12. A. If there is a change in attitude toward wolves does it stem from the urban areas primarily?  
B. What change, if any, do you see in rural areas?

13. A. Do you have a program to compensate livestock owners for animals killed by predators?  
B. If so, how long have you had it?  
C. If not, do you contemplate such a program?
14. How much of the decision to implement such a program comes from a desire to help farmers and how much because you wanted to curb wholesale predator killing as an alternative?
15. Do you get as many (fewer? more?) letters against wolves as you used to? What is their general tenor

Name \_\_\_\_\_

Agency \_\_\_\_\_

Address \_\_\_\_\_

Wolf Specialists  
First Meeting  
Paper B.3

THE NORDIC PROJECT WOLF

Mats Segnestam  
Executive Director, The Swedish Society for the Conservation of Nature,  
Riddargatan 9, Stockholm 11351

The wolf in the Nordic countries has been virtually exterminated. Professor Bertil Haglund has reviewed the changes in the wolf population in the three Nordic countries and he has described the present situation of the wolf (paper A.3). From a conservation standpoint, the development that has taken place is, of course, unacceptable. Even if the awakening was late in coming, there is in Sweden no hesitation, but a determination to work for the survival of the wolf as a species in our country. The Swedish Society for the Conservation of Nature has, of course, taken a stand on this matter, but even the Swedish authorities have clearly stated their opinion. It is written in the Game Statutes that base populations of the four large predators should be retained in the country; and in connection with the national physical planning in Sweden it has been emphasized that there is a need for undisturbed areas where predatory birds and animals can continue to live.

At the initiative of the Swedish Society for the Conservation of Nature (Svenska Naturskyddsforeningen, SNF) a discussion was taken up concerning the possibilities of saving the last vestiges of the Fennoscandinavian wolf. The objective was to protect the nominate race, Canis lupus lupus. The need for Nordic cooperation being obvious, SNF initiated contacts with Finland and Norway at an early stage. Denmark has also expressed an interest in participating. Project Wolf was outlined by SNF and a working group was formed, with representatives for forest-vertebrates research, museums of natural history, the National Swedish Environment Protection Board, the World Wildlife Fund, and SNF. Corresponding groups were formed in Finland and Norway. The project will be headed by SNF in cooperation with the Swedish National Appeal of the World Wildlife Fund. The Scandinavian Project Wolf is in this way also connected to IUCN/WWF's world-wide program to save the wolf.

The first matter of importance to be dealt with in Project Wolf is an attempt to establish a "gene bank", building from the wolves of "Scandinavian" race in zoos - at present about twenty animals. Fortunately, the wolf has been shown to have a good reproduction rate in captivity, but in this respect it is important that the best possible conditions be created. Project Wolf will therefore issue a memorandum on the rearing of wolves. Studies have already been conducted on the marking of wolves. A stud book has been prepared after consultations with zoos in Finland and Sweden, and a copy has been sent to the Zoological Society in London. It is important that genetic defects due

to inbreeding be avoided; all the wolves now in captivity are descendants of two wild sibling-pairs (one pair was captured in northern Finland and the other in northern Sweden), Because of the risk of inbreeding, the breeding work must be carefully conducted according to a delineated plan, and under controlled conditions. Therefore, one of the objectives of Project Wolf is to ensure access to breeding material through agreements with the concerned zoos and through the purchase of wolves. SNF presently owns two wolves and we hope to acquire two more.

At present, some ten zoos are prepared to participate in the project and an additional number will undoubtedly be needed. Zoos can in this way make a valuable contribution to conservation and the zoos themselves will benefit from the project. We have received encouragingly positive replies from the zoos -- for example, Skansen here in Stockholm has built a new wolf enclosure and has obtained two wolves of the desired race, and Skane's Zoo in southern Sweden will play a leading role with the building of five enclosures, one of them very spacious.

If wolves do not migrate from the Soviet Union via Finland to Sweden - and at present the probability of that is not very great - some kind of reintroduction will be the only way of reestablishing a wolf population in Sweden. One possibility that has been under discussion is the creation of a very large enclosure in a suitable area, probably in the forest region and outside the areas for reindeer herding. (The problem is to find an area which is large enough and sufficiently undisturbed). We could then try to release young wolves which have been reared in the enclosure without much contact with people and have been taught by their parents to hunt.

An important part of the work not least in the long run, is to bring about changes in attitudes, to do away with the remaining vestiges of a dogmatic and prejudiced attitude toward predatory animals in general and the wolf in particular. Unfortunately, many people in Scandinavia still consider the wolf to be dangerous, ravenous and evil -- an attitude that can be traced back to our forefathers. Therefore it must be stressed that the wolf has a right to equal status and knowledge about the wolf as a functioning part of the ecosystem must be shared with the general public. Public relations activities will be conducted as part of Project Wolf. A postcard with a wolf motif has been designed by the artist Gunnar Brusewitz. The card is the first in a series of printed materials that will be sold and in other ways spread throughout the Nordic countries for purposes of information and education. In cooperation with the zoos, we shall also provide general information about Project Wolf and about the project's background. Furthermore, we shall publish a special children's book that throws light on the predators' situation and their role in the ecosystem. We also intend to produce slide series and exhibitions on the predators' role and -- hopefully, if there are sufficient funds -- films. In this regard we could make good use of the films that Professor Pimlott is to show later today. Last but not least, there are the contributions made by the press, radio and TV to publicize the project. The mass media in Sweden are very responsive, and they have demonstrated

an understanding of the concept of conservation that is as encouraging as it is important. We will do our best to tell the representatives of the press, radio and TV not only about the campaign to save the wolf, but also about predatory animals in general.

The first stage of the work on Project Wolf will be coordinated by SNF and its staff. In Sweden one person will be employed for a period of time to handle the practical matters, e.g. negotiations and contracts with zoos. We will also maintain very close contact with the National Swedish Environment Protection Board where, it is encouraging to note, there is an expressed intention to invest in research and investigation concerning predatory animals in Sweden. Project Wolf will, of course, be coordinated with these activities.

We have not yet been able to come up with final cost estimates for the project, but according to preliminary calculations, costs in Sweden during the first year will come to about 80,000 SKR (approximately US \$20,000) and the financing of the operation in the future will cost about 25,000 SKR (US \$6,000) annually. These costs cover only the establishment of the gene bank and the public relations activities. To this must be added the costs for any large-scale investments that may be made in wolf enclosures, etc. WWF/Sweden is assuming the heaviest financial burden. Part of the costs for the wolf enclosures will be paid by the government through the National Swedish Labour Market Board. SNF will contribute through a special fund set aside for the protection of predatory animals.

In this short summary I have attempted to outline the broad objectives of this project for the protection of the wolf. From the very beginning we have been encouraged by the positive interest shown by the various institutions and also by the fine cooperation between the conservation organizations and the government conservation authorities.



Wolf Specialists  
First Meeting  
Paper C.1

CURRENT TECHNIQUES IN THE STUDY OF ELUSIVE WILDERNESS CARNIVORES<sup>1</sup>

L. David Mech  
Division of Endangered Wildlife Research, U.S. Fish and Wildlife Service,  
North Central Forest Experiment Station,  
St. Paul, Minnesota 55101

Until recently, the life histories, behavior, and ecology of most wilderness carnivores have been difficult to study, at least under natural conditions. This is because generally these animals occur in low densities, travel long distances, and are naturally elusive and secretive. When they inhabit dense forests, as many do, they pose special problems.

However, the publication of the design of the first miniature radio-transmitters that could be attached to animals and would transmit long distances (Cochran and Lord 1963; Craighead et al. 1963; Marshall 1963) and the subsequent sophistication of the transmitter and receiving system (Cochran 1967; Cochran unpublished), have revolutionized the field study of many mammals.

The present paper describes the manner in which the radio-tracking technique has been adapted to the study of wilderness carnivores, shows how the method has facilitated such studies, and gives examples of the type of results that can be expected with this technique. The following species will be discussed: the gray wolf Canis lupus, lynx Lynx canadensis, fisher Martes pennanti, marten Martes americana, leopard Panthera pardus, mountain lion Felis concolor, grizzly bear Ursus horribilis, and black bear Ursus americanus. However, studies of the wolf in northern Minnesota, which the author has personally investigated most intensively, will be emphasized.

All radio-tracking studies require capturing the subjects. With bears, leopards, fishers and martens, efficient capture techniques such as wire live-traps or larger modifications of them have been known for a long period, but with some species special techniques had to be developed.

For example, trained dogs are used to detect, track and tree mountain lions, and the lions are then darted with tranquilizer guns (Hornocker 1970).

---

1 Paper presented at the XI International Congress of Game Biologists, Stockholm, Sweden, September 1973.

With wolves, we use steel traps, preferably Newhouse No. 114, which has a gap between the jaws when closed, thus minimizing pressure on the foot; these are also equipped with studs, which prevent the animal from sawing its foot back and forth between the jaws. Rather than being staked solid, the trap is attached to a drag hook by a chain of some 2 meters (7 feet), a technique that also reduced the chances of injury and allows larger wolves to be held. To date, 95 wolves have been captured in this way, and several recaptured.

At first a professional wolf trapper of considerable repute was hired, and he captured many of the wolves, using his own lures. However, we observed that experienced wolves soon learned to avoid lures, so we ourselves began trapping using our own methods. Traps set in trails, around bait, and near scats or natural scent posts were most effective and would even recapture experienced wolves. In this way, we have increased trapping success from one wolf per 150 trapnights to one per 50 trapnights or less.

Canadian lynxes are captured in wolf traps incidentally (Mech 1973a).

For subduing carnivores, we immobilize them with a combination of phencyclidine hydrochloride and promazine hydrochloride, administered intramuscularly in dosages recommended by Seal et al. (1970). We have applied these drugs to most of the 95 wolves handled, to two leopards (in Kenya), five martens, nine fishers, and six lynxes. Only two drug-related deaths have occurred, one involving an extremely emaciated wolf and the other an overheated lynx. In addition, during 71 captures involving 46 mountain lions, Hornocker (1970) used the phencyclidine hydrochloride successfully (without the promazine), with no drug-related deaths, and Rogers (pers. comm.) routinely used the combination of both drugs on several hundred captures of black bears. In most cases, administration was direct via syringe mounted on a pole, although the mountain lions were shot by dart gun. Generally drug action takes 5 to 15 minutes, and down time is 1 to 2 hours, depending on dosage and weight of the animal. Fishers and martens usually go down faster and become active again after 20 minutes and may have to be given half-dose booster shots.

Wolves can be handled without drugs, as Kolenosky and Johnston (1967) learned, and we have applied their technique of holding the wolf down with a forked stick. Generally, we handle half-grown or emaciated wolves this way and then muzzle them and tie their feet. However, because of the extent of our processing of each animal, including taking the weight, various measurements, tooth description, and blood samples, we have found that immobilization facilitates the operation.

Collecting blood samples and blood smears is an integral part of our processing of live-trapped animals. Some 30 cc of blood is drawn from wolves via the femoral vein, the cephalic vein, or the dorsal branch of the lateral saphenus, and a proportional amount taken from smaller animals, usually by heart puncture. Hematology, blood chemistry and endocrinology analysis are made by Dr. U.S. Seal (U.S. Veterans Administration Hospital,

Minneapolis, Minnesota), and the following routine parameters are examined: hemoglobin, red blood cells, hematocrit, mean corpuscular volume, mean corpuscular hemoglobin concentration, white blood cells, cholesterol, calcium, phosphorus, bilirubin, uric acid, serum urea nitrogen, glucose, lactic dehydrogenase, alkaline phosphatase, serum glutamic oxalacetic transaminase, total protein, albumin, gamma globulin, thyroxine, cortisol, testosterone, and estrogen. These are studied in collaboration with Dr. Seal's overall investigations of blood in relation to metabolic patterns, life histories and taxonomy of various animals (Seal et al. 1967; Seal 1969; Seal in press a), b)). The current investigations involve attempts to determine correlations between blood parameters and social and ecological factors (Seal et al. in press).

Collection of the behavioral and ecological data depends on radio-tracking itself, so it is necessary to discuss the various elements of a radio-tracking system. The transmitter, attached to the animal and powered by batteries, sends out signals of low power through an antenna. These are picked up by a distant directional antenna and fed into a sensitive receiver where they are heard by an operator or recorded in any number of ways.

Several frequency ranges have been used for mammals, including the following bands: 27-30 MHz', 53 MHz', 148-151 MHz' and 162-163 MHz'. Generally, the lower frequencies are recommended for ground tracking, with the higher ones used when aerial tracking predominates (Cochran, pers. comm.).

Transmitters, obtained commercially,<sup>1</sup> weigh only a few grams. They must be attached to batteries, and an antenna, and installed in a collar to be fastened to the animal. This is usually done by the biologist, although some companies do provide entire radio collars.

The size and number of batteries used depends on the size animal to be studied; obviously larger species can carry heavier loads. The number and size of batteries determines the life of the transmitter and partly determines its range, although some trade-off is possible between life and range. Range can also be partly determined by the size of the animal in another way. This is because the transmitting antenna is usually at least partly bound inside the collar for protection, and the length of the antenna, up to the optimum size, of 25 to 30 cm (10 to 12 inches) for commonly used frequencies, determines the range of transmission. A wolf with a 40 cm (16 inches) neck circumference, for example, can carry a transmitter with far more range than can a marten, with an 11 cm (4.5 inches) neck circumference (Table 1).

Generally mercury batteries are used, and we have found it important to have them custom wired in series and potted in a waterproof compound by the battery company.<sup>2</sup> Mallory No. SR-4840 (2 RM1CC cells potted in series, yielding 2.76 volts and 1,000 milliamp hours and weighing 42 gm

---

1 AVM Instrument Co., Champaign, Ill., U.S.A. Mention of trade names does not imply endorsement by the U.S. Government.

2 Mallory Battery Co., Tarrytown, N.Y., U.S.A.

or 1.5 oz) and No. 303997 (2 No. 12RLD cells potted in series, yielding 2.70 volts and 3600 milliamp hours and weighing 123 gm or 4.4 oz) have been specially designed and manufactured for our project. The SR-4840's are used in pairs for lynxes, and a pair will power a transmitter for 10 months or more, depending on the exact current drain of the transmitter. The No. 303997 battery, used for wolves, provides up to two years of life, assuming transmitter current drains of approximately 0.2 milliamps at 2.7 volts (0.54 milliwatts).

The most difficult problem to overcome in applying a transmitter system to a carnivore is keeping the system protected from the weather, from water while the animal is swimming, from physical abuse by brush and rocks as the animal travels and from interference by the animal's associates or antagonists. Of course, the longer the expected life of the transmitter, the greater the protection necessary.

Overcoming this problem has required development of special collars in most cases. . In each instance, at least the transmitter components, battery leads and batteries are "potted" in an amorphous compound such as denture acrylic or epoxy resin that hardens and protects them. This package can then be bolted or otherwise attached to a collar made of nylon, delrin, polyethylene or other strong synthetic material, and the protruding antenna wire can then be fastened within the collar by laminating with a second strip of the same material. In some cases, the antenna is made of thick stranded wire or solid spring steel and left protruding, which produces the maximum signal but which is subject to breakage.

In earlier studies involving raccoons Procyon lotor and other smaller mammals, we solved the problem by molding the entire transmitting system, including the antenna, in a hard, solid, waterproof collar of denture acrylic (Mech et al. 1965). We then adapted this method to our present studies on wolves, and it worked well. During a pilot study of five radioed wolves (Mech & Frenzel 1971), entire collars weighing 311 gm (11 oz) operated for up to nine months. They contained two Mallory ZM12 cells (similar to 12 RLD cells), but these were not potted by the factory.

Seidensticker et al. (1970) tried denture acrylic for potting transmitter packages at the base of a metal-strap collar, for mountain lions and elk Cervus canadensis, but these workers preferred fibreglass and epoxy resin. Their collar weighed 680 gm (24 oz) and gave an average life of 6 to 8 months, although some lasted more than a year (Hornocker pers. comm.).

To obtain longer lives on wolf transmitters, we tried doubling the battery load. However, this gave no more life until we used two specially potted Mallory No. 303997 batteries as described above. These molded into an acrylic collar with a total weight of 538 gm (19 oz) have yielded longer lives, including one that transmitted for 27.5 months; theoretical life of such a collar is at least four years.

By retrieving several collars that had been worn by wolves for periods up to 52 months, we learned that the limiting factor in the transmitting system was cracking of the acrylic. This evidently allowed moisture to seep to the cells and either short them out or rust the leads. However, with the No. 303997 batteries, even when exposed, the factory potting prevents moisture from interfering with the cells. Of course, cracking of the acrylic may also eventually damage the antenna, so this has now become the limiting factor in the transmitting system. Our current endeavours are devoted to overcoming this problem.

Lynx collars are similar to wolf collars but contain 2 Mallory SR-4840 batteries, and the antennas (5-mm, or .2-in-thick stranded steel clothesline cable) are only molded into the collar for about half their length, protruding backwards at the top of the collar for the other half. Application of the acrylic to these collars is by hand, without a mold.

Radio collars for fishers and martens are not molded in acrylic. Rather the collar is a 5-mm (.2-in) wide, thin brass strip that is also a tuned-loop antenna, and the transmitter and batteries are attached to the base of it and potted in epoxy or acrylic. Range and life are given in Table 1. The brass strip is open at the top so that it can be placed around the animal's neck, adjusted snugly behind the head, and then soldered together.

Applying an acrylic collar to a wolf is cumbersome. Each collar has a hinge and joint devoid of acrylic, where a base strip of nylon is exposed. After careful fitting of the collar to the neck of the wolf, the two nylon ends of the joint are bolted together. Then a wide piece of masking tape is placed beneath the entire joint and a mixture of acrylic in putty-like consistency is applied to the bed formed by the tape. The acrylic mixture must be distributed around the entire joint, filling it in and making it continuous with the rest of the acrylic. The tape is then fastened around itself at the top of the joint and stuck tightly to the hardened acrylic on both sides of the joint. This then encloses the entire joint and forms a mold in which the new acrylic can harden and completely bridge the previous gap. The same procedure is applied to filling in the hinge on the opposite side of the collar. After about ten minutes, the acrylic hardens, and the collar becomes one solid, continuous piece around the wolf's neck.

Receiving systems are of many types, including the sophisticated Cedar Creek Automatic Radio-tracking System, which will automatically record the locations of up to 52 animals simultaneously every 45 seconds (Cochran et al. 1965). For wilderness carnivores, however, aerial tracking usually is a necessity. This is supplemented by mobile and ground-based receiving systems.

Tracking receivers are available commercially from several companies, and circuit diagrams for receivers have been published by Cochran & Nelson (1963) and by Seidensticker et al. (1970). With any type of tracking system it is uneconomical to use any receiver other than the most sensitive.

Locating radioed animals is usually accomplished by means of directional antennas, also commercially available in many sizes. For aircraft, a three or four-element yagi type will give good range and can be attached to the wing struts of small high-wing aircraft such as the Aerorica Champ, Piper Supercub, Cessna 150, 172, 180, 185 or 206. According to Cochran (pers. comm.), the antennas should be mounted as far ahead of, and away from, the wing as possible, and this is done through special mounting brackets, with one antenna on each strut. Antenna leads are fed into the cockpit through the airvent in the leading edge of the wing, through the window, or through the door. There are several ways of orienting the antennas, but we have found that orienting each of them vertically and pointing them parallel with the wings allows efficient homing. Since the antenna in this orientation is most sensitive to the side of the plane, rather than forward, one must circle to pick up distant signals. Once an approximate bearing is selected from the circle by determining the direction in which the signal is strongest, the aircraft is headed in that direction.

A coaxial switch connecting both antenna leads allows the operator to switch between the two antennas.

Once the signal is picked up and the plane heading in the general direction of the source, rapid switching between the two antennas and consequent adjusting of the plane's direction right or left allows the operator to head the plane to give signals of equal strength from both antennas; the plane should then be aimed directly at the radioed animal. Continual correction can be accomplished upon the approach in the same manner, and a gradual descent should be started.

Signal strength will then increase until the aircraft is over the animal, whereupon continued straight flight beyond the animal will result in a decrease. Practice and constant adjustment of the receiver gain or volume control downward will allow the operator to decide when he is over the animal. A tight circle can then be made around the point at an altitude of 500 feet or less, with the operator switching from the inside to outside antennas and comparing signal strength. If the inner antenna gives a stronger signal for a full circle, this confirms that the animal is in the circle. If at one point in the circle the signal from the outer antenna is stronger, the radioed animal is outside the circle and in the direction of the stronger signal,

Ground tracking is useful when there is sufficient accessibility. Antennas of varying size up to 11 elements, or paired hook-ups of antennas, mounted on masts, can be used on vehicles for rapid scanning of areas within 1-2 kilometers (0.6 to 1.2 miles) of the vehicle's route. In mountainous areas, much longer ranges can sometimes be obtained from high points. Some workers install antennas on semi-permanent towers or masts atop hills or mountains, obtain initial bearings from there, and then proceed in that direction with vehicles for closer homing.

Completely portable receivers and antennas are necessary for closing in on an animal on the ground to confirm mortality, or to locate dens.

Small loop antennas or three or four-element yagis are useful in this respect.

Because the length of antenna elements is inversely proportional to the frequency used, higher frequencies allow smaller antennas to be used with greater sensitivity, so this is another consideration to be made in frequency choice.

Automatic recording of signals is sometimes of value with wilderness species. This can be done whenever one wishes to monitor a point or limited location such as a kill or den to determine when a given radioed animal visits it. The technique is to set up an antenna leading to a receiver in a weather-proof housing, along with a power source such as an automobile battery, with the antenna pointed at the location and situated close enough to pick up a good signal when the animal is there. A DC-operated recorder is then hooked to the receiver, and recordings will be made whenever the animal is present (Gilmer et al. 1971). We have been using a modification of this system with a scanning receiver that allows the monitoring of the presence of several radio-marked wolves around a den.

Once an individual animal can be located almost at will, as radio-tracking permits, a wide variety of information can be obtained. Obviously home range and daily and seasonal movements can be studied, but much more difficult investigations also can be carried out, such as studies of predation (Mech 1967; Schladweiler & Tester 1972), mortality (Mech et al. 1968), spatial organization of populations (Sargent 1972; Mech 1972), and mother-young relations (Schneider et al. 1971).

Depending on the species, different animals can be studied in different ways. With wolves, for example, packs can be observed and followed by aircraft during winter for long periods and behavioral, ecological, and sociological data obtained (Mech & Frenzel 1971). We have now homed in on wolves over 3,000 times, and during winter we have been able to observe them some 75% of the time we locate them by radio. Although in summer this observation rate decreases to about 10%, we can still make some valuable observations, aside from just recording the location data.

Using this technique we have found that wolf packs in Minnesota are territorial, with territories generally ranging from 125 to 310 square kilometers (48 to 120 square miles) each; lone wolves are nomadic over non-territorial ranges of over 2,600 square kilometers (1,000 square miles), but tend to avoid packs, and may be killed if they do not. We have tracked dispersing wolves straight-line distances of over 200 kilometers (125 miles), with estimated travel distances of 1,120 kilometers (700 miles), and have learned that the wolf density in our study area is approximately one wolf per 26 square kilometers (one per 10.0 square miles) (Mech 1973b).

Bears offer other research opportunities once radioed. Craighead & Craighead (1965) have been able to home-in on grizzly bears from the ground and watch a number of different types of behavior that would

otherwise have been very difficult to study. Rogers (1970) has tracked black bears to their winter dens, determined how much weight they lose over winter, how many cubs each female produces, and how much first-year mortality they sustain.

Reference to "A Contribution Toward a Bibliography on Wildlife Telemetry and Radio Tracking" by Will & Patric (1972) will demonstrate a number of other applications of the radio-tracking technique. Although the method has revolutionized the study of many species, we feel that it is with the most elusive mammals, among them the wilderness carnivores, that it has contributed the most.

Perhaps it is fitting in this respect to conclude with the following endorsement of the technique from Brian Bertram of Serengeti Research Institute (pers. comm.): "I am now getting information at a vastly increased rate over this time a year ago, when I used to spend hours and sometimes days simply looking for lions Panthera leo. Now I have been able to spend periods of a week at a time visiting this 'labelled' pride at 3-hour intervals, day and night, and so have been able to keep track of every mouthful."

#### ACKNOWLEDGMENTS

These studies were supported by the U.S. Bureau of Sport Fisheries and Wildlife, the U.S.D.A. Forest Service, the World Wildlife Fund, the Ober Charitable Foundation of St. Paul, the New York Zoological Society, the National Rifle Association, the African Wildlife Leadership Foundation, and the Big Game Club of Minneapolis. The technical help and advice of Mr. W.W. Cochran and the AVM Instrument Co., Champaign, Illinois, in developing the radio-tracking equipment for these projects was especially important and is gratefully acknowledged. Mr. John Costello of Mallory Battery Co., Tarrytown, N.Y. was also most helpful in developing the specially potted batteries. Dr. U.S. Seal, of the U.S. Veterans Administration Hospital, Minneapolis, Minnesota, performs and interprets the blood analysis in collaboration with this research.

#### REFERENCES

- Cochran, W.W. 1967. 145-160 MHz beacon (tag) transmitter for small animals. AIBS/BIAC Information Module M15. 12 pp.
- Cochran, W.W. & Lord, R.D. Jr. 1963. A radio-tracking system for wild animals. J. Wildl. Mgmt. 27: 9-24.
- Cochran, W.W. & Nelson, E.M. 1963. The Model D-11 direction finding receiver Univ. of Minn. Mus. of Nat. Hist. Tech. Rept. No. 2 14 pp. (mimeo).



- Cochran, W.W., Warner, D.W., Tester, J.R. & Kuechle, V.B. 1965. Automatic radio-tracking system for monitoring animal movements. BioScience 15(2): 98-100.
- Craighead, F.C. & Craighead, J.J. 1965. Tracking grizzly bears. BioScience 15(2): 88-92.
- Craighead, F.C., Craighead, J.J. & Davies, R.S. 1963. Radio-tracking of grizzly bears. pp. 133-148. In L.E. Slater (ed.) Bio-telemetry. The Macmillan Co., N.Y. 372 pp.
- Gilmer, D.S., Kuechle, V.B. & Ball, I.J. Jr. 1971. A device for monitoring radio-marked animals. J. Wildl. Mgmt. 35: 829-832.
- Hornocker, M.G. 1970. An analysis of mountain lion predation upon mule deer and elk in the Idaho Primitive Area. Wildl. Mon. 21. 39 pp.
- Kolenosky, G.B. & Johnston, D.H. 1967. Radio-tracking timber wolves in Ontario. Am. Zool. 7: 289-303.
- Marshall, W.H. 1963. Radiotracking of porcupines and ruffed grouse. pp. 173-178. In L.E. Slater (ed.) Biotelemetry. Macmillan Co., N.Y. 372 pp.
- Mech, L.D. 1967. Telemetry as a technique in the study of predation. J. Wildl. Mgmt. 31: 492-496.
- Mech, L.D. 1972. Spacing and possible mechanisms of population regulation in wolves. Am. Zool. 12: 9 (abstract).
- Mech, L.D. 1973. Canadian lynx invasion of Minnesota. Biol. Cons. 5(2).
- Mech, L.D. 1973. Wolf numbers in the Superior National Forest of Minnesota. U.S.D.A. For. Serv. Res. Paper. NC-97. North Central Forest Experiment Station, St. Paul, Minnesota. 10 pp.
- Mech, L.D. & Frenzel, L.D. 1971. Ecological Studies of the timber wolf in Northeastern Minnesota. U.S.D.A. For. Serv. Res. Paper NC-52. North Central For. Expt. Sta., St. Paul, Mn. 62 pp.
- Mech, L.D., Kuechle, V.B., Warner, D.W. & Tester, J.R. 1965. A collar for attaching radio transmitters to rabbits, hares, and raccoons. J. Wildl. Mgmt. 29: 898-902.
- Mech, L.D., Barnes, D.M. & Tester, J.R. 1968. Seasonal weight changes, mortality, and population structure of raccoons in Minnesota. J. Mammal. 49: 63-73.
- Rogers, L. 1970. Black bear of Minnesota. Naturalist 21: 42-47.

Sargent, A.B. 1972. Red fox spatial characteristics in relation to waterfowl predation. J. Wildl. Mgmt. 36: 225-236.

Schneider, D.G., Mech, L.D. & Tester, J.R. 1971. Movements of female raccoons and their young as determined by radio-tracking. Animal Behavior Mon. 4: 43 pp.

Schladweiler, J.L. & Tester, J.R. 1972. Survival and behavior of hand-reared mallards released in the wild. J. Wildl. Mgmt. 36: 1118-1127.

Seal, U.S. 1969. Carnivora systematics: a study of hemoglobins. Comp. Biochem. Physiol. 31: 799-811.

Seal, U.S. in press, a. Molecular approaches to taxonomic problems in the Canidae. In M.W. Fox (ed.) Social ecology of canids. Van Nostrand Reinhold Co., N.Y.

Seal, U.S. in press, b. Interpretive survey of blood studies in the cervidae in terms of metabolic patterns and life history. Proc. of Symposium on Moose Management.

Seal, U.S., Swaim, W.R. & Erickson, A.W. 1967. Hematology of the Ursidae. Comp. Biochem. Physiol. 22: 451-460.

Seal, U.S., Erickson, A.W. & Mayo, J.G. 1970. Drug immobilization of the Carnivora. Int. Zoo Yearbook 10: 157-170.

Seal, U.S., Mech, L.D. & Van Ballenberghe, V. in press. Wolf pub blood analyses and their ecological and metabolic interpretation. J. Mammal.

Seidensticker, J.D., Hornocker, M.G., Knight, R.R. & Judd, S.L. 1970. Equipment and techniques for radiotracking mountain lions and elk. Univ. of Idaho. Forest, Wildlife and Range Expt. Sta. Bull. No. 6. 20 pp.

Will, G.B. & Patric, E.F. 1972. A contribution toward a bibliography on wildlife telemetry and radiotracking. Rhode Island Ag. Expt. Sta. Contr., No. 1439. 55 pp.

Table 1. Summary of characteristics of radio-collars used for various wilderness carnivores.

Species	Battery supply	Collar material	Antenna type	Total weight	Transmission range <sup>2</sup>		Maximum life
					Ground	Air	
Wolf <sup>1</sup>	2 Mallory	Denture	30 cm (12 in)	538 gm	1.6-3.2 km	32 kin	50 mon
	No. 303997	acrylic	inside collar	(19 oz)	(1 - 2 mi)	(20 mi)	27.5 mon
Lynx	2 Mallory	Denture	30 cm (12 in),	170 gm	1.6-3.2 km	32 km	14 mon
	No. SR-4840	acrylic	half inside half protruding	(6 oz)	(1 - 2 mi)	(20 mi)	12 mon <sup>3</sup>
Fisher	2 Mallory	Brass	19-24 cm	28 gm	0.5-1.0 km	8 km	8 mon
	No. 660	strip	(7.5-9.5 in)	(1 oz)	(1/4-1/2 mi.)	(5 mi)	2 mon
Marten	1 Mallory	Brass	11 cm (4.5 in)	17 gm	0.5-1.0 km	3.2 km	8 mon
	No. 660	strip		(.6 oz)	(1/4-1/2 mi.)	(2 mi)	2 mon

<sup>1</sup> Current collars use only 1 No. 303997 battery, weigh 425 gm (15 oz) and have theoretical life of 25 mon.  
<sup>2</sup> To Model IA-11S Receiver (AVM Instrument Co., Champaign, Ill., USA) with 4-element yagi antenna; ground range is in heavy brush and rocks, which is worst condition for range; air range is to 4-element yagi antenna at 600 meters (2,000 feet) above ground. At double this elevation, ranges up to 80 km (50 mi) have been obtained.

<sup>3</sup> Still transmitting.

Wolf Specialists  
First Meeting  
Paper C.2

A REVIEW OF METHODOLOGY AND RELATIVE MERITS OF TECHNIQUES USED IN  
FIELD STUDIES OF WOLVES

L.N. Carbyn,  
Canadian Wildlife Service,  
Edmonton, Alberta

and

Dept. of Zoology, University of Toronto,  
Toronto, Ontario.

In many countries wolf Canis lupus populations have been reduced to the stage where the species has been classified as endangered. Since Canada, together with Russia, still has substantial wolf populations, it is important that biologists evaluate the status of our knowledge of wolves and focus attention on areas where more work is required.

There is another important reason why such a review becomes necessary. Young & Goldman (1944) documented the almost complete demise of this species over most of the United States without any large scale, organized public opposition. Since then public sentiment for this species has often resulted in much debate and heated controversies with the general result that in most areas the wolf is not considered an undesirable species as it used to be. This is, in part, a result of dissemination of biological facts through modern communications (television, radio, periodicals) which resulted in a wider appreciation of the life history of the species.

Future controversies will undoubtedly revolve around the justifications of consumptive versus non-consumptive uses of the species (this has been the case already for the wolf population in Minnesota, U.S.A.). Even though a good deal of information has been gathered on the general life history, population dynamics and behavior of this mammal, many questions of a very fundamental nature still remain unanswered, specifically when applied to a wide range of geographic locations.

This paper is a summary of the methodology used in the past, and a reflection on the methods considered most effective for future work. No attempt is made to review the complete literature on the subject, nor did I include the wide range of possibilities of research under controlled, experimental and clinical conditions.

I would like to extend ray thanks to Dr. E. Grace for reviewing the manuscript and to Dr. L.D. Mech for exposing me to investigational techniques for which I had no personal experiences,

## STUDY TECHNIQUES

Before listing the various approaches employed in field studies, it is relevant to outline the major problems related to the study of this species.

The animal exists in low densities (density of about one wolf per 18 to 21 km<sup>2</sup> or 7 to 8 square miles being the maximum yet recorded - Parker 1973) and is wide-ranging (can travel up to 70 km or 45 miles in a 24 hour period, with theoretical possibilities of up to 200 km or 120 miles in the same period of time). As a result, a given pack will utilize an area that may range from about 110 km<sup>2</sup> or 43 sq. miles (Mech 1971) and possibly up to 13,000 km<sup>2</sup> or 5,000 sq. miles (Burkholder 1959).

Obviously under such circumstances it is difficult to maintain contact with packs and to collect information on a continuous basis. The fact that wolves exist in low densities provides some advantages in identifying individuals and individual packs.

I have classified the approaches to wolf studies into six categories, five of which center around field work and the sixth has indirect applications to field studies. These are;

1. Examination of carcasses in predator control programs (e.g. Fuller et al. 1955; Rausch 1967).
2. Compilation of information gathered by field personnel (e.g. Young et al. 1944; Cowan 1947; Carbyn 1971).
3. Naturalistic studies (e.g. Murie 1944; Pimlott 1960; Joslin 1967; Carbyn 1972).
4. Use of light aircraft (e.g. Burkholder 1959; Mech 1966; Pimlott et al. 1969; Parker 1972; Haber in prep.).
5. Use of electronic devices (e.g. Mech 1971; Kolenosky 1972).
6. Observations of captive animals to describe behavioral interactions (Rabb et al. 1967).

Except for the last method, those listed are rarely used in isolation and, generally, some aspects of 1, 2, 3, 4 or 5 were combined. The relative merits and disadvantages of each technique are discussed below.

### Examination of Carcasses in Predator Control Programs

Strychnine baited sets have been used in predator control programs. When systematically carried out, it is a very effective method for reducing populations, and sometimes may come close to total annihilation of a population (Fuller et al. 1955). It provides an opportunity to

collect population data (age, sex structure of packs, pregnancy rates), materials for aging, taxonomic investigations and collection of endo-parasite material.

Exact aging of wolves collected in this manner is a very difficult matter, and no completely satisfactory technique has been established. Methods of aging are:

1. Body weight, general dental characteristics and wear on molars, incisors and canines — a very subjective and unreliable method.
2. Sectioning of teeth (Wasylyk 1964) shows some promise but the accuracy has not been tested with large samples of known aged material. The most readily discernible annulations are in the cementum. It is in this material that a time specific biomarker can be used (Johnson 1972). Johnson used an oxytetra-cycline-ceraentum marking technique to study aging in red foxes. Where predator control programs are conducted adjacent to areas with no predator control programs (e.g. Prince Albert National Park) this technique can be applied in field situations to obtain time specific marking of wolves for comparison with subsequent cemental annulation for aging purposes.
3. Separation of yearling wolves (pups) from adults can become a difficult task towards the latter part of the winter. Rausch (1967) describes a method whereby pups are distinguished from adults on the basis of the extent of fusion of the epiphyses to the diaphysis of the radius and ulna. A more detailed description of this method has been described by Sullivan *et al.* (1956). During periods of rapid growth the junction is no longer discernible at about one year of age. Rausch further described a method of separating two-year old females from pups and adults on the basis of size of uterus and presence or absence of corpora albicantia in the ovaries.

A disadvantage of using data from predator control programs is that although often a large percentage of a population is sampled, it does not provide a total picture of pack structure and fecundity. Furthermore, destructive sampling reduces possibilities for other phases of studies, i.e. undisrupted predator/prey and behavioral studies. Because of the high value of wolf fur it is often difficult to get all carcasses for examination, when these predator control programs are carried out in provincial areas.

#### Compilation of Information Gathered by Field Personnel

Compilation of information gathered by field personnel is useful in establishing indices of abundance and distribution. It is also a useful way to collect "anecdotal" information of unusual significance.

The disadvantages are that it is subject to a number of variables such as environmental conditions, accuracy of observation and amount of human travel in wilderness areas. In the western Canadian National Parks a good deal of important information on the status of wolves in various areas has been gathered by the Warden Service. Recently, standard questionnaires have been distributed to parks' staff to document incidence of mange in the western National Parks (W. Samuel pers. comm.).

### Naturalistic Studies

This approach simply involves the traditional method of observing, recording and interpreting natural phenomena under field conditions, by living in close contact with the study subjects. There are two major ways in which this method has been applied to wolf studies. These are:

1. Maintaining close contact with wolves at den and rendezvous sites (activity areas of wolf pups) in summer, e.g. Murie 1944; Joslin 1967.
2. Tracking of wolves through snow in the winter (Carbyn 1972).

In summer the technique is to contact packs through howling (Pimlott 1960) and to habituate wolves to the presence of the human investigator and observe them at close range. This is the best means of obtaining behavioral data under natural conditions, but vegetation in heavily wooded areas presents problems in observation. Recently, some thoughts have been given to the use of closed circuit television cameras. Automatic scanning devices and microphone-transmitter systems are being used at den sites by researchers in Minnesota (L.D. Mech pers. comm.; F. Harrington pers. comm.).

The naturalistic approach is the only workable way so far devised to obtain data on summer predation in forested regions. This is done through direct observation of both predator and prey, collection of scat at den and rendezvous sites and examination of prey remains.

Winter tracking provides the only means of obtaining data on:

1. Small mammal predation (e.g. snowshoe hare).
2. Predation on some smaller ungulates (e.g. lambs of bighorn sheep) which, under some circumstances, are devoured within a short period of time, leaving very little evidence behind that could be spotted from the air or obtained through radiotelemetry without ground tracking.
3. Behavioral data on scent marking, return to old kills, anti-predator mechanisms of ungulate species and some aspects of mating activities, e.g. data on vaginal bleeding.

Although providing some very important information, the naturalistic approach also has major drawbacks. It is time consuming and the logistics often present a major obstacle. A great deal depends on weather conditions (e.g. snowfalls) and the whims of the wolves. This method, therefore, ironically, presents both the most rewarding and often least efficient ways of gathering data on wolves.

#### Observations from Light Aircraft

Use of light aircraft is a relatively efficient method of gathering data on winter predation in certain areas. It is particularly effective in tracing wolf movements under ideal snow conditions and in areas with open terrain such as large continuous water bodies. In many cases landing opportunities are non-existent so that biological specimens cannot always be collected. Another disadvantage is that the investigator tends to miss a great deal of detail detectable only from the ground.

Kill data obtained by this method could be biased. It was already mentioned that kills of small mammals and young ungulates often cannot be spotted from the air. Furthermore, it is conceivable that a larger percentage of ungulates that developed ant-predator mechanisms by fleeing into open areas are spotted in contrast with those species which may seek cover when attempting to escape the predator.

#### Radiotelemetry

The most efficient method of obtaining data on movement, home range or territoriality and predation is through the use of radio transmitters. Transmitters mounted in collars weigh about 11-13 ounces and have a theoretical lifespan of up to 3 years and a range up to 35 miles (L.D. Mech pers. comm.). Radiotelemetry allows the investigator to proceed beyond the limits which are presented by other methods.

Capturing of wolves has been carried out from the air using helicopters (Pimlott et al. 1969) and using steel traps (Size No. 4 with one spring removed, Kolenosky et al. 1967; Mech 1971) and less successfully with snares (Pimlott et al. 1969 and Mech 1971).

Handling of wolves does not seem to have effects on the individual's chances of rejoining a pack (Kolenosky et al. 1967; Mech 1971). However, no detailed information is available on the effects of radio collars on individual wolves in free roaming conditions. It is conceivable that a radio-collared wolf may be a "marked" animal and its collar would affect its hierarchical position in the pack structure. After long periods of food deprivation wolves tend to gorge themselves and are able to consume ungulate carcasses within a very short period of time. Collars may inhibit the animal from getting its share quickly.

Few studies have been designed so that effects of radio packs on the individuals are measured. Boag (1972) showed that in red grouse Lagopus l. scoticus levels of activity in penned immature individuals with radios



were lower than similar grouse without radio packs. Food consumption among experimental females was also affected by the presence of radios. Similar observations were made by Greenwood et al. (1973) on three different species of ducks. Although radio transmitters undoubtedly have greater effects on birds and small mammals, it is nevertheless important to keep in mind the possible ways in which they subtly affect the physical condition and behavior of large mammals equipped with these instruments.

#### Observation of Captive Animals

Observation of captive animals has provided valuable insights into the social behavior of the species. It is also very important in generating ideas regarding the significance of behavioral observations.

Disadvantages of this method have often been discussed. Animals held in captivity may not behave in the same way as they would under unrestricted conditions.

Also, usually the subjects have to be hand raised in the first generation, for untamed bitches will usually kill their offspring in captivity (Fox 1971). Therefore, hand raised animals are raised in an environment deficient of species specific experiences.

#### SUGGESTED AREAS OF CONCENTRATION FOR FUTURE STUDIES

I have broken the areas of concentration for future studies into the following categories:

1. Wolf/prey population dynamics:
  - (a) In "pristine" unharvested prey populations, e.g. National Parks.
  - (b) Harvested prey populations, e.g. provincial or state forests.
  - (c) Controlled and uncontrolled wolf harvested areas.
  - (d) Interpretation of scat collections.
2. Behavioral studies:
  - (a) Pack structure and social interactions.
  - (b) Territoriality.
  - (c) Behavioral traits that contribute to population "stability".

- (d) Hunting behavior, learning abilities to specific prey complexes, anti-predator mechanisms in prey species.

Wolf-prey interactions for certain areas (e.g. Isle Royale) have been documented in some depth (Mech 1966). Because of different prey complexes and environmental conditions (e.g. snow cover) this aspect has to be studied in a variety of situations. Little is known about the long range effects of wolf predation in areas with high prey concentrations, e.g. calving grounds of elk and caribou, mineral lick sites of ungulates. Success of wolf predation of various species should be studied in light of anti-predator mechanisms in prey populations. The long range culling effects of predation on ungulates needs further study for different areas especially as it relates to prey population that are hunted and not hunted by humans.

Data on wolf predation in winter are far more complete than those for the summer. Summer studies have often involved the collection of scat. The usefulness of this would be greatly increased if (a) scavenging activity can be separated from actual predation, and (b) number of scat can be related to the number of prey taken.

It was suggested to me by Mech that future studies could center around experimental feeding of captive wolves in order to determine their fecal emissions. Since the area (skin surface) to volume of flesh consumed varies in different prey species, such investigations would be of great value.

Behavioral studies are of paramount importance in understanding the ecology of the species. Such aspects as the role of an individual in the pack structure, mating behavior, hunting techniques, anti-predator mechanisms developed by prey species, scent marking and territoriality are only a few examples where it is important to obtain more behavioral information that can be related to the ecology of the species. Behavioral workers under natural conditions are faced with difficulties of identifying individuals, mobility of wolves and, in forested areas, obstruction of views by dense vegetation cover.

Man-induced changes in wolf populations can take on several forms, and have been least studied. Direct consequences of hunting or trapping wolves could affect mating conventions, pack and territory stability, survival rates and recruitment of young into wolf populations. In National Parks the potential effect of human disturbances at den and rendezvous sites needs further investigations. More information is needed on the relative sensitivity of predator and prey species to the presence of humans. For example, in National Parks where ungulates are feeding along roadsides it is conceivable that these populations do not receive the same constant predation pressures as those populations in remoter areas. Over a period of time wolves probably would "learn" to take advantage of this food source, but how is this learning ability affected if during parts of the year they are trapped or shot at when leaving park boundaries?

## CONCLUSIONS

An assessment of the various methods indicates that each method has certain disadvantages. The naturalistic approach is the only method which can provide data on some aspects of wolf ecology but is most effective if supplemented by radio telemetric studies.

It is relevant that many questions regarding the behavior and ecology of wolves, in natural conditions, are still unanswered or only superficially dealt with. I believe meaningful studies in the future should continue to employ combinations of the techniques described, and no single technique can provide all the answers required to understand, rationally protect and manage this controversial species.

## REFERENCES

- Boag, D.A. 1972. Effect of radio packages on behavior of captive red grouse. J. Wildl. Mgmt.; 36(2): 511-518.
- Burkholder, B.L. 1959. Movements and behavior of a wolf pack in Alaska. J. Wildl. Mgmt. 23(1): 1-11.
- Carbyn, L.N. 1971, 1972. Unpublished Progress reports. Canadian Wildlife Service. Studies of wolves in Jasper and Prince Albert National Parks.
- Cowan, I. McT. 1947. The timber wolf in the Rocky Mountain National Park of Canada. Can. J. Res. 25: 139-174.
- Fox, M.W. 1971. Behavior of wolves, dogs and related canids. Jonathan Cape Ltd. 214 pp.
- Fuller, W.A. & Novakowski, N. 1955. Wolf control operations, Wood Buffalo National Park, 1951-1952. Can. Wildlife Service, Wildlife Management Bulletin, Ser. 1, No. 11.
- Johnston, D.H. 1972. Oxytetracycline as a time-specific bio-marker of mammalian tooth cementum. Paper presented at the 34th Midwest Fish and Wildlife Conf., Des Moines, Iowa.
- Joslin, P.W. 1967. Movements and home sites of timber wolves in Algonquin Park. Amer. Zool. 7: 279-288
- Kolenosky, G.B. 1972. Wolf predation on wintering deer in east-central Ontario. J. Wildl. Mgmt. 36(2): 357-369.
- Kolenosky, G.B. & Johnston, D.H. 1967. Radio-tracking timber wolves in Ontario. Amer. Zool. 7: 289-303.

- Mech, L.D. 1966. The wolves of Isle Royale. Fauna of the National Parks of the United States. Fauna Series 7, 210 pp.
- Mech, L.D. & Frenzel, L.D. Jr. (eds.) 1971. Ecological studies of the timber wolf in northeastern Minnesota. N. Central Forest Expt. Sta., St. Paul, Minn. 62 pp.
- Murie, A. 1944. The Wolves of Mount McKinley. Fauna of the National Parks of the United States. Fauna Series No. 5. 238 pp.
- Parker, G. 1972. Biology of the Kaminwiak population of barren-ground caribou. Part I. Canadian Wildlife Service, Report Series No. 20. 95pp.
- Parker, G. 1973. Distribution and densities of wolves within barren-ground caribou range in northern mainland Canada. J. Manan. 54(2): 341-348.
- Pimlott, D.H. 1960. The use of tape-recorded wolf howls to locate timber wolves. 22nd Midwest Wildl. Conf. 15 pp. (mimeo).
- Pimlott, D.H., Shannon, J.A. & Kolenosky, G.J. 1969. The ecology of the timber wolf in Algonquin Provincial Park. Ontario Dept. Lands and Forests. 92 pp.
- Rabb, G.B., Woolpy, H. & Ginsburg, B.E. 1967. Social relationships in a group of captive wolves. Amer. Zool. 7: 305-311.
- Rausch, R.A. 1967. Some aspects of the population ecology of wolves, Alaska. Amer. Zool. 7: 253-265.
- Sullivan, E.G. & Haugen, A.O. 1956. Age determination of foxes by x-ray of forefeet. J. of Wildl. Mgmt. 20(2): 210-212.
- Wasylyk, G.M. 1964. Age determination of wolves by annual structure of dental cementum. Undergraduate thesis, U.B.C. 23pp.
- Young, S.P. & Goldman, E.A., 1944. The wolves in North America. The American Wildlife Institute, Washington, D.C. 636 pp.

A P P E N D I X .

Minutes of a meeting of a Committee the IUCN Wolf Specialists Group convened to discuss projects for funding by an International Appeal

The Committee met in Stockholm on 7 September 1973, from 0900 to 1200 and 1415 to about 1700, to discuss various wolf research and conservation projects proposed for the European region and to decide the type of endorsement to be given to each project for the purpose of recommendations for funding. Dr. D.H. Pimlott took the chair for the first part of the meeting, up to 11 a.m., and then handed over to Dr. L.D. Mech. Most of the Members of the Group present in Stockholm attended the meeting at one time or another, but only a few were able to remain the whole time.

The projects which were discussed were based on the following topics:

1. Status and distribution of the wolf in Italy;
2. Ecology and behaviour of the wolf in Italy;
3. Status and distribution of the wolf in Spain;
4. Ecology and behaviour of the wolf in Spain;
5. Status and distribution of the wolf in Portugal;
6. Ecology and behaviour of the wolf in Portugal;
7. Ecology and taxonomy of the wolf in Greece;
8. Status, distribution and ecology of the wolf in Poland and surrounding areas;
9. Taxonomy of the wolf in Europe, including the implications of possible hybridization with dogs;
10. Studies of the wolf in captivity; and
11. Reintroduction of the wolf into Scandinavia.

In general, the discussion of each of these projects was introduced by a biologist from the appropriate country. The points mentioned in favour of the two proposed studies in Italy were that good baseline information is already available, one study area has been restocked with prey species and another has been left as a control, and qualified personnel with knowledge of the areas are also readily available. In support of the proposed project in Greece, it was argued that it might throw some light on how wolves can be maintained in high numbers even in close proximity to high human densities and, in addition, that, for a relatively small investment it could provide many carcasses for study.

The proposed project in Poland was considered important because the number of wolves left in the country is comparatively small, but a start has been made with ground-tracking and qualified personnel are available; it was also thought that there might be advantages in demonstrating that an international conservation group is vitally interested in the wolf in Eastern Europe.

The proposed taxonomic study in Europe as a whole was considered by the group to be important for the purpose of establishing whether several subspecies are involved in the various European countries or whether each country is essentially concerned with the same subspecies. The project for the reintroduction of the wolf into Scandinavia was also fully supported, but it was made clear by Scandinavian representatives it would be possible to fund it locally, so that priority for funding purposes should be given to other projects.

The Committee reached the following conclusions:

1. All the listed projects were significant and worthwhile, and sources of possible funding should be investigated - World Wildlife Fund national appeals and other conservation and government agencies being approached accordingly, wherever possible.
2. Particularly deserving of consideration by WWF is the funding of the two following projects:
  - A. A study of the ecology and behaviour of the wolf in a Mediterranean country where wolves are living in proximity to human beings; this study should include radio-tracking to determine the precise nature of the wolves' movements in relation to human beings; and
  - B. An investigation into the status, distribution and ecology of wolves in Poland and surrounding areas.
3. If additional funds were available, the next two projects in order of priority should be:-
  - A. The project proposed in Greece, with special reference to the analysis of carcass material; and
  - B. The taxonomic study of wolves in Europe, with special reference to possible hybridization with dogs.

After the above conclusions had been reached, Dr. Bibikov suggested that the Group should also endorse a recommendation to the World Wildlife Fund that it should favourably consider a project for providing countries with radio-tracking equipment and radio-tracking specialists who could help to get new studies based on such equipment started. The Committee agreed to this suggestion subject to the qualification that funds for such a project would probably be most appropriately derived from WWF National Appeals, although not necessarily those of the actual countries requesting such assistance.

The International Union for Conservation of Nature and Natural Resources (IUCN) is an independent international body, formed in 1948, which has its headquarters in Morges, Switzerland. It is a Union of sovereign states, government agencies and non-governmental organizations concerned with the initiation and promotion of scientifically-based action that will ensure perpetuation of the living world - man's natural environment - and the natural resources on which all living things depend, not only for their intrinsic cultural or scientific values but also for the long-term economic and social welfare of mankind.

This objective can be achieved through active conservation programmes for the wise use of natural resources based on scientific principles. IUCN believes that its aims can be achieved most effectively by international effort in cooperation with other international agencies, such as UNEP, UHESCO and FAO.

The World Wildlife Fund (WWF) is an international charitable organization dedicated to saving the world's wildlife and wild places, carrying out the wide variety of programmes and actions that this entails. WWF was established in 1961 under Swiss law, with headquarters also in Morges.

Since 1961, IUCN has enjoyed a symbiotic relationship with its sister organization, the World Wildlife Fund, with which it works closely throughout the world on projects of mutual interest. IUCN and WWF now jointly operate the various projects originated by, or submitted to them.

The projects cover a very wide range from environmental policy and planning, environmental law, education, ecological studies and surveys, to the establishment and management of areas as national parks and reserves and emergency programmes for the safeguarding of animal and plant species threatened with extinction, as well as support for certain key international conservation bodies.

WWF fund-raising and publicity activities are mainly carried out by National Appeals in a number of countries, and its international governing body is made up of prominent personalities in many fields.