

Vadim Sidorovich and Irina Rotenko

**Reproduction biology  
in grey wolves *Canis lupus* in Belarus:  
Common beliefs versus reality**

MINSK  
CHATYRY CHVERCI  
2018

UDC 599.742.11:591.16(476)

The monograph was reviewed by  
Prof. Dr. **Luigi Boitani**,  
Sapienza University of Rome, Italy;  
Prof. Dr. **Włodzimierz Jędrzejewski**,  
Instituto Venezolano de Investigaciones Cientificas, Venezuela  
Dr. **Ilpo Kojola**,  
Finish Game and Fishers Research Institute, Finland

This scientific monograph gives a detailed information about reproduction biology in the grey wolf *Canis lupus* in Belarus. This topic includes the wolf breeding (mating and denning) behavior, fertility of the species and mortality of its pups. The initial material was not collected occasionally from wolf hunters and wolf pup searchers, but mainly gained by authors first-hand according to a well-set research design and long-term. By analyzing the gathered data, we became convinced that in the wolf reproduction biology there are more exceptions than rules. Therefore, the standard patterns of reproduction biology in wolves that are wide-spread in the published literature about the species we call as common beliefs that are given versus the wolf reality that we have found in Belarus. Concerning the non-standard features in the wolf reproduction biology, we revealed that multiple breeding in wolf pack is a common phenomenon, breeding of yearling females and wolf-dog hybridization were found to be irrespective the food base and strongly depending on the species population density i.e. they are reproduction regulations. Wolf pup mortality was investigated and the crucial role of deliberate predation of lynxes on wolf pups was revealed.

**ISBN 978-985-581-173-3**

© Sidorovich V., Rotenko I., text,  
illustrations, 2018

# Contents

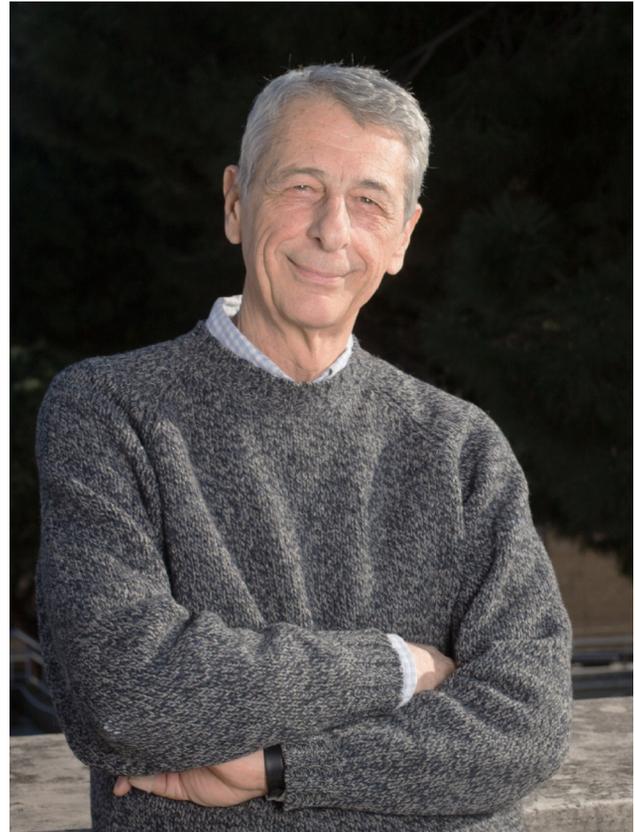
<b>Preface by Luigi Boitani</b>	6
<b>Chapter 1. Introduction</b>	8
<b>Chapter 2. Study areas</b>	20
2.1. Paazierre Forest	20
2.2. Naliboki Forest	25
<b>Chapter 3. Methods</b>	86
3.1. Method of wolf census and approach to estimate the species population density	86
3.2. Snowtracking of wolves and identification of wolf tracks	88
3.3. Collecting information from the individual wolves that were marked with a clipped finger	92
3.4. Wolf pup searching and study on wolf denning behavior	93
3.5. Estimation of wolf fertility parameters	110
3.6. Investigation of wolf pack composition	111
3.7. Study on the interference between wolves and lynxes	112
3.8. Gathering of scats of wolf pups and their parents, analysis of the scats in order to estimate the pup and parent diets	113
3.9. Determination of wolf age	113
3.10. Estimation of the population density of the main prey species	114
3.11. Statistical methods	115
<b>Chapter 4. Breeding behavior in wolves</b>	116
4.1. Mating in wolves	117
4.2. Wolf denning and tending of early days pups	121
4.3. Raising of pups after weaning	137

4.4. Some behavioral traits of wolf-stray dog pairs at denning and raising pups	141
<b>Chapter 5. Fertility and reproduction regulations in wolves</b>	144
5.1. Frequency of breeding in female wolves and its density-dependent variation	145
5.2. Fecundity and its density-dependent variation	150
5.3. Pack multi-breeding as a density-dependent reproduction regulation in wolves	155
5.4. Hybridization with stray dogs as an overexploited population response to compensate the loss	167
<b>Chapter 6. Mortality in wolf pups with implication for the species population structure</b>	170
6.1. Mortality causes and estimates of mortality rate in wolf pups	170
6.2. Decline in the wolf reproduction with implication for wolf pack composition	182
<b>Basic results</b>	192
<b>Literature</b>	194



## Preface

Wolves are not an easy research subject. Elusive, often nocturnal, moving fast across huge areas and often difficult terrain, wolves have challenged researchers, hunters, nature lovers who have been trying to observe them in the wild. The difficulty to track them is part of the fascination that has attracted humans to this species throughout human history. In the early 70s, the irruption of radiotelemetry among the suite of technicalities used by wildlife biologists dramatically increased the wealth of data and insights collected on many aspects of the biology of wolves as well as other predators. Several thousands of wolves have been radio-collared in many parts of their large range across the northern hemisphere and all aspects of their biology have been investigated. One would easily conclude that there is very little left to be studied and learned on wolves but this would be a great error, as clearly shown by this book by Sidorovich and Rotenko. There are at least two main reasons making this book exceptionally interesting to wolf scientists. The first reason is that this book reveals previously unknown aspects of wolf reproduction, such as the high frequency of yearling reproducing females and of multiple litters in the same pack. It is true that



*Luigi Boitani, professor, doctor of biology, Sapienza University of Rome, Italy, 2015.*

wolves are extremely adaptable to a variety of habitat types, prey base, human pressures to the point that every new study in a new geographic area is likely to yield new results. However, none really knows the limit of this ecological and behavioural flexibility and this book reports on wolf biology in a very unusual setting: for example, wolves in Belarus are heavily hunted

and have to face the fierce competition of lynxes preying on their litters.

The second reason is that this book is the result of the incredibly intensive field work done by Vadim Sidorovich and Irina Rotenko for many years and in two study areas. The number of litters found, of kilometres of snow and mud-tracking, of hours of observation, the numbers of wolves followed throughout their lives and, in general, the quantity of data gathered during so many years has little or no comparison among wolf research projects. The authors reveal an unusual capacity for the field work and a natural sense for the real life of wild wolves. Their exceptional dedication to gathering first hand data in the field has produced excellent sample sizes for many of their analyses even where qualitative statements are privileged over data munching and modelling. The result is a book to be read as a combination of a scientific report and a personal account of living in the forest in close companion of wolves. Among hundreds of anecdotes, a consistent and forceful story of the life of wolves in the forests of Belarus emerges to be compared with the well-established scientific information available for wolves of North America and western Europe. Scientists will have some difficulties in

using this book, because data are often offered in unconventional formats. However, the quantity of data and the obvious great knowledge and practice of the authors on their subject provide strong support to their conclusions.

Luigi Boitani

## Chapter 1. Introduction

The introduction of this book about the grey wolf *Canis lupus* reproduction biology was mostly written by one of the authors, Vadim Sidorovich, who initiated, designed and carried out the main part of the below-given studies on wolves in Belarus. Irina Rotenko, who is the second author, helped me with wolves really a lot. From 2005 until 2010 all work was done together with her. From 2011 until 2017 she still assisted me with the studies on wolves despite the fact she was busy with other matters. Many other persons, who assisted somehow in the wolf studies are mentioned in the acknowledgements.

This introduction consists of three parts. The first part is about our aims and motivations to write this book. The second part highlights the new knowledge and skills represented in the book. Finally, I would like to thank those who really helped me in this study in the acknowledgements.

Thinking about the aims and motivations, as well as about the originality in the book messages, I would like to say the following in several theses.

Being an amateur of wildlife and a professional zoologist, I was caught by passion of



(1) *Vadim Sidorovich, predator researcher of the Naust ecostation, doctor of biology since 1989, professor since 2008. Naliboki Forest, 2017.*

learning reproduction in wolves, first of all, the species denning and family life. Over two decades we quite successfully searched for the wolf dens in Belarus (mainly in Paazierre Forest and Naliboki Forest) and marked many of the found wolf pups by finger clipping, then we traced the marked wolves for as long as possible. All these allowed us to collect a quite unique data set in relation to reproduction in wolves. So, the first and main idea for the book was just to share the gained knowledge and skills with wolf colleagues and amateurs.

In accordance with the main idea for the book, I have no ambitions to analyze and synthesize on the topic for the whole (large and ecologically various) distribution range of the species. Therefore, in this book you will not find a comprehensive review in relation to the wolf reproduction and social behavior, which combine our own data with data and knowledge gathered worldwide. Although I could do this, I prefer to study the species in the wild, getting

answers on small questions about behavioral and ecological details. An analysis of all the published results on the topic simply demands too much time at a computer screen, which is not how I wish to study wolves as well as is not my life choice generally.

As to the absence of such a review, I also did not that because of my evident problem with English. I hope the readers of this



(2) *Irina Rotenko, predator researcher of the Naust ecostation, Naliboki Forest, 2017.*

book will take into account I am not a native English speaker and have never visited any English courses even for a day. I simply had other priorities, and one of them brought this book. Moreover nowadays, when there are so much information published on most of questions, a review of results up-to-date is getting more and more as a separate job in relation to a reporting of a study results.

One may ask why we have written this book, without publishing a series of articles for zoological journals. There are several reasons for that, and I would like to tell about them. Nowadays, articles in such journals are under such heavy reviewing, and, in turn, they demand too much time, leaving not enough time for the study itself. It appears a temptation to economize life time and neglect such journal system. Therefore, in order to advance in my research and life objectives I chose an alternative way. To share research results with colleagues, we chose to create books and make them available for everyone, free on the Web. It seems to be a good alternative way and web stats support this choice.

Moreover, some other peculiarities of our approach do not facilitate publishing in zoological journals. We avoid excessive use of statistics, mathematical simulation *etc.*

Instead we try to provide enough proof not with abundance of figures and complicated statistics, but by using many suitable documented examples. We limit the use of estimates and statistics to a minimum, but attach great importance to detailed and high quality basic data. This is how we believe zoology should be. We have no affinity with zoologists, who hide their lack of knowledge behind too many estimates, statistics and mathematical modeling. To our regret, such zoologists are getting more and more common in the modern city-biased world.

Also, we avoid ambiguous and too sophisticated terms for a still unclear phenomenon. Therefore, for instance, in this book about the wolf reproduction we did not use the terms ‘rendezvous site’ or ‘adoptee’.

On the other hand, by comparing the creation of a book and the writing of a scientific article, we immediately realize the main advantage of books. In a book one can describe or illustrate something thoroughly and without limitations, and give the reader access to all results in one.

There was another aim and motivation to do this book. By investigating the publications in relation to the grey wolf, we noticed that our results may bring quite a

lot of new knowledge on the species reproduction biology in the region of the European forest zone, and this encouraged us to publish the results.

There is a lot of knowledge about the wolf breeding behavior and denning in North America, but the behavioral patterns differ a lot from those in Europe (Mech & Boitani, 2003 and references therein; Sidorovich *et al.*, 2017). Reading the literature about grey wolves and talking with colleagues about the species in North America, comparing that with my experience and knowledge gained in Belarus, I became convinced that wolves in North America and Europe are very distinctive in their behavior, almost as if they are two different species.

We may mention two simple examples.

As to the wolf breeding behavior, in North America breeding wolves permit humans to observe them at the den by keeping a security distance (*e.g.* Mech, 1988; Mech & Boitani, 2003). Quite opposite, in Belarus breeding wolves often immediately escape with their pups from the denning area, if people enter from a road into their denning habitats. Even, if people pass still quite far (300-700 meters) from the wolf den, they move their pups to another denning area, at

least, several kilometers away. In Belarus, breeding wolves never use one den for a long time like in North America. Quite opposite, during the first 30-50 days of pup raising, parent wolves keep pups in several denning sites with many used dens in each denning site (up to 79, usually 15 to 30) by replacing pups frequently (Sidorovich *et al.*, 2017).

Concerning the intraspecific aggression, in North America wolves are often aggressive towards each other and it's not rare if a wolf gets killed by another wolf (Mech & Boitani, 2003). In Belarus and seemingly in the whole of Eurasia such strong aggressive encounters are rare. After almost four thousand kilometers of snowtracking of wolves in Belarus we never faced with this. Moreover, among almost seven hundred carcasses of wolves inspected, we found very few wolves with traces of fights with other wolves. However, once in winter (late January) at a forest road, we discovered a relatively small male wolf with an injured hind paw, which was killed by another wolf.

We will briefly discuss the possible causes for such differences in the wolf traits in Eurasia and North America. Wolves in North America and in Europe or wider in Eurasia were isolated for an evolutionary

long enough time to be distinctive; the species lived and evolved in different habitats with different prey stock. Moreover, wolves were extirpated over most of their North-American range, later followed by reintroduction and spontaneous recolonization of large areas (*e.g.* Paquet & Carbyn, 2003). During wolf expansion in North America hybridization of wolf with stray dogs and coyotes could frequently happen. Another great difference is that the indigenous people, *i.e.* native North Americans have never persecuted wolves, and only the European invaders and then the new Americans began extirpating wolves in North America about two centuries ago.

Conversely in Belarus, Eastern Europe and further eastwards wolves were strongly persecuted for a considerably longer time: at least since the 16th century. At the same time, despite of the longer and heavy wolf persecution by humans, wolves in Eurasia have never been extirpated on such a large spatial scale as in North America. Another example is hybridization of wolves with stray dogs. Again conversely to North America, hybridization was a rare phenomenon in Belarus, at least, until the early 2000's. A European study on wolf genetics revealed that at that time the wolf

population in Belarus displayed very little genetical contamination by hybridization with stray dogs; none of the genetically investigated wolves from Belarus showed dog ancestry (Stronen *et al.*, 2013). Various other differences between North American and European wolves were already discussed in earlier literature (Jędrzejewski *et al.*, 2010).

Published studies on wolves in other regions of Europe such as Eastern Poland, Russia, Fennoscandia, Italy (*e.g.* Bibikov, 1985 and references therein; Jędrzejewska *et al.*, 1996; Jędrzejewska & Jędrzejewski, 1998; Jędrzejewski *et al.*, 2000, 2001, 2002, 2007; Mech & Boitani, 2003 and references therein for Italy and Fennoscandia) are basically characterized by detailed results on foraging and diets, impact on the prey populations, home range and territoriality, movement and population dynamics.

Concerning studies on the wolf breeding in Europe, there are several publications on the topic (Bibikov, 1985; Theuerkauf *et al.*, 2003; Schmidt *et al.*, 2008). Wolf denning behaviour in the European forest zone was described in two articles for the area of Bielaviezha (Białowieża in Polish) Forest, the Polish part (Theuerkauf *et al.*, 2003; Schmidt *et al.*, 2008). However, the

articles were based on telemetry study with few breeding females (n=6) and a rather small number of investigated dens (n=8 and 16). Therefore, in our point of view, the mentioned results might bring a simplified and biased knowledge on the topic (see Chapter 4 for details).

A lot of information on the wolf breeding in Russia has been published (*e.g.* Bibikov, 1985; items and references therein, first of all, Danilov *et al.*, 1985 ), but those studies were mainly based on data that was gained from hunters and wolf pup searchers. For our part, there is no doubt that data collected by hunters are not sufficient and may be greatly biased. Having both our own data and data from hunters in Paazierre Forest, we became convinced of this. For instance, if a hunter reports a discovered wolf litter, it's hard to be sure, if the possibility of multiple breeding in the wolf pack was sufficiently checked.

The results on wolf denning behavior in the European part of Russia (Danilov *et al.*, 1985) are of short descriptive nature. Actually, the authors (Danilov *et al.*, 1985) did not consider denning behavior as the main aim of their study on wolf reproduction. Their research was targeted on the effect of the wolf breeding on their demography as well as on fertility in wolves.

On these questions the results gained by the Russian authors were a great advance in the study on the wolf reproduction.

Anyway, taking everything into account, we can conclude that before the given study in Europe and even in Eurasia nobody from zoologists investigated the grey wolf breeding and overall reproduction systematically on a large set of own-gained data that were gathered through a scientifically sound approach. Therefore, despite of the presence of the above-mentioned publications we state that actually there is not much correct knowledge about denning in wolves in the European forest zone.

Our data on the wolf breeding in Belarus was collected from two local populations of wolves (in Paazierre Forest and Naliboki Forest), on a regular basis during a long period. In effect, a very extensive set of data on wolf reproduction, in particular on aspects such as fertility, denning behavior, reproductive regulations, diet of pups, survival and mortality of pups were collected. Quite a lot of interesting information was gained by pup finger clipping and subsequent tracing of such marked wolves with their specific footprints. In addition, smart use of many camera traps during just four years brought some exciting results.

One of the motivations to prepare this book about the wolf breeding was that in Europe and wider in Eurasia there is a widely spread belief that the species is strictly monogamous with a certain way of breeding and pack formation in family pattern (*e.g.* Bibikov D.I., 1985 and references therein; Jędrzejewska & Jędrzejewski, 1998).

Actually, in our study in Belarus since the late 1990s we have found so many abnormalities, that we start thinking about what actually prevails in the wolf reproduction: the “rules” or “exceptions”. Such "abnormalities" occurring often is a very interesting phenomenon. To describe and analyze these was another important goal of the book.

There are several commonly accepted and seemingly ‘normal’ features of the wolf reproduction and the species pack forming in the Eurasian forest zone (Bibikov, 1985; Mech & Boitani, 2003 and references therein). Below a list of these “rules”, or should we say “common beliefs”?

(1) The first breeding of female wolves happens, when they are about two years old or older.

(2) During breeding season, a wolf pack has merely one litter or there are no pups.

(3) Usually a wolf pack consists of parent wolves and their pups of the current and previous biological years as a normal maximum; additionally, such a pack may subordinate some non-relative wolves.

(4) Usually offspring disperse from their maternal pack around mating season, in the second year of their life, when they are 20-22 months old.

(5) When wolves are more or less common, wolves usually kill and even consume stray dogs, but do not incorporate them into a pack and do not interbreed with them. Pairing with stray dog happens in a rarefied wolf population; and both sexes of stray dog may be paired with both sexes of wolves, respectively.

(6) There is nearly nothing mentioned about a great negative role of the Eurasian lynx *Lynx lynx* and wild ungulates (mostly elk *Alces alces*, red deer *Cervus elaphus* and bison *Bison bonasus*) on the survival of wolf pups. There is a common belief that these animals do not markedly impact wolf reproduction.

In our study we found that (2), (3) and (4) are only partially correct, there are exceptions of (1) and (5), while (6) is entirely the opposite.

The following 'abnormalities' were found in Belarus:

(1) Pack multiple breeding appeared to be a common phenomenon in Belarus. Indeed, during about 20 years of investigating wolf breeding in Naliboki Forest and Paazierre Forest and having found 72 dens with pups ourselves, we revealed 13 cases of double breeding and 2 cases of triple breeding in a wolf pack. So, in 39% of the investigated denning cases there was registered a multiple breeding phenomenon in the pack. The main reason for multiple breeding was mating of the dominant (founding) male not only with the founding female (mother), but with daughters or other subdominant females. Taking into account that not in all cases the possibility of multiple breeding was checked sufficiently, *i.e.* when other possible litters could be not discovered, we assume that actually multiple breeding in wolf packs occurs even more often than can be derived from our data.

(2) Pup survival may be extremely low, and quite often whole litters die.

(3) Out of 72 wolf dens with pups, breeding of yearling females was revealed for two times (3%). Considering the ratio between yearling and other females in the

wolf population, the data suggests that approximately 5-8% of yearling females already breed.

(4) Timing of parturition in the wolf population seems to be getting prolonged or there are just many exceptions. In the 2000's among 61 well-documented parturitions, we registered one parturition in mid-January, 4 parturitions in late March-early April and 4 parturitions in the last ten days of May. The majority of the registered parturitions in wolves were dated within a normal seasonal period, *i.e.* the last ten days of April till mid-May.

(5) Also, we gained enough proofs that lynxes suppress the wolf reproduction a lot by deliberately hunting on vulnerable individuals such as pups of the year, yearling females and heavily pregnant females. Wild ungulates kill many wolf pups, as well.

(6) We frequently found peculiarities of pack formation. One of them is offspring that stayed with their parents for 3 to 5 years without breeding. The opposite trend is pack formation by mostly unrelated wolves (without direct family ties). This is connected with pack deterioration through wolf persecution by humans or/and because of extremely low survival of pups. Both situations lead to pack formation with