ARCTIC
VOL. 75, NO. 2 (JUNE 2022) P. 272–276
https://doi.org/10.14430/arctic75056

Newly Documented Behavior of Free-Ranging Arctic Wolf Pups

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(*Received 29 June 2021; accepted in revised form 5 October 2021*)

ABSTRACT. Whereas much is known about the behavior and development of captive young wolf (*Canis lupus*) pups, less detail has been published about some aspects of free-ranging wolf pup behavior. This article synthesizes 42 observations of free-ranging Arctic wolf pups from ages 13 through 52 days made during 10 summers from 1987 through 2006 on Ellesmere Island, Nunavut, Canada. Besides listing key behaviors such as howling and caching, I record unique observations of ages of pup urination without adult stimulation (22, 33, 42, 52 days), knowledge of which is important to studies of wolf domestication, and of a 48-day-old pup that traveled 39 km during a 12 h and 19 min round trip between the den and a prey carcass, including a 26.5 km trek in 5 h. These observations should lead to a deeper and more complete understanding of this critical period of pup growth and development.

Key words: anogenital stimulation of urination; behavior; *Canis lupus*; den; development; urination; wolf domestication; wolf pup

RÉSUMÉ. Même si on en sait beaucoup sur le comportement et le développement des louveteaux (*Canis lupus*) en captivité, moins de détails ont été publiés au sujet de certains aspects du comportement des louveteaux en liberté. Cet article fait la synthèse de 42 observations de louveteaux arctiques en liberté âgés de 13 à 52 jours effectuées au cours de 10 étés allant de 1987 à 2006 sur l'île d'Ellesmere, au Nunavut, Canada. En plus de faire mention de comportements clés comme le hurlement et la mise en cache, je tiens compte d'observations uniques concernant l'âge de la miction des louveteaux sans stimulation par des loups adultes (22, 33, 42, 52 jours), ce qui est important à savoir dans le cadre des études de domestication du loup, et d'un louveteau de 48 jours qui s'est déplacé sur une distance de 39 km durant 12 h et 19 min aller-retour entre sa tanière et la carcasse d'une proie, dont un tronçon de 26,5 km en 5 h. Ces observations devraient mener à une compréhension plus approfondie et complète de cette période critique de la croissance et du développement des louveteaux.

Mots clés : stimulation anogénitale de la miction; comportement; *Canis lupus*; tanière; développement; miction; domestication du loup; louveteau

Traduit pour la revue *Arctic* par Nicole Giguère.

INTRODUCTION

Although much is known about the behavior and development of young, hand-raised or captive wolf pups (synthesized by Packard, 2003), much less such information has been recorded for free-ranging wolf pups during their first several weeks of age. General descriptions of early wolf pup behavior during life around wolf dens are available (Murie, 1944; Clark, 1971; Mech, 1988; Packard, 2003) as well as more detailed information about critical aspects of early pup behavior such as nursing (Packard et al., 1992) and provisioning by adults (Mech et al., 1999). However, the only specific information for various early ages that is available for free-ranging wolf pups is contained in descriptions of pup behavior during different days when pups were 9 to 74 days old on Baffin Island, Nunavut, Canada (Clark, 1971). Although useful, this information represents observations primarily for a single year. Knowledge about specific behaviors by young, free-ranging wolf pups furthers basic understanding of wolf natural history and can be useful to other fields. For example, information about pup tolerance of inclement weather (Mech, 1993) was useful to the study of wolf domestication (Germonpré et al., 2021). Thus, more descriptions of such behavior are still needed for a deeper and more complete understanding of this critical period of free-ranging wolf pup growth and development. This article presents such information.

METHODS

This study is based on intermittent observations of Arctic wolf (*Canis lupus arcticus*) pups around a rock-cave den (Fig. 1) and a pit den near Eureka, Ellesmere Island, Nunavut, Canada (80° N, 86° W). Colleagues and I made these observations on varying dates between 13 June and 10 August during 11 years between 1987 and 2006 (Mech, 1988, 1995, 2007). Wolves in the study area fed primarily on muskoxen (*Ovibos mochatus*) and Arctic hares (*Lepus*

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FIG. 1. The study area on Ellesmere Island, Nunavut, Canada. Arrow shows den used each year except 1990 and 1991. Circle shows location of observers. (Photo: Dale Andersen)

arcticus). The wolves were unafraid of me and allowed associates and me to watch from all-terrain vehicles within 15–50 m of the den. The number of adults attending the dens varied each year from two to seven and pups from one to five (Table 1). No special effort was made to record the growth, development, and behavior of the pups, nor were observations made in any structured fashion. Rather observations about all pack members were made ad lib and recorded on notepads. The notes were then elaborated on in journal form within 24 h, and excerpts from these notes were made for this article. The area experienced constant daylight during the study, so we observed pups and followed them at all times of day.

To tie the observations to pup age, it would have been ideal to have known when the pups were born each year, but that was not possible. At any given latitude, birth date can vary from year to year because a wolf's estrous period is about two weeks long, and the start of an individual wolf's estrous period can vary by a month (Kreeger, 2003). Thus, pups in any one location over the years could be born over a period of at least a month. However, I was able to approximate the birth date of pups in one year based on the age of eye opening. The age of eye opening of captive wolf pups raised by various workers is the 11th to the 15th day (Mech, 1970). In addition, the eyes of pups born on a known date on Baffin Island (about 69° N) opened at 13 days of age (Clark, 1971). In 1991, I located pups whose eyes were just opening, but they could barely see, so these pups could be aged at about 13 days old. Using that litter as my reference point in conjunction with other key events, such as ears barely standing (Fig. 2), for these pups at various ages, I then matched those events in litters of unknown age to estimate the approximate age of pups of the unknown-age litters. For example, if observation x was for age y in the known-age litter, then I assumed that observation x for an unknown-age litter was also for age y and used observations in that litter to match with those of other litters to age them. This method assumes early development depends on nutrition (Wang et al., 2017) and that the pups of each litter were fed reasonably consistently each year. Because the pups' main source of sustenance for their first 8–9 weeks is nursing (Packard et al., 1992), that was probably the case. However, the actual ages of the unknown-aged litters could vary by a few days from those I estimated.

RESULTS AND DISCUSSION

During most years of the study, the Ellesmere pups were born between 18 May and 15 June with the modal date roughly in early June (Table 2) and raised in a cave or burrow beneath a large rocky prominence (Fig. 1). For wolf pups on Baffin Island, during the single year when birth date was thought to be known, it was 7 June (Clark, 1971).

On Ellesmere during 1990 and 1991, however, the pups were born in a pit in the ground on the top of a long, knife-edge terrace in a set of similar parallel terraces of an eroded cut bank, the same pit each year (Mech, 1993). During 1990, the breeding female carried the single pup, when an estimated 10 days old, about 2.8 km from the pit den to the rock-cave den, from which the pup did not emerge for another 10 days. In 1991, two pups were born in the pit den, and the female moved them to another pit when they were about 17 days old and about to climb out of their natal pit and possibly fall over the edge of the narrow terrace.

I recorded 42 observations covering 29 different days of development from 13 through 52 days of age (Table 2), including both the transition period and the socialization periods of development (Scott and Fuller, 1965; Mech, 1970). Many of the observations involved physical

TABLE 1. Number of adult wolves and pups each year of the study near Eureka, Ellesmere Island, Nunavut, Canada.

Dates of study	Number of adults	Number of pups	Number of observation days	Estimated pup age (days) at first observation	Estimated date of birth
23 June to 10 August 1987	7	5	20	28	25 May
20 June to 4 August 1988	4	4	45	33	18 May
21 June to 8 August 1990	3	1	45	13	8 June
13 June to 8 August 1991	3	2	55	13	1 June
2 July to 6 August 1992	2	3	36	28	4 June
30 June to 25 July 1994	4	1	26	28	2 June
26 June to 1 August 1996	2	2	36	20	6 June
10 to 15 July 2004	2	4	6	25	15 June
9 to 20 July 2005	6	3	12	46	24 May
1 to 12 July 2006	7	5	12	32	31 May

FIG. 2. Wolf pup with ears barely standing.

FIG. 3. Kitten-like wolf pup.

TABLE 2. Key observations of Arctic wolf pups made around a den near Eureka, Ellesmere Island, Nunavut, Canada. Age variation in all the behaviors below was almost certainly a result of incomplete observations of litters, that is, some behaviors noted for a certain age in one year might have been observed at the same ages during other years if observations had been complete each year (see Methods).

Estimated pup age (days)	Observation	Date	Year
13	Tiny ears; eyes barely open or not; my impression was they could not see. Much pushing around with their heads against mother's body; legs not well developed. They are mostly head and body.	14 June	1991
17	Eyes open; climbing to top of pit den. Female moves both pups.	18 June	1991
20	Can walk; ears still small.	21 June	1991
20	Pup first emerges; can barely stand; ears visible.	2 July	1996
20	Emerged from (the rock cave) den (after female carried it 2.8 km from a pit den first seen on June 23).	2 July	1990
21	Big head; little ears.	3 July	1996
22	Larger nose and ears; urinates by itself.	23 June	1991
23	Sprawly; can barely stand.	5 July	1996
24	Pups ate regurgitant for several minutes.	25 June	1991
25	Ears still down.	7 July	1990
25	Ears not prominent.	10 July	2004
26	Howled.	27 June	1991
27	Eats grass.	9 July	1996
28	Walks but waddles; ears standing; chewed on leveret and could pull fur from it; 3 m from den.	10 July	1996
29	Pup ate regurgitant for about 4 min.	11 July	1990
29	8 m from den.	11 July	1996
29	Ears about to stand.	1 July	1994
29	Ears first start to stand.	3 July	1992
30	Pups sleep in front of den; ate regurgitant.	12 July	1996
30	Ears half standing.	12 July	1990
31	Ears up; tiny; playing.	24 June	1987
32	Mother licks pup anogenitally.	14 July	1990
32	Ears up; short; legs short; nose blunt.	4 July	2006
33	Urinating alone; ears standing.	5 July	1994
33	Ears up but not protruding above top of head; pups look kitten-like (Fig. 3).	21 June	1988
34	Playing.	22 June	1988
34	Pups 50 m from den.	23 June	1988
35	Ears prominent; drank water from stream.	17 July	1996
35	Yearling licked pup's bottom.	7 July	1994
35	Carrying meat with fur; tail up.	24 June	1988
36	Can't find food when within 15 cm; ear tips not totally up.	18 July	1996
37	Cached twice near den.	19 July	1990
38	Pup caches hare part.	10 July	1994
39	Eating hare meat.	10 July	1991
39	Appear kitten-like.	21 July	1996
40	75 m from den.	22 July	1996
41	Pup caches bloody fur.	30 June	1988
42	Urinating on their own.	13 July	1991
44	Cached 225 m from den.	26 July	1996
46	Nose pointed; ears up.	10 July	2005
48	Pup travels 12.5 km to muskox carcass during a 39 km, 12 h and 19 min round trip, including a 26.5 km trek in 5 h.	30 July	1990
52	Pups initiate group howl; urinate alone.	11 July	1988

development while others were behavioral. Behavioral observations included the following key behaviors: (1) able to climb to the top of a pit den estimated to be about 38–46 cm deep when 17 days old, (2) can barely stand but can walk at 20 days, (3) urinate without adult stimulation at 22, 33, 42, and 52 days; (4) howl at 26 days and initiate a group howl at 52 days, (5) eat grass at 27 days, (6) chew on an Arctic hare leveret and pull fur from it at 28 days, (7) eat regurgitant at 24, 29, and 30 days, (8) play at 31 and 34 days, (9) venture as far as 50 m from the den at 34 days, (10) drink water from a stream and carry a piece of meat with fur at 35 days, (11) cache unknown matter twice near the den at 37 days, part of a hare at 38 days, bloody fur at 41 days, and unknown matter 225 m from the den at 44 days, and (12) stray 75 m from the den at 40 days and 12.5 km from the den with its parents when 48 days old. The age variation in all the above behaviors was almost certainly a result of incomplete observations of litters, that is, some behaviors noted for a certain age in one year might have been observed at the same ages during other years if observations had been complete each year (see Methods).

Regarding the last observation, on 30 July 1990 the single male pup (no siblings) accompanied his parents and grandmother on a 39 km, 12 h and 19 min round trip between the den and a muskox calf carcass, including a 26.5 km trek in 5 h. Field notes recorded the following:

> The pup is strong for first 9 km, often second after the leading [mother] wolf, Whitey. Pup lagging at 10 km. 1909 hr the adults play, run, troop, especially Whitey and Mom [grandmother]. Male leading at end, Mom last with pup. 1949 hr they arrive at carcass.

The pup joined the other pack members in feeding on the carcass, and they then all returned to the den. Twelve hours later, this pack including the pup (weight estimated at 5.5 to 6.8 kg) made a 30 km trek to a new rendezvous site. These observations, although of no major significance except for two discussed below, basically document the abilities of free-ranging young Arctic wolf pups as they age and develop. In this respect, they add to similar findings for pups of similar age on Baffin Island (Clark, 1971) and establish some new information. For example, I could find no mention by Clark (1971) of the Baffin Island pups caching food, so the current study presents the first such observations. It is also interesting that whereas Clark (1971) recorded Baffin Island pups eating regurgitated food at 17 days of age, this study never recorded it until the pups were 24, 29, and 30 days old. The two significant exceptional records mentioned above are observations about young pup urination, and young pup mobility discussed below.

Information on pup urination is relevant to a major hypothesis about wolf domestication currently regaining scientific acceptance (Germonpré et al., 2018, 2021; Serpell, 2021; Mech and Janssens, 2022). The pup adoption hypothesis posits that humans began domesticating wolves by collecting them from dens, raising them, and artificially selecting those compatible with living with humans. This hypothesis assumes that Late Pleistocene humans would have had the knowledge and capability to raise young wolf pups. However, young wolf (and dog) pups require anogenital stimulation from their mothers in order to defecate and urinate, but early humans would have had no way of knowing this, nor would they know how to simulate it. Thus, the specific pup age when such stimulation is no longer necessary is an important consideration for speculation about the ages of pups when humans could have collected and raised them successfully.

The only information available about the age at which young wolf pups might no longer need such stimulation has been from captives, but that information does not agree. Fox (1972) indicated that urination and defecation became voluntary at 6 to 8 weeks, but Klinghammer and Goodman (1987) stated that pups no longer need stimulation after 10 days of age. Until the current study, I know of no such information for free-ranging pups. I observed pups urinating without stimulation at 22, 33, 42, and 52 days of age (Table 2). Other relevant observations I made are of a mother wolf anogenitally stimulating a 32-day-old pup and a yearling wolf licking the bottom of a 35-day-old pup (Table 2). In neither case did I note whether that licking brought urination or defecation. Although these observations about wolf pup elimination and adult anogenital stimulation are sparse, they are the only ones known, they provide some estimation about at what age pups might have been procured by early humans and successfully raised, and they suggest that other observers should make special efforts to obtain more complete information about this subject.

The other significant new observation involves the long treks that the 48-day-old, single male pup made in 1990. I know of no other reports of a wolf pup this young traveling so far. An observation of a Baffin Island pup moving 11 km between dens when 30 days old (Clark, 1971) is the most similar information I found to the 39 km, 12 h and 19 min round trip made by the Ellesmere 48-day-old pup. This observation could be atypical of 48-day-old wolf pups because it was made by an individual born without litter mates and thus one that received all of the food provided by its parents and single helper. In addition, during its treks, it would have been more easily protected by the adults than would a more average-sized litter. Nevertheless, the observation does document the ability of a pup of its age under favorable conditions.

The general observations recorded here provide milestones during the growth and development of free-ranging wolf pups of young ages and can serve as baselines against which future observations made elsewhere can be measured and compared.

ACKNOWLEDGEMENTS

I thank numerous associates who accompanied me at various times during the summers when these observations were made

and assisted in making them. I also appreciate the financial support of the U.S. Fish and Wildlife Service, the National Geographic Society, and the U.S. Geological Survey and the logistical support of the Polar Continental Shelf Project, Environment Canada, and the staff of the Eureka Weather Station. S.H. Fritts reviewed an earlier draft, and three journal reviewers also made many helpful suggestions for improving this article. Data generated during this study are available as a USGS data release at https://doi.org/10.5066/P9EJCD4K.

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