

ECOLOGICAL RESERVES COLLECTION
GOVERNMENT OF BRITISH COLUMBIA
VICTORIA, B.C.
V8V 1X4

ECOLOGICAL RESERVES UNIT
1019 WHARF ST.
VICTORIA, B.C. V8W 2Y9

MOUNTAIN GOAT SURVEYS IN
SPATSIZI WILDERNESS PARK
BRITISH COLUMBIA
JULY 1984

by

David F. Hatler
(Wildecor)

and

W.G. Hazelwood
(Alpenglow Resources)

ABSTRACT

Mountain goats were censused in seven designated wildlife zones in Spatsizi Wilderness Park during a four-day period in mid-July 1984. A total of 538 goats were observed and classified in those zones, by helicopter, and a minimum of 65 others were documented during a reconnaissance survey of two zones by fixed-wing aircraft on the first day. A comparison of the helicopter and fixed-wing surveys indicated that goats were missed by both, with the fixed-wing work recording substantially more animals in one area and the helicopter finding more in the other. Aspects of census methodology, including factors affecting counts, are discussed. Data on 298 Stone's sheep, 188 caribou and 15 moose observed incidentally during the surveys are also presented.

TABLE OF CONTENTS

	Page
1.0 INTRODUCTION	1
2.0 OBJECTIVES	3
3.0 METHODS	4
3.1 General	4
3.2 Helicopter Surveys	4
3.2.1 Flight Characteristics	4
3.2.2 Classification of Mountain Goats	6
3.3 Fixed-Wing Reconnaissance	12
4.0 RESULTS	14
4.1 General	14
4.2 Mountain Goat Observations	16
4.2.1 Eaglenest Zone	16
4.2.2 Eco Reserve Zone	16
4.2.3 Dawson Zone	22
4.2.4 Kluayetz Zone	25
4.2.5 Tomias Zone	25
4.2.6 Marion Zone	29
4.2.7 Caribou Mountain Zone	30
4.2.8 Sex and age composition, all areas	33
4.2.9 Reconnaissance surveys	40
4.3 Observations of other species	45
5.0 DISCUSSION	45
5.1 Factors and observations relating to goat counts	45
5.1.1 Biological factors	45
5.1.2 Weather/light conditions	48
5.1.3 Aircraft Considerations	48
5.1.4 General Comments	49
5.2 Final consideration of goat numbers and composition	50
6.0 LITERATURE CITED	52
7.0 APPENDICES	54

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1.	Total numbers of four ungulate species observed during mountain goat surveys in Spatsizi Wilderness Park, B. C., July 1984.	15
2.	Sex and age composition of mountain goats observed in the Eaglenest Zone.	17-18
3.	Sex and age composition of mountain goats observed in the Eco Reserve Zone.	20
4.	Sex and age composition of mountain goats observed in the Dawson Zone.	24
5.	Sex and age composition of mountain goats observed in the Kluayetz Zone.	25
6.	Sex and age composition of mountain goats observed in the Tomias Zone.	28
7.	Sex and age composition of mountain goats observed in the Marion Zone.	31
8.	Sex and age composition of mountain goats observed in the Caribou Mountain Zone.	34
9.	Sex and age composition of mountain goats observed during helicopter surveys in seven wildlife zones, Spatsizi Wilderness Park, B. C., July 1984.	35-36
10.	Summary of sex and age designations for moulted adult mountain goats.	38

LIST OF FIGURES
AND PLATES

<u>Figure</u>	<u>Page</u>
1. Flight lines and mountain goat observations in Eaglenest and Eco Reserve wildlife zones.	19
2. Flight lines and mountain goat observations in the Dawson and Kluayetz wildlife zones.	23
3. Flight lines and mountain goat observations in the Tomias wildlife zone.	27
4. Flight lines and mountain goat observations in the Marion and Caribou Mountain wildlife zones.	32
5. Flight lines and mountain goat observations during fixed-wing reconnaissance surveys in the Dawson and Kluayetz zones.	41
6. Comparison of helicopter and fixed-wing sightings of mountain goats.	43
 <u>Plates</u>	
1 & 2 Aspects of goat counting and classification.	8
3 & 4 Survey approach strategy in relation to goat escape terrain	9

LIST OF APPENDICES

<u>Appendix</u>	<u>Page</u>
1. Summary of flight transcript, large mammal sightings during mountain goat surveys by helicopter.	55-61
2. Flight notes, reconnaissance surveys for mountain goats by fixed-wing aircraft.	62-65
3. Incidental observations of Stone's Sheep, caribou and moose during mountain goat surveys.	66-78
4. Summary of sex and age composition data for mountain goats, sheep, caribou and moose.	79-80
5. Miscellaneous observations of Spatsizi Park wildlife during mountain goat surveys.	81

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1.0 INTRODUCTION

In June 1984, the authors successfully bid on a contract from the B.C. Ministry of Lands, Parks and Housing to conduct a survey over seven specified wildlife zones in Spatsizi Wilderness Park, in northern British Columbia. Field work on that project was completed on 24 July 1984, and an interim report consisting of rough field maps, flight transcripts and a summary of total numbers of animals seen was submitted to the Ministry in early August. This is the final report on that work.

Although we are experienced in mountain goat surveys, and know general wildlife distribution in the Spatsizi area well, we must nevertheless confess to some initial apprehensions in regard to this project. Those apprehensions should be discussed since they relate to the fact that inventory by contract, a new concept in B. C. wildlife administration, introduces some new variables in consideration of the term "success" as it might be applied to a particular survey. Specifically, the contractor accepts risks and responsibilities beyond those normally experienced by "in house" survey personnel. The two primary factors here, survey quality and cost effectiveness, are discussed separately in following paragraphs:

A.) Survey Quality - The reason for the survey was to obtain population information for management. The need for accuracy of that information is obvious, and that brings up the first major concern of the Contractors. There are a number of factors which can act singly or in combination, to affect survey accuracy. They include adverse weather (poor visibility) and unpredictable animal distribution due to various factors including weather, predator pressure, phenological phenomena or "normal" (but unknown) local diurnal and seasonal movements. However, the major liability in relation to survey quality is the absence of any "standard" and tested techniques for inventory of goats.

Based on questionnaire responses from 28 biologists in north-western North America, Eastman (1977) concluded that "development of inventory techniques" was the number one research priority for the species. We carefully reviewed the mountain goat literature which has been published since

that time, but it appears that no significant advances have been made and published. Alaskan biologists, notably Ballard (1975, 1977), Fox (1977) and Nichols (1980 a,b, 1982, 1983) have been among the most active in inventory research. Diverse counts on replicate flights in their study areas serve mainly as a clear warning - - one does not see all of the goats all of the time, therefore single counts are risky. Indeed, closer to our area of interest, B. Foster and colleagues (Mar-Terr 1981) made 8 thorough counts of goats in the Stikine Canyon over a one year period, and obtained counts of 72 - 255 animals. They considered that the most consistent counts were made during the snow-free season, during which time the low count (186) was 27 % less than the high count (255) and 51 % less than the projected population total (316).

The point to be made here is that we were aware of the above problems from the outset, and were concerned about their implications. The literature and our own experience suggested that there was an uncomfortably high potential for obtaining a "bad" (= low = unsuccessful) count. Such a count, we realized, could put us in a position of being responsible for serious negative effects on other people (e.g., the guide outfitter), and could jeopardize our opportunities for any future Ministry contracts.

B.) Cost Effectiveness - the most frightening aspect of the survey contract is the implications of inadequately judging flying requirements in preparing the bid. We have both conducted numerous surveys as government employees, and we know the frustration of being turned back by a local weather system after a significant expenditure of ferry time, or having to discontinue a survey short of intended "complete" coverage because fuel or budget had run out, or having to wait for days on end for suitable weather in order to complete a survey.

Such events are "too bad" in a practical or professional sense, but are not personally threatening. That is, when one is conducting surveys "in house", there is a clear separation between salaries and operational funds. The contract, however, is a commitment to achieve specified survey coverage of an area, and personal remuneration is drawn from funds remaining after those commitments have been met. As suggested above, the most common contingency, and the least predictable, is weather - - it can "make or break" the operation. However during the course of the surveys we also became acutely aware of the simple passage of time as it translates to an accumulating

helicopter bill. For example, each time one flies up into the headwaters area of a mountain valley for the purpose of counting animals, he is confronted with the decision of when to turn around and head back out of the valley and on to the next one. The objective is to find "all of the animals". How many times does one circle an alpine basin containing suitable habitat and/or fresh tracks before concluding that he has seen all he is going to see there? There are a minimum of 136 such valleys one kilometer or longer in length in the Eaglenest/Eco Reserve area alone (see Figure 1), and considerably more than that which are shorter. The consequence of spending 30 seconds "too long" in each is an underestimate of more than 2 hours flying time, i.e., more than \$1000.00. The consequence of breaking off too soon is missed animals, i.e., reduced survey quality.

Having bared our souls on the above points, we can reiterate that we were experienced enough to recognize some of the potential problems ahead of time, and we did "build in" some contingency funding in our cost estimates. In the end, we were lucky. Flight time requirements were greater than anticipated, but we were still able to provide full coverage with little strain because there were no contingencies. The weather was unusually cooperative and the entire field operation went exceedingly smoothly. In the following pages, we detail the results of the July 1984 goat surveys and, although it was not required by the Ministry, provide some additional discussion on the generalities of mountain goat inventory.

2.0 OBJECTIVES

The primary objectives, as outlined by terms of reference in the applicable Ministry contract, were to obtain a total count of mountain goats in 7 wildlife zones of Spatsizi Park by helicopter observations of all suitable habitat in those zones, and to classify all goats seen to at least adult/kid categories. Contract terms also called for more detailed sex and age composition counts whenever possible and required that incidental sightings of other big game species be noted and mapped.

3.0

METHODS3.1 General

Preparation for the surveys included the usual logistical duties and assembly of preliminary information. An arrangement was made with Collingwood Brothers to use Hyland Post as a base of operations. Fuel caches were established there (6 drums), at Coldfish Lake (4 drums) and at Summit airstrip (4 drums). Recent literature was reviewed to enable us to take advantage of any advances in survey technology and/or identification of animal classification criteria.

Ray and Reg Collingwood, together, and Jim Haney were interviewed. Interview procedure simply involved following an imaginary flight line (approximating that actually taken during the survey) on 1:250,000 scale maps. Areas where goats have been regularly or sporadically seen were color coded on the maps and approximate numbers were noted. The locations of mineral licks were also recorded. The Collingwoods provided input on all 7 zones covered; Haney on portions of the Kluayetz Zone and along the Klappan frontage of the Eaglenest (both based on his experience managing a guide camp at Summit in 1981). Tommy Walker also provided some information on mineral licks in the area. Maps prepared during the interviews were used in flight by the rear observer to keep the survey crew alerted to the presence of high potential areas, including mineral lick sites.

3.2 Helicopter Surveys3.2.1 Flight Characteristics

A Bell 206 Jet Ranger helicopter (Highland Helicopters Ltd., Smithers, B. C.), equipped with "bubble" windows for rear observers, was employed for the bulk of the work reported here. Two observers, one front and one rear, were positioned on the port side of the aircraft, and the flight was generally directed in a counter-clockwise pattern around mountain blocks to orient that side next to most slopes to be observed. Occasionally, as dictated by terrain features, light conditions and/or wind, a clockwise pattern was required. Flight speed during surveys ranged from about 65 to 120 kph, depending upon terrain and cover characteristics, and

averaged about 90 kph.

The forward observer served as the navigator during the surveys. Competence in that function is of paramount importance to the success of goat inventory. Accurate in-flight mapping of flight lines and observation is required to insure that all habitat is covered while preventing overlapping coverage, which may introduce duplication of counts. At the same time, visualization of the evolving survey plan is a continuing process, the navigator knowing at all times where he has been, where he is, and where he will be later. In some cases the best local plan was to fly a ridgetop line - - in others, if valleys on the opposite side of the ridge had not yet been surveyed, it seemed best to keep the helicopter and its disturbance behind intervening terrain and to cover the highest areas later.

Generally, the flight proceeded horizontally along a contour selected locally, in flight, on the basis of professional judgments relating to "goat habitat". For rimrock areas at the edge of plateaus and relatively open slopes without cliffs, the best flight elevation seemed to be about 50-75 meters above ridgetop, and well out away from the slope so that the rear observer, who has the greatest vertical observational range because of the bubble windows, has an unobstructed view downslope to about the 5000' level. A similar pattern proved sufficient for slopes with only a few intermittent cliffs. For slopes having a series of cliffs in tiers, it was necessary to fly up to 4 passes at different elevations. At such times it seemed most effective to begin at a level along the scree slopes below the lowest level of cliffs. That contour was flown until the navigator observed a natural break, at which point the helicopter was directed up to the next locally appropriate level and the flight direction was reversed. This procedure was followed until that particular section of the slope had been covered. Working upward, from the lowest cliffs to the highest, is not particularly kind to the helicopter or the pilot but it is biologically justified in that goats disturbed from below tended to move uphill,

remaining visible, while those disturbed from above often take cover and may be missed.

Because the objective was to observe and count all goats present, some flexibility in flight characteristics was clearly required. The only measure of success available in the field under such an objective is an ad hoc feeling - - the observers merely searching a particular slope by the pattern that seems to be required until they are satisfied that the search is complete.

In all cases, the pilot (T. Brooks, an interested and competent observer) assisted in spotting animals. He observed opposite slopes and valley bottoms on the starboard side of the aircraft and with the front observer, surveyed terrain ahead of the aircraft. In this regard, it should be mentioned that we did not and would not consider using a third observer (in the starboard rear of the helicopter). Since, as described above, that is the "off" side of the aircraft for most goat survey work, and it can be adequately covered by the pilot, the primary effect of the extra observer would be negative, adding to weight and thereby reducing the aircraft's climbing and hovering ability, especially at full fuel load. That in turn, decreases efficiency in classifying animals, and in the turbulence and subsidence often encountered in mountain flying, significantly reduces the safety margin.

3.2.2 Classification of Mountain Goats

Once animals had been spotted, an attempt was made to classify them to sex and age. Total counts and counts of kids were usually attained from a higher elevation (Plate 1) for larger groups (10+), and during the classification approach for smaller groups. An attempt was made to position the helicopter between the animals and their escape terrain, to prevent them from "clumping up" in caves and crevice (Plates 3 and 4). This was usually achieved by approaching from the escape terrain direction and heading the animals away and up the mountain slope.

The best results were obtained when the helicopter could follow a group slowly and closely, up and across the hill.

We were prepared to stop and observe large groups from the ground with spotting scopes and binoculars. However, that proved unnecessary since most animals could be successfully classified from the helicopter. Further, classification from the helicopter could be accomplished relatively quickly -- thereby increasing the chances to complete the survey before a weather change. Also, most groups were moving after being spotted, and would not have been amenable to detailed ground observations anyway.

As emphasized by Chadwick (1983), the biologist who has probably logged the most time systematically observing goats, the animals are difficult to classify. He has done most of his work from the ground. Various researchers, especially Nichols (1980a), have been attempting to establish classification criteria recognizable from the air. We considered the criteria listed by the above authors and by Ballard (1975, 1977) and Foster (1982) in our field deliberations.

The timing of our survey relative to the animals' moult cycle was such that pelage characteristics were the single most useful feature for distinguishing various animal classes. Horns are not particularly conspicuous from the air and they were of little use in distinguishing sex, although they were occasionally helpful in establishing age, especially of younger animals. However body size differences are usually more obvious than horn size differences. The following list indicates the animal classes we recognized and the features by which we recognized them. Most of those features had been previously identified by one or more of the authors cited above, but some (asterisked below) appear to be "new" or at least have not been emphasized previously.



Plate 1. Having achieved a total count and a kid count, the helicopter survey team can now move in and classify the others.

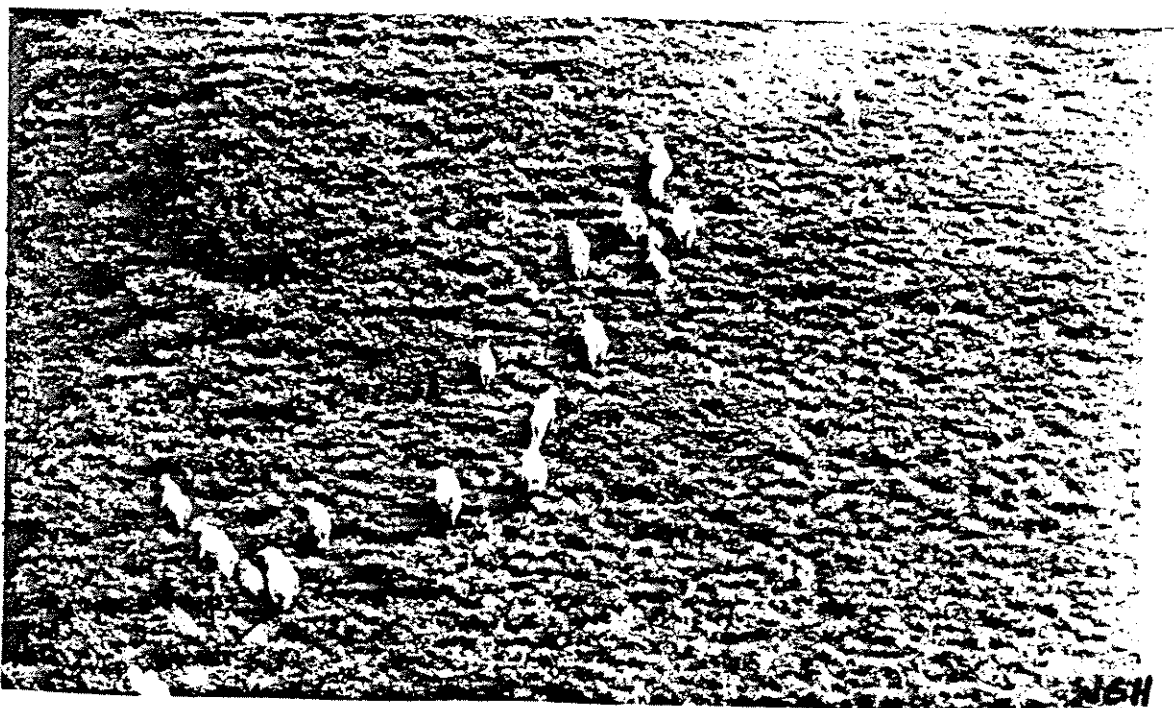


Plate 2. Smooth-coated (sm) and shaggy (sh) adults are both present in this group. In all cases, kids were with shaggy females.

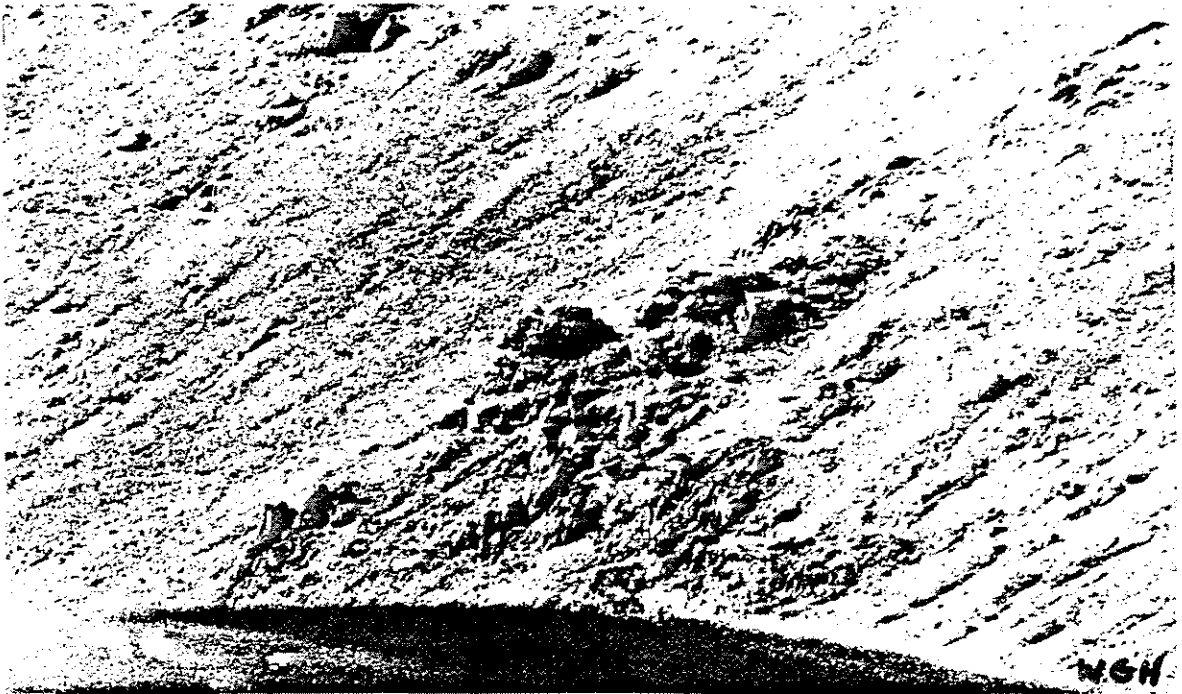


Plate 3. Harrased by the helicopter, this nursery herd seeks the nearest (marginal) escape terrain.

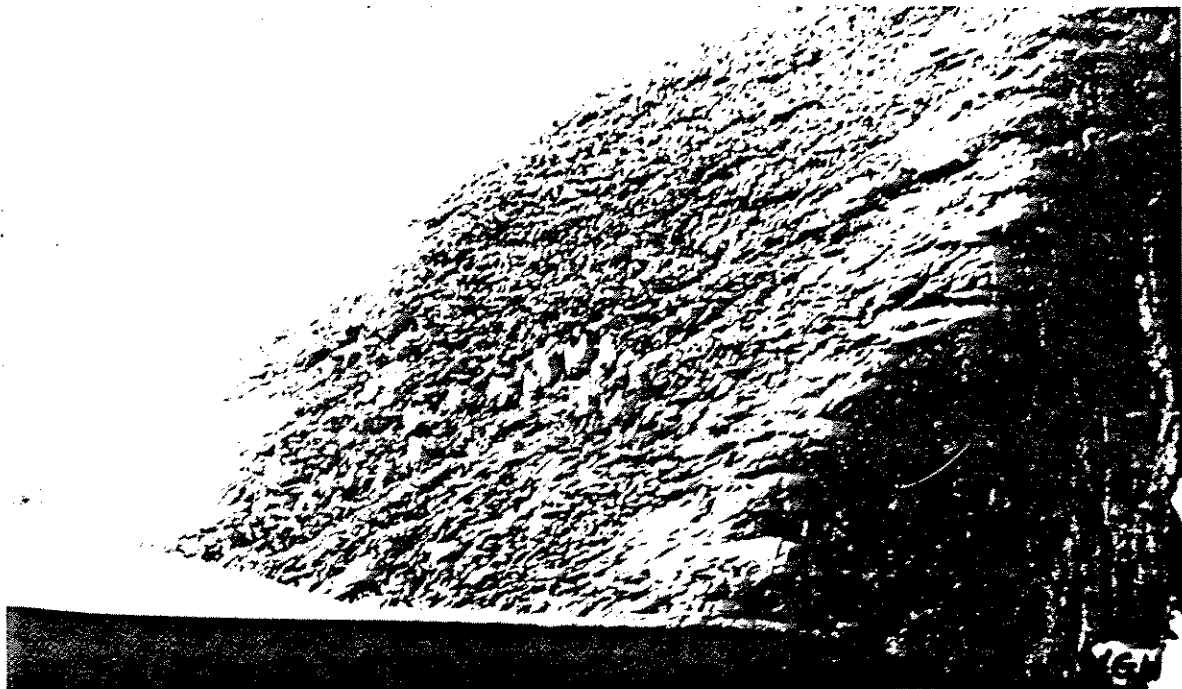


Plate 4. The approach strategy here is to move the goats away from escape terrain and to herd them slowly uphill. Sex and age classification is most efficient when observers are below and behind climbing goats.

ADULT MALE - Completely moulted (short, smooth pelage); alone or in only small groups - usually four or fewer but including seven in one case; large body size, blocky in appearance; scrotal sac prominent; sides dirty* (smooth-coated animals in nursery groups, including some young males, were clean, white, while the adult males, including a few in or near nursery bands, were almost always grayish on the sides, presumably from dust bathing); peculiar, stiff-legged "rocking horse" gait* (this gait was distinguishable from some distance).

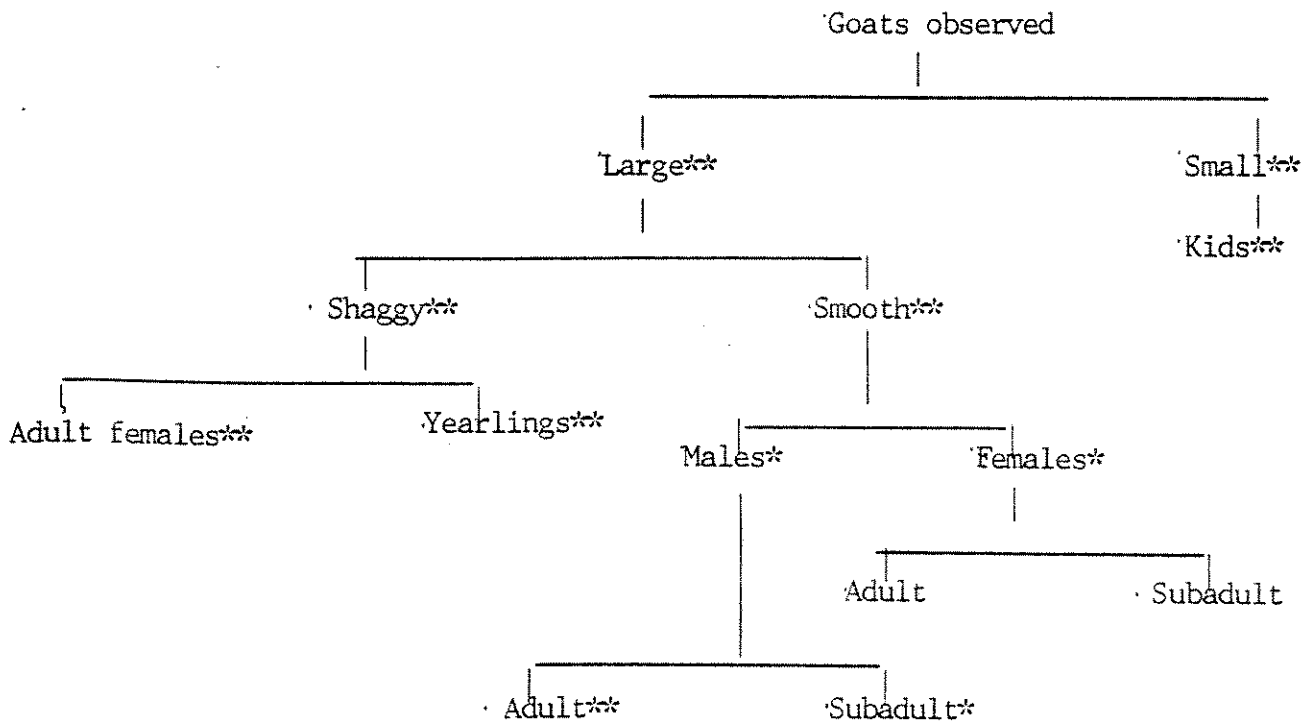
ADULT FEMALE - Adult-sized animals which retained more than 20% of their winter pelage were referred to as "shaggies" in the field (see Plate 2). Many had kids with them, and that group was always assignable, with confidence, to the adult female category; animals with some winter pelage, but less than 20% were observed more closely for horn size and shape and presence/absence of a scrotum or vulva. The few in that category seen on our surveys were all believed to be adult females; there were also some adult females among those animals which were completely moulted (called "smoothcoats" in the field) (Plate 2). Body size, horn size and shape, and presence/absence of a scrotum or vulva were the features we looked for to distinguish such animals but we were not always successful, especially in large groups. Some confusion with subadults of both sexes (see below) is possible.

YOUNG OF THE YEAR - Kids were easily distinguished by body size alone. We did not attempt to sex them, since the literature indicates that urination posture is the only viable distinguishing feature which can be observed from a distance.

YEARLINGS - This class also was fairly distinctive, consisting of small-bodied and small-horned animals with shaggy pelage. It is theoretically possible to sex yearlings from the air, but not consistently before they have moulted (see Chadwick, 1983, Nichols 1980a) We remained alert to any opportunities to sex that class, but we did not attempt to do so specifically.

SUBADULTS - Animals in this category were completely moulted; males were distinguished by presence of a scrotum and/or occasionally by horn size and shape; females in this class were occasionally distinguishable from moulted adult females by their smaller body size, but that was usually possible only when both classes were together in the group observed. It is likely that most animals in this category were two-year-olds, as described by Chadwick (1983) and others, but we believe that too little is known about the animals at this latitude (growth rates, etc.) to be certain. Since we could not consistently assign animals to the subadult category with confidence, and we could not specifically recognize two-year-olds as such, they were not systematically recorded.

Functionally, classification procedure proceeded in a roughly dichotomous step-by-step fashion, as depicted by the diagram below:



The asterisks in the diagram are to convey our general level of confidence in recognition of the various classes; two asterisks indicate the highest level, i.e. we believe there were few, if any, errors in recognizing the categories as marked. Most error potential is in the "smooth" pelage category, in which case we may have missed some young males, especially in large groups when we did not get the opportunity to observe them closely enough, and we do not feel we could confidently distinguish between subadult and adult females. It should also be mentioned that although we are confident in our recognition of yearlings, there is some potential for confusing them with the shaggy nannies, especially in large groups when observers are concentrating on separating out and identifying smooth-coated individuals.

3.3 Fixed-Wing Reconnaissance

It had been noted that bands of goats are often seen, and may be counted with little apparent disturbance during the course of high elevation caribou radio-tracking flights in the area (Hatler, personal observation). The present contract included a budget allocation for reconnaissance surveys by fixed-wing aircraft in the Dawson and Kluayetz Zones. The stated objectives were to obtain replicate data on numbers, to assist in interpretation of the helicopter results in those zones, and to determine whether such reconnaissance might increase the efficiency of goat surveys by providing preliminary information on animal distribution.

The aircraft used was a Cessna 185, piloted by Tom Britton of Central Mountain Air Services Ltd. To take advantage of available time and perfect weather conditions, the flights were done with just one observer (DFH), although the high elevation, calm weather flying was sufficiently undemanding so that the pilot was able to operate as an essentially full-time observer on his side of the aircraft. In that regard, it should be pointed out that, Mr. Britton is an unusually competent wildlife spotter, and he has had considerable experience in the

southern Spatsizi Park area both in the employ of the present Guide-Outfitter, and during numerous caribou radio-tracking surveys with the senior author.

The reconnaissance work was carried out on 21 July 1984, in two separate flights. The first, commencing at about 0805, was initiated in the Happy Lake area of the Kluayetz Zone at the termination of a short caribou tracking flight (i.e., there were no ferry charges to the point of commencement). That zone and the southernmost portions of the Dawson Zone were covered in just under 2½ hours, and the remainder of the Dawson Zone in a flight of similar duration (1115 - 1405) after a fuel and rest stop at Hyland Post.

The aircraft was flown over the survey areas at elevations ranging from about 7,000 to 10,000 feet. We tried different flight patterns and elevations over some portions of both areas in an ad hoc attempt to find the "best" combination. More such testing would be advisable, because results may vary with other factors such as time of day, but under the conditions of topography, snow cover and light pertaining, it appeared that 8,000' gave the best results. At that elevation, with the aircraft following a flight path vertically above about the 4,000 - 4,500' contour, the observer sees the entire slope from ridgetop (most less than 7,000' in the area covered) to timberline, with little "eye-shifting" required.

During the fixed-wing surveys there was no attempt to classify animals. Groups were counted from the elevations at which they were seen and locations and flight lines were plotted on 1:250,000 scale topographic maps. For a few larger groups, lower passes would probably have produced more accurate counts. This was especially true when the animals were bedded, and in which case some kids may have been too close to their mothers to be seen as separate individuals. The resulting "estimates" (rough counts) for these groups seemed preferable in this case, to the risk of disturbing the animals and causing unusual movements and/or otherwise biasing the helicopter work which

was to follow. Further it was felt that the helicopter surveys would in any case produce the more accurate counts when such groups were relocated.

4.0

RESULTS

4.1 General

Appendix 1 constitutes a chronological listing, by wildlife zone, of all large mammals observed during the course of the helicopter surveys. Table 1 summarizes those results in terms of total numbers of the four large mammal species observed in the seven zones and in the survey area as a whole. As shown, we tallied 538 mountain goats during approximately 26.5 hours of survey time over an intensive four-day period.

More detailed information on our sightings is provided in following pages. For mountain goats, a separate section complete with maps and tables, is given for each wildlife zone. Summary statements include reference to results of previous surveys and/or incidental observations for those areas where they were available. Aspects of behavior, including movements, are also noted where they seem pertinent to the subject of goat inventory. Separate sections are also provided for goat occurrence in the Spatsizi area as a whole, and for comparison of the reconnaissance and helicopter results. Detailed data, including maps, for the incidental sightings of other species are also given, but with less attendant narrative.

Table 1. Total numbers of four ungulate species observed during mountain goat surveys in Spatsizi Wilderness Park, B. C. July 1984. *Total count = 1039*

UNGULATE NUMBERS				
Wildlife Zone	Goats	Sheep	Caribou	Moose
EAGLENEST	266	95	27	0
ECO RESERVE	45	67	13	0
DAWSON	144	7	11	1
KLUAYETZ	45	0	93	1
TOMIAS	27	0	32	2
MARION	10	129	4	11
CARIBOU MOUNTAIN	1	0	8	0
TOTAL	538	298	188	15

4.2

MOUNTAIN GOAT OBSERVATIONS4.2.1 Eaglenest Zone

This is by far the largest and most difficult to survey of the seven wildlife zones covered. Table 2 summarizes composition data for the 266 goats seen there, while flight lines and locations of those animals are depicted in Figure 1. The composition count results for this and all other zones are compared and summarized in section 4.2.8.

Various observers, including government personnel and guides/outfitters have observed goats in the Eaglenest Zone on numerous occasions over the years, but there have been relatively few sets of observations over a large portion of the area in any short time period. Osmond-Jones *et al.* (1977) accounted for a minimum of 31 in the area over the June-September field season in 1976. Haber (1979) assembled all available information on ungulates in the Spatsizi area into "wolf pack territories". His Eaglenest pack territory roughly corresponds with the present Eaglenest, Cartmel and Eco Reserve Zones, for which he inferred a total (1976) of about 200 animals. Clearly there has been no previous instantaneous total as high as that we obtained for the area of the present Eaglenest Zone. During the interviews, numbers suggested by the Collingwoods for various concentration areas throughout the zone indicated a minimum total of 183 animals, although they did not attempt a "total estimate" owing to the nature of their usual occurrence in the area, i.e., they rarely see large areas of the zone in any one short time period.

4.2.2 Eco Reserve Zone

Composition data for 45 goats observed in this zone are given in Table 3, and their locations are shown in Figure 1. As predicted by the Collingwoods, there were few goats in the Nation Peak block. Reg recalled having seen "one or two" on the Gladys Valley side once, but no others in many trips through the area. Osmond-Jones *et al.* (1977) recorded two animals "north of Gladys Lake" in the summer of 1976. The single group we observed in the

45

7

Table 2. Sex and age composition of mountain goats observed in the Eaglestest Zone, Spatsizi Wilderness Park, B.C., July 1984. Page 1 of 2

MOUNTAIN GOATS OBSERVED ^a										
Ident. No.	Group Size	Adult		Young	Yrlgs.	No.	Moulted		Uncl.	
		Males	Females				Male	Fem.		
21-10	30	-	12	10	2	6	1	3	2	
21-11	4	4	-	-	-	-	-	-	-	
21-12	1	1	-	-	-	-	-	-	-	
21-13	13	-	7	5	-	1	-	-	1	
22-8	17	-	8	4	-	5	2	3	-	
22-10	8	-	3	3	1	1	-	1	-	
22-12	9	-	4	4	1	-	-	-	-	
22-13	5	-	2	2	-	1	-	-	1	
22-14	15	-	8	3	-	4	-	4	-	
22-15	3	-	1	1	1	-	-	-	-	
22-18	1	1	-	-	-	-	-	-	-	
22-19	9	1	3	3	1	1	-	-	1	
22-20	4	1	1	1	1	-	-	-	-	
22-21	2	2	-	-	-	-	-	-	-	
22-22	2	2	-	-	-	-	-	-	-	
23-15	24	-	8	8	3	5	1	-	4	
23-19	4	-	-	-	1	3	-	3	-	
23-20	2	2	-	-	-	-	-	-	-	
23-21	1	-	-	-	1	-	-	-	-	
23-22	2	-	1	1	-	-	-	-	-	

^aSee text for classification criteria.

^bIdent. No. = date-observation number, e.g., 21-17 is 21 July, obs. No. 17--see flight transcript, Appendix 1.

Table 2 (continued)

MOUNTAIN GOATS OBSERVED ^a										
Ident. No.	Group Size	Adult Males	Adult Females	Young	Yrlgs.	No.	Moulted		Uncl.	
							Male	Fem.		
23-23	1	1	-	-	-	-	-	-	-	-
23-24	40	-	18	14	5	3	1	1	1	1
23-25	9	-	3	2	1	3	-	-	3	3
23-26	1	-	1	-	-	-	-	-	-	-
23-27	3	-	1	1	-	1	1	-	-	-
23-28	8	1	4	2	1	-	-	-	-	-
23-31	3	3	-	-	-	-	-	-	-	-
23-32	1	1	-	-	-	-	-	-	-	-
23-33	12	-	5	2	3	2	1	-	1	1
23-35	1	1	-	-	-	-	-	-	-	-
23-37	1	1	-	-	-	-	-	-	-	-
23-38	2	2	-	-	-	-	-	-	-	-
23-39	20	-	12	4	3	1	-	1	1	-
23-41	1	1	-	-	-	-	-	-	-	-
23-42	7	7	-	-	-	-	-	-	-	-
TOTAL	266	32	102	70	25	37	7	16	14	14

^aSee text for classification criteria.^bIdent. No. = date-observation number, e.g., 21-17 is 21 July, obs. No. 17--see flight transcript, Appendix 1.



Fig. 1. Flight lines and mountain goat observations in Eaglecrest (A) and Eco Reserve (B) wildlife zones, Spatsizi Wilderness Park, British Columbia, July 1984

* KNOWN LICK

MT KLAPPAN

Table 3. Sex and age composition of mountain goats observed in the EcoReserve Zone, Spatsizi Wilderness Park, B.C., July 1984.

MOUNTAIN GOATS OBSERVED ^a									
Ident. No.	Group Size	Adult Males	Adult Females	Young	Yrlgs.	No.	Moulted		
							Male	Fem.	Uncl.
22-4	6	-	2	2	1	1	-	1	-
23-4	4	-	3	1	-	-	-	-	-
23-5	4	-	2	1	1	-	-	-	-
23-6	5	3	1	1	-	-	-	-	-
23-7	6	-	3	2	-	1	-	1	-
23-8	1	1	-	-	-	-	-	-	-
23-9	3	3	-	-	-	-	-	-	-
23-10	4	-	2	2	-	-	-	-	-
23-12	4	-	2	1	1	-	-	-	-
24-7B	8	-	4	4	-	-	-	-	-
TOTAL	45	7	19	14	3	2	-	2	-

^a See text for classification criteria.

^b Ident. No. = date-observation number, e.g., 21-17 is 21 July, obs. No. 17--see flight transcript, Appendix 1.

Nation Block was also on the Gladys Valley side. Three nannies, two kids and a yearling were seen moving upslope (north) at about 4200 feet and they may have been in the process of crossing the valley from Sanctuary Mountain at that location. They had just moved from covering vegetation out onto open rubble when seen, and had we passed that way a half-minute sooner, we would have missed them.

Due to its special status as a reserve for sheep and goats, this zone has been monitored fairly frequently in recent years. As with the Eaglenest Zone, our current count of 45 appears to be the highest instantaneous total which has been recorded. Haber (1979) inferred a total of "52 - 60" for the area from summer observations by Carswell (1975). However, Carswell himself estimated the local population to be only 20. V. Geist was quoted by Pojar (1977) as postulating a total of about 30 goats in "the Gladys Lake area" in the early 1960's, and Osmond-Jones *et al.* (1977) estimated the same number following the park inventory in the summer of 1976. Haber (1979) saw 28 goats in the reserve area on a flight on 15 July 1978, and judged the accuracy of that result as "low to moderate". The most recent previous count in the area was 25 seen incidentally by Jones (1983) in a winter sheep survey. The sum of local estimates provided by the Collingwoods for areas in which they have seen goats in the zone is "50+". As they have indicated many of the animals occupying the rugged cliffs fronting on the Spatsizi River are billies.

Our intensive coverage of the Eco Reserve Zone resulted in a count of 37 animals. The additional 8, 4 nannies with kids, were seen in passing while we were ferrying back to base camp from survey areas to the west. That is, we could confirm that our careful original survey missed at least 17.8% of the animals actually present.

4.2.3 Dawson Zone

A total of 144 goats were counted, and classified during the helicopter survey (Table 4, Figure 2). That number is known to be minimal on the basis of unduplicated sightings during the fixed-wing reconnaissance and on the caribou tracking flight during the same period (see Section 4.2.9). Haber (1979) inferred a total number of 221 animals in his Spatsizi wolf pack territory, which corresponds roughly to the present Dawson, Caribou Mountain and Marion Zones. His conclusion was based on analysis of data accumulated by Osmond-Jones et al. (1977) over several summer months in 1976. The maximum number we can generate for the actual Dawson Zone from that source is 186, and that probably includes at least some duplication among 81 animals seen in the Griffith Creek area over 4 days in early September. The most seen on any one day during that period was 43. Most other counts in the area have been in winter, incidental during sheep surveys. The most recent of these, by Hatler (1984) recorded only 41 animals. In an intensive March survey, Luckhurst and Marsh (1973) recorded 25 goats in what is now the Dawson Zone.

A behavioral observation of a large nursery group at the mouth of the Dawson (Obs. 6, 22 July, Appendix 1) seems worth mentioning. During our classification of the 30 animals involved, several disappeared into a small cave. Most of the group fled uphill some distance and we followed them until all had been classified. We then returned to the cave and found that 8 animals had moved out of it - - 2 adult females (shaggy), one subadult female (moulted) and 5 kids. Apparently up to 3 females had abandoned their kids at least temporarily and moved 500 meters or more away from them. If that happens often, kids will be undercounted in groups which are stimulated by aircraft noise to escape or hide before they are seen.

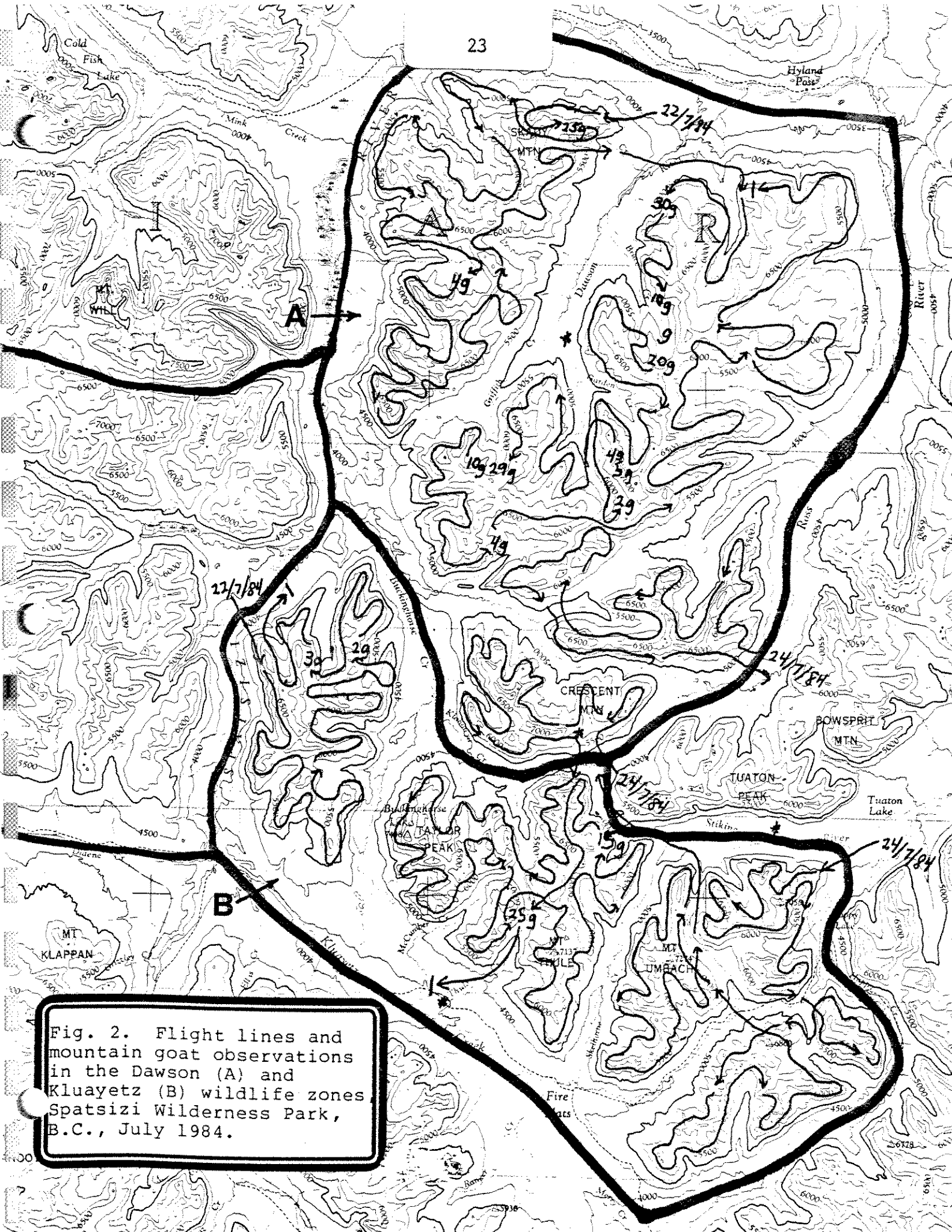


Fig. 2. Flight lines and mountain goat observations in the Dawson (A) and Kluayetz (B) wildlife zones Spatsizi Wilderness Park, B.C., July 1984.

Table 4. Sex and age composition of mountain goats observed in the Dawson Zone, Spatsizi Wilderness Park, B.C., July 1984.

MOUNTAIN GOATS OBSERVED ^a										
Ident. No.	Group Size	Adult		Young	Yrlgs.	No.	Moulted		Uncl.	
		Males	Females				Male	Fem.		
22-1	25	-	10	7	-	8	3	2	3	
22-4	4	4	-	-	-	-	-	-	-	
22-6	30	-	12	10	-	8	-	7	1	
22-8	10	-	5	2	2	1	-	1	-	
22-9	1	1	-	-	-	-	-	-	-	
22-10	20	-	12	3	2	3	-	3	-	
22-11	2	-	1	1	-	-	-	-	-	
22-12	5	5	-	-	-	-	-	-	-	
22-13	4	4	-	-	-	-	-	-	-	
22-14	29	-	15	6	4	4	-	-	4	
22-15	10	-	5	3	2	-	-	-	-	
22-16	4	4	-	-	-	-	-	-	-	
TOTAL	144	18	60	32	10	24	3	13	8	

^a See text for classification criteria.

^b Ident. No. = date-observation number, e.g., 21-17 is 21 July, obs. No. 17--see flight transcript, Appendix 1.

4.2.4 Kluayetz Zone

We saw and classified only 45 goats during the helicopter survey of the Kluayetz Zone (see Table 5). As shown in Figure 2 that included only two groups, and the larger (25) was actually missed on the first pass. It had been seen on the reconnaissance (fixed-wing) survey, and since classification of the group was considered important, it was systematically searched out. A more detailed account of the discrepancies between the helicopter and fixed-wing results is given in Section 4.2.9. Suffice it to say here, that the helicopter result was nearly 50% less than the number known to be present in the Kluayetz Zone.

Most previous "counts" in the area are incidental observations, scattered over both time and space. Observations by Osmond-Jones *et al.* (1977) in summer 1976 include 27 at Mount Thule and 4 at the Stikine Headwaters on 18 July. In recent years the mountains of this zone have been most intensively observed by Bergerud and Butler (1978) and their crews, but they apparently did not record goat observations. Local estimate by the Collingwoods for concentration areas in the Kluayetz Zone give a combined total of 58.

4.2.5 Tomias Zone

The Tomias Zone, although large, has little mountain goat habitat. We observed a total of 27 animals, in two nursery groups (Table 6 and Figure 3), all in the more rugged southwestern section. We apparently missed the adult males in that area; Reg Collingwood (personal communication) has regularly seen small numbers of billies at the heads of the valleys draining north into the Ross (north of Bowsprit Mountain). There are a few isolated cliffs and bluffs along the west side of the zone (up to Blueberry Creek) which appear "suitable", but we saw no tracks on scree slides in those areas. Osmond-Jones *et al.* (1977) saw no goats in the Tomias Zone in Summer 1976.

Table 5. Sex and age composition of mountain goats observed in the Kluayetz Zone, Spatsizi Wilderness Park, B.C., July 1984.

MOUNTAIN GOATS OBSERVED ^a									
Ident. No.	Group Size	Adult		Young	Yrlgs.	No.	Moulted		Uncl.
		Males	Females				Male	Fem.	
22-24	2	-	1	1	-	-	-	-	-
22-27	3	3	-	-	-	-	-	-	-
24-19	15	-	6	3	4	2	1	1	-
24-20	25	-	12	6	4	3	-	-	3
TOTAL	45	3	19	10	8	5	1	1	3

^aSee text for classification criteria.

^bIdent. No. = date-observation number, e.g., 21-17 is 21 July, obs. No. 17--see flight transcript, Appendix 1.



Fig. 3. Flight lines and mountain goat observations in the Tomias wildlife zone Spatsizi Wilderness Park, B.C., July 1984.

Table 6. Sex and age composition of mountain goats observed in the Tomias Zone, Spatsizi Wilderness Park, B.C., July 1984.

MOUNTAIN GOATS OBSERVED ^a									
Ident. No.	Group Size	Adult		Young	Yrlgs.	Moulted			Uncl.
		Males	Females			No.	Male	Fem.	
24-5	22	-	10	7	4	1	-	-	1
24-7	5	-	2	2	-	1	-	1	
TOTAL	27	-	12	9	4	2	1	1	1

^a See text for classification criteria.

^b Ident. No. = date-observation number, e.g., 21-17 is 21 July, obs. No. 17--see flight transcript, Appendix 1.

Interestingly, the local estimates by the Collingwoods for the area is 27, although that includes 4 - 6 billies.

4.2.6 Marion Zone

Observations in this and the following zone comprised our biggest surprises during the course of these surveys, since those are the areas we know best. The various "goat cliffs" in the Marion Zone have been observed in passing on many of the senior author's caribou tracking flights, and incidental sightings have often been recorded. On the "goat bluffs" north of Marion Creek, the highest total recorded by Hatler (1983) in a few observations over a one-year period was 6, on 10 October 1981. In subsequent years, (Hatler, Unpubl.Prog.Reports), the highest count has been 7+, on 7 November 1982. On that occasion, there may have been several more; the seven seen were glimpsed as they disappeared around a knoll, following in the

tracks of an unknown number that we did not see. Sightings by others on those bluffs include 6, seen by Haber (1979) on 13 July 1978 and 15 recorded by Osmond-Jones *et al.* (1977) on 16 August 1976. On our July 1984 flight, an intensive search of that area turned up only 2 animals (Table 7, Figure 4).

The other area of goat occurrence in the Marion Zone is the ridge above Hyland Post. Our total of 8 compares with a minimum of 6 recorded by Osmond-Jones *et al.* (1977) in mid-June 1976, and 8 seen by Haber (1979) on 15 July 1978. However, Jones (1983) counted 18 animals all apparently along the east end of the ridge, in March 1983.

4.2.7 Caribou Mountain Zone

We are aware of three locations where goats have often been seen in this zone. The most prominent of these is the escarpment area over Mink Creek (Rainbow Mountain Area). Among the records available to us are 9 animals seen there by Haber (1979) on 13 July 1978, 7 recorded by Osmond-Jones *et al.* (1977) on 15 September 1976 and 9 seen by Jones (1983) in March 1983. Ray Collingwood (personal communication) reported that he has seen up to 13 animals in that location, and gave 9 - 13 as an "expected" range. Carswell (1975) reported sightings by pilot C. Simmons of up to 8 animals in the Rainbow Mountain area. We have seen goats there frequently in our travels through the area, but usually only small numbers (1 - 4). On the July 1984 surveys, we covered the area intensively once, and observed it in passing about twice a day for 4 days, and we saw no goats there.

The cliffs above the canyon east of Rainbow Mountain (near the mouth of the Kliweguh Valley) is another area in which goats occur. Reg Collingwood (personal communication) indicated it as a "hang-out" for 1 - 2 billies. We saw one there.

The third area of known occurrence is a mineral lick along the east side of Cullivan Creek about 8 km north of Bug Lake. Both Reg Collingwood and Tom Britton (personal communication)

Table 7. Sex and age composition of mountain goats observed in the Marion Zone, Spatsizi Wilderness Park, B.C., July 1984.

MOUNTAIN GOATS OBSERVED ^a									
Ident. No.	Group Size	Adult Males	Adult Females	Young	Yrlgs.	No.	Moulted		Uncl.
							Male	Fem.	
23-7	2	-	1	-	-	1	-	1	-
23-8	7	-	3	3	-	-	-	-	1
23-9	1	1	-	-	-	-	-	-	-
TOTAL	10	1	4	3	-	2	-	1	1

^aSee text for classification criteria.

^bIdent. No. = date-observation number, e.g., 21-17 is 21 July, obs. No. 17--see flight transcript, Appendix 1.



Fig. 4. Flight lines and mountain goat observations in the Marion (A) and Caribou Mtn. (B) wildlife zones, Spatsizi Wilderness Park, B.C., July 1984.

independently reported past sightings of 6 - 8 animals there. We found tracks and sign there but saw no animals. Our total count for the Caribou Mountain Zone on this survey was therefore just one adult billy (Table 8).

4.2.8 Sex and Age Composition, All Areas

Table 9 presents composition data, by zone, of mountain goats classified during the helicopter surveys. Highlights from those data are briefly outlined below:

ADULT FEMALES consistently constituted about 40 % of the animals observed in all zones.

ADULT MALES were somewhat more variable in occurrence, comprising 12 - 15 per cent of the animals seen and about 1 for every 3 adult females in three of the four zones with significant goat populations (all except Kluayetz).

YOUNG-OF-THE-YEAR were well represented in all zones where adult females were observed, constituting one-fourth to one-third of the total samples for those zones, and occurring in an overall ratio of 63.9 per 100 adult females.

YEARLINGS constituted less than 10 % of the goats classified in all areas, but there was still nearly 1 for every 4 adult females observed overall.

MOULTED ADULTS presumably mostly two-year-olds (see text) were the most variably occurring class, constituting only 4 % of the animals observed in the Eco Reserve zone but 11 - 17 % of those in the three other zones with large samples.

Chadwick (1983) noted that "a typical mountain goat population has ... 70 to 90 mature billies for every 100 mature nannies". The average among our sample (28.7) is less than half of the lower number above, and it is just above half (36.8) in the "best" zone in that regard (Eco Reserve). Chadwick (op.cit.) goes on to say that "... lower male-female ratios have been reported, but these may reflect the effects of hunting, or else the greater difficulty of finding the largely solitary, wide-

Table 8. Sex and age composition of mountain goats observed in the Caribou Mountain Zone, Spatsizi Wilderness Park, B.C., July 1984.

MOUNTAIN GOATS OBSERVED ^a								
Ident. No. ^b	Group Size	Adult		Young	Yrlgs.	No.	Moulted	
		Males	Females				Male	Fem.
23-1	1	1	-	-	-	-	-	-
TOTAL	1	1	-	-	-	-	-	-

^a See text for classification criteria.

^b Ident. No. = date-observation number, e.g., 21-17 is 21 July, obs. No. 17--see flight transcript, Appendix 1.

Table 9. Sex and age composition of mountain goats observed during helicopter surveys in seven wildlife zones, Spatsizi Wilderness Park, British Columbia, July 1984.

Classes	Wildlife Zones ^a							All
	E'nest	Eco R.	Dawson	Kluayetz	Tomias	Marion	C. Mtn.	
<u>Adult Females^b</u>								
Number	102	19	60	19	12	4	0	216
Per Cent ^c	38.3	42.2	41.7	42.2	44.4	40.0	0.0	40.2
<u>Adult Males</u>								
Number	32	7	18	3	0	1	1	62
Per Cent	12.0	15.6	12.5	6.7	0.0	10.0	100.0	11.5
N/100 ^c	31.4	36.8	30.0	15.8	0.0	25.0	-	28.7
<u>Young (kids)</u>								
Number	70	14	32	10	9	3	0	138
Per Cent	26.3	31.1	22.2	22.2	33.3	30.0	0.0	25.7
N/100	68.6	73.7	53.3	52.6	75.0	75.0	0.0	63.9
<u>Yearlings</u>								
Number	25	3	10	8	4	0	0	50
Per Cent	9.4	6.7	6.9	17.8	14.8	0.0	0.0	9.3
N/100	24.5	15.8	16.7	42.1	33.3	0.0	0.0	23.2
<u>Moulted Adults^d</u>								
<u>Males</u>								
Number	7	0	3	1	0	0	0	11
Per Cent	2.6	0.0	2.1	2.2	0.0	0.0	0.0	2.0
<u>Females</u>								
Number	16	2	13	1	1	1	0	34
Per Cent	6.0	4.4	9.0	2.2	3.7	10.0	0.0	6.3
<u>Unclassified</u>								
Number	14	0	8	3	1	1	0	27
Per Cent	5.3	0.0	5.6	6.7	3.7	10.0	0.0	5.0
<u>All</u>								
Number	37	2	24	5	2	2	0	72
Per Cent	13.9	4.4	16.7	11.1	7.4	20.0	0.0	13.3
N/100	36.3	10.5	40.0	26.3	16.7	50.0	-	33.3

Table 9 (continued)

Classes	Wildlife Zones ^a							
	E'nest	Eco R.	Dawson	Kluayetz	Tomias	Marion C. Mtn.	All	
All Number	266	45	144	45	27	10	1	538

^aAbbreviated wildlife zones: E'nest = Eaglenest, Eco R. = Eco Reserve, and C. Mtn. = Caribou Mountain.

^bAdult females are "shaggy" adults, as described in text.

^cPer cent is proportion of total number seen applicable to each class; N/100 is number in each class on a per 100 adult females basis.

^dMoulted adults are probably mostly 2-3 year olds (see text).

ranging billies during censuses". The timing of the census may also be a factor - - surveys nearer rut time might locate more males.

If the observed low male ratio, above, constitutes a population deficiency, that fact is not reflected in the kid ratio obtained. The overall ratio of 63.9 per 100 mature females exceeds Chadwick's (1983) Glacier Park ratios over a three year period (1974-76: 56,55,57) and are considerably higher than past summer Spatsizi ratios, as compiled by Haber (1979). While the high observed ratio in 1984 indicates at least adequate reproductive performance of the populations observed, it probably mostly reflects the results of the easy winter of 1983-84 (personal observation).

Our yearling ratios, if representative, are lower than those observed by Chadwick (1983), especially in the Eco Reserve and Dawson Zones. On one occasion we found a yearling alone (Eaglenest Zone, Obs.21, 23 July, Appendix 1), and that caused us to wonder about the extent of such occurrence. However, assuming that most remain in or near nursery bands, either the benefits of the easy winter did not appear to be conferred on this class to the extent "expected" or else kid production in spring 1983 was low. We have no data in hand on that point but caribou generally had poor calving success in 1983 (Hatler, Unpubl.Prog.Reports) but, like the goats, apparently did well in 1984 (see Appendix 3).

As implied in section 3.2.2 the 72 moulted adult-sized animals present something of an enigma in that they could not be classified with certainty. During the course of the surveys, such animals were occasionally described in the flight notes (Appendix 1) as "probably adult", "apparently subadult" and so on. Of the moulted animals for which sex was determined, 11 (24.4%) were males, and all were believed to be subadults, probably mostly two-year-olds. Table 10 provides a summary of our best guess on the age composition of the remaining 61 moulted animals, based on the Appendix 1 notes mentioned above. As shown, 34 (55.7%)

Table 10. Summary of sex and age designations for moulted adult mountain goats^a observed during helicopter surveys in Spatsizi Wilderness Park, B.C., July 1984.

Wildlife Zone	Age Classes ^b of Moulded Goats Observed												
	Females					Sex Unknown							
	Subadult		Adult		Age	Subadult		Adult		Age			
	Kno.	Sus.	Kno.	Sus.	Uncl.	Tot.	Kno.	Sus.	Kno.	Sus.	Uncl.	Tot.	
Eaglenest	4	4	0	0	3	5	16	2	4	0	0	8	14
Eco Reserve	2	0	0	0	0	0	2	0	0	0	0	0	0
Dawson	4	0	5	0	4	13	13	0	0	0	0	8	8
Kluayetz	1	0	0	0	0	1	1	0	0	0	0	3	3
Tomias	1	0	0	0	0	1	1	0	0	0	0	1	1
Marion	1	0	0	0	0	1	1	0	1	0	0	0	1
Caribou Mtn.	0	0	0	0	0	0	0	0	0	0	0	0	0
All	13	4	5	3	9	34	34	2	5	0	0	20	27

^aSolitary adult males and animals positively identified as males in nursery groups not included.

^bKno. = "known" (classified to age with relatively high degree of confidence); Sus. = suspected (classified to age, but with lesser degree of confidence); Age uncl. (not classified to age).

of those were known to be females, of which 18 were "known" or suspected to be subadults. Among the 27 moulted animals not sexed, 7 (26%) were nevertheless known or suspected subadults.

The minimum number of known or suspected subadults (probably all or mostly two-year-olds) from the above figures is 36 (11 males, 18 females, 7 unclassified), which is 6.7% of the total number of goats observed or 16.7 per 100 mature females. Note that this minimum ratio of that class per 100 females is substantially higher than that for yearlings (9.3, see Table 9), a fact which offers further support for either poor production of kids in 1983 (relative to the previous year) or relatively poor survival of that class during winter 1983-84. If all 29 of the moulted adults not classified to age were actually subadults, then the ratio per 100 females (maximum) is 29.6, and if the actual age ratio among those 29 (9 females, 20 sex unknown) is the same as that observed among the 26 females whose age was known or suspected (18 of 26 = 69.2% subadult), the ratio of subadults per 100 mature females is: $69.2 (29) + 36/216 = 25.9$. All of these figures, assuming that most observed subadults are two-year olds, suggest good production and survival of the 1982 cohort.

The small proportion of "adult females" among the sample of moulted animals ($8/26 = 30.7\%$ of females whose age was determined) probably includes some "mature" animals (i.e., those which were barren in 1984, but which should be added to the mature females component, thereby slightly reducing all ratios given above on a per-100-females basis. However, an unknown number of that class would include females older than two years, but not yet sexually mature (Chadwick 1983).

4.2.9 Reconnaissance Surveys

Flight notes for the reconnaissance surveys by fixed-wing aircraft in the Dawson and Kluayetz Zones are given in Appendix 2. Flight lines and animal observations are shown in Figure 5. Results for each zone, including comparisons with the helicopter counts, are presented in following paragraphs.

Kluayetz Zone Spring snow melt was less advanced in this zone than in any other during our surveys, and "spring" was just beginning in some areas, especially along ridges to the west, fronting on the Kluayetz Creek-Fire Flats area. Goats were, as yet, only sparsely distributed in that portion of the zone and we saw only 7 groups there, totalling a minimum of 71 animals. An additional 15+ in 4 groups was tallied in the un-named mountain block west of Buckinghorse Lake, at the head of the Spatsizi River. Our fixed-wing total of 86+, seemed minimal at the time, considering the amount of area covered and the extent of apparently suitable habitat in which we saw no animals. Nevertheless, that total was nearly double the total (45) recorded 3 days later during the intensive helicopter coverage of the area.

Dawson Zone The minimum total documented from the fixed-wing aircraft on 21 July was 128 animals, but only 93 were seen on the "official" reconnaissance. The other 35, seen earlier in the day incidentally while we were radio-tracking a caribou on the east side of the Dawson valley, were not in sight a few hours later. The helicopter total of 144, which was observed the following day, therefore exceeded the fixed-wing count in the Dawson Zone.

Aspects of Comparison Since the primary objective of the July survey was to obtain counts of goats in the specified areas, practical considerations of logistics and timing required to achieve that objective had to take precedence. It was therefore not possible to design a rigorously scientific comparison of the fixed-wing and helicopter counts - - that is it is



Fig. 5. Flight lines and mountain goat observations during fixed-wing reconnaissance surveys in the Dawson and Kluayetz wildlife zones, Spatsizi Wilderness Park, July 1984.

difficult to ascertain which of several possible factors were the most important contributors to the observed differences between the two survey modes. Confounding effects from weather, time of day and animal movements are all possible in the present case.

At Kluayetz, the three-day interval of hot weather between surveys over most of the area may have resulted in a significantly changed distribution - - possibly just local, involving more use of the extensive snow patches in the area at helicopter time. The bulk of the Kluayetz Zone was flown about 2 hours earlier in the day on the fixed-wing survey than on the helicopter survey, although any differences due to survey time would have been due more to diurnal location differences rather than to activity patterns. Several of the animals seen on the fixed-wing survey, including the large group of 35+ on Mount Thule, were bedded when seen.

The un-named mountain block at the head of the Spatsizi also produced unexpected results in regard to time of day. It was the last area of the Kluayetz Zone covered on the fixed-wing survey, at mid-day. Animals seen at that time included two single, bedded animals (probably billies), a group of three adults moving along a ridge, and a bedded nursery group of at least 10 animals. The helicopter survey of that block was on the evening (about 8 p.m.) of 22 July, i.e. the day after the fixed-wing survey, and at a time when the animals would be expected to be active. Actually, only 5 animals were seen, including the 3 billies. None of the others had been disturbed from their beds during the fixed-wing flight, yet we could not find them the following day, despite an extra attempt to do so after we realized we had missed them.

As illustrated in Figure 6, movements of some groups apparently occurred between the two flights. A large nursery group had moved from Mount Thule west across the valley to an adjacent mountain. Perhaps our inability to relocate the nursery

No's of goats seen

- ☒ - Fixed-wing Recon.
- ⊗ - Helicopter
- △ - Caribou Tracking Ft.

Apparently Unduplicated numbers:
 R = Recon.
 H = Helicopter

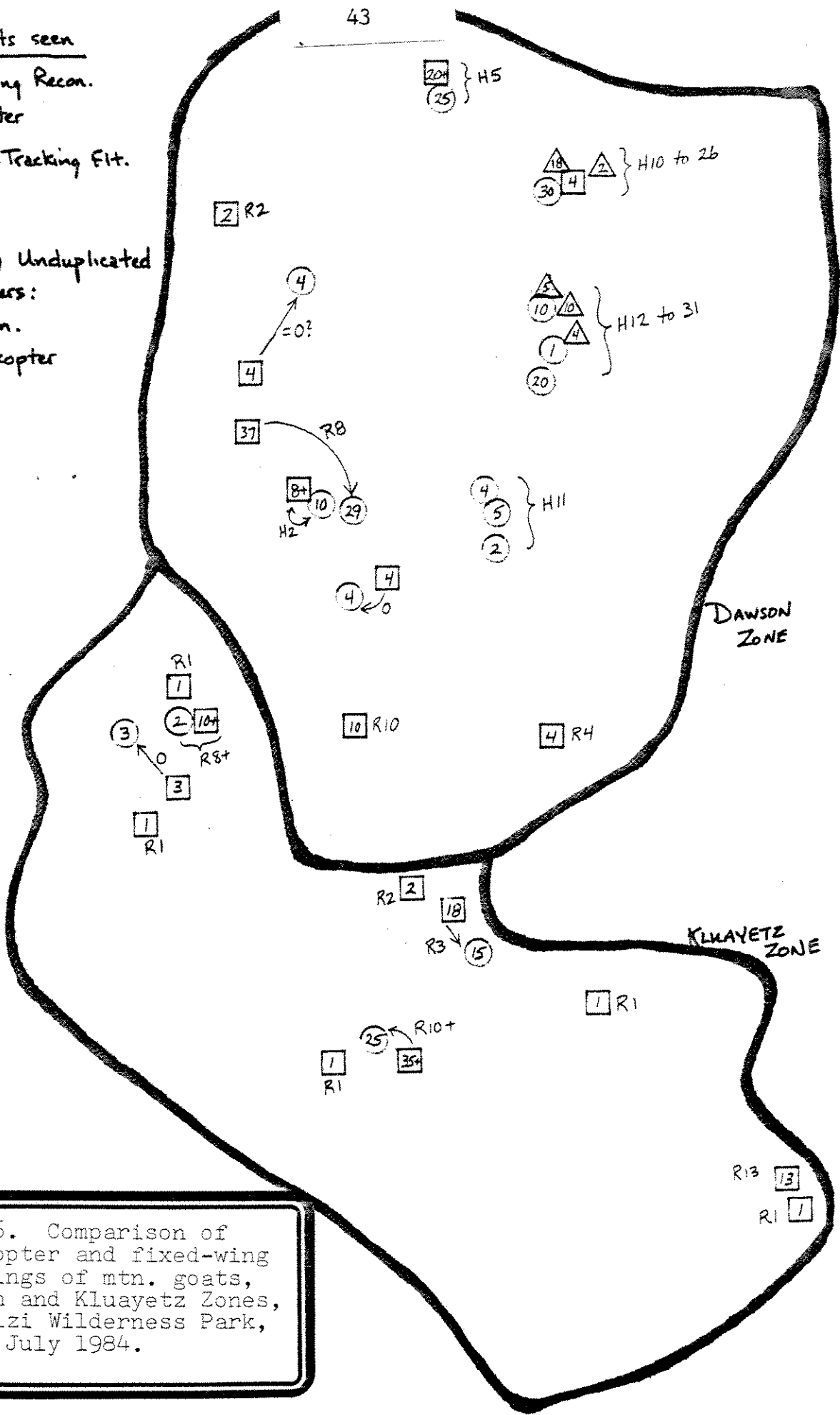


Fig. 6. Comparison of helicopter and fixed-wing sightings of mtn. goats, Dawson and Kluayetz Zones, Spatsizi Wilderness Park, B.C., July 1984.

group on the mountain at the Spatsizi headwaters is due to an extensive movement of that group - or perhaps the movement was only local, for example to a lowland lick.

In the Dawson Zone there was less time between flights, therefore less time for differential weather effects and/or movements to effect count results. Nevertheless, some movement did occur. A large group seen north of the head of Griffith Creek on 21 July had, apparently moved south across the valley by the following day. Time of day, as it affects animal distribution, should also have been less a factor in the Dawson, although the bulk of the official Dawson reconnaissance was nearer mid-day than was the helicopter survey. There was some indication that the animals were more active and more visible early in the morning. This is illustrated (see Figure 6) particularly along the ridge at the east side of the Dawson River, from Bruce Creek to the mouth. There, 39 goats in five groups were observed incidental to caribou tracking activities before 0800 on the 21st, only 4 in one group were seen in the same area about 5 hours later, and 41 in three groups (distributed differently, see Figure 6) were seen there from the helicopter at about 1000 the next day. However, the reconnaissance survey, late in the morning of the 21st found at least one more group in the Skady Mountain Block than did the helicopter survey early the following morning, and it found 14 in the southern Dawson between 0955 - 1025 on the 21st and none there by helicopter at about the same time on the 24th.

Overall, a comparison of results for the two survey modes affects the overall counts in the two zones differently. As shown in Figure 6 an overlay of the two sets of data, all goats observed by helicopter in the Kluayetz Zone were likely also in groups observed from the fixed-wing, i.e., there were no apparent unduplicated sightings by helicopter. In that case, the fixed-wing total (86+) is also the minimum total for the Kluayetz Zone, a figure which is 91% higher than the official helicopter count.

In the Dawson Zone, on the other hand, it is apparent that there were unduplicated sightings in both sets of flights, i.e., animals were missed both from the fixed-wing aircraft and the helicopter. At least 69 were seen on both surveys (the duplication figure is 194 if the 35 seen on the caribou-tracking flight are also included in the fixed-wing total) 24 were seen only on the reconnaissance, and 40 - 75 (again depending on inclusion of the incidental observations) were seen only from the helicopter. The only apparent "exclusive" observations from the fixed-wing were those to the west and south, on the actual reconnaissance flight, therefore the minimum total count for the Dawson Zone is the helicopter total (144) plus the unduplicated reconnaissance total (24), = 168. That figure is 17 % higher than the helicopter count alone, and as indicated by the question marks in Figure 6, it is a conservative interpretation.

4.3 Observations of other species

During the course of the goat surveys, we obtained sightings of 298 Stone sheep, 188 caribou, and 15 moose. Surprisingly, we saw no large carnivores. Appendix 3 presents a series of tables and figures detailing sex and age compositions, group sizes and locations of the three ungulate species mentioned above, appendix 4 summarizes the sex and age data for all species. Our contract budget does not allow an extensive discussion on the incidental sightings, but it should be noted that, as with the goats, young of the year among the sheep and caribou classified were fairly high (25 % of sheep and 30.2 % of caribou, excluding known males in both cases). A few miscellaneous behavioral observations of those species, and a list of some birds observed during the surveys are given in Appendix 5.

5.0 DISCUSSION

As indicated earlier, the absence of contingencies, the good weather and the overall smooth flow of our operations enabled us to devote more time than expected to consideration of goat survey methods and the reliability of results. While our budget does not permit full development of those subjects here, we nevertheless feel it is worthwhile to at least mention our pertinent impressions, ideas and observations prior to generating our final conclusions about current goat populations in the areas we observed.

5.1 Factors and observations relating to goat counts

5.1.1 Biological Factors

The importance of animal behavior in consideration of management and inventory is becoming increasingly apparent (see Chadwick 1983). For example, we must know seasonal and diurnal movement patterns of study populations in order to accurately predict the accuracy and significance of survey results at any particular time.

It generally appeared that goats were "out" (conspicuous in open areas) more often in the early morning hours than at other times of day, and probably the late evening was next "best" in that regard. However, we had several records of animals active at mid-day. It is not clear, at this time, whether these times of greatest activity are really the times in which the animals are most vulnerable to being counted. When the animals are active, they are less likely to be occupying what we usually construe as "goat habitat" (cliffs, etc.). Rather, they are more spread out over greater distances both up and downslope from escape terrain, and observers must therefore scan a larger area to see them. That may effectively cancel out the benefits of their activity, especially since they may move down to attractions such as mineral licks or water sources in more thickly vegetated areas at such times. Further, the low angle sun with its attendant glare and deep shadows is also a negative factor in the "early and late hours" schedule.

We kept close track of goat elevations only on the 23rd (see Appendix 1). Those data were not closely analyzed - - the elevation of goat habitat varies from place-to-place, so variability in elevation of goat occurrences should be expected. That result is apparent in the data indicated, but there is some suggestion of increased elevation as the day progresses.

Mature billies were seen in or near nursery groups on three occasions (Obs. 19 & 20, Eaglenest 22 July; Obs. 6, Eco Reserve, 23 July, Appendix 1) but went their separate ways upon being disturbed. That, plus the general segregation of most of them in the more rugged habitats, is consistent with the literature.

We believe that the use of "lowland" mineral licks by goats in summer (see Hebert and Cowan 1971, Singer 1978, Chadwick 1983) has the potential for seriously biasing counts downward in that season. We did not see goats at any of the licks we knew about (see Figures 1 - 4), but we speculate that the local "disappearance" of groups seen during the reconnaissance survey

but not the helicopter survey, and the absence of known groups in the Marion and Caribou Mountain Zones could be related to use of licks we did not know about.

Seasonal movements have important implications for goat inventory and management. Nichols (1980b) has discussed the subject at length and has been involved in a pertinent research effort since that time (Nichols 1982, 1983, 1984). It was our impression, and there is support in some of the results indicated in Figure 6, that at least some of the groups were making substantial movements.

We believe that the Kluayetz Zone and southwestern portions of the Eaglenest Zone, especially, were just being recolonized after the winter's absence from those areas, while winter areas such as Sanctuary Mountain in the Eco Reserve were being vacated. The nature and extent of such movements is not known, but there are some important implications: a.) with large groups present, and moving, it is possible to miss a substantial proportion of a local population just by missing one group. b.) counts over a short time period may be even more important than previously thought.

On this subject, both J. Haney and the Collingwoods independently noted that goats seemed to be either more abundant or more conspicuous along the western edge of the park in mid-September. That could reflect continuing seasonal movements westward throughout the summer. If the distribution between July and September are significantly different, the July counts will be of little value in planning fall-oriented management strategies on a wildlife zone basis.

Movements of goats between wildlife zones has been documented in the Spatsizi area. Carswell (1975) photographed a female swimming Mink Creek, apparently enroute from Rainbow Mountain (Caribou Mountain Zone) to the Eco Reserve area, and Reg Collingwood (personal communication) saw one moving across the plateau from the Marion Zone toward the Rainbow Block.

5.1.2 Weather/Light Conditions

Our July 1984 experience and results confirm the value of good clear weather during surveys. As, noted previously, we have also confirmed the difficulty of observing goats in the low angle light predominating in morning and evening, when the animals seem to be the most active. As discussed by Nichols (1980) the best conditions for observation pertain when there is a high, thin overcast during peak activity periods. We enjoyed such conditions for short periods on three of our four survey days. However, it occurs only rarely - - and must be considered a bonus when it does rather than a a set of circumstances which one can afford to wait for.

5.1.3 Aircraft Considerations

Several observers (Ballard 1977; Hazelwood 1983) have described the benefits of a jet helicopter in goat census work, and we definitely agree where classification of animals is required. However, as our reconnaissance results demonstrated (4.2.9) the helicopter count is not necessarily "baseline" in terms of numbers.

As Nichols (1980a) and others have stated, the Cessna 185 is probably too fast for most goat census requirements, especially if animals are to be classified, but we believe that use of such aircraft at high elevation to obtain preliminary distribution and possibly total count information show considerable promise.

A high elevation, fixed-wing survey is less likely to detect goats hiding (under ledges, in caves, etc.), but that is compensated for by the fact that they are disturbed less and are therefore less likely to be hiding. We passed over bedded goats, on the fixed-wing surveys, which never moved and that was never the case in the helicopter.

Part of the discrepancy between the fixed-wing and helicopter counts in the Dawson Zone was a result of our conscious decision to avoid disturbing animals during the reconnaissance. We remained high, satisfying ourselves with "minimum counts"

(e.g., "20+" for a group which was later shown to number 25 and "8+" for a group of 10). We probably could have obtained closer counts with the fixed-wing had we tried. In that regard, instances in which a minimum reconnaissance total exceeded the helicopter total (e.g., the group of "35+" seen later as only 25 in the Mount Thule area) apparently indicate subdivision of the group prior to the helicopter survey. In that case, 35 was the minimum number counted by two observers, but more were believed present.

In terms of cost, part of the 5.0 hours fixed-wing time used was for experimental purposes, including double coverage of some area to observe from different elevations and/or perspectives relative to light direction. The total area of the two zones could actually be covered sufficiently (group location/minimum counts) in about 3.5 hours. Closer counts, requiring frequent changes in flight altitude, would increase flying time.

A possibly important note here is that T. Britton and DFH have been conducting regular high elevation flights during the caribou monitoring work, and they are perhaps unusually accustomed to observing animals and terrain from that perspective. New-comers should conduct some "warm up" image establishes before conducting actual surveys.

5.1.4 General Comments

Given some of the problems outlined above, our July 1984 surveys cannot be considered the "definitive" word on goat numbers in the Spatsizi area. We do believe, however, that our results are the best that could be obtained with a single survey given present knowledge of goat distribution and behaviour in relation to census timing and opportunity.

The July time period is definitely the best time to recognize the various sex and age classes in the population, therefore it still appears to be the proper time for composition surveys. However, we would like to raise the possibility that it may not be possible to get the best information on composition

and representative numbers on the same survey. That is "total count" and "composition count" may be conflicting objectives, considering seasonal distribution and behavior patterns.

Having been stimulated by the July survey results, the senior author will be more diligent in recording incidental goat observations during caribou tracking flights in the coming months.

5.2 Final Consideration of Goat Numbers and Composition

As indicated or implied in the area accounts, our substantial totals for goat numbers in the various zones of the park nevertheless did not include all animals that were present. The large, rugged, much dissected Eaglenest Zone is the area where the risk of missing animals in the survey seems highest, but we have no pertinent replicate information from that area. In the Eco Reserve account (4.2.2) we described an incidental observation of 8 animals which raised the total applicable to that zone from 37 to 45. The minimum "error" associated with those observations is 17.8%, i.e., 82.2% of the goats known present were seen on the intensive helicopter survey. The comparable minimum error figures for the Kluayetz and Dawson Helicopter counts, as described in the comparison with the reconnaissance results (4.2.9), were 47.7% and 14.3% respectively. We have no objective minimum error figures for the other zones, but as implied in the various accounts our experience in the area and familiarity with goat occurrence especially in the Marion and Caribou Mountain Zones suggests that "error" of 50% or more could be applicable in these areas as well.

The total helicopter count, 538 as listed in Table 1, must therefore be revised upward by at least 65 animals (41 for Kluayetz and 24 for Dawson, as outlined earlier). The new figure, 603, can be considered the minimum population total for the seven zones covered. However, it would be reasonable to also apply at least a 15 % "correction factor" (the lowest error documented in this study - - Dawson Zone, above) to the more difficult-to-survey

Eaglenest Zone, and probably also the Eco Reserve Zone, such a manipulation would raise the above total by 40 (Eaglenest) plus 7 (Eco Reserve) to 650. As implied earlier, there is also evidence that we missed animals, perhaps a substantial proportion of those present, in the other zones (especially Marion and Caribou Mountain). However, the overall numbers are low in those zones and corrections would not add more than a few percentage points to the seven-zone total. In short, we believe 650 to be a conservative figure. Further, given a count of 61 in a portion of the Terraze Zone by Ray Collingwood (personal communication) during the time period of our survey (groups of "23,33 and 5 others") and the likelihood of numbers approaching or exceeding 100 in the Cartmel Zone (Flight notes, 23 Sept. 1982, Blower and Stewart), a Spatsizi Park population on the order of 1000 animals is a realistic possibility.

In terms of sex and age composition in the areas covered, we cannot offer any evidence to support or refute the assumption that our sample represents the population. As implied previously, we consider it likely that the mature male component is under-represented because of the solitary and widespread distribution of that class during the season of our observations. It is possible that other classes, e.g. yearlings or other subadults, may regularly occupy habitats in which they would be less likely than members of other classes to be seen in a summer census. However, such facts can be determined only by large numbers of replicate surveys or detailed research involving marked animals.

6.0 LITERATURE CITED

- Ballard, W. 1975. Mountain goat survey techniques evaluation. Alaska Dept. Fish and Game, P-R Proj. Prog. Rep., W-17-7, Juneau. 21p.
- Ballard, W. 1977. Status and management of the mountain goat in Alaska, pp. 15-23 In Samuel, W. and W.G. MacGregor (eds). Proc. 1st Internat. Mountain Goat Symposium, Kalispell, Mont.
- Bergerud, A.T. and H. E. Butler. 1978. Life history studies of caribou in Spatsizi Wilderness Park, 1977-78. Special Rep., B.C. Parks Branch, Victoria. 156p.
- Carswell, R. 1975. Wildlife inventory, Gladys Lake Ecological Reserve. Unpubl. Rep., British Columbia Parks Branch, Victoria, 99p.
- Chadwick, D.H. 1983. A beast the color of winter. Sierra Club Books, San Francisco. 208p.
- Eastman, D.S. 1977. Research needs for mountain goat management, pp. 160-168 In Samuel, W. and W.G. MacGregor (eds). Proc. 1st Internat. Mountain Goat Symp., Kalispell, Mont.
- Foster, B.R. 1982. Observability and habitat characteristics of the mountain goat (Oreamnos americanus Blainville, 1816) in west-central British Columbia. Unpubl. M.Sc. Thesis, Univ. of B.C., Vancouver. 134p.
- Fox, J. 1977. Summer mountain goat activity and habitat preference in coastal Alaska, as a basis for assessment of survey techniques, pp. 190-199 In Samuel, W. and W.G. MacGregor (eds). Proc. 1st Internat. Mountain Goat Symp., Kalispell, Mont.
- Haber, G.C. 1979. The upper Stikine-Spatsizi wolf-ungulate system, northwestern British Columbia. Rep. No. 1, Spatsizi Assoc. for Biol. Research, Vancouver. 133p.
- Hatler, D.F. 1983. Studies of radio-collared caribou in the Spatsizi Wilderness Park area, British Columbia. Rep. No. 2, Spatsizi Association for Biol. Research, Vancouver. 102p.
- Hatler, D.F. 1984. Wildlife surveys, Spatsizi Wilderness Park, March 1984. Unpubl. rep. for B.C. Parks Branch, Victoria. 29p.
- Hazelwood, W.G. 1983. Fish and wildlife 1982/83 ungulate surveys. Unpubl. rep., B.C. Fish and Wildlife Branch, Victoria. 53p.
- Hebert, D. and I. McT. Cowan. 1971. Natural salt licks as a part of the ecology of the mountain goat. Can. J. Zool. 49: 605-610.

- Jones, G.W. 1983. Spatsizi Park Wildlife Survey. Unpubl. flight report for surveys, 15-21 Feb. and 15-18 March 1983. B.C. Parks Branch, Victoria.
- Luckhurst, A. and B. Marsh. 1973. Unpubl. flight map, Spatsizi, B.C., (Nat. Topo. Ser., 104H), March 1973. Min. of Environ., Victoria.
- Mar-Terr Enviro Research Ltd. 1981. Relationships between mountain goat ecology and proposed hydroelectric development on the Stikine River, B.C. Unpubl. rep., No. MT-1, British Columbia Hydro and Power Author., Vancouver.
- Nichols, L. 1980a. Mountain goat management techniques studies. Alaska Dept. Fish and Game, P-R Proj. Final Rep., W-17-9-12.2R, W-17-10,11-12.3R, Juneau. 51p.
- Nichols, L. 1980b. Mountain goat movements study. Alaska Dept. Fish and Game, P-R Proj. Rep., Vol. I, W-21-1, Job 12.5R, Juneau. 9p.
- Nichols, L. 1982. Mountain goat movements study. Alaska Dept. Fish and Game, P-R Proj. Rep., Vol. II, W-21-2, Job 12.5R, Juneau. 22p.
- Nichols, L. 1983. Mountain goats movements study. Alaska Dept. Fish and Game, P-R Proj. Rep., Vol. III., W-22-1, Job 12.5R, Juneau. 23p.
- Nichols, L. 1984. Mountain goat movements study. Alaska Dept. Fish and Game, P-R Proj. Rep., W-22-2, Job 12.5R, Juneau. 21p.
- Osmond-Jones, E.J., M. Sather, W.G. Hazelwood and B. Ford. 1977. Wildlife and fisheries inventory of Spatsizi Wilderness and Tatlatui Provincial Parks, British Columbia. B.C. Parks Branch, Victoria. 292p.
- Pojar, J. 1977. Vegetation and some plant-animal relationships of Ecological Reserve No. 68, Gladys Lake. Unpubl. Rep., Ecological Reserves Unit, Min. of Lands, Parks and Housing, Victoria, B.C. 145p.
- Singer, F.J. 1978. Behavior of mountain goats in relations to U.S. Highway 2, Glacier National Park, Montana. J. Wildl. Manage. 42: 591-597.

7.0 Appendices

APPENDIX 1.

SUMMARY OF FLIGHT TRANSCRIPT,
LARGE MAMMAL SIGHTINGS DURING
MOUNTAIN GOAT SURVEYS BY HELICOPTER,
SPATSIZI WILDERNESS PARK, B. C.

JULY, 1984

HELICOPTER SURVEYS

21 July 1984 (14:00 - 14:30) Ferry Flight over Tomias Mountain

OBS.	SPECIES	TOTAL NO.	DETAILS
TOMIAS BLOCK			
1.	C	1	Medium Bull
2.	C	3	2 Cows, 1 Medium Bull (Cow collared, B11)
3.	C	1	Large Bull
4.	C	4	Large Bulls
5.	C	3	2 Large, 1 Medium Bull(s)
6.	C	5	4 Cows, 1 Small Bull

21 July 1984 (16:35 - 20:50) Weather - CAVU, light winds

OBS.	SPECIES	TOTAL NO.	DETAILS
ECO RESERVE BLOCK			
1.	SS	3	3 Ewes
2.	SS	25	19 Adults, 6 Lambs
3.	SS	9	2 Rams (II's) 2 Lambs, 5 Adults
EAGLENEST BLOCK			
4.	SS	4	4 Rams (III's)
5.	SS	7	7 Rams (4 IV's, 3 III's)
6.	SS	11	11 Rams (8 IV's, 3 III's) (some hard to call)
7.	SS	12	9 Adults, 3 Lambs
8.	SS	7	1 Ram (II), 1 Lamb, 5 Ewes
9.	SS	11	8 Adults, 3 Lambs
10.	G	30	12 Females (shaggy), 10 Kids, 2 yearlings, 6 smooth including 1 young male, 2 other young and 3 unclassified, but probably adult females
11.	G	4	4 Billies
12.	G	1	1 Billy
13.	G	13	7 Female (shaggy), 5 Kids, 1 smooth (2 yrs. old)
ECO RESERVE BLOCK			
14.	C	12	3 Cows with calves (including collared animal A00), 2 Medium Bulls, 4 unclassified adults

22 July 1984 (07:50 - 12:40) Weather - CAVU, light winds

OBS.	SPECIES	TOTAL NO.	DETAILS
DAWSON BLOCK			
1.	G	25	10 Females (shaggy), 7 Kids, 8 smooth including 3 Males, 2 Adult Females, 3 unclassified
2.	M	1	Bull, Medium
3.	SS	4	1 Ram (II), and 3 Ewes
4.	G	4	4 Billies
5.	SS	3	3 Rams (1 IV, 2 III's); also seen on fixed-wing flight 9 km. north
6.	G	30	12 Females (shaggy), 10 Kids, 8 smooth of which 7 definitely Female and 1 unclassified. At least 3 of the smooth females were apparent adults. Note: No Yearlings.
7.	C	4	Large Bull and 3 Cows. The bull is collared animal (B35), and he has moved only a few hundred metres since monitoring flight yesterday.
8.	G	10	5 Females (shaggy), 2 Kids, 2 Yearlings, 1 smooth (apparent sub-adult female - 2 yr. old)
9.	G	1	1 Billy
10.	G	20	12 Females (shaggy), 3 Kids, 2 yearlings, 3 smooth, all females and all apparently sub-adults (2 yrs.?). 7000'
11.	G	2	1 Female (shaggy) and 1 Kid
12.	G	5	5 Billies
13.	G	4	4 Billies
14.	G	29	15 Females (shaggy), 6 Kids, 4 yearlings, 4 smooth (unclassified)
15.	G	10	5 Females (shaggy), 3 Kids, 2 yearlings
16.	G	4	4 Billies
17.	C	1	Large Bull

22 July 1984 (16:10 - 20:55)

OBS.	SPECIES	TOTAL	DETAILS
ECO RESERVE BLOCK			
1.	SS	6	6 Rams (5 IV's, 1 III)
2.	C	1	1 Cow
3.	SS	5	3 Ewes and 2 Lambs
4.	G	6	2 Females (shaggy), 2 Kids, 1 yearling, 1 smooth female (sub-adult)
5.	SS	9	1 Ram (II), 5 Ewes, 3 Lambs
EAGLENEST BLOCK			
6.	C	1	1 Cow
7.	SS	11	1 Ram (II), 4 Lambs, 6 Adults
8.	G	17	8 Females (shaggy), 4 Kids, 5 smooth (2 males, 3 females, all believed sub-adults) - no yearling
9.	C	8	5 Cows with 3 calves 6000' plus
10.	G	8	3 Females (shaggy), 3 Kids, 1 yearling, 1 smooth (sub-adult female)
11.	SS	7	7 Rams: 4 IV's and 3 marginal but probably III's
12.	G	9	4 Females (shaggy), 4 Kids, 1 yearling
13.	G	5	2 Females (shaggy), 2 Kids, 1 smooth (unclassified)
14.	G	15	8 Females (shaggy) 3 Kids, 4 smooth (all female but age not determined)
15.	G	3	1 Female (shaggy), 1 Kid, 1 yearling
16.	C	5	Cow and Calf plus 3 unclassified adults
17.	C	2	2 Medium Bulls
18.	G	1	1 Billy
19.	G	9	1 Billy (adult, 3 Females (shaggy), 3 Kids, 1 yearling, 1 smooth (unclassified)
20.	G	4	1 Billy (adult), 1 female (shaggy), 1 Kid, 1 yearling
21.	G	2	1 adult Billy and 1 unclassified adult (hidden - probably also a Billy)
22.	G	2	2 Billies
KLUAYETZ BLOCK			
23.	C	28	7 Calves, 6 Cows, 3 Medium Bulls, 12 unclassified adults, including at least 3 yearlings

OBS.	SPECIES	TOTAL NO.	DETAILS
24.	G	2	1 Female (shaggy) and 1 Kid
25.	C	3	Large Bull, Small Bull, yearling female
26.	C	2	Cow and Calf
27.	G	3	3 Billies

23 July 1984 (08:30 - 20:50, with rest stop) Weather - 30-40% high (10,000') thin cloud

OBS.	SPECIES	TOTAL NO.	DETAILS
MARION CREEK BLOCK			
1.	M	3	Cow with 2 calves, feeding in pond
2.	M	2	Cow with 1 calf
3.	M	2	Cow with 1 calf
< 7B	M	4	4 unclassified Adult Moose in ponds >
ECO RESERVE BLOCK			
4.	G	4	3 Females (shaggy) and 1 Kid 4800'
5.	G	4	2 Females (shaggy), 1 Kid, 1 yearling. One of the adults was 75% moulted. 5000'
6.	G	5	3 Billies (adult), 1 Female (shaggy), 1 Kid 5300'
7.	G	6	3 Females (shaggy), 2 Kids, 1 Smooth Female (sub-adult) 5700'
8.	G	1	1 Large Billy, 6100'
9.	G	3	2 Billies at 6300' and 1 Large Billy at 6700'
10.	G	4	2 Females (shaggy) and 2 Kids 6300'
11.	SS	6	2 Rams (II's), 2 Ewes, 2 Lambs
12.	G	4	2 Females (shaggy), 1 Kid, 1 yearling
13.	SS	4	Rams (2 IV's, 2 III's) one of the smaller ones very light - almost a "fannin"
EAGLENEST BLOCK			
14.	SS	3	2 Ewes and a Lamb
15.	G	24	8 Females (shaggy), 8 Kids, 3 yearlings, 5 smooth (at least 1 male) 5700'
16.	SS	11	3 Rams (II, III, IV), 1 Ewe and Lamb, 6 unclassified adults
17.	SS	4	3 Ewes and 1 Lamb (2 of the ewes were distinctly smaller, and were probably yearlings)

OBS.	SPECIES	TOTAL	DETAILS
18.	C	2	Cow and Calf
19.	G	4	1 yearling, 3 smooth (Female - Sub-Adult?)
20.	G	2	2 Billies (1 very large & 1 small), 6500'
21.	G	1	1 yearling, 6500'
22.	G	2	1 Female (shaggy) & 1 Kid 6400'
23.	G	1	1 Large Billy, 6700'
24.	G	40	18 Females (shaggy), 14 Kids, 5 yearlings, 3 smooth (1 male, 1 female, 1 unclassified) 6300'
	SS	1	Also, 1 Ewe in GOAT HERD!
25.	G	9	3 Females (shaggy), 2 Kids, 1 yearling, 3 smooth (unclassified but probably all sub-adults)
26.	G	1	1 Female (shaggy)
27.	G	3	1 Female (shaggy), 1 Kid, 1 smooth (young male)
28.	G	8	4 Female (shaggy), 2 Kids, 1 yearling, 1 Adult Billy
29.	C	2	1 Large and 1 Small Caribou Male
30.	C	2	Cow and Calf
31.	G	3	3 Large Billies 6200'
32.	G	1	1 Large Billy, 5800'
33.	G	12	5 Females (shaggy), 2 Kids, 3 yearlings, 2 smooth (1 male and 1 unclassified) elev.5400'
34.	C	2	2 Medium Bulls
35.	G	1	1 Billy 6000'
36.	SS	6	Rams (4 IV's, 2 III's)
37.	G	1	1 Billy 6300'
38.	G	2	2 Billies 5700'
39.	G	20	12 Females (shaggy), 4 Kids, 3 yearlings, 1 smooth (female, prob.sub-adult) 6400'
40.	C	3	2 Cows and 1 Calf
41.	G	1	1 Billy 5500', watering in run-off pond below glacier
42.	G	7	7 Billies!! most Large 6000'

OBS.	SPECIES	TOTAL	DETAILS
Evening, 23 July 1984			
CARIBOU MOUNTAIN BLOCK			
1.	G	1	1 Large Billy
1a.	C	8	Unclassified Group
MARION CREEK BLOCK			
2.	SS	3	3 unclassified
3.	SS	5	5 unclassified
4.	SS	114	Mostly Ewes, Lambs but including 10 - 12 Rams of which at least 2 Class IV's
5.	C	4	4 Bulls - 1 medium and 3 small
6.	SS	2	Ewe and Lamb
7.	G	2	1 Female (shaggy) & 1 smooth (female, probably 2 yr. old)
8.	G	7	3 Females (shaggy), 3 Kids, 1 smooth (probably sub-adult) 5300'
9.	G	1	1 Billy
10.	SS	5	Rams (2 III's, 3 II's)
24 July 1984 (09:10 - 14:00) Weather - CAVU, calm, warm			

OBS.	SPECIES	TOTAL	DETAILS
TOMIAS BLOCK			
1.	C	4	Medium Bull, yearling Bull, 2 Cows
2.	C	5	2 Cows with 3 Calves!
DAWSON BLOCK			
3.	C	5	3 Cows, 2 Calves (1 Cow collared B15)
4.	C	1	Unsexed yearling
TOMIAS BLOCK			
5.	G	22	10 Females (shaggy), 7 Kids, 4 yearlings, 1 smooth (unclassified): one of the adult females listed as shaggy was 50% moulted
6.	C	6	1 Large Bull, 2 Cows with Calves, 1 small antlered (young?) cow
7.	G	5	2 Females (shaggy), 2 Kids, 1 smooth (female-yearling)
8.	M	2	Cow & unclassified yearling swimming across Tuaton Lake

OBS.	SPECIES	TOTAL	DETAILS
KLUAYETZ BLOCK			
9.	C	10	3 Cows with Calves, 1 small Bull and 3 unclassified adults
10.	C	8	8 unclassified
11.	C	8	4 Cows, 3 Calves, 1 Medium Bull
12.	C	5	Cow & Calf, 3 unclassified adults
13.	C	5	2 Cows with Calves, 1 unclassified adult
14.	M	1	Unclassified adult, seen from up high
15.	C	1	1 unclassified adult
16.	C	6	3 Cows with Calves
17.	C	2	Cow and Calf
18.	C	15	3 Cows and Calves, 9 unclassified adults
19.	G	15	6 Females (shaggy), 3 Kids, 4 yearlings, 2 smooth (1 male, 1 female, both apparently young)
20.	G	25	12 Females (shaggy), 6 Kids, 4 yearlings, 3 smooth (unclassified)
* 7B	G	8	4 Females (shaggy) & 4 Kids - seen on bluffs near Red Goat Mountain - apparently missed in previous survey here & added to that list.
	M	4	4 unclassified moose feeding in one of the lakes along the Spatsizi (seen from up high)

* Goat sighting was in the Eco Reserve Block

* Moose sighting was in the Marion Creek Block

END

OF

SURVEY

Appendix 2. Flight notes, reconnaissance surveys for mountain goats by fixed-wing aircraft, Spatsizi Wilderness Park, 21 July 1984.

Weather: generally clear and calm, with a slight haze--good to excellent visibility conditions.

Methods: see text.

KLUAYETZ ZONE

Un-named mountain, southeast end (near Happy Lake)

- Start, 0805.
- 13 (nanny/kid group seen on upper slope; we were at 9000' plus, and kids close to or under their mothers could have been missed.
- 1, probably a billy, seen on the ridge about 1/2 km south of of the above group.
- No others seen in that mountain block.

Mt. Umbach Block

- Trails present at several locations, especially on the north end, but only one goat seen, that probably a billy, on the cliffs over the upper Stikine.

Mt. Thule Block

- Nothing seen on southeast end.
- One (billy?) seen in basin on west side of ridge between Mt. Thule and McCumber Crk. There are old tracks on most slopes here, and fresh tracks (maybe caribou?) on some.
- Large nanny/kid group seen low (5600') in west-facing basin just north of Thule Peak. Most appeared to be lying down on a terraced, boulder strewn ridge, and there were a number of apparent light-colored rocks and snow patches in the vicinity, making a complete count from 9500' difficult. Not wanting to disturb them, we remained high and attempted two counts/estimates each, settling on "about 35", possibly more.
- Mountain at north end--nanny/kid group (minimum of 18) feeding on a green, south-facing slope; 2 adults (billies?) seen just over the ridge to the north (facing Klahowya Lake).
- No more goats on west side, although fresh tracks were seen on most slopes there.

Taylor Peak Block

- Trails and tracks present, especially on the south end, but no goats seen.

Appendix 2 (continued, page 2)

First leg of survey in the Kluayetz Zone terminated at 0955, to return to base for fuel. Surveyed Crescent Mountain and the Ross River side of the Dawson Zone enroute, arriving back at Hyland Post at about 1025.

Un-named mountain west of Buckingham Lake

- Covered after western (Spatsizi) side of the Dawson Zone, starting at about 1300.
- One goat bedded on a high rock bluff (probably a billy).
- Nanny/kid group bedded on cliffs--at least 10, but kids close to their mothers could have been missed.
- Three goats, almost certainly billies, traveling along ridge.
- One goat in cliffs (billy?).
- A few trails and tracks were seen along the west and north sides, but at least some were probably caribou.

Summary, Kluayetz Zone:

There was still considerable snow cover, up to 50% on north slopes, especially on the ridges at the south end (fringing on Fire Flats). Goats were apparently sparsely distributed: only 11 individual sightings, totalling 86 animals. Only 4 of the sightings involved nanny/kid groups (13, 35+, 18, 10+ = 76). The remaining sightings were of individuals or small groups (1 x 3, 1 x 2, 5 x 1), most probably males.

DAWSON ZONE

Skady Mountain and Spatsizi River frontage

- Begin survey at 1115.
 - Nanny/kid group of at least 20 at bottom of the cliffs facing the Spatsizi north of Fireclay Creek. They were up and moving around, despite the time of day.
- Tracks and trails were seen on most suitable slopes and cliffs on the Spatsizi side, but there were only two sightings: 2 adults on a ridge at the top of a below-timberline cliff face, and 4 in a high basin.

Head of Griffith Creek

- Large nanny/kid group feeding on a green south-facing slope. They were spread out on a good background, and the count of 37 should be close.

Dawson drainage, east-facing side

- Group of at least 10 sheep glimpsed as they disappeared over a ridge.

Appendix 2 (continued, page 3)

- Group of three rams (one probably Class IV and the other two smaller) seen on an open flat north of the wintering bluffs; a group of 8 ewes and lambs was seen further down that slope.
- No goats seen along the ridges this side of the Dawson.

Upper Dawson

- No goats seen in Garden Creek, or in the Dawson Headwaters area.

Griffith Creek, south side

- Nanny/kid group of about 8, in cliffs facing west and north.
- Tracks seen on slopes above the new burn area.

(Broke off, about 1300-1335) to survey the remaining area of the Kluayetz Zone, west of Buckinghorse Lake).

Ridges facing Buckinghorse drainage

- Tracks and trails at several locations, but only one group of four animals seen.

Lower Dawson, west-facing side

- The goats seen at Bruce Creek earlier in the morning, during a caribou tracking flight, are now out of sight. None were seen in two passes over the area (morning count: 3 groups, 4 + 10 + 5 = 19).
- Only 4 goats seen on the cliffs at the valley mouth, where at least 20 were seen, in passing, earlier in the morning.

Lower Dawson, Skady Side

- No more seen: end of survey at 1405.

The following areas were covered at the end of the earlier flight (0955-1025) enroute back to Hyland Post for fuel:

Crescent Mountain

- Trails and tracks common on suitable slopes, but only one group of goats seen (10 nannies and kids on a peak at the north end).

Ridge at Upper Ross (N. of Crescent Mountain)

- Four goats seen along ridge--these known to be billies because they were seen at close range during the caribou tracking flight the previous day.

Appendix 2 (continued, page 4)

East side of Dawson Block (Ross River side)

-As in past flights, no animals or tracks seen. There are a few trails at the heads of some of the valleys.

North end (facing lower Spatsizi River)

-Tracks and trails present in the canyons, but no animals seen.

Summary, Dawson Zone:

Goats were seen more commonly--many of them active--on the first half of the flight than on the second, suggesting that changes in goat distribution with time of day and/or observer fatigue may have influenced the results. A total of 93 goats were tallied on this flight, and 35 others were seen from the fixed-wing aircraft earlier in the day, but were not visible (or at least were not seen) on the official reconnaissance. The minimum total documented from the fixed-wing aircraft, therefore, was 128.

Appendix 3. Details of incidental observations of Stone's sheep, caribou and moose during mountain goat surveys, Spatsizi Wilderness Park, British Columbia, July 1984.

General:

Following pages include maps of sighting locations and tables giving sex and age composition and group size data for the three species in the seven park wildlife zones we surveyed. During the first two days, classification categories were as follows:

Sheep - a) adult males (Classes II, III and IV, by horn curl); b) lambs; c) adult females; d) other unclassified adults (females plus Class I males).

Caribou - a) adult males (large, medium and small, by antler size--small males confirmed by genital features); b) adult females (presence of calf or by genitals); c) calves; d) unclassified adults (sex not determined, but animals not young-of-the-year; e) unclassified (neither sex nor age determined).

Moose - a) adult males (large, medium and small antlers); b) adult females; c) calves; d) unclassified adults; e) unclassified.

Most animals seen in the Eaglenest, EcoReserve and Dawson zones were fully classified. However, it became apparent that the classification maneuvers for those species were significantly consuming flying time (estimated 1.5 hours total), and in the remaining zones less intensive classification was done; except for a large group of sheep in the Marion Zone, classification to at least adults/young was nevertheless carried out in most cases.

Contents, Appendix 3

<u>Figures</u>		<u>Page</u>
3.1	Eaglenest and EcoReserve Zones	67
3.2	Dawson and Kluayetz Zones	68
3.3	Tomias Zone	69
3.4	Marion and Caribou Mountain Zones	70
<u>Tables</u>		
3.1	Stone's Sheep observations	71, 2, 3, 4
3.2	Caribou observations	75, 6, 7
3.3	Moose observations	78



Fig. 3.1 Stone's sheep (s) caribou (c) and moose (x) sightings, Eaglenest and EcoReserve Zones, Spatsizi Wilderness Park, B.C., July 1984.



Fig. 3.2 Stone's sheep (s caribou (c) and moose (x) sightings, Dawson and Kluyetz Zones, Spatsizi Wilderness Park, B.C., July 1984



Fig. 3.3 Stone's sheep (s) caribou (c) and moose (x) sightings, Tomias Zone, Spatsizi Wilderness Park, B. C., July 1984.

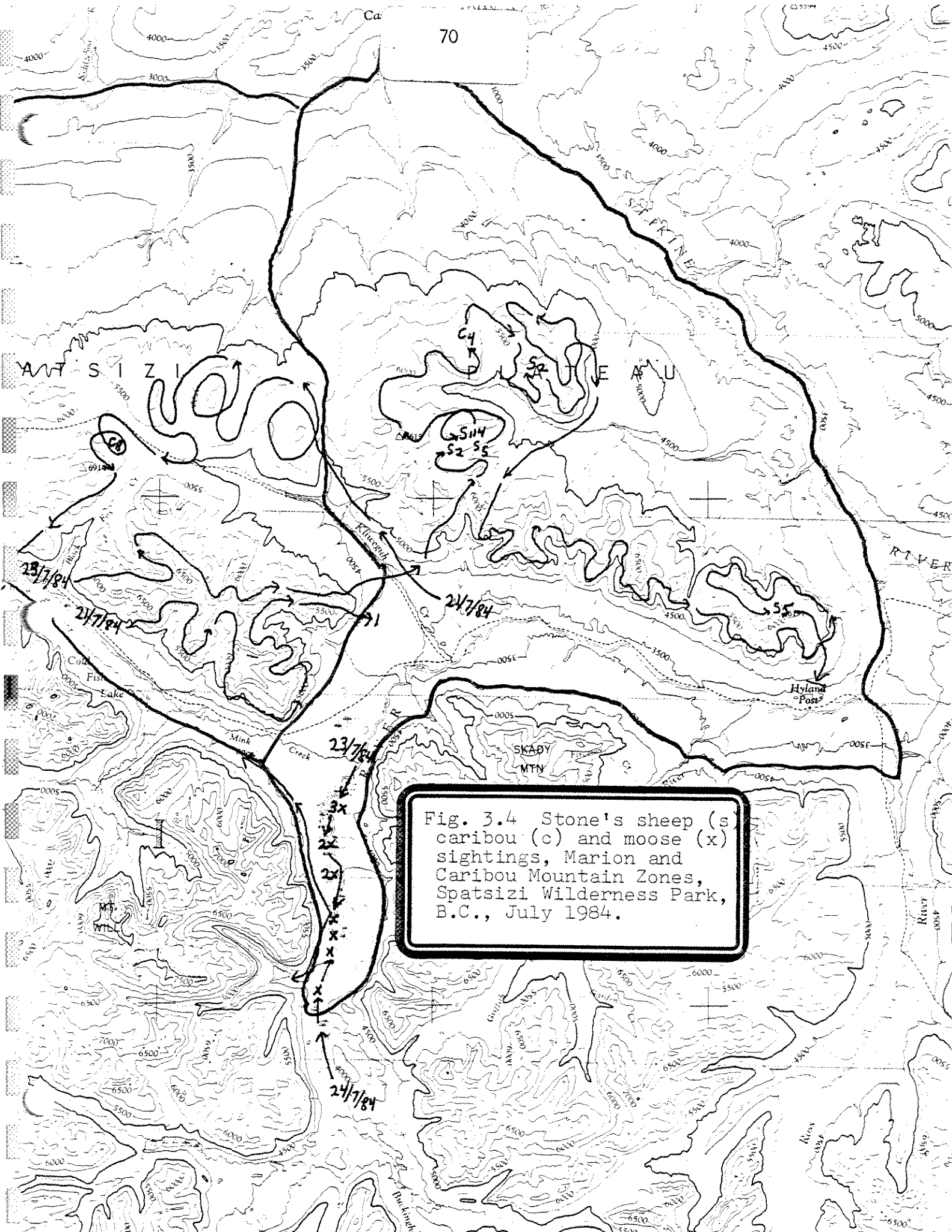


Fig. 3.4 Stone's sheep (s), caribou (c) and moose (x) sightings, Marion and Caribou Mountain Zones, Spatsizi Wilderness Park, B.C., July 1984.

Table 3.1 Incidental observations of Stone's sheep during mountain goat surveys in Spatsizi Wilderness Park, British Columbia, July 1984.

Wildlife Zone	Ident. No. ^a	Group Size	Adult Males ^b				Adult Females	Young	Uncl. Adults ^c
			II	III	IV	All			
EAGLENEST	21-4	4	-	4	-	4	-	-	-
	21-5	7	-	3	4	7	-	-	-
	21-6	11	-	3	8	11	-	-	-
	21-7	12	-	-	-	-	-	3	9
	21-8	7	1	-	-	1	5	1	-
	21-9	11	-	-	-	-	-	3	8
	22-7	11	1	-	-	-	-	4	6
	22-11	7	-	3	4	7	-	-	-
	23-14	3	-	-	-	-	2	1	-
	23-16	11	1	1	1	3	1	1	6
	23-17	4	-	-	-	-	3	1	-
	23-24	1	-	-	-	-	1	-	-
	23-26	6	-	2	4	6	-	-	-
TOTAL		95	3	16	21	39	12	14	29

^aIdent. No.--see footnote b in Appendix 1.

^bAdult Males: Class II, III and IV rams, as described by Geist (1971).

^cUnclassified adults: sex not determined, but animals not young of the year.

Table 3.1 (continued), Stone's sheep observations...

Wildlife Zone	Ident. No. ^a	Group Size	Adult Males ^b				Adult Females	Young	Uncl. Adults ^c
			II	III	IV	All			
ECO RESERVE	21-1	3	-	-	-	-	3	-	-
	21-2	25	-	-	-	-	-	6	19
	21-3	9	2	-	-	2	-	2	5
	22-1	6	-	1	5	6	-	-	-
	22-3	5	-	-	-	-	3	2	-
	22-5	9	1	-	-	1	5	3	-
	23-11	6	2	-	-	2	2	2	-
	23-13	4	-	2	2	4	-	-	-
TOTAL		67	5	3	7	15	13	15	24

^aIdent. No.--see footnote b in Appendix 1.

^bAdult Males: Class II, III and IV rams, as described by Geist (1971).

^cUnclassified adults: sex not determined, but animals not young of the year.

Table 3.1 (continued), Stone's sheep observations...

Wildlife Zone	Ident. No. ^a	Group Size	Adult Males ^b				Adult Females	Young	Uncl. ^c Adults
			II	III	IV	All			
MARION	23-2	-	-	-	-	-	-	3	
	23-3	5	-	-	-	-	-	5	
	23-4	114	-	-	2	2	-	112*	
	23-6	2	-	-	-	1	1	-	
	23-10	5	3	2	-	5	-	-	
TOTAL			129	3	2	2	7	1	120

* 112 unclassified adult & young

^aIdent. No.--see footnote b in Appendix 1.

^bAdult Males: Class II, III and IV rams, as described by Geist (1971).

^cUnclassified adults: sex not determined, but animals not young of the year.

Table 3.1 (continued), Stone's sheep observations...

Wildlife Zone	Ident. No. ^a	Group Size	Adult Males ^b			Adult Females	Young	Uncl. Adults ^c
			II	III	IV			
DAWSON	22-3	4	1	-	-	1	3	-
	22-5	3	-	2	1	3	-	-
TOTAL		7	1	2	1	4	3	-
KLUAYETZ			NO SHEEP RECORDED					
TOMIAS			NO SHEEP RECORDED					
CARIBOU MIN.			NO SHEEP RECORDED					

^aIdent. No.--see footnote b in Appendix 1.

^bAdult Males: Class II, III and IV rams, as described by Geist (1971).

^cUnclassified adults: sex not determined, but animals not young of the year.

Table 3.2 Incidental observations of caribou during mountain goat surveys in Spatsizi Wilderness Park, British Columbia, July 1984.

Wildlife zone	Ident. No.	Group Size	Adult Males ^b			Total	Adult Females	Young	Uncl. Adults	Uncl. ^c
			L	M	S					
CARIBOU MTN.	21-A	8	-	-	-	-	-	-	-	8
	TOTAL	8	-	-	-	-	-	-	-	8
EAGLENEST	22-6	1	-	-	-	1	-	-	-	-
	22-9	8	-	-	-	5	3	-	-	-
	22-16	5	-	-	-	1	1	3	-	-
	22-17	2	-	2	-	2	-	-	-	-
	23-18	2	-	-	-	1	1	-	-	-
	23-29	2	1	-	1	2	-	-	-	-
	23-30	2	-	-	-	1	1	-	-	-
	23-34	2	-	2	-	2	-	-	-	-
23-40	3	-	-	-	-	2	1	-	-	
TOTAL	27	1	4	1	6	11	7	3	-	
DAWSON	22-7	4	1	-	-	1	3	-	-	-
	22-17	1	1	-	-	1	-	-	-	-
	24-3	5	-	-	-	3	2	-	-	-
	24-4	1	-	-	-	-	-	-	-	1
TOTAL	11	2	-	-	2	6	2	-	1	

^aIdent. No.--see footnote b in Appendix 1.

^bAdult Males: Large, medium and small, as determined by antler size.

^cUnclassified: neither sex nor age determined.

Table 3.2 (continued), Caribou observations...

Wildlife Zone	Ident. No.	Group Size	Adult Males ^b			Adult Females	Young	Uncl. Adults	Uncl. Uncl. ^c
			L	M	S				
KIJAYETZ	22-23	28	-	3	-	6	7	12	-
	22-25	3	1	-	1	1	-	-	-
	22-26	2	-	-	-	1	1	-	-
	24-9	10	-	-	1	3	3	3	-
	24-10	8	-	-	-	-	-	-	8
	24-11	8	-	1	-	4	3	-	-
	24+12	5	-	-	-	1	1	3	-
	24-13	5	+	-	-	2	2	1	-
	24-15	1	-	-	-	-	-	1	-
	24-16	6	-	-	-	3	3	-	-
	24-17	2	-	-	-	1	1	-	-
	24-18	15	-	-	-	3	3	9	-
TOTAL		93	1	4	2	25	24	29	8

^aIdent. No.--see footnote b in Appendix 1.

^bAdult Males: Large, medium and small, as determined by antler size.

^cUnclassified: neither sex nor age determined.

Table 3.2 (continued), Caribou observations...

Wildlife Zone	Ident No.	Group Size	Adult Males ^b			Total	Adult Females	Young	Uncl. Adults	Uncl. ^c
			L	M	S					
TOMIAS	21-1	1	-	1	-	1	-	-	-	
	21-2	3	-	1	-	1	2	-	-	
	21-3	1	1	-	-	1	-	-	-	
	21-4	4	4	-	-	4	-	-	-	
	21-5	3	-	2	1	3	-	-	-	
	21-6	5	-	-	1	1	4	-	-	
TOTAL	24-1	4	-	1	1	2	2	-	-	
	24-2	5	-	-	-	-	2	3	-	
	24-6	6	1	-	-	1	3	2	-	
	TOTAL	32	6	5	3	14	13	5	-	
	ECO RESERVE	21-14	12	-	2	-	2	3	3	4
		22-2	1	-	-	-	-	1	-	-
TOTAL	13	-	2	-	2	4	3	4	-	
MARION	23-5	4	-	1	3	4	-	-	-	
	TOTAL	4	-	1	3	4	-	-	-	

^aIdent. No.--see footnote b in Appendix 1.

^bAdult Males: Large, medium and small, as determined by antler size.

^cUnclassified: neither sex nor age determined.

Table 3.3 Incidental observations of moose during mountain goat surveys in Spatsizi Wilderness Park, British Columbia, July 1984.

Wildlife Zone	Ident. No.	Group Size	Adult Males ^b			Adult Females	Young	Uncl. Adults	Uncl. c					
			L	M	S					Total				
TOMIAS	24-8	2	-	-	-	1	-	-	1*					
<u>TOTAL</u>	2	-	-	-	-	1	-	-	1*					
ECO RESERVE	NO	NO	M	O	O	S	E	R	E	C	O	R	E	D
MARION	23-1	3	-	-	-	1	2	-	-					
	23-2	2	-	-	-	1	1	-	-					
	23-3	2	-	-	-	1	1	-	-					
	24-7B	4	-	-	-	-	-	4	-					
<u>TOTAL</u>	11	-	-	-	-	3	4	4	-					
CARIBOU MIN.	NO	NO	M	O	O	S	E	R	E	C	O	R	E	D
EAGLENEST	NO	NO	M	O	O	S	E	R	E	C	O	R	E	D
DAWSON	22-2	1	-	1	-	1	-	-	-					
<u>TOTAL</u>	1	-	1	-	1	-	-	-	-					
KUJAYETZ	24-14	1	-	-	-	-	-	1	-					
<u>TOTAL</u>	1	-	-	-	-	-	-	1	-					

* This was an unclassified yearling

^a Ident. No.--see footnote b in Appendix 1.

^b Adult Males: Large, medium and small, as determined by antler size.

^c Unclassified: neither sex nor age determined.

APPENDIX 4:CLASSIFIED COUNT SUMMARY FOR 7 WILDLIFE ZONES OF SPATSIZI WILDERNESS PROVINCIAL PARKMOUNTAIN GOAT

Adult Males	62		
Adult Females	216		
Young of the Year	138		
Yearlings	50		
Moulted Males	11		
Moulted Females	34		
Unclassified Adults	27		
	<hr/>		
TOTAL	538		
Percentage of young in Population	$\frac{138}{538} = 25.65\%$		
Percentage of yearlings	$\frac{50}{538} = 9.29\%$		
Percentage of young per 100 females	$\frac{100}{216} = \frac{X}{138}$	$216X = 13,800$	$X = 63.89\%$
Percentage yearlings per 100 females	$\frac{100}{216} = \frac{X}{50}$	$216X = 5,000$	$X = 23.15\%$
Percentage of adult males per 100 females	$\frac{100}{216} = \frac{X}{62}$	$216X = 6,200$	$X = 28.70\%$

STONE'S SHEEP

Adult Males Class II	12
Class III	23
Class IV	<u>31</u>
	<hr/>
	66
Adult Females	29
Young of the Year	30
Unclassified Adults	61
Unclassified	<u>112</u>
TOTAL	<hr/>
	298

CARIBOU

Adult Males - Large	10
Medium	16
Small	<u>9</u>
	<hr/>
	35

Appendix 4 (continued)CARIBOU (cont'd)

Adult Females	59
Young of the Year	41
Unclassified Adults	36
Unclassified	<u>17</u>
TOTAL	<u>188</u>

.....
MOOSE

Adult Males - Large	0
Medium	1
Small	0
Adult Females	4
Young of the Year	4
Yearlings	1
Unclassified Adults	<u>1</u>
TOTAL	<u>11</u>

Appendix 5. Miscellaneous observations of Spatsizi Park
wildlife during mountain goat surveys, July 1984.

Stone's Sheep

A single ewe was observed in the company of 40 goats near the extreme headwaters of Tsetia Creek (Obs. 24, Eaglenest, 23 July, Appendix 1). She was definitely "with" the goats, following one subgroup closely during their escape movement from the helicopter disturbance. We saw no other sheep within some distance of that area.

Caribou

Many caribou seen during these surveys were bedded on snow patches. The Kluayetz Zone was confirmed as an important area for caribou in early summer.

We recorded two instances of females appearing to have two calves. On the first, west of Buckinghorse Lake (Obs. 23, Kluayetz, 22 July, App. 1), a female with two split off from a larger group and continued off. No other caribou remained nearby or attempted to follow them, and the calves pressed closely to and under the female. They were photographed. The other observation was of two females with three calves, that group seen on a snow patch in the Blueberry Creek area (Obs. 2, Tomias, 24 July, App. 1).

Golden Eagle

Among birds observed, this was the most common species. Owing to the nature of our flight pattern along the ridges, it was impossible to keep track of individuals, but we conservatively estimated that we saw more than 30 different birds.

Gyrfalcon

Surprisingly, we saw only one during four days among the Spatsizi uplands, that in upper Tsetia Creek on the 23rd.

Waterfowl

A raft of 35-40 Surf Scoters was seen on Coldfish Lake on 24 July, and 2 Common Mergansers were seen at Southfork Lake on the 23rd.

Willow Ptarmigan

Two adult males were seen at Southfork Lake on the 23rd.

Wandering Tattler

One was seen at Southfork Lake on the 23rd.