

7.0 APPENDICES

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Appendix 1. Criteria for distinguishing sex and age classes of mountain goats, northern British Columbia, July 1984 and 1985.

Adult Male

1984 - completely moulted (short, smooth pelage); alone or in 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, which was distinguishable from some distance.

1985 - same features pertain except that most were only half to three-quarters moulted and a few still retained an almost complete shaggy winter pelage. Because shedding occurs from front to back, most animals retained a shaggy appearance on their hind quarters, therefore the scrotum was rarely visible.

Adult Female

1984 - adult-sized animals which retained more than 20% of their winter pelage were referred to as "shaggies" in the field. 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). 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.

1985 - most adult-sized animals in nursery groups were still mostly shaggy. Those few which were 50% or more moulted were probably equivalent to the "smoothcoats" of 1984. Confusion with unshed subadults was likely, particularly in the larger groups.

#### Young-of-the-Year

1984 - 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.

1985 - same as 1984.

#### Yearlings

1984 - 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 specifically.

1985 - same as in 1984.

Subadults

1984 - 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.

1985 - unlike the previous year, not all members of this class were completely moulted and a few, which were recognized by body and/or horn size, were no further along in the moult than some adult females. Nevertheless, many were in more advanced moult stages than others in nursery groups and, except in the confusion of large, moving groups, could be recognized and occasionally could be sexed.

Appendix 2. Report on inventory flight for mountain goats in wildlife zones of the Tatlatui Provincial Park and southern Spatsizi Plateau Wilderness Park areas, British Columbia, July 1985.

FLIGHT REPORT

Date: 10-14 July 1985 Flt. No. \_\_\_\_\_  
 Location: Tatlatui and southern Spatsizi Park areas  
 Weather: Variable: see remarks section  
 Aircraft: Bell 206 Pilot: T. Brooks Observers: D. Hatler  
W.G. Hazelwood

Species Key: M = Moose      SS = Stone's Sheep      GB = Grizzly Bear  
 C = Caribou      DS = Dall's Sheep      BB = Black Bear  
 G = Goat      D = Mule Deer      W = Wolf

Classification: M = Male; F = Female; Y = Young-of-the-year;  
 U = Unclassified; A = Adult

Location	Remarks	Spec.	M	F	Y	U
10 July 1985: depart Smithers at 1700. Weather: windy, with local squalls; 85% cloud; high ceiling east of Tabletop Mtn.						
Birdflat Creek, north end	Large bull - antlers 45"+, hefty body	M	1			
<u>THUTADE ZONE</u> Tabletop Creek area	<u>Map Ref. No. 1:</u> 1825 m, on green slope	C			9	20
Tabletop Creek Area	<u>No. 2:</u> none large; about 35 m downslope from group of 29	C	3			
N. of Mt. Jorgensen	<u>No. 3:</u>	C	1			
Dennis Peak area	<u>No. 4:</u> Single nanny, shaggy and very dirty coat.	G		1		
N. of Dennis Peak	<u>No. 5:</u> high, in krummholz	M		1	1	
Sturdee Valley	Fuel trip, from Thomas Peak. There are many Cliff Swallows nesting on buildings there.	Swallows				
Back to Thutade Zone, Upper Firesteel	<u>No. 6:</u> Mountains across the river from south end of Rognaas; 2 medium bulls	C	2	1	1	4A
Tatlatui Lake	Down, at end of day. 2 Bonaparte's Gulls and 1 Herring Gull seen	Gulls				
<u>11 July 1985</u>						
<u>TATLATUI ZONE</u>	Weather: stormy overnight; high winds and low cloud early in a.m., out at 0945, with weather to south-west improving; 2:00 a ceiling; and					

LOCATION	REMARKS	SPECIES	M	F	Y	U
N. end, to Tatlatui Peak	A few tracks, possibly all caribou but some looked more like goat by location.	Tracks				
Mt. Hoy area	<u>No. 1:</u>	C			5	72
Mt. Hoy area	<u>No. 2:</u> a lot of snow still remaining on the slopes in this area; near head of glacier.	C		1	1	
Hoy Lake area	<u>No. 3:</u> 1 shed and 1 still more than half shaggy; south facing slope, 1700 m.	G	2			
Hoy Lake area	<u>No. 4:</u> just above lake; 1 medium and 1 small. Lake still with 25% ice cover.	C	2			
Hoy Lake area	<u>No. 5:</u> 1 medium, 1 large.	C	2			
Hoy Lake area	<u>No. 6:</u> among adults, there was one half moulted subadult (probably 2 years) and one other small one (maybe yearling) tucked back in a cave. All of the adults were shaggy; 1625 m.	G			6	12
Hoy Lake area	<u>No. 7:</u> at 1750 m on mountain west of lake; large horns; mostly moulted.	G	1			
Hoy Lake area	<u>No. 8:</u> same area, 1800 m.	G	1			
Hoy Lake area	<u>No. 9:</u> 1925 m; none completely moulted and one only about half.	G	4			
Hoy Lake area	One eagle in Hoy Lake area and another in pass toward Thutade.	G.Eagle				2
Thutade Creek	<u>No. 10:</u> at about 1800 m, about 150 m apart; one was less than half moulted.	G	2			
Thutade Creek	<u>No. 11:</u> same elevation, two together and one about 100 m away.	G	3			
Thutade Creek	<u>No. 12:</u> 1775 m.	G	2			
West of Thutade Lake	<u>No. 13:</u> Unclassified adult moose in wet meadow; one eagle in general area, upslope.	M G.Eagle				1 1

LOCATION	REMARKS	SPECIES	M	F	Y
North of Thutade Lake	No. 14: above lick area on north-facing slope, 1775 m; among the 17, 3 were obvious yearlings and 2 were young adults, probably 2 year olds; all were still shaggy.	G			8
North of Thutade Lake	No. 15: same area, down below falls near lick; shaggy, 1525 m.	G		1	
Tatlatui Lake	Back to camp for lunch and fuel.				
East end Tatlatui Zone	Old tracks seen across several slopes and snowfields but most probably caribou.  No more goats seen.				
<u>THUTADE ZONE</u>	Enroute to fuel at Sturdee, passed along south and east sides of Thutade Zone again; 2 goats seen: No. 7: nanny 75% shed across from the Niven River; one shaggy nanny with left horn missing or broken on cliffs near south end of burn (No. 8).	G		1	
		G		1	
<u>BROTHERS ZONE</u>	Storms to north and south, but Brothers is open and below cloud cover.				
East of Brothers Peak	No. 1: single female with no antlers, on snowpatch.	C		1	
East of Brothers Peak	No. 2: bulls - 1 large and 1 medium.	C	2	2	
East of Brothers Peak	Several marmots and many burrows seen in basin where caribou were.	Other			
Brothers Peak area	No. 3: 1 smooth and 1 less than half moulted - trailing much wool.  No more observations in Brothers Zone, but local cloud obscured some of the south-facing end.  Observations from Henderson on 11th:	G	2		
	A: 3 bulls, Tabletop end of Tatlatui Zone.	C	3		
	B: 4 moose in pass Tabletop Creek	M	2		
	C:	M		2	



LOCATION	REMARKS	SPECIES	M	F	Y
<u>EDOZADELLE b ZONE</u>	Open when we started, but a snow squall hit on north end.				
North end	<u>No. 1:</u>	C			3
	<u>No. 2:</u>	C			3
<u>12 July 1985</u>	Low ceiling, calm in a.m. No attempt at morning surveys.  Henderson Observations:				
N. end of Tatlatui Lake	<u>D:</u> Near outlet	M		1	1
East of camp, Tatlatui N. of Thutade	<u>E:</u> bull, about a medium <u>F:</u> small bear with light shoulders and dark lower body, in burn area.	M GB	1		
	P.M. - continued poor conditions, no surveys.				
<u>13 July 1985</u>	Calm, 50% cloud cover, ceiling at about 2600 m; snow cover above 1825 m is at least 50%.				
<u>KITCHENER ZONE</u>					
Tatlatui Lake area	<u>No. 1:</u> medium bull; these at 1775 m.	C	1	2	1
	<u>No. 2:</u>	C			3
	<u>No. 3:</u> 1 medium bull; 2 of the others were yearlings.	C	1		2
West of Tatlatui Lake	2 Golden Eagles in same basin where above caribou were seen.	Eagles			
	<u>No. 4:</u> the female without a calf was a yearling.	C		3	2
South of Trygve Lake	<u>No. 5:</u>	C		3	3
	<u>No. 6:</u>	C		1	1
Melanistic Peak area	<u>No. 7:</u> one of the adults was half moulted; 1775 m.	G		2	1
	<u>No. 8:</u> the unclassified goat was a yearling; one of the nannies was about half shed, and appeared to be smaller than the 3 shaggy ones (i.e., probably subadult); 1675 m.	G		4	2

LOCATION	REMARKS	SPECIES	M	F	Y	U
	No. 9: the bull a medium; one Golden Eagle nearby.	C eagle	1	4	4	5A
	Light conditions were excellent and the wind was not sufficiently strong to affect flying.					
Above Trygve Lake (south)	No. 10: there were no other caribou nearby, thus this may represent a case of twins.	C		2	3	
Trygve Lake, west end	38 Canada Geese, 4 Greater Scaup (2 M, 2 f), 1 Mew Gull and 1 Savannah Sparrow seen.	birds				
	No. 11: 1775 m on bare rock; kid looked very small.	G		1	1	
	1 Golden Eagle around the corner	eagle				1
Kitchener Krag area	No. 12: alone, on ridge to west	SS		1		
South of Kitchener	No. 13: 2 Class III	SS	2			
South of Kitchener	No. 14: there was at least one yearling in the group, and there were no obvious rams (i.e., none Class II or larger).	SS		3		8A
Mt. Oakes area	No. 15:	G		1	1	
Mt. Oakes area	No. 16: large, mostly moulted, 1650 m.	G	1			
Back to Sturdee for fuel	Passed over south section of Brothers Zone again, which was partly obscured by clouds on the 11th. Nothing seen. On the return trip to resume the survey, we passed over the Brothers Peak area, where the 2 billies were seen on the survey; they were no longer present on that mountain.					
Kitchener Lake	11 on one of the small lakes near the inlet stream.	geese				11
	No. 17: the unclassified animal was a yearling.	G		3	1	1
End, Kitchener Zone	A little over 5 hours survey time were required to cover this area.					
TERRAZE ZONE	No. 1: 1800 m; completely moulted	G	1			
	No. 2: the unclassified animal was a yearling.	SS		2	2	1

LOCATION	REMARKS	SPECIES	M	F	Y
Ridge at head of Chapea Creek Near above group	<u>No. 4:</u>	G		1	1
	<u>No. 5:</u> large, 2/3 moulted.	G	1		
	<u>No. 6:</u> one of the calves noticeably larger than the other five.	C		7	6
	<u>No. 7:</u> the nannies all shaggy.	G		3	2
	<u>No. 8:</u> one nanny half shed	G		5	3
	<u>No. 9:</u> 2 of the unclassified were yearlings, the other 3 were not seen well enough before they hid in the rocks, but one was 75% shed and another was 50%; 1825 m.	G		4	4
	<u>No. 10:</u> shaggy	G		1	
	<u>No. 11:</u> 2 shaggy and 1 half moulted females; unclassified animals were a yearling and a 30% moulted sub-adult (smaller than the adults, but larger and with longer horns than the yearling); 1925 m.	G		3	1
	<u>No. 12:</u> two of the kids stayed with one nanny, and acted like twins; all 3 females shaggy; 1900 m. Note: Bill Love reported seeing a nanny with 2 newborn young at Duti this spring.	G		3	3
	S.E. Terrace Zone	The above completes that portion of the Terrace Zone east of the Duti River.			
<u>EDOZADELLY a ZONE</u>	As with the other areas, still lots of snow above 1825 m.				
Canyon on north end	<u>No. 1:</u> one large and one small billy, the former only 1/4 moulted but the latter one almost completely smooth; the two unclassified were yearlings; of the remaining, all appeared to be nannies and only one was partly shed (about 30%); all the goats were essentially together.	G	2	6	3
	Fuel-up by old beaver (?) pond above birds canyon. Saw 2 Green-winged Teal and a pair of solicitous Semipalmated Plovers.				

LOCATION	REMARKS	SPECIES	M	F	Y	I
	No. 2: small group on northwest end; there did not appear to be much caribou activity on Edozadelly yet.	C			1	71
<u>ROGNAAS ZONE</u>	The only goats anyone has ever heard of in this zone were 2 seen by Ron Fleming, as they walked on the plateau from the south end toward the north ("a few years ago").					
Creek on northeast end	No. 1: 2 cow-calf pairs in creek bottom - one pair were very dark animals and the other two were very light.	C		2	2	
North end	No. 2: there were two groups which were about 200 m apart when first seen. The 6 unclassified were in a separate group which then ran to the others.	C		5	4	61
North west side	No. 3: medium bull; mostly an unusually large maternal band.	C	1		9	11
<u>End of Day</u> Tatlatui Lake	5 Bonaparte's Gulls, 2 Mew Gulls and 2 Herring Gulls seen near outlet; loon nest on island south of camp (only egg shells remaining); Spotted Sandpipers common, and WGH saw one with a chick near camp. Also seen at camp, Yellow-rumped warblers, robins, Boreal Chickadees and Gray Jays.	birds				
<u>14 July 1985</u>	High overcast (80%) and calm. Barometer has remained high and steady (30+) over the whole trip so far, even during the stormy times.					
<u>TERRAZE ZONE</u> (continued, west of Duti)	No. 13: one completely moulted and one about two-thirds.	G	2			
	No. 14: 2 shaggy and 1 half moulted, probably a subadult judging from size.	G		3	1	
	No. 15: female shaggy	G		1	1	
Ella Creek	No. 16: seen in valley bottom from up high; one apparently a yearling.	C				51
	No. 17: moulted. 1325 m.	G	1			

LOCATION	REMARKS	SPECIES	M	F	Y	U
Mt. Terraze, east side	<u>No. 18</u> : female shaggy, 1850 m.	G		1	1	
Mt. Terraze, east side	<u>No. 19</u> : one moulted and the other still half shaggy; 1900 m.	G	2			
Mt. Terraze, east side	<u>No. 20</u> : on snowpatch	C		1		
Mt. Terraze, west side	<u>No. 21</u> : large group, difficult to classify because there were all stages of moult present and most hid in the rocks and/or pressed tight against each other; just three of the total were more than 75% moulted, and two of those were classified (1 large female and 1 small male). There were at least 2 yearlings but possibly more. This was a maternal band and certainly most of the "unclassified" animals were females; 1750 m.	G	1	12	11	23
	<u>No. 22</u> : the unclassified animal a yearling.	G		2	1	1
	<u>No. 23</u> : seen on distant snowpatch	C				1A
	As seen from near Happy Lake, there is far more snow in the Kluayetz Zone than during our survey there last year.					
	<u>No. 24</u> : on a snowpatch at 1975 m.	C		1	1	9A
End of Terraze Zone	and of southern Spatsizi-Tatlatui areas.					
Preliminary totals for Wildlife Zone, are as follows:						
	Thutade - 3					
	Tatlatui - 59					
	Kitchener - 20					
	Rognaas - 0					
	Brothers - 2					
	Edozadelly b - 0					
	Edozadelly a - 13					
	Terraze - 107					
	Total: 204.					

Appendix 3. Report on inventory flight for ~~some~~  
mountain goats in four wildlife zones, northern  
Spatsizi Plateau Wilderness Park and vicinity,  
British Columbia, July 1985.



LOCATION	REMARKS	SPECIES	M	F	Y	U
<u>CARIBOU MOUNTAIN ZONE</u>						
Over Mink Creek	No. 1: billy, mostly shed, farther up hill (1800 m), but not far from main group (1750 m) which consisted of 4 shaggy and 1 half-moulted adults, all apparently females, and 1 yearling.  No other sightings in Caribou Mountain Zone.	G	1	5	2	1
<u>End of Day</u>						
<u>15 July 1985</u>	Clear, calm; frost at Iskut in a.m. but warming to 20°C or more later in the day.					
<u>CARTMEL ZONE</u>						
West side	No. 1: near well-used lick area	SS		2	1	
	No. 2: same area; includes 1 yearling 1 Golden Eagle nearby	SS eagle			1	5A 1
	No. 3: large, 75% moulted; 1775 m.	G	1			
	No. 4: shaggy, 1825 m, hiding in the rocks.	G		1	1	
	No. 4a: mostly moulted, 1750 m.	G	1			
	No. 5: 1925 m; 3 shaggy nannies and a completely moulted subadult males.	G	1	3	1	
	No. 6: 2 Class II rams	SS	2		4	9
Southwest End	No. 7: 3 shaggy and 1 nearly shed females, and 1 yearling	G		4	2	1
	No. 8: 1525 m; females were 5 shaggy, 2 half moulted and one smooth-coated; 2 yearlings also present.	G		8	3	2
	No. 9: half moulted, small horns - believed to be a young billy; 1250 m.	G	1			
	No. 10: small nanny, possibly subadult, about 30% shed; 1250 m.	G		1		
	No. 11: ...					
	No. 12: ...					



LOCATION	REMARKS	SPECIES	M	F	Y	U
South End	No. 13: 10 shaggy nannies and one half moulted, 2 yearlings and 2 smooth-coated and 1 half shed animals of undetermined sex; 1825 m.	G		12	8	5A
	No. 14: mostly shed, 1975 m.	G	1			
	One Golden Eagle in area.	eagle				1
	No. 15: 1 Class II, and about 7 Class III; the rest believed to be Class IV's.	SS	18			
East Side	No. 16: small Class II	SS	1			
	No. 17: 2 large Class IV	SS	2			
	No. 18: Class II, III and IV; a White-tailed Ptarmigan seen nearby.	SS ptarmigan	3			1
	No. 19: completely moulted, 1700 m.	G	1			
	No. 20: very light-coloured, Class IV.	SS	1			
	No. 21: 2 Class II	SS	2		2	14A
Un-named Mountain	No. 22: alone, on south side	SS		1		
	No. 23: north side; 2 Class III and 1 Class II.	SS	3			
	No other animals seen on this mountain.					
Cartmel Lake area	No. 24: one seen at 1800 m was completely moulted; the other glimpsed at 1550 m was not observed closely but appeared to be a "smooth" billy as observed from about 75 m.	G	2			
Cartmel Lake area	No. 25: smooth coat, large; 1800 m.	G	1			
	No. 26: shaggy; 1750 m.	G		1	1	
	No. 27: 2 ewes and 2 yearlings in the valley bottom (1625 m)	SS		2		2
End Cartmel Zone						

LOCATION	REMARKS	SPECIES	M	F	Y	U
<u>MT. BROCK ZONE</u>	Time and fuel did not permit a thorough survey of all uplands in the zone, but the absence of goats on the Un-named Mountain (North Cartmel Zone) and the fact that Mt. Brock is the potential goat habitat nearest to that block suggested a need for at least one quick pass around that area. The following were seen:					
	<u>No. 1:</u> 1775 m; group of 13 with 8 shaggy, 1 half moulted and 1 smooth nanny, and 1 yearling; a smooth billy was nearby and somewhat higher.	G	1	10	2	1
	<u>No. 2:</u> partly shed, 1750 m.	G		1		
	<u>No. 3:</u> smooth; 1775 m.	G	1			
	<u>No. 4:</u> 2 smooth and 1 half moulted; 1775 m.	G	3			
	<u>No. 5:</u> smooth; 1700 m	G	1			
	1 Golden Eagle nearby	eagle				1
<u>END OF NORTH SPATSIZI</u>	<u>GOAT SURVEYS</u>					
Preliminary results,	by Zone:					
	Marion - 10					
	Caribou Mountain - 9					
	Cartmel - 64					
	Brock (partial) - 20					
	Total: - 103					

Appendix 4. Report on inventory flight for  
mountain goats in Mount Edziza Provincial  
Park and Recreation Area, British Columbia,  
July 1985.



LOCATION	REMARKS	SPECIES	M	F	Y	U
Armadillo Peak area	<u>No. 8</u> : 4 IV's and 4 III	SS	8			
	<u>No. 9</u> : 1 IV, 1 III, 1 II and 1 ewe or Class I	SS	3			1A
	<u>No. 10</u> : 1 only 30% moulted and the other about half; 1550	G	2			
Bourgeaux Creek area	<u>No. 11</u> : Reddish-coloured female with light wash on head, shoulders and mid-back; yearling cubs with light shoulders; in green sub-alpine meadow at about 1350 m.	GB		1	2	
	<u>No. 12</u> : large, completely moulted; 1750 m.	G	1			
	<u>No. 13</u> : Adults all shaggy females; 1925 m.	G		8	2	
	<u>No. 14</u> : Completely moulted; 1575 m.	G	1			
	<u>No. 15</u> : 4 shaggy females, 1 yearling and one half shed subadult of undetermined sex. 1 Golden Eagle in area	G eagle	4	1	2	1
	<u>No. 16</u> : 2 shaggy females, 1 yearling and 1 30% moulted subadult which, by horn characteristics, appeared to be a billy, 1825 m.	G	1	2	1	1
	Another Golden Eagle seen	eagle				1
	<u>No. 17</u> : 2 shaggy and one half moulted subadult.	G		3	2	
North end of plateau	<u>No. 18</u> : seen on a distant snow-patch in the upper lava area	C				1A
End of Day						
<u>16 July 1985</u>	Another clear, calm, beautiful day.					
AREAS SOUTH OF RASPBERRY PASS						
Depart Iskut 0905	Took a photo showing south end of Kakiddi Lake and uplands in that direction, to show extent of snow cover above 1675 m -- more than 50% in many areas.					
	The 8 rams seen yesterday (No. 8) were on a cinder cone about 2 km	SS				

LOCATION	REMARKS	SPECIES	M	F	Y	U
North of Raspberry Pass	<u>No. 19</u> : On a ridge not covered yesterday; 1 Class II ram	SS	1		1	67
	<u>No. 20</u> : Near above group; 1 Class II ram in this group as well, and there were at least two yearlings.	SS	1		2	10
	<u>No. 21</u> : The 3 were all yearlings; one of the females was shaggy and the other had a complete clean winter coat, i.e., had not even started to moult yet; 1575 m.	G		2		3
	<u>No. 22</u> : females all shaggy; one yearling; 1625 m.	G		5	1	3
	<u>No. 23</u> : fully moulted, large; 1675 m.	G	1			
	<u>No. 24</u> : another with complete winter coat (no moult yet), 2 shaggy and 1 half moulted; 1600 m. We had missed these animals on the first pass by that area; possibly they came down from the plateau, above, while we were classifying Group 22.	G		4		
	<u>No. 25</u> : one moulted and one 75%; 1825 m.	G	2			
	<u>No. 26</u> : shaggy; 1350 m, in canyon well below timberline.	G		1	1	
	<u>No. 27</u> : near above goats, same canyon; 1350 m; billy 75% shed, the other animal may also have been a male but it was less than 25% moulted and it ducked into thick balsam before we could get a close look.	G	1			1
	<u>No. 28</u> : head of canyon, just moving onto plateau, 75% moulted with one horn broken off about half way down; 1425 m.	G	1			
Canyon west from Spectrum Range	Small pond just up from No. 28, stopped for rest. Saw 2 immature male goldeneyes and 2 eclipsing male Oldsquaws; large (7½") grizzly track on nearby snowpatch.	birds GB				
	Much snow above 1675 m in this area, 80% or more on flats east of observations 29 and 30 several					

LOCATION	REMARKS	SPECIES	M	F	Y	U	
Rec. Area Block, SE Ball Creek drainage	<u>No. 29</u> : both females shaggy, 1750 m	G		2	1		
	<u>No. 30</u> : large, completely moulted; 1825 m.	G	1				
	<u>No. 31</u> : this large group scattered to a rocky area and complete classification was impossible. The 22 females included 17 shaggy, 3 half shed, and 2 completely shed animals. The 16 unclassified included 4 animals more than 60% moulted, 4 yearlings, and 8 with unknown characteristics (based on an initial total count of 47 and subtraction of the 39 described above to at least some degree; 1900 m.	G		22	9	16	
	<u>No. 32</u> : 80% moulted, 1700 m; half moulted; 1775 m. shaggy; 1675 m.	G G G	1		1 1		
	<u>No. 33</u> : both completely shed, 1450 m; one was hiding in a balsam thicket and didn't show up in the first pass.	G		2			
	<u>No. 34</u> : 2 moulted and one only half 1700 m.	G		3			
	<u>No. 35</u> : completely moulted; 1800 m.	G		1			
	<u>No. 36</u> : 5 shaggy and 1 about half moulted; the unclassified one was a yearling; 2 of the kids showed a definite attachment to one female and may have been twins.	G			6	5	1
	<u>No. 37</u> : shaggy female; 1675 m; completely shed billy just around the corner from nanny - kid pair, same elevation.	G G		1		1	
	<u>END OF SURVEY</u>						
Preliminary summary of goat results:							
	North of Raspberry Pass:		52				
	South of Raspberry Pass:		99				
	Edziza area total:		151				

Appendix 5. Numbers of various sex and age classes of mountain goats per 100 adult females, as observed during helicopter surveys in the Tatlatui, Spatsizi and Mt. Edziza areas, British Columbia, July 1985.

General:

Accurate calculation of ratios per 100 females is not possible for all of the 1985 data, because females could not always be distinguished from subadults during the surveys. For that reason, some ratios must be calculated on the basis of the estimated number of females for several areas. Following paragraphs describe the estimation assumptions and procedure, and show specific calculations for those observations involved.

Estimation Procedure:

The task is to estimate the numbers of animals designated "unclassified adults" which were actually adult females. As described in the text, the other animals which were probably involved most often in the unclassified category were subadults of both sexes. Therefore, the primary basis for following calculations is an assumption that the sum of the three classes (adult females + subadults + unclassified adults) among the 1985 results constitutes the same group of animals as (adult females + moulted adults) in 1984 (Hatler and Hazelwood 1984). It is also assumed that the number of females is no less than the number of young for any one area. We acknowledge that twins occasionally occur, but argue that the mean number of young among goats over any significant area will probably never be greater than 1.0.



Among the 1984 results, a total of 538 goats were classified, of which 216 (40.2%) were adult females and 72 (13.4%) were moulted adults (including some adult and subadult females and 11 subadult males). It was determined that about 30% of the moulted females were adults (Hatler and Hazelwood 1984), thus the total adult female complement in the 1984 samples was  $216 + 18 = 234$ , or 81.3% of the adult female + moulted adult categories. Based on that calculation, the new number for adult females (F) in those samples with a large number of unclassified adults is here calculated as a conservative 75% of the sum of known adult females (f) + unclassified adults (U) + subadults (S), as listed in Table 8.

Specific Calculations:

Tatlatui Zone:        f = 1, U = 23, S = 3

$$F = 0.75 (1 + 23 + 3) = 20$$

Terraze (west) Zone:    f = 19, U = 20, S = 2

$$F = 0.75 (19 + 20 + 2) = 31$$

Edziza (Rec. Area):    f = 37, U = 15, S = 0

$$F = 0.75 (37 + 15) = 39$$

Appendix 6. Flight report for fixed-wing survey  
of mountain goats, Tatlatui Provincial  
Park area, British Columbia, July 1985.

LOCATION	REMARKS	SPECIES	M	F	Y	U
<u>Kitchener Zone</u>						
Airplane Bay	<u>Obs. No. 3</u> 3 females, 1 un-sexed yearling and 2 kids, north side of valley in alpine cliffs.	G		3	2	12
Melanistic Peak area	On snowpatch	C				7
N. fork Malloch Creek	<u>Obs. No. 4</u>	C				1
" " " "	Just into alpine. Large group on snowpatch.	G	1			
		C				14
South of Trygve Lake		C		1	1	12
Black Lake	Back for refueling					
Duti River-Malloch Creek confluence area	On snowpatch.	C				2
<u>Brothers Zone</u>						
Kitchener Lake	2 single caribou seen, from up high, on snowpatches north of the lake.	C				1
		C				1
Brothers Peak area	15 caribou on a snowpatch; all uplands in this zone covered from high elevation, but no goats seen.	C				15
<u>End of Survey</u>						
This day presented difficult flying in the mountains with a small aircraft on flats. Nevertheless, that did not account for the relative absence of goats in the count. There is little doubt that numerous animals were occupying habitats in which they were not readily seen. The totals observed were as follows:						
	Thutade Zone					- 0
	Tatlatui Zone					- 32
	Kitchener Zone					- 7
	<u>Brothers Zone</u>					- 0
	All					- 39

Appendix 7. Locations and sex/age compositions of big game seen incidentally during mountain goat surveys in the Tatlatui, Spatsizi and Mt. Edziza Provincial Park Areas, British Columbia, July 1985.

<u>TABLES</u>		<u>PAGE</u>
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Appendix 7.1 Incidental observations of Stone's sheep during mountain goat surveys in and around three provincial parks in northern British Columbia, July 1985.

Wildlife Zone	Ident <sup>a</sup> No.	Group Size	Adult Males <sup>b</sup>			Adult Females	Young	Uncl. Adults <sup>c</sup>
			II	III	IV			
<u>Kitchener</u>	13-12	1				1		
	13-13	2		2				
	13-14	11					3	8
<b>Totals:</b>		14	2	2		1	3	8
<u>Tatlatui</u>	No sheep observed.							
<u>Thutade</u>	No sheep observed.							
<u>Rognaas</u>	No sheep observed.							
<u>Brothers</u>	No sheep observed.							
<u>Egozadelly b</u>	No sheep observed.							
<u>Egozadelly a</u>	No sheep observed.							
<u>Terraze</u>	13-3	5				2	2	1
<b>Totals:</b>		5				2	2	1

<sup>a</sup> Ident. No.--see footnote b in Appendix .

<sup>b</sup> Adult Males: Class II, III and IV rams, as described by Geist (1971).

<sup>c</sup> Unclassified adults: sex not determined, but animals not young of the year.

Appendix 7.1 (continued)

Wildlife Zone	Ident <sup>a</sup> No.	Group Size	Adult Males <sup>b</sup>				Adult Females	Young	Uncl. Adults <sup>c</sup>
			II	III	IV	All			
<u>Caribou Mtn.</u> No sheep observed.									
<u>Marion</u>	14- 2	17					5	12	
	14- 3	11					2	9	
	14- 4	12	7	5	12				
	14- 5	6						6	
	14- 6	6				2	2	2	
	14- 7	4			1	2	3	1	
	14- 8	9	1		1			5	
	14- 9	6						6	
	14-10	21					7	14	
		92	2	7	5	14	4	19	55
<u>Totals:</u>									
<u>Cartmel</u>	15- 1	3				2	1	5	
	15- 2	6					1	9	
	15- 6	15	2		2		4	5	
	15-12	7	1		1		1	5	
	15-15	18	1	7	10	18			
	15-16	1	1						
	15-17	2		2					
	15-18	3	1	1	3				
	15-20	1		1					
	15-21	18	2		2		2	14	
	15-22	1				1			
	15-23	3	1	2	3				
	15-27	4				2		2	
		82	9	10	14	33	5	9	35
<u>Totals:</u>									

<sup>a</sup> Ident. No.--see footnote b in Appendix .  
<sup>b</sup> Adult Males: Class II, III and IV rams, as described by Geist (1971).  
<sup>c</sup> (Unclassified adults: sex not determined, but animals not young of the year.

Appendix 7.1 (continued)

Wildlife Zone	Ident. No. <sup>a</sup>	Group Size	Adult Males <sup>b</sup>				Adult Females	Young	Uncl. Adults <sup>c</sup>
			II	III	IV	All			
Mount Edziza North of Raspberry	15-4	1	1						
	15-8	8		4	4				
	15-9	4	1	1	1			1	
	16-19	8	1				1	6	
	16-20	13	1			1	2	10	
Totals:		34	4	5	5	14	3	17	

South of Raspberry No sheep observed.

<sup>a</sup> Ident. No.--see footnote b in Appendix .

<sup>b</sup> Adult Males: Class II, III and IV rams, as described by Geist (1971).

<sup>c</sup> Unclassified adults: sex not determined, but animals not young of the year.

Appendix 7.2 Incidental observations of caribou during mountain goat surveys in and around three provincial parks in northern British Columbia, July 1985.

Wildlife Zone	Ident. No.	Group Size	Adult Males <sup>b</sup>			Adult Females	Young	Uncl. Adults	Uncl. C
			L	M	S				
<u>Kitchener</u>	13-1	4	1			2	1		
	13-2	11					3	9	2
	13-3	10	1				2		7
	13-4	5				3 <sup>1(d)</sup>	2		
	13-5	6				3	3		
	13-6	2				1	1		
	13-9	14	1			4	4		5
	13-10	5				2	3		
	Totals:	57	3	3		15	19	20	
	<u>Tatlatui</u>	11-1	12					5	
11-2		2				1	1		
11-4		2	1	1					
11-5		2	1	1					
Totals:		18	1	2	1	1	6	7	

<sup>a</sup> Ident. No.--see footnote b in Appendix .  
<sup>b</sup> Adult Males: Large, medium and small, as determined by antler size.  
<sup>c</sup> Unclassified: neither sex nor age determined.  
<sup>d</sup> Superscripts identify number of yearlings in the class indicated.



Table 7.2 (continued)

Wildlife Zone	Ident. No.	Group Size	Adult Males <sup>b</sup>			Total	Adult Females	Young	Uncl. Adults	Uncl. C
			L	M	S					
<u>Thutade</u>	10-1	29					9	20		
	10-2	3	2	1	3					
	10-3	1	1		1					
	10-6	8	2		2	1	1	4		
	Totals:	41	5	1	6	1	10	24		
<u>Rognaas</u>	13-1	4				2	2			
	13-2	15				5	4	6		
	13-3	25	1		1		9	15		
	Totals:	44	1		1	7	15	21		
<u>Brothers</u>	11-1	1				1				
	11-2	4	1	1	2	2				
	Totals:	5	1	1	2	3				
<u>Edozadelly<sup>b</sup></u>	11-1	10					3	7		
	11-2	9					3	6		
	Totals:	19					6	13		

<sup>a</sup>Ident. No.--see footnote b in Appendix .

<sup>b</sup>Adult Males: Large, medium and small, as determined by antler size.

<sup>c</sup>Unclassified: neither sex nor age determined.

Appendix 7.2 (continued)

Wildlife Zone	Ident. No.	Group Size	Adult Males <sup>b</sup>			Adult Females	Young	Uncl. Adults	Uncl. <sup>c</sup>
			L	M	S				
<u>Edozadelly a</u>	13-2	8				1	7		
	Totals:	8				1	7		
<u>Terraze</u>	13-2	3			2	1			
	13-6	13			7	6			
	14-16	5					5 <sup>1</sup>		
	14-20	1			1				
	14-23	1						1	
	14-24	11			1	1	9		
Totals:	34			11	8	15			
<u>Caribou Mtn.</u>	No caribou observed.								
<u>Marion</u>	No caribou observed.								
<u>Cartmel</u>	No caribou observed..								
<u>Brock</u>	No caribou observed.								
<u>Mount Edziza</u>	15-2	3	2					1	
	15-18	1						1	
Totals:	4	2						2	

<sup>a</sup>Ident. NO.--see footnote b in Appendix .

<sup>b</sup>Adult Males: Large, medium and small, as determined by antler size.

<sup>c</sup>Unclassified: neither sex nor age determined.

Appendix 7.3 Incidental observations of moose during mountain goat surveys in and around three provincial parks in northern British Columbia, July 1985.

Wildlife Zone	Ident. No.	Group Size	Adult Males <sup>b</sup>			Adult Females	Young	Uncl. Adults	Uncl. C
			L	M	S				
<u>Kitchener</u>	No moose observed.								
<u>Tatlatui</u>	11-13	1						1	
<u>Totals:</u>		1						1	
<u>Thutade</u>	10-5	2				1	1		
<u>Totals:</u>		2				1	1		
<u>Rognaas</u>	No moose observed.								
<u>Brothers</u>	"	"	"	"	"	"	"	"	"
<u>Edozadelly b</u>	"	"	"	"	"	"	"	"	"
<u>Edozadelly a</u>	"	"	"	"	"	"	"	"	"
<u>Terraze</u>	"	"	"	"	"	"	"	"	"
<u>Caribou Mtn.</u>	"	"	"	"	"	"	"	"	"
<u>Marion</u>	"	"	"	"	"	"	"	"	"
<u>Cartmel</u>	"	"	"	"	"	"	"	"	"
<u>Brock</u>	"	"	"	"	"	"	"	"	"
<u>Mount Edziza</u>	"	"	"	"	"	"	"	"	"

<sup>a</sup> Ident. No.--see footnote b in Appendix .  
<sup>b</sup> Adult Males: Large, medium and small, as determined by antler size.  
<sup>c</sup> Unclassified: neither sex nor age determined.

Fig. 7.1 Sheep, caribou and moose sightings in Kitchener (A), Tatlatui (B) and Thutade (C) Wildlife Zones, July 1985.







Fig. 7.2 Sheep, caribou  
 and moose sightings in  
 Terrazze (A), Edzoadelly a  
 (B), Edzoadelly b (C),  
 Brothers (D) and Rognaas  
 (E) Wildlife Zones, July  
 1985.

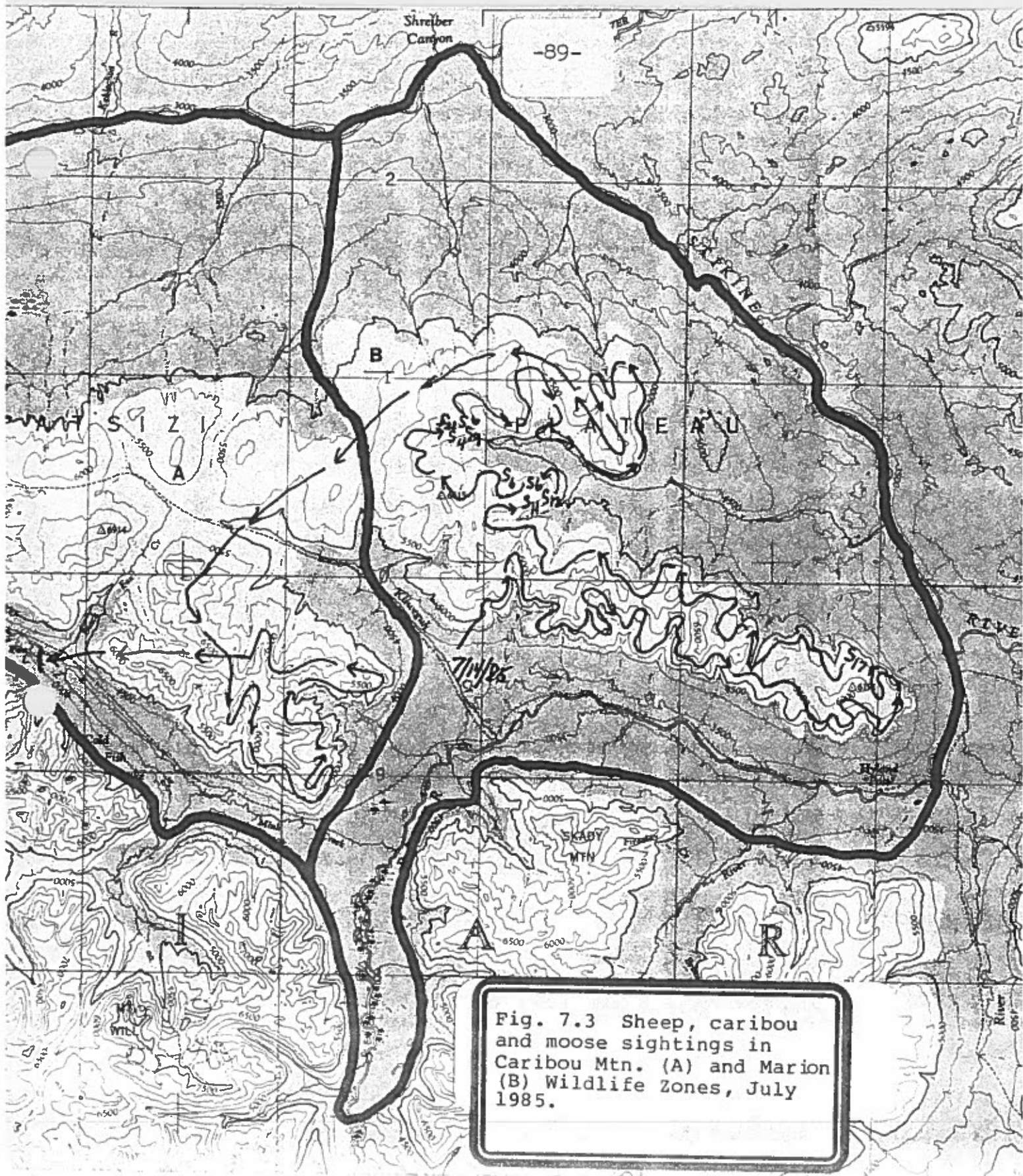


Fig. 7.3 Sheep, caribou and moose sightings in Caribou Mtn. (A) and Marion (B) Wildlife Zones, July 1985.









Fig. 7.5 Sheep, caribou and moose sightings in Mt. Edziza Provincial Park and Recreation Area, July 1985.



Appendix 8. Results of fixed-wing survey of mountain goats in September 1985, and comparison with previous 1985 flight results, Tatlatui Provincial Park area, British Columbia.

### INTRODUCTION

This report is an addendum to our previous report (Hatler, D.F. and W.G. Hazelwood. 1985. Mountain goat surveys in the Tatlatui, Spatsizi, and Mt. Edziza Prov. Park areas, British Columbia, July 1985. Unpubl. Rep., B.C. Min. of Lands, Parks and Housing, Victoria. 91p.). Methods and rationale for the fixed-wing surveys were described in that report (Section 3.3, pp.7-8), as were results for a comparison of July fixed-wing and helicopter observations in the same areas (Section 4.4, p 40).

### METHODS

The aircraft, pilot, and front observer for the September fixed-wing survey were the same as those employed in July. The primary methodological difference between the two flights was that there was no rear observer in September. As in the July flight, that in September passed briefly by the main goat ranges in the Thutade Zone, but the focus was on the Tatlatui and Kitchener Zones.

### RESULTS AND DISCUSSION

Appendix 9 presents detailed flight notes for the recent survey, which was completed under cool, clear and windy conditions on 7 September. A variety of factors combined to reduce the effectiveness of that survey. Chief among those were probably: 1) The heavy morning frost, which delayed the initiation of the survey beyond what would likely have been the optimum time of day, and probably also caused condensation which contributed to the carburetor icing problems we experienced in the afternoon; 2) The high winds and turbulence, particularly during the attempt to survey the Kitchener Zone.

Table 8.1 compares results for the three flights undertaken in 1985, while Figure 8.1 compares distribution on those occasions and shows the September flight lines. As shown, unlike the case for similar comparisons in 1984 (Hatler and Hazelwood 1984), the fixed-wing surveys produced substantially lower goat counts than did the helicopter survey in 1985. The total of 38 compares with 82 seen in the same area of coverage with the helicopter, and 39 seen on the July fixed-wing survey. However, the Kitchener Zone was less intensively covered in September, due to the turbulence and engine difficulties mentioned earlier. The pilot, Bob Henderson, knew of at least 18 goats he had seen recently in the Kitchener Zone, but which we did not see on 7 September. They included 13 in Airplane Valley (we saw 10 there from the helicopter in July, and saw tracks of a good sized group in September), and "up to 5" in the Mt. Hewett area (we saw 5 there on the helicopter survey). In addition, two males are known to have been taken by hunters in that zone since the July flights. The implied total of 22 (instead of the 3 we actually saw), would be slightly higher than the 20 we recorded for the Kitchener Zone on the July helicopter count.

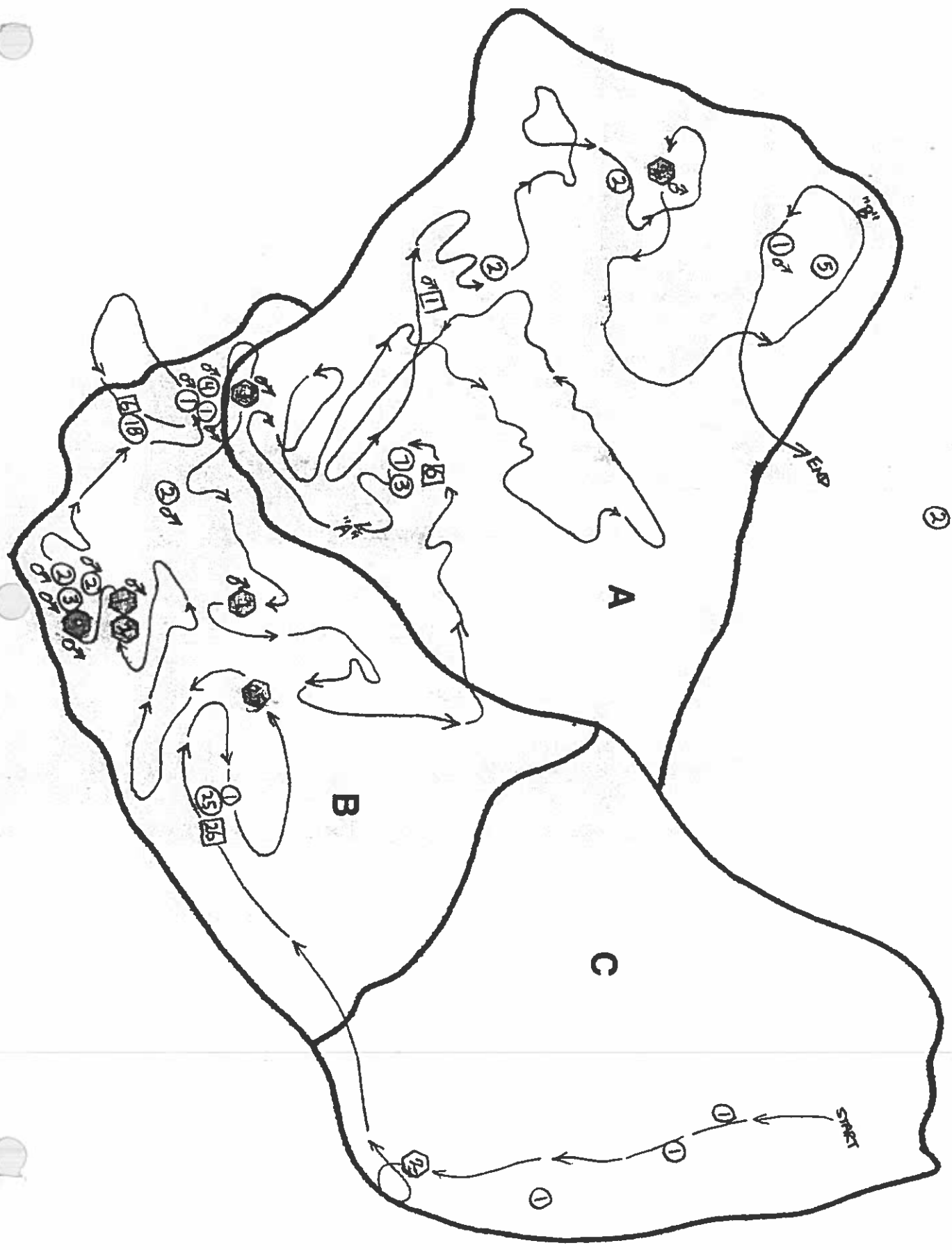
Table 8.1. Numbers of mountain goats observed in three wildlife zones in the Tatlatui Provincial Park area, British Columbia, July and September 1985.

Zone Date/Aircraft <sup>a</sup>	Numbers of Goats				Total
	Males	Females	Unc. Ad. <sup>b</sup>	Kids	
<u>THUTADE</u>					
July/Heli.	-	3	-	-	3
July/FW	-	-	-	-	0
Sept/FW	-	-	2	-	2
<u>TATLATUI</u>					
July/Heli.	15	1	29	14	59
July/FW	-	-	32	-	32
Sept/FW	6	1	18	8	33
<u>KITCHENER</u>					
July/Heli.	1	10	3	6	20
July/FW	1	3	1	2	7
Sept/FW	3	-	-	-	3
<u>All 3 Areas</u>					
July/Heli.	16	14	32	20	82
July/FW	1	3	33	2	39
Sept/FW	9	1	20	8	38

<sup>a</sup>Helicopter (Bell 206) and Fixed-wing (Cessna 180)

<sup>b</sup>Includes animals classified as yearlings and subadults during the helicopter surveys, and all unclassified adults (non-kids) during the fixed-wing surveys.

Figure 8.1 Locations and numbers of mountain goats observed on three survey flights in summer 1985 in the Kitchener (A), Tatlatui (B) and Thutade (C) Wildlife Zones, Tatlatui Provincial Park, British Columbia. The numbers shown are numbers of goats on a July helicopter survey (circles), a July Cessna 180 survey (boxes), and a September Cessna 180 survey (hexagons). "A" and "B" are single males known to have been taken by hunters prior to the September flight. A male symbol ( $\sigma^7$ ) is placed by all observations known or suspected to have involved only males.



In the Tatlatui Zone, several males and a nursery group seen in the Hoy Lake area in July were not located in that area in September. It is possible that the male shot by a hunter ("A" on Figure 8.1) and the 13 nannies and kids seen by Henderson in the Airplane Valley area in early September were among those seen at Hoy Lake in July, although it seems more likely that the Hoy Lake animals moved west along ridges in the Skeena drainage, outside the park.

As expected, the September results imply differences in seasonal distribution, but it is difficult to document actual movements without marked individuals. The nursery group from the lick area north of Thutade Lake is the single clearly recognizable group observed. It had moved about 6.5 km northwest between July and September. The implied movement between Hoy Lake and Airplane Valley, if it occurred, would have been about 12 km. On the other hand, if the same animals were involved, 5 of 7 billies seen north of Thutade Creek moved little more than 1 km between the two surveys, i.e., though the 1985 summer. The two billies seen on Mt. Oakes in September were not seen in that area in July, and may have traveled some distance to get there. The two animals seen there in July were a nanny and kid.

The successive July and September sightings of the large Thutade Lake nursery group are of some interest in demonstrating the apparent cohesiveness of that group (18 adults and 8 kids seen in the group on the helicopter survey, 26 total recorded there on the July fixed-wing flight, and 18 adults and 7 kids observed on the September fixed-wing survey).

#### CONCLUSIONS

Unlike the case with the 1984 surveys, the added fixed-wing observations have added nothing to the interpretation of numbers for the survey areas in 1985. That is, there is no objective evidence for modifying conclusions about baseline numbers of goats in the survey areas, as determined from the helicopter results. Clearly, the helicopter totals stand as the minimum number of animals occupying survey areas at survey time.

While not changing conclusions about numbers, the 1985 fixed-wing results serve to confirm that one can fly in those mountains in good weather without seeing goats that are nevertheless there, and they have provided some additional evidence that the animals may move from place to place during the course of an annual cycle. The 1985 results do not necessarily prove that fixed-wing surveys can not provide useful data on numbers and distribution of mountain goats. The major difficulty was that in order to keep cost estimates down on the optional fixed-wing program, we unwittingly arranged to use an aircraft which proved to be unsuitable for the job. The Cessna 180 on floats was an inefficient climber, and it covered the area much more slowly than anticipated, so that we underestimated the total flying time required for thorough coverage of the selected zones. The floats both magnified the negative effects of turbulence and obstructed the observers' view. The difference in performance between the 180 and the Cessna 185 on wheels used the previous year was painfully evident throughout the 1985 surveys.

APPENDIX 9

FLIGHT REPORT

Date: 7 September 1985 Flt. No. \_\_\_\_\_  
 Location: Tatlatui and Kitchener Wildlife Zones, Tatlatui Park area, B.C.  
 Weather: Clear, cold, calm in a.m., but warm and very turbulent in p.m.  
 Aircraft: Cessna 180 Pilot: B. Henderson Observers: D. Hatler

Species Key: M = Moose SS = Stone's Sheep GB = Grizzly Bear  
 C = Caribou DS = Dall's Sheep BB = Black Bear  
 G = Goat D = Mule Deer W = Wolf

Classification: M = Male; F = Female; Y = Young-of-the-year;  
 U = Unclassified; A = Adult

Location	Remarks	Spec.	M	F	Y
Depart Black Lake at 1155.	It was very cold overnight (-9°C at Serem camp at 0730) and it took several hours to get the aircraft wings defrosted in prep. for this flight.				
<u>THUTADE ZONE</u>					
Dennis Peak area	We again passed by the outer edge of the mountain block here, i.e., not flying back up the ridges and canyons, and saw no animals.				
Mt. Jorgensen area	<u>Obs. No. 1:</u> 2 adults; only one was seen on the first pass, but the second came out of a balsam patch as we approached the second time. Bob says a group of 3 has been seen in that area in recent weeks.	G			2
<u>TATLATUI ZONE</u>					
N. Side Thutade Lake	No goat seen in the lick area where they were in July.				
So. of Tatlatui Peak	<u>Obs. No. 2:</u> Group of 25, including 7 kids (2 separate counts) seen at the head of the valley south of the peak. This is doubtlessly the group from the N. Thutade lick.	G			7 1
Trib. of Thutade Crk.	<u>Obs. No. 3:</u> Single, with thick pelage.	G	1		
Same area	<u>Obs. No. 4:</u> Missed on the way in; they were bedded down at about 1400m.	G		1	1
Thutade Creek	<u>Obs. No. 5:</u> 4 large ones	G	4		
Hoy Lake area	<u>Obs. No. 6:</u> large, well-furred	G	1		
Mt. Hoy area	On and near a snowpatch in a tight canyon.	C			

LOCATION	REMARKS	SPECIES	M	F	Y	U				
East of Mt. Hoy	<u>Obs. No. 7:</u>	G	1							
Tatlatui Camp	Down for lunch and rest at 1330; the wind at high elevations has been increasing.									
<u>KITCHENER ZONE</u>	Note: The male seen as Obs. No. 6 (above), was actually in this zone.	G								
Airplane Valley area	<u>Obs. "A":</u> as shown on the map, billy shot by a guided hunter at mouth of valley last week.	G								
Airplane Valley	Bob saw a group of 13 nannies and kids in the first large canyon on the south side of the valley a few days ago; tracks were evident there, but we could not locate the animals today. High gusty winds and troubles with carburetor icing precluded close flying at the heads of valleys from this point on to the end of the survey.	G								
Mt. Oakes	<u>Obs. No. 8:</u>	G	2							
Mt. Hewett area	Another billy has been shot this season in the Kitchener Zone (No. "B" on the map); up to 5 other goats have also been seen in the Mt. Hewett area in recent weeks.	G								
End of Survey: <u>Summary</u>	- A total of 38 goats were observed, including 33 (6 males, 1 female, 8 kids and 18 unclassified adults) in the Tatlatui Zone, 2 unclassified adults in the Thutade Zone, and 3 males in the Kitchener Zone.									