SECTION I

1956 PRODUCTION AND BANDING STUDIES - SELAWIK

Peter E. K. Shepherd

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BY: Peter E.K. Shepherd

1956 field studies began at Selawik on June 4 and continued until August 9. Operations were conducted from the Selawik village base camp, with a native Eskimo, Lloyd S. Davis assisting. Objectives for this year included: (1) a production survey, (2) banding, and (3) air-ground comparison studies.

Summary of Activities

1956 waterfowl investigations began with breeding pair counts which continued until June 13. During this period aerial transects were also flown by Henry A. Hansen and the writer.

The next week (June 17-23) deserter counts of male pintail and baldpate were conducted. In addition to these counts a cover survey of the study area was begun.

From June 24 to July 6, work involved further cover studies, early brood observations, some banding, and a second breeding pair count.

On July 7 the crew left Selawik for the upper Selawik River and spent the remainder of this week banding geese and dabblers.

Upon returning to the Selawik Base camp July 15, Henry A. Hansen had arrived and aerial brood transects were then flown.

These transects were completed by July 17.

A ground production survey began July 18 and ended July 23.

The remaining portion of the summer was spent in Banding attempts and brood observations. Field work ended August 9, 1956.

Procedures and Equipment

Operational procedures followed closely those of last year's, however, nest studies were discontinued and deserter counts intensified. A small plant collection was made and will be sent to the National Museum for keying. Other additional projects included a compilation of two seasons bird check lists, a cover survey of all ponds and lakes on the study area, and a wildlife food utilization survey of Selawik village. These projects are not included in this report and will be dealt with separately.

An 18 foot skiff with a lift, and a 14 foot canoe were added to the equipment. Both proved satisfactory and seem to fill requirements for work in the Selawik area.

All gear not returned to Fairbanks was stored at Selawik Village and a list of these items is available at the Fairbanks office.

Climatic and Habitat Conditions

Selawik underwent an early breakup this season, with the ice passing the village on May 20, 1956. Effects of this early

breakup soon became evident in local phenology and were noticed from the start of field operations. Vegetative and animal life illustrated an advance of a week to ten days, compared to the same dates last year (this period is roughly equal to the delay in break-up). These observations were largely reflected in rapid growth of emergent vegetation, leafing of alder, and in post nuptial gathering of male waterfowl.

Local water levels were essentially the same as they appeared after breakup in 1955. In fact, the increased snowfall during the winter had but little effect on the 1956 run-off, although the picture might have been different had not most of this water source been evaporated by continuous warm winds during April and May. The water level at Selawik dropped 14 inches from June 4-14, but started a slow rise on June 15 when a strong west wind began. This wind continued for fourteen days bringing the water levels above those of June 4. After these winds ceased, the shortage of rain caused a sudden drop in water. Consequently, mid-July levels were lower than any seen on previous field work. On the Upper Selawik many lakes were down over 3 feet from 1955 levels.

Heavy rainfall on July 24 and 25 brought the streams and lakes up to early spring levels, with subsequent rainfall sustaining this increase throughout the remainder of July and early

August.

It was felt that habitat conditions were as good or better than the 1955 season. Generally, Selawik is not subject to extreme fluctuations of water, and nearly all lakes on the study area were in the same condition as the previous season. The accelerated growth of aquatic and terrestrial vegetation created a more suitable cover for nesting and brooding ducks, whereas in 1955 much of the vegetative cover was not sufficiently dense when many of the young waterfowl began to hatch. Furthermore, the harsh and bitterly cold west winds noted in last year's work were not as prevalent and were shorter duration, due in part to the rapid breakup of Selawik and Kobuk Lakes.

Seasonal Phenology - 1956:

The results of an early spring were shown in much of the 1956 waterfowl phenology. Migrant geese first appeared April 28, followed by flights of pintail on April 30. Many dabblers became evident the first two weeks in May, especially baldpate and teal. Scaup arrived May 15, and on May 16, old squaws were commonly seen. The late arrivals, largely American scoters, were on the Marsh by May 21.[1]

Pintail ducks and geese first nested about May 15; baldpate nesting the last week in May, followed by scaup which were laying the first week in June. A substantial increase of lone male scaup

[1] All dates on spring arrival before June 4 were supplied from the field notes of Lloyd S. Davis.

in breeding pair observations on June 10 gave evidence that many of these ducks had begun their nesting duties.

Overall nesting extended from May 15 to July 15.

Territorial dabblers and divers were commonly seen on the marsh throughout June. Paired pintail were infrequently seen after the last week in June and rarely observed in early July. Baldpates could still be seen paired the first week in July, while paired scaup occurred over the study areas as late as July 15 (A male scaup still in breeding plumage was noted July 25).

Post nuptial flocking of pintail and mallards had begun before field work started and reached a peak between June 9 and June 12. A week later, bachelor flocks of baldpate, teal, shoveller, and some scaup were gathering over the marsh. On June 15 scattered flocks of from 4 to 10 whitefronts in each were commonly seen. At this date the first small groups of male scaup and old squaw appeared, and by June 21 had reached appreciable numbers. Many of these diver drakes and some baldpate were still flying as late as July 10.

Pintail in partial eclipse plumage were observed June 11 and many had begun the wing molt by June 21. The beginning of wing molt and appearance of first young has coincided both seasons at Selawik. This flightless period extended about one month or an interval nearly equal to the time required for fledging

and flying of young pintail.

Other dabblers, including baldpate, teal, and shoveller started molting the last week in June. Canada geese and white-fronted geese were well into the molt by July 7 and some had regained flight ability by July 15.

The first flocks of post eclipse geese were noted on July 19. These flocks increased in number and reached a peak the last week in July. Most of the geese gathered on the east shore of Selawik lake, with the white fronted geese beginning the fall migrational flight early in August. Newly fledged and flying pintail and mallards were seen on July 18 and 19. Flocks of adult dabblers were quite common the first week in August. A few newly flying scaup mingled in with the dabbler flocks, but most had still not completed the wing molt before August 7. (See Table 1).

Breeding Pair Counts

The first ground census counts of breeding pairs was begun June 4 and concluded June 13. These counts indicated a population of 14.3 pairs per square mile, or about fourteen per cent increase over 1955 figures.

The counts, however, were begun a little late and some pintail had started incubation. Consequently, the male post nuptial desertion had commenced and the overall figure, especially for pintail, could have been slightly higher. The reverse of this

was noted from diver counts as many scaup still were in transient; thus, the population of this species was probably not stabilized at the conclusion of the first census. Furthermore, constant high winds during the ground survey caused considerable movement of paired scaup between segments of the study area, no doubt duplicating counts. A second census count late in June showed that a population of paired scaup equal to that of early June was still present on the marsh. At first the reason for this sizeable population of scaup remaining on the marsh so late was not known, but later evidence pointed towards the possibility of a substantial renesting effort.

It is thought, especially for the Selawik area, that a count beginning one week to ten days after breakup, followed by an extra scaup census, would more effectively estimate the local breeding population. Aerial counts probably would be of more value in population estimates if carried out not more than two weeks after breakup. (See Table 2 for species composition of breeding pairs and broods.)

TABLE 2

Ground Composition by Species - Selawik 1956

	Breeding Pairs	Broods*
Scaup	46.1	41.5
Pintail	23.2	23.0
Baldpate	11.2	18.7
Teal	5.4	7.0
American Scoter	7.5	6.0
Old Squaw	0.9	0.5
Mallard	2.0	1.1
Shoveller	3.3	1.7
Canada Goose	0.4	0.5
	100.0	100.0

*Based on first census count.

Nesting Success Census by Counts of Deserters

An intensified deserter count was conducted this season and covered a larger area than previously censused during 1955. These counts were taken from July 15 to June 24, censusing only pintail and baldpate (See Table 3).

TABLE 3

Deserter Counts

Date	Pintail Female	Pintail Male	Date	Baldpate Female	Baldpate Male
June 15	14	115	June 18	0	25
18	8	50	19	1	32
19	14	90	20	3	55
20	28	200	21	6	132
21	29	202	23	6	60
23	32	180	24	6	63
24	27	190			
	152	1,027		22	367
SUCCESS - 87%			SUCCESS - 94%		

Techniques for the counts were again modified for the Selawik area, largely because of visibility factors and the scattered occurrence of deserter flocks. We found that surveys run by motorboat were more satisfactory than stalking or canoeing upon flocks. The motor method was faster and at times frightened small flocks of 5 to 10 birds that would often hide in emergent vegetation and not flush when counted by canoe or on foot.

Another factor, applicable to other areas as well, was wind and strong sunlight. When approached upwind, birds will most often flush into the wind and away giving little time for positive sex differentiation. This visibility factor is especially intensified by strong sunlight in the observers eyes and glasses. Our counts were held down wind with the sun to our backs, thus avoiding these unfavorable conditions.

Counts were discontinued when hens could not be distinguished from eclipse drakes. However, it would have been possible, but not practical to continue baldpate counts at least one more week. Pintail counts may be most satisfactorially taken from the peak of male post nuptial gathering on into the first of the brood season. This is also applicable to baldpate counts, but will extend the census period a week to ten days.

1956 Production Studies

1956 production studies at Selawik were carried on over the

same area as established last season. Two small, additional segments were added to the original study area, enlarging this area to twenty-five miles.

Only one brood census was conducted, beginning July 18 and ending July 23. This census showed an average of 6.2 broods per square mile. Of this number 33% were class II and III broods. The 1955 first count gave 4.9 broods per square mile, of which 16% were class II and II broods. Size of class II brood rose from 5.7 ducklings per brood in 1955 to 6.3 in 1956. Brood counts and sizes are available in Table 7.

Notable in comparison of 1955 data with that of 1956 was the significant gain in pintail and baldpate broods. (See Table 4 for comparative date). These species showed a 44% and 47% increase respectively, over the 1955 first counts. Baldpate illustrated a 14% gain over 1955 final figures. The gain in pintail on the 1956 census, however, might be partially attributed to the advanced phenology of the season (87% class II, 1956; 27% class II, 1955). Although the census periods were purposely dropped back one week in an effort to compensate for the earlier season.

Baldpate on the other hand were not greatly advanced in their brood phenology (average date of hatch was three days earlier than in 1955), and certainly showed an increase.

Scaup counts, including potential later broods, failed to equal 1955 first brood count figures. A decrease in scaup broods was detected on the study area and might have been of considerable consequence had there not been as large a late hatch as occurred in late July.

A hatching curve compiled from aged scaup broods showed a bi-modal curve, which might indicate one of two possibilities. That is, a definite renesting by the scaup or the presence of two separate populations. Most evidence on hand points toward the first possibility, that of an extensive renesting effort. First a comparison of the sizes of these late broods with that of the earlier broods showed a difference of one duckling per brood. Next, the interval between these peaks is roughly 18 days, which corresponds to a few days less than the normal incubation period of scaup. Finally, the exceptional number of late pairs noted in early July adds some plausibility to this assumption (See Figure I for 1956 hatch curves).

A second brood count was not possible this seasgn; therefore, final production figures for 1956 can not be given. It was apparent, however, that there was a slight increase in dabbling duck production, and a small and perhaps local decrease in diver production. In all, the outlook for an increased final

production was good and overall productinn probably was equal, or slightly exceeded the 1955 figures.

Banding - Selawik 1956

Banding operations were initiated July 7 and continued until August 8, 1956. The week of July 7 to July 14 was spent banding white-fronted and Canada geese on the Upper Selawik and Ta-grau-vic Rivers. The low water this season hampered the banding of white-fronted geese considerably, but concentrations of lesser Canada geese discovered on the Ta-grau-vic River bolstered the total number of geese banded measurably. In one day's travel up this river over 1,000 geese were noted loafing and feeding along its banks. Undoubtedly many more escaped by portaging across river bends and into nearby lakes.

Some dabbler banding was attempted throughout the remainder of July, but few ducks were banded. Weather conditions in late July allowed little banding, and it was not possible to visit the better dabbler areas visited last season.

Diver banding was started on July 30 and continued until August 7. The portable diver trap was used again this year and found quite effective in most situations. Because scaup broods were widely dispersed over the marsh, banding of this species was slow and arduous, calling for considerable movement, numerous portages, and repeated settings of the net.

These factors and the small number of scaup all contributed to a lowered banding success with only 85 scaup banded. (Tables 5 and 6 summarize banding and weights of banded birds).

TABLE I

1956 WATERFOWL PHENOLOGY - SELAWIK, ALASKA

Species	First Arrival	Est. First Nesting	Est. First Nest Hatch	First Brood Obser-vation	Moulting Adult	Fledged Young	Adult Moult Completed	Computed Hatch Peak
Pintail	4/20	5/21	6/16	6/17	6/21	7/21	7/18	6/26
Scaup	5/15	6/1	7/6	7/6	6/31		8/6	7/19
Baldpate	5/7-14	5/21-30	6/26	6/29	6/28	8/1-7	7/23	7/10
G. W. Teal	5/7-14	5/21-30	6/24	7/1	7/1	7/28	7/21	7/9
Canada Goose	4/28	5/21	6/20	6/27	7/6	8/1	7/23	7/1
W.F. Goose	4/28	5/21	6/16	7/7	7/6	7/28	7/19	6/26
Am. Scoter	5/21	6/15	7/21-28	8/3				8/1
Mallard	5/1-7	5/21		7/21			7/19	6/21-30
Shoveller	5/7-14	6/1	7/1	7/3	6/26		7/21	7/1-7
Old Squaw	5/15	6/7-14	7/15	7/23	6/28			7/19-26

TABLE 4

COMPARISON OF 1955-56 FIRST CENSUSES OF BROODS - SELAWIK

AREA I	SCAUP	PINTAIL	BALDPATE	G.W.TEAL	SHOVELLER	MALLARD	AM. SCOTER	OLD SQUAW	
a									
1955	9	6	2	3	-	-	2	0	22
1956	12	4	5	1	-	-	1	-	23
b									
1955	14	9	8	3	-	-	0	1	35
1956	12	10	12	3	1	1	3	0	42
c									
1955	6	4	2	0	-	-	0	-	12
1956	12	6	7	2	-	-	2	0	29
d									
1955	13	2	8	-	2	1	0	1	27
1956	10	11	4	-	-	-	1	-	27
e									
1955	2	1	1	-	-	-	-	-	4
1956	6	10	10	4	1	1	2	1	35
TOTAL 1955	44	22	21	6	2	1	2	2	100
TOTAL 1956	52	41	38	10	2	2	10	1	156
							+ 1 Canada Goose Brood		
1955 Broods/sq. Mi.	2.2	1.1	1.0	.3	.1	.05	.1	.1	4.9
1956 Broods/sq. Mi	2.0*	1.6	~~.4~~ 1.5	~~.08~~ .4	.08	~~.4~~ .05	.4	.04	6.1
FINAL 1955	3.7	1.4	1.3	.3	.15	.1	.43	.15	7.5

*Included potential later broods

TABLE 5

SUMMARY OF BANDING - SELAWIK 1956

SPECIES	ADULT M	ADULT F	LOCAL M	LOCAL F	TOTAL BANDED*
W.F. Goose	13	14	4	11	94
Canada Goose	10	19	25	16	72
Pintail	1	2	7	11	27
G.W. Teal	-	-	2	6	8
Baldpate	-	-	9	5	14
Greater Scaup	-	2	40	41	85
Am. Scoter	-	1	-	-	1
					301
OTHER					
Wilson Snipe	-	-	- 2		2
				TOTAL	303

*Not all ducks were sexed.

TABLE 6

WEIGHTS OF BANDED BIRDS

SPECIES	ADULTS No. of Birds	Av. Wts. By Sex	Age Class	LOCALS No. of Birds	Min. Wt.	Max. Wt.
					In Ounces	
W.F. Goose	11	M-5 lbs	I c	1	28 -	28
	14	F-4 lbs,8 oz.	II a	5	36 -	40
			b	7	40 -	45
			c	1	51 -	51
Lesser Canada Goose			I b	3	11 -	12
			II a	6	28 -	36
Pintail		F-1 lb., 9 oz.	I c	4	6 -	7
			II b	7	15 -	20
Baldpate			I b	2	5 -	5
			c	1	7 -	7
			II a	1	9 -	9
			b	5	15 -	18
Greater Scaup		F-1 lb., 8 oz.	I b	1	6 -	6
			c	3	7 -	8
			II a	53	9 -	15
			b	26	16 -	22
American Scoter		F-1 lb., 12 oz.				

TABLE 7

SCAUP BROOD OBSERVATIONS - AGE CLASS AND NUMBER
NO. BROODS)SIZE(

DATE	I a	I b	I c	II a	II b	II c
July 6	2 (7,9)					
19	5 (7,8,9,8,9)	5 (9,9,8,10,6)				
20	2 (10,7)	4 (9,8,10,9)	1 (8)			
21	2 (9,9)	5 (3♂, 1♂,8,7, 8)	1 (6)			
23		3 (10,9,9)	1 (8)			
27		2 (9,8)	2 (9,9)			
28	1 (5)		1 (7)			
29	1 (8)					
Aug. 2	4 (3,5,6,1♂)					
3	1 (7)					
4	2 (7,4)	1 (1♂)			1 (7)	
6	2 (6,5)		1 (8)		1 (9)	
7			1 (6)	1 (10)	5 (4,7,7,8,8)	
8	3 (6,1♂,2)	3 (5,7,8)	1 (8)		3 (6,8,8)	
	Av. I 52 broods - 7.3			Av. II 11 broods - 7.4		

PINTAIL BROOD OBSERVATIONS - AGE CLASS AND NUMBER NO. BROODS (SIZE)

DATE	I a	I b	I c	II a	II b	II c	III
June 17	1 (8)						
27		1 (1♂)	4 (9,5,4,5)				
29			1 (8)				
30	1 (4)						
July 6				1 (5)			
10	2 (5,5)		1 (8)	1 (7)			
14				1 (7)	2 (1♂,6)		
18	1 (6)						
19		1 (3)		1 (2♂)	1 (1♂)	1 (1♂)	1 (5)
21			1 (2♂)				3 (1♂, 1♂),9)
22				1 (3)	2 (6,2♂)		1 (2♂)
23				1 (3)	1 (5)		2, 6,7)
27							1 (2♂)
28							1 (4)
Aug. 4					1 (4)		1 (8)
Av.	Av. Cl I - 12 broods, 5.8			Av. Cl II - 9 broods, 5.1			Av. Cl III - 6 broods, 6.5

BALDPATE BROOD OBSERVATIONS _ AGE CLASS AND NUMBER NO. BROODS (SIZE)

DATE	I a	I b	I c	II a	II b	II c
June 30	1 (6+)					
July 2	1 (9)					
10	2 (2,6)	2 (9,9)				
14	1 (5)					
19	2 (8,4)	2 (3,3)				
20	1 (9)	2 (9,10)				
21	1 (6)	6 (12,4,5,5, 8,5)	1 (11)			
22		2 (6+,6)	1 (8)			
23		1 (5)	1 (8)	1 (7)		
26		1 (5)	1 (7)			
28		1 (4)				
Aug. 6				1 (7)		
	Av. Cl I - 28 broods, 6.9			Av. Cl II - 2 broods, 7.0		

GREEN-WING TEAL BROOD OBSERVATIONS - AGE CLASS AND NUMBER NO. BROODS (SIZE)

DATE	I a	I b	I c	II a	II b	II c	III
July 1	1 (8)						
9				1 (10)			
19			1 (9)				
20				1 (8)	1 (8)		
21		1 (7)			1 (10)		
22				1 (2♂)			
23				1 (7)	1 (1♂)		
29	1 (7)						
Aug. 3					1 (8)		
	Av. Cl I - 4 broods, 7.7			Av. Cl II - 6 broods, 8.5			

SHOVELLER BROOD OBSERVATIONS - AGE CLASS AND NUMBER BROODS (SIZE)

DATE	I a	I b	I c	II a	II b	II c	III
July 3	1 (9)						
22		1 (6)					
28			1 (5)				

AMERICAN SCOTER BROOD OBSERVATIONS - AGE CLASS AND NUMBER
NO. BROODS (SIZE)

DATE	I a	I b	I c	II a	II b	II c
Aug. 3	1 (16)					
8	1 (7)	1 (8)				

MALLARD BROOD OBSERVATIONS - AGE CLASS AND NUMBER
NO. BROODS (SIZE)

DATE	I a	I b	I c	II a	II b	II c
July 21	1 (7)	9				
22				1 (2+)		

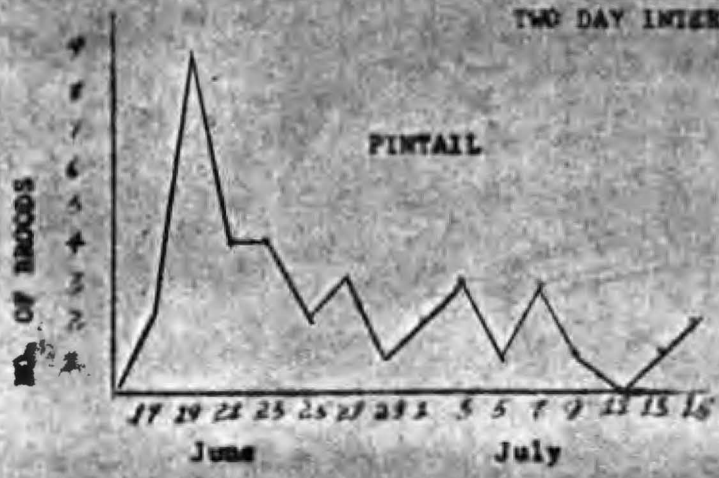
CANADA GOOSE BROOD OBSERVATIONS - AGE CLASS AND NUMBER
NO. BROODS (SIZE)

DATE	I a	I b	I c	II a)	II b	II c
June 27	1 (1/-)	1 (3)	1 (2/)			
July 17					1 (5)	

WHITE_FRONTED GOOSE BROOD OBSERVATION - AGE CLASS AND NUMBER
NO. BROODS (SIZE)

DATE	I a	I b	I c	II a	II b	II c
July 7		1 (3)				

FIGURE 1
1956 HATCHING CURVES
TWO DAY INTERVALS



Computed Av. Date of Hatch:
June 26

Computed Av. Date of Hatch:
July 19

BALDPATE

Computed Av. Date of Hatch:
July

SECTION II
Part A
Air-Ground Comparison Study
SELAWIK 1956

Breeding population study:

Habitat effects on visibility:

During the spring breeding pair counts the marsh in the immediate vicinity of the Selawik study plots was in optimum condition for aerial census counts. (The visibility index for breeding pairs was computed as follows:

$$\frac{6.8 \text{ (air)}}{14.3 \text{ (ground)}} = .48 \text{ or } 2.10)$$

Very little, if any, green vegetation was present and only a small portion of the area had old dead emergent cover showing above the early spring high water. In some instances surrounding patches of alder and willow provided loafing and resting cover for waterfowl, although this type of cover is mainly utilized during periods of high winds. Because the Selawik area is subject to high winds of long duration, this factor might limit visibility considerably if aerial counts happened to be conducted at such times. Other than these restricting factors, very few unfavorable habitat conditions are present on the lower flats. Progressing upriver in an easterly direction, the presence of muskeg type habitat probably will interfere with aerial observations.

Weather and time of day:

Weather and time of day have differing effects on aerial and ground census counts. Movement and dispersal of territorial pairs is quite evident during periods of high winds. Although this factor is thought to be of little consequence as far as air counts are concerned, it does cause some duplication in ground counts because of the much longer time required for these counts. Rough water and poor light conditions also decrease the visibility during aerial counts. In addition, the angle of sun rays, rough air, and poor light are known to obstruct vision.

Lone drakes are most often observed in the early morning and evening, while pairs are evident from mid-morning until late afternoon. As the nesting season progresses, drakes become more numerous through the day when hens are laying or in early incubation --- especially during warm weather. Dabbler drakes, when alone, often hide in emergent brush or available dead cover but pairs tend to stay out of these types of cover in favorable weather. Divers, on the contrary, will most always be seen on the open bays and coves. This fact is especially true of lone drakes. These birds are seldom found in heavy cover, except during periods of high wind.

Deserter counts appear to be a useful tool in predicting nest success and probable brood production. Surveys this year indicated the possibility of a good season, which was true as far as dabblers were concerned and could have been true for divers. Diver pro-

duction, however, did not parallel that of the dabblers and was down over the previous season. Counts made in 1955 suggested a poor dabbler hatch and, conversely, the diver hatch was good.

Personal observations of two waterfowl areas and review of other phenology records demonstrate a possible correlation between chronological sequence and production from year to year.

This year's Selawik brood hatch curves and deserter counts illustrate a much more successful initial nesting and a substantial early hatch. Conversely, last year's data (season 10 days later) showed only a fair nesting success and an extended brood season. Some years a late season might turn waterfowl from the breeding area which could have been one reason for the surplus of dabblers noted on the Selawik breeding pair counts in 1955. Early seasons appear to favor habitat conditions and might provide more optimum nest and brood cover during the critical late incubation and early brood period. This factor may also be reflected by increased average brood and clutch sizes. A gain in brood size was noted here in 1956 and Lensink (1954) remarked on this same point at Ft. Yukon. He noted a reduction of brood and clutch sizes during late seasons, but stated however that no corroborative information was available.

Summary:

1. Because the habitat of the lower Selawik flats has a more or less homogenous character during the first part of the breeding season (June 1-15), it is felt that habitat conditions are optimum for aerial census counts.

2. Wind appears to be the prime weather factor working against good aerial visibility.

3. Movement of breeding pairs has little effect on aerial counts as they can be completed in a relatively short period of time.

4. Visibility of loon drakes and pairs is dependent upon a number of factors, i. e., changes in weather, stage of laying, and territorial characteristics.

5. Deserter counts seem to be a useful tool in predicting dabbler probable production but have shown little correlation with the outcome in diver production.

6. Personal observation and other phenology records demonstrate the possibility of some relation between chronological sequence and production from year to year.

SECTION II

Part B

Air-Ground Comparative Study
SELAWIK 1956

Production Survey:

Habitat effects:

Data gathered on the July 17 aerial brood census gave a count of 25 broods on 13 square miles of the Selawik study area. These data were compared against ground counts which indicated that 156 broods, including potential later broods, were present. This information was in turn computed and the air-ground visibility index derived as follows:

$$\frac{\text{13 sq. mile (Air)}}{\text{25 sq. mile (Ground)}} = \frac{\text{25 (Broods)}}{x}$$

$$13x = 625$$

$$x = 48 \text{ and,}$$

$$\text{Visibility index} = \frac{48}{156} = .30$$

Conditions for the counts were most favorable, with no wind and good light. Some transects had to be flown away from the sun because navigation was impaired by direct light in the pilot's eyes. Future transects could be arranged in other areas to avoid such an unfavorable factor.

Assuming that the entire study area consists of a homogenous habitat of varying densities, all cover and emergent vegetation

was recorded along each transect by average density and expressed in per cent. A graph was then constructed and broods seen on each transect plotted against the average vegetative densities of the corresponding area on the ground where they were observed. Analysis of these data suggest the following points:

1. High and low brood density areas were reflected in the aerial counts, except in the case where emergent cover exceeded 33% of the total water area.

2. Optimum visibility occurred below the 33% level of emergents.

The data also revealed that approximately the same percentage of Class II and III broods were observed from the air as were on the ground (ground-33%, air-32%). Consequently nearly the same percent of Class I broods was observed by both methods. Of the Class II and III, three were identified as pintail, and it is assumed that nearly all the other Class II broods were also pintail. Moreover, only four class II broods (3 green-wing teal and 1 baldpate) other than pintail were counted on the ground.

Of the 17 Class I broods observed from the air, 9 were identified as scaup broods. The remaining 8 broods were unidentified as to species. Thus it is felt that divers are

perhaps readily observed from the air.

No potential later broods as evidenced bypairs, lone drakes, or hens were recorded by aerial observation.

It is felt that aerial crews should be able to measure Class II brood sizes and determine changes from year to year. Aerial counts, however, may tend to underestimate actual brood size. The validity of using Class III brood counts appears doubtful because considerable intermingling of ducklings occurs at this stage of the flightless period. In addition, groups of moulting adults could easily be mistaken for Class III broods because the speed at which the surveys are taken affords little time to observe behavior. It seems plausible that more emphasis should be placed on recording Class II broods and sizes, and disregard Class III brood sizes which are often distorted and thought meaningless for production forecasts.

Unfortunately our July aerial brood counts did not include brood sizes so no comparative data are available.

When observed from the air the mixed broods of scaup of all ages might cause some confusion as to the number of broods and brood size. Scaup appear to have a "baby sitting" habit and often a hen will care for two or more broods while the other hens are feeding. Baldpate have also been observed

engaged in this unique behavior, both at Selawik and at Minto Lakes.

Finally, no positive evidence as to differences in cover or habitat utilization by all age classes was found; Class I downies are just as apt to use the same cover as Class III broods, although the older ducklings frequently conceal themselves in very dense vegetation which early Class I broods avoid because it restricts their movements. Concentrations of dabblers usually occur in areas of high density emergent vegetation, thus complicating aerial observation.

Effects of weather and time of day on brood visibility:

Observations throughout the brood season gave evidence that early evening is by far the best time for brood counts. In areas seemingly devoid of broods during the day (especially dabbler broods) birds were seen to appear like clock-work on open water areas in the late afternoon and early evening. This fact was especially true on warm, sultry days during which few broods were seen until the cool of the evening. Overcast and rainy days seem to appeal to waterfowl and observations on those days are more frequent, provided there is little wind. These days showed a considerable movement of broods, few prefering to remain in heavy cover. Scaup and baldpate are not as subject to the above factors and can be observed at most any time on open water areas during favorable weather.

Wind again, as with breeding pairs, appears to be one of the prime unfavorable factors acting against brood visibility. Even scaup, generally an open water duck, will head for cover when the wind begins to blow over the flats. It is felt that during periods of high wind, or even a slight wind, visibility would be impaired measurably by both forcing the waterfowl to cover and distorting the lake surfaces so that broods cannot be detected.

Relationship of brood data to total production:

If a favorable breeding population was found on the spring census counts, a decrease in the average size of Class II and III broods might be indicative of two conditions:

1. A poor nesting success, which could be determined by deserter counts.

2. An extended brood season.

Both conditions could conceivably be reflected in the percentage of Class II broods tallied on the brood census counts. An extended brood season, possibly lengthened by a late spring, exposes the hatch to increased mortality, which, if corroborative evidence can be shown, would be evident in the number of ducklings per Class II brood.

Brood counts with proper adjustment to seasonal phenology might be used to show production trends from year to year. The

number of Class II broods per square mile would no doubt give some indication of seasonal progress and final production.

A fairly definite relation between potential later broods and final production was noted at Selawik this year. Counts of scaup broods during the census period gave an impression of a much lowered production; however, counts of lone hens at the same time were nearly equal to the number of broods present. These potential later broods were found to have hatched on a follow-up count over two segments of the study area. Therefore, in order to avoid erroneous impressions of total production, it seems logical that these potential broods must be taken into consideration. Whether potential later broods can be assessed by aerial counts remains unsolved but they are needed to complete the picture in estimating final production.