An Experimental Roadside Waterfowl Production Survey in Stratum 27, Alberta

by

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During July 7-11, 1969, a roadside survey of young waterfowl was made along selected transects in Stratum 27, Alberta. This Stratum roughly encompasses the parkland region of the province. The purpose of this work was mainly to give some insight as to the feasibility of a possible operational roadside production survey and to provide data comparable with that obtained in an aerial waterfowl production survey conducted in Stratum 27 (Norman and Purinton, 1969) and throughout the prairie and parkland waterfowl breeding range by the U.S. Bureau of Sport Fisheries and Wildlife. Although it was expected a roadside survey would be considerably more time consuming than an aerial survey, it was felt that this disadvantage might be compensated for by the obtaining of more detailed and accurate data in a ground survey. The expected primary advantage of the ground survey was an ability to speciate observed ducklings which is not possible in the aerial survey.

Methods

The roadside counts were made along 40 transects each eight miles long. Transect locations were chosen by first drawing four evenly spaced east-west lines across Stratum 27 which extends about 200 miles from east to west and 130 miles from south to north.

Alternate eight and ten mile intervals were plotted along these lines, the eight mile intervals representing the "ideal" transect locations. Actual transect locations were then determined by placing the actual transects as close to the "ideal" transect locations as the existence of a continuous eight-mile segment of east-west road would allow. In several cases the route was also jogged along a north-south road. This arrangement resulted in the placement of ten transects approximately along each of the four east-west lines, the resulting 40 transects being separated by approximately ten mile east-west intervals and 30 mile south-north intervals.

The survey period was from July 7 through 11, 1969. Each survey day was divided into a morning observation period, from 5:30 A.M. to 9:30 A.M., and an evening period, from 4:00 P.M. to 8:00 P.M., because it was expected more waterfowl would be seen during these times then during mid-day. Two two-man crews equipped with binoculars and window-mounted spotting scopes were employed. Water bodies completely or partly within a 1/8 mile wide strip on each side of the survey route and visible from the road were included in the survey. For borderline water bodies only waterfowl on that portion of the body judged to be within 1/8 mile of the road were counted. Each water body was quickly scanned as it was approached in the survey vehicle. The vehicle was then stopped and the water area scanned several times with binoculars.

Observed ducklings were recorded according to species, age-class (Collop and Marshall, 1954) and numerical size of broods. The species of very young ducklings was in most cases determined through observing the accompanying adult female. More advanced ducklings could usually be speciated independently of the parent. Record was kept of which brood counts were thought to be complete as compared to those where it was thought some members of the brood might have been overlooked.

By comparison, the U.S. Bureau of Sport Fisheries and Wildlife aerial production survey in Stratum 27 is conducted along five evenly spaced uninterrupted east-west transect lines across the stratum. The survey route comprises 864 linear miles. The survey aircraft is flown at about 100 miles per hour and at about 125 feet above the ground. The two-man crew records waterfowl observed within 1/16 - mile on each side of the survey route. Broods are recorded according to the three major age-classes, I, II and III, flying young being included in the Class III category. When conditions permit, the numerical size of observed Class II and III broods is recorded. No attempt is made to determine the species of broods. In 1969 the aerial survey in Stratum 27 was conducted during July 11-13. The transects were flown between approximately 6:00 A.M. and 10:00 A.M.

Results

Table 1 shows according to species and age-class the number of broods as well as numbers of ducklings encountered in the roadside survey. As might be expected a sizeable portion of the observed broods of generally early-nesting mallards and pintails were in the fully feathered Class III and Flying age category. However, good numbers of Class I and II mallard broods indicated a substantial late nesting effort for that species. Most of the broods of later nesting species such as gadwall and scaup were in the Class I category. Mallards and pintails, the two most common nesting species in the stratum, were also the two most commonly encountered species of broods; mallards making up 20 percent and pintails 19 percent of observed broods. However, observed gadwall and widgeon broods averaged numerically larger than pintail broods resulting in more individual ducklings of these two species being seen than of pintails.

Average brood sizes, based only on observations where it was thought the entire brood was counted, are shown in Table 2 according to species and age-class. Although it might have been expected that the numerical size of broods would decrease with increasing age as a result of partial mortality in broods, for both mallards and pintails fairly large samples showed Class III and Flying broods to be of larger mean size than younger broods. The same relationship held true between good-sized samples of Class I and II widgeon broods. A possible explanation for this could be that for normally early nesting species like mallards and pintails the older broods represented successful first nesting attempts, while the younger broods represented second attempts by hens who lost their first clutch. As was pointed out by Sowls (1955) there is a tendency for clutch size to be larger in first nesting attempts than in later attempts. In this same regard the results generally also showed the Class I broods of normally late nesting species like gadwall and blue-winged teal to be larger than the Class I broods of the usually early nesting species, the Class I broods of the late nesting species probably representing first nesting attempts.

Although the aerial survey in Stratum 27 was slightly later than the ground survey and the survey routes did not coincide, it is felt the survey periods were close enough and the sampling intensities of the two surveys high enough to allow some comparisons of results. These comparisons are given in Table 3. The number of broods seen in the two surveys was similar with about 10 percent fewer broods being seen in the ground survey. Per linear mile of survey route slightly more than twice as many broods were seen in the ground survey; however since the width of the ground survey transects was 1/4-mile while that of the air survey transects was 1/8-mile, results were more similar in terms of broods seen per square mile of area surveyed. Because of the higher speed of coverage from the air and the fact that there were only two persons involved in the air survey as opposed to four in the ground survey, about five times as many broods were seen from the air per man-hour spent on the transects.

The age-class composition of observed broods differed somewhat between the two surveys. Class I and Class III and Flying broods made up a relatively larger portion of brood observations in the ground survey than in the air survey. This might be interpreted to mean that in the air survey a larger proportion of broods in these two age categories, as compared to broods in the Class II category, are overlooked. The Class I young could be more frequently missed because of their small size, and the Class III and Flying young could sometimes be mistakenly identified as adults.

Somewhat surprisingly, average numerical sizes for Class II and for Class III and Flying broods for which a complete count of individuals was thought obtained were larger for the aerial survey than the ground survey. It had been expected that because of the rapidity with which the aircrew passed over broods, as opposed to the ground crews' ability to stop and study them, there might be a tendency in the ground survey to occasionally detect additional hidden brood members that from the air would be overlooked. However, the larger brood sizes in the aerial results do not indicate any tendency toward this occurring.

Conclusions

Largely as a result of being able to separate observed ducklings according to species, the ground survey is felt to have provided considerably more valuable data than could be obtained in an air survey. However, it proved much more time consuming than an aerial survey. Although it would probably be possible to reduce each two-man ground crew to a single person without greatly decreasing the number of broods observed per crew, it is still expected it would take four men working eight hour days perhaps a week to cover as many linear miles of transect as a two-man aircrew could cover during flights on three mornings. Such a time and manpower consuming survey is perhaps not warranted or possible on an operational wide-scale basis under present conditions. However, such a survey might be considered should a need arise in the future for more detailed information on the productivity of individual species. At such a time the undertaking of a ground production survey would probably require the co-operative efforts of individuals from a number of conservation organizations.

In Table 4 is indicated a possible method by which results of a ground-based survey of young waterfowl could be used to predict reproductive success of individual species. The method gives for each species a productivity index which is basically a ratio between young observed in the production survey and an estimate of the adult breeding population. In the example the breeding population estimates are based on counts made in Stratum 27 during a May waterfowl breeding pair survey (Norman and Purinton, 1969). In arriving at estimates of total breeding populations, transect counts were expanded to account for the total area in the stratum and to account for a proportion of waterfowl present along transects that were overlooked by the aircrew. The duckling population indexes were obtained by expanding the duckling counts obtained in the ground production survey to account for total area in the stratum (expansion factor = square miles in stratum ÷ square miles of area surveyed). Relating the breeding population survey results to the production survey results in the manner shown is based on the assumption that although the routes of the two surveys did not coincide, enough area was sampled in each survey to allow matching of results. However, more reliable productivity indexes would probably result if the counts of adults and young were both made along the same transects.

The practical use of productivity indexes such as shown in Table 4 as bases for setting hunting regulations would require that the indexes allow predictions of expected immature/adult ratios in fall populations. Following each hunting season it is possible to estimate for various waterfowl species what the immature/adult ratio was immediately prior to the beginning of the hunting season based on immature/adult harvest ratios obtained from the Species Composition Survey corrected for differential immature/adult hunting vulnerability with results from pre-hunting-season banding. Thus, by obtaining productivity indexes over a number of years and correlation these with matching year immature/adult ratios in fall populations, as determined after each hunting season, it might be possible with experience to predict from productivity indexes fall population immature/adult ratios.

While for a particular species differences in productivity indexes among years and regions would be expected to reflect actual differences in reproductive success, direct comparison of productivity indexes among different species would not be as valid. As a result of interspecific differences in the timing of hatching peaks and in brood behavior, similar reproductive success among different species might be represented by widely different productivity indexes - and vice-versa. For example, the low productivity index shown in Table 4 for scaup as opposed to the high index for gadwall may be in part due to the survey occurring before the scaup hatching peak but just after the gadwall hatching peak. As another example, the higher canvasback than mallard productivity index could be due to a possible tendency for canvasback broods to be on large, rather open water bodies where they can be easily seen out to the boundaries of the 1/4 - mile wide survey strip, while on the other hand mallard broods may tend to remain in smaller more heavily vegetated potholes where they are difficult to observe.

A possible refinement for improving the accuracy of the productivity indexes might be to apply different weighting factors to the survey counts for different age-classes thereby accounting for differences among age-classes in the proportion of observed young that would be expected to survive to the hunting season. For example, a fairly large portion of observed Class I ducklings might be expected to suffer mortality before they gain flight, while on the other hand most observed Class III and Flying young, having survived the most dangerous juvenile period might be expected to live to the hunting season. Thus, an observed Class III duckling might be given more weight in arriving at a productivity index than on observed Class I duckling. However, knowing the exact weighting factors to apply to each age-class would probably require more information on duckling mortality than we now have.

Annual variations in water conditions at the time of the survey would be expected to have an influence on the proportion of observed young that survived to the hunting season and on the number of broods hatching after the production survey. Thus, another possible refinement in determining productivity indexes might be to adjust the indexes with results of water body counts obtained during the survey. In years with above average numbers of water bodies, basic productivity indexes might be adjusted slightly upward; and in years of poorer water conditions adjusted slightly downward. However, it is expected that most of the annual and regional variability in reproductive success due to differences in water conditions would be reflected in the unadjusted duckling counts.

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Table 1. Observations of ducklings during a 1969 experimental roadside waterfowl production survey in Stratum 27, Alberta.

	BROODS				DUCKLINGS			
	Class I	Class II	Class III and Fly	Total Broods	Class I	Class II	Class III and Fly	Total Ducklings
Mallard	17	12	29	58	75	55	213	343
Gadwall	35	2	2	39	273	18	13	304
American Widgeon	25	18	2	45	151	114	19	284
Green-winged Teal	14	8	6	28	85	31	31	147
Blue-winged Teal	7	3	1	11	54	23	6	83
Shoveler	7	6	3	16	42	39	15	96
Pintail	3	6	46	55	18	31	231	280
Redhead	7	1	1	9	39	11	-	50
Canvasback	7	8	1	16	40	40	9	89
Lesser Scaup	6	-	-	6	40	-	-	40
Bufflehead	5	-	-	5	29	-	-	29
Ruddy Duck	3	-	1	4	29	-	2	31
All Species	136	64	92	292	875	362	539	1776

Table 2. Average duckling brood sizes determined from observations of complete broods during a 1969 experimental roadside production survey in Stratum 27, Alberta.

	Class I			Class II			Class III and Fly		
	n	range	$\bar{x}$	n	range	$\bar{x}$	n	range	$\bar{x}$
Mallard	11	1-10	5.6	8	1-11	6.0	17	3-12	8.1
Gadwall	23	4-18	9.3	2	7-9	8.0	1	-	10.0
American Widgeon	19	2-12	6.7	11	2-12	7.4	1	-	8.0
Green-winged Teal	3	6-12	9.8	4	4-7	5.5	3	5-11	8.3
Blue-winged Teal	4	6-10	8.3	2	8-9	8.5	1	-	5.0
Shoveler	3	3-6	4.3	5	1-10	6.8	2	3-8	5.5
Pintail	2	5-6	5.5	5	2-8	5.2	27	1-14	5.7
Redhead	4	1-12	6.5	1	-	9.0	-	-	-
Canvasback	4	4-7	5.3	6	2-7	4.8	2	1-8	4.5
Lesser Scaup	2	7	7.0	-	-	-	-	-	-
Bufflehead	3	5-8	6.0	-	-	-	-	-	-
Ruddy Duck	3	6-12	8.7	-	-	-	-	-	-
All Species	81	1-18	7.3	44	1-12	6.4	54	1-14	6.8

Table 3. Comparisons of the results of a 1969 experimental roadside production survey with those of the operational aerial production survey in Stratum 27, Alberta.

	Roadside Survey	Aerial Survey
Number of broods Observed	292	326
Broods Observed per Linear Mile of Survey Route	0.9	0.4
Broods Observed per Square Mile of Survey Area	3.7	2.9
Broods Observed per Survey Man-Hour	4.0	19.8
Per cent Class I Broods	46.6	38.3
Per cent Class II Broods	21.9	34.4
Per cent Class III and Flying Broods	31.5	22.1
Per cent Class Unknown Broods	–	5.2
Mean Size of Class II Broods*	6.4	7.4
Mean Size of Class III and Flying Broods*	6.8	7.3

* mean brood sizes for both aerial and roadside surveys based only on brood observations where an accurate count of brood members was thought obtained.

Table 4. Waterfowl productivity indexes derived from the 1969 Waterfowl Breeding Pair Survey and an experimental roadside production survey in Stratum 27, Alberta. (Survey results are expanded to account for total area in the Stratum).

	Breeding Population (thousands)	Duckling Population Index (thousands)	Productivity Index (Duckling Index ÷ Breeding Pop.)
Mallard	612	101	.17
Gadwall	157	90	.57
American Widgeon	175	84	.48
Green-winged Teal	230	43	.19
Blue-winged Teal	167	24	.14
Shoveler	100	28	.28
Pintail	447	83	.19
Redhead	67	15	.22
Canvasback	25	26	1.04
Lesser Scaup	196	12	.06
Bufflehead	24	9	.38
Ruddy Duck	26	9	.35
All Species	2,225	523	.24