Waterfowl Harvest by Slave Indians in Northern Alberta

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ABSTRACT. The consumption of waterfowl by a small band of Slave Indians was monitored from May to September of 1966 and 1967 at Habay in northern Alberta. The Indians killed waterfowl by two main methods: with shotguns when birds were on the wing, and with clubs when flightless. In 1966 this food formed the major source of protein for the Indians over the spring-to-fall period; in August they consumed an average of 0.6 of a pound of flesh per day per person. In 1967 the amount fell to about one-quarter of this amount when the band relied more heavily on an alternative food source. The responses shown by Indian hunters to changing waterfowl densities are compared with those shown by predators to changing prey densities.

RÉSUMÉ. *La récolte du gibier aquatique par les Indiens Esclaves dans le nord de l'Alberta.* En 1966 et 1967, de mai à septembre, les auteurs ont étudiés la consommation de gibier aquatique par une petite bande d'Indiens Esclaves à Habay dans le nord de l'Alberta. Pour tuer ce gibier, les Indiens utilisent deux méthodes principales: les fusils lorsque les oiseaux sont en vol et des gourdins lorsqu'ils ne volent pas. En 1966, cette nourriture a constitué la source majeure de protéines pour les Indiens pendant la période du printemps à l'automne; en août il se consommait une moyenne de 0.6 livre (272 g) de chair par jour par personne. En 1967 cette quantité est tombée à un quart de ce total et la bande a plutôt compté sur une autre source de nourriture. Les auteurs établissent une comparaison entre la réaction des chasseurs indiens à des densités changeantes de gibier aquatique et la réaction des prédateurs aux densités changeantes de proies.

РЕЗЮМЕ. *Добыча водоплавающей птицы индейцами Слейв-Ривер в Северной Альберте.* В периоды с мая по сентябрь 1966 и 1967 гг. производился учет потребления водоплавающей дичи небольшой группой индейцев Слейв-Ривер в районе Хейби (Северная Альберта). Для добывания птицы индейцы применяли два основных способа: отстрел из охотничьих ружей, когда она на крыле, и убой палками, когда птица не способна летать. В 1966 г. водоплавающая дичь явилась главным источником протеина для индейцев в период с весны до осени; в частности, в августе потребление птичьего мяса достигало в среднем 0,6 фунта на человека в день. В 1967 г. добыча дичи снизилась примерно на 75%, и индейцам пришлось пользоваться другими источниками питания. Реакция охотников-индейцев на изменения количества водоплавающей дичи сравнивается с реакцией хищных животных на сходные колебания условий охоты.

INTRODUCTION

Historically, the distribution of aboriginal peoples was largely controlled by the availability of major sources of food, usually seasonal in their occurrence. In northern Canada this distribution has been greatly modified with the imposition of certain aspects of European culture on these peoples. Nevertheless, in certain more remote areas, many of the traditional practices of the Indian have been retained, albeit usually in a modified state. One of the most noteworthy of these

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practices is the harvesting of seasonally available vetebrates, both fish and game. In this paper the harvesting of waterfowl by a band of Slave Indians in northern Alberta, and their responses to changing availability of this major seasonal food source are considered.

METHODS

This study was discussed and approved by the band council and had the support of the band of Slave Indians as a whole. It was conducted in 1966 and 1967 at Habay (58° 49′ N., 118° 45′ W.) where these Indians still relied heavily on the abundant waterfowl population, present from May to October, in the nearby marshes surrounding Hay and Zama Lakes.

The data reported herein were collected while one of us lived in close contact with the band. Through association with the hunters, in the village as well as on hunting trips, it was a simple matter to determine who amongst the men hunted, how far they travelled to hunt and the general area hunted. Techniques and success were recorded in the field; evidence of selection while hunting was obtained through direct observation and by comparing the composition of the kill with that of the available prey (waterfowl).

Information on the waterfowl populations was obtained while in the field with the hunters and on separate regularly conducted censuses. In both instances, relative availability and species composition were recorded by noting the number and species of waterfowl that flew within a specified distance. An estimated arbitrary distance of 50 yards was chosen because that was the distance considered within killing range by the Indians. The relative abundance of waterfowl throughout the lake complex was obtained from aerial surveys flown at regular intervals throughout the summers.

Information on the magnitude of the waterfowl harvest, species and sex of birds involved, and the average kill per hunt were obtained by collecting both wings from all birds killed by hunters. Species and sex identification from these parts were based on Carney (1964). Because the wings were normally fed to dogs, a token sum of 10 cents per pair was paid to help purchase packaged dog food from the local store. It could be argued that this sum might have provided an incentive to hunt through contributing to the income and enabling the hunter to buy more shells; but based on the following observations, we believe it did not. We have no evidence that the money was used for a specific purpose; it was spent frivolously, mainly on treats for the children. Furthermore, the maximum kill from a box of shells was 25 birds which represented in payments only one-half the value of the shells used.

OBSERVATIONS

Slave Indians

In 1966 and 1967, the Slave Indians with whom we worked lived in two villages, Habay (58° 49′ N., 118° 45′ W.), and Assumption, about 8 miles to the south, both within the Hay Lake Indian Reserve. About 120 people were resident at the former site and 575 at the latter. Each summer about 55 Assumption residents moved temporarily to Habay where both fish and waterfowl were more available.

At the time of this study, these people practised virtually no agriculture, nor had they a permanent wage-earning capacity. Instead, theirs was a society based largely on hunting and gathering, and hence depended heavily on the natural resources of the area. Thus it was not surprising that of 50 potential hunters present in the summer, 29 of them hunted regularly.

Waterfowl resource

Waterfowl represented the major source of protein for the Habay residents in summer. This food was available only during the season of open water from May to October. The marshes adjacent to Habay were used in both spring and fall by large concentrations of migrating waterfowl that remained in the area for varying periods of time *en route* to and from more northerly breeding grounds. In summer these marshes were also used by large numbers of moulting ducks as well as smaller numbers of breeding birds. Twelve species of ducks and three species of geese occurred regularly in the area; the geese were present only in spring and autumn.

The amount and timing of spring runoff greatly influenced the size and configuration of these shallow marshes, as well as species composition of associated vegetation. These parameters in turn affected waterfowl, both species composition and numbers, as well as local distribution within the marshes. For example, when water levels were high, diving ducks made up a higher proportion of the birds present, both as breeding and moulting individuals, than when water levels were low and dabbling species predominated.

Waterfowl harvest

The Indians harvested waterfowl in a number of ways, the method varying with the season. The use of the shotgun is reflected in the hunting recorded for

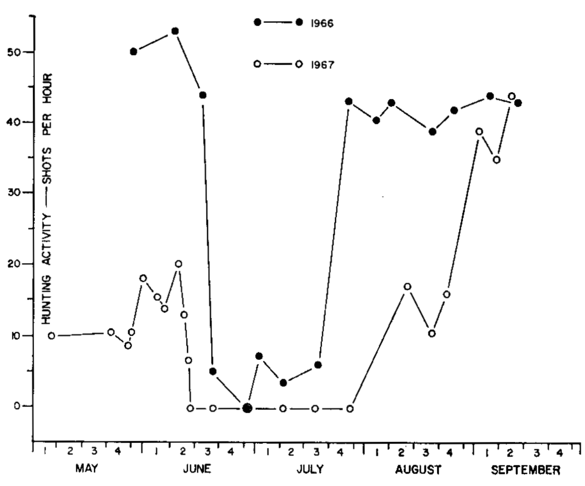

FIG. 1. Seasonal distribution of hunting activities of a band of Slave Indians in 1966 and 1967. Index to activity based on total number of shots heard per hour during the peak hunting period in the evening when as many as 29 hunters were in the field.

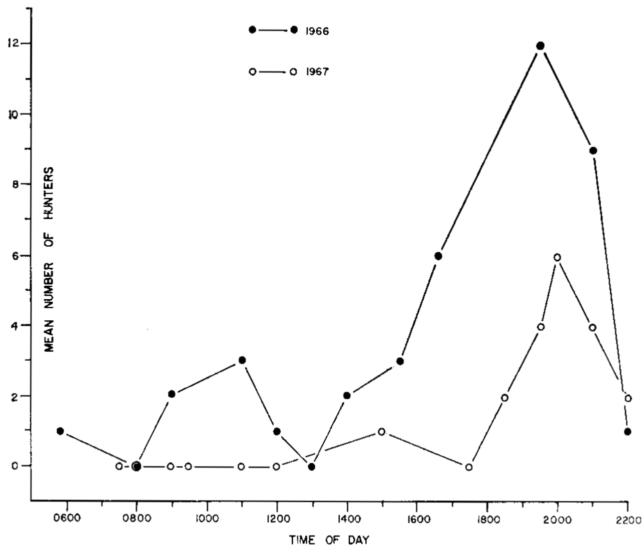

FIG. 2. Daily pattern of hunting by Slave Indians in 1966 and 1967.

the years 1966 and 1967 (Fig. 1). In spring and autumn when waterfowl were capable of flight, they were shot on the wing. The men hunted in groups of 2 or 3, hiding in natural or artificial cover and waiting for waterfowl to fly within shotgun range. Decoys were not used but geese were often lured within killing range by imitating their calls. Most hunting occurred in the evening (Fig. 2).

During summer, flightless ducks were harvested by driving them into large concentrations where they were killed with sticks. Generally, 8 to 15 men co-operated on these hunts by forming a long line in which they proceeded as a front, beating vegetation along the shores of the marshes. When a number of birds had been gathered together they were encircled and killed. In areas of deeper water, such as streams, flightless ducks were killed by another technique: 2 men in a canoe would harass groups of these birds killing those that were within striking distance of their paddles.

The harvest of waterfowl by the summer residents at Habay was estimated in each year of the study; it was based on the number of pairs of wings saved by the Indians from birds killed on hunts. Once having gained the confidence and cooperation of the hunters, we believed the estimated kill to be an accurate index of the numbers taken because tallies between observed numbers of ducks shot by individuals and the subsequent numbers of wings handed over on the following day were nearly always the same. In 1966 we were able to estimate the number of waterfowl killed only for the period 1 August to 12 September. Before 1 August, we enjoyed neither the confidence nor the cooperation of all hunters. During the late summer, 3,069 pairs of wings were collected. This represented an average daily kill of 71.4 birds and was at a time when the hunting activity registered 40 to 45 shots per hour. Using these figures and the indices of hunting in Fig. 1, it was possible to estimate the total harvest by shotgun for the entire period 20 May to 12 September. In so doing it was necessary to assume that the number of ducks killed per shot fired was similar for the entire season. Based on evidence from 1967, we believe this assumption is valid. The figure was calculated to be 7,283 birds. During midsummer ducks killed as a result of cooperative hunts added to this total. Three such hunts were known to have occurred, with only the third being witnessed. Participants in the first two drives estimated a harvest of approximately 500 birds in each. On the third hunt 326 birds were killed (Table 1). Thus approximately 1,300 birds were killed without shotguns for a total of approximately 8,600 birds harvested between 20 May and 12 September 1966.

TABLE 1. Flightless waterfowl killed during one cooperative hunt in the marshes adjacent to Hay Lake during July 1966.

Species[1]	Number	Percent
Shoveler (*Anas clypeata*)	106	33
American wigeon (*A. americana*)	86	26
American coot (*Fulica americana*)	57	17
Green-winged teal (*Anas crecca*)	25	8
Blue-winged teal (*A. discors*)	20	6
Unidentified ducklings	32	10
Total	326	100

[1]Nomenclature based on "Thirty-second Supplement to the American Ornithologists' Union Check-List of North American Birds." *Auk* 90:411-19, April 1973.

By 1967 we enjoyed the full confidence and cooperation of all hunters and believed the estimate of numbers of harvested waterfowl to be accurate. That year a total of 2,010 was recorded. This total was significantly less than that of the previous year.

The decline in the use of waterfowl was reflected in decreased hunting, both in the index of shots per hour (Fig. 1) and in the number of hunting camps found adjacent to the marshes. It was a common practice of hunters on all-day hunts to roast ducks at midday. In the spring of 1966, 7 such sites were found with the remains of 45 ducks and geese associated with them. In 1967, only 2 such sites were found with the remains of 5 ducks present.

The species composition of waterfowl harvested differed from that in the marshes (Table 2). These data suggest that the Indians were selective in their hunting, and that all larger species were taken whenever they came within shotgun range whereas the two abundant smaller species — green- and blue-winged teal — were ignored since they appeared in significantly lower ($P < 0.05$) proportions in the harvest than in the marsh. The proportion of the kill made up by American wigeon was significantly higher ($P < 0.05$) than its representation in the marsh.

TABLE 2. Species composition of waterfowl in shot sample and in the marshes for the period 18 August to 14 September 1967.

Species[1]	Shot sample[2] No.	Shot sample[2] %	Marsh sample[3] No.	Marsh sample[3] %
Mallard (*Anas platyrhynchos*)	826	47	492	47
Pintail (*A. acuta*)	419	24	156	15
American wigeon (*A. americana*)	226	13	46	4
Shoveler (*A. clypeata*)	74	4	16	2
White-fronted goose (*Anser albifrons*)	51	3	—	—
Green-winged teal (*Anas crecca*)	48	3	250	24
Gadwall (*A. strepera*)	40	2	—	—
Blue-winged teal (*A. discors*)	23	1	73	7
Canada goose (*Branta canadensis*)	14	1	—	—
Redhead (*Aythya americana*)	10	1	15	1
Lesser scaup (*A. affinis*)	5	0	—	—
Goldeneye (*Bucephala clangula*)	4	0	—	—
Snow goose (*Chen hyperborea*)	4	0	—	—
Canvasback (*Aythya valisineria*)	2	0	6	1
Bufflehead (*Bucephala albeola*)	2	0	—	—
Total	1,748	99	1,054	101

[1]See Table 1; [2]Based on wings collected from Indians; [3]Based on birds counted flying within gunshot range at several heavily-used hunting sites.

TABLE 3. Vulnerability of four large species of ducks to the guns of Slave Indian hunters.

Species[1]	Number: Shot at	Number: Hit	Number: Recovered	Per cent success
Mallard (*Anas platyrhynchos*)	71	42	40	56
American wigeon (*A. americana*)	64	42	42	66
Pintail (*A. acuta*)	46	26	26	57
Shoveler (*A. clypeata*)	28	16	16	57

[1]See Table 1.

This fact could be explained by the apparent greater vulnerability of this species to the gun (Table 3). The apparent selection of larger species of ducks is further demonstrated in the proportion of potential targets shot at by adult hunters (Table 4). There is a further suggestion in these data that dabbling ducks were selected in preference to diving ducks when size was not a factor.

TABLE 4. Proportion of potential targets shot at by a sample of 11 adult (over 18 years of age) Slave Indians.

Species[1]	Potential targets	
	No.	% shot at
Green-winged teal (*Anas crecca*)	310	0
Mallard (*A. platyrhynchos*)	188	97
Blue-winged teal (*A. discors*)	183	3
American wigeon (*A. americana*)	132	99
Pintail (*A. acuta*)	121	95
Shoveler (*A. clypeata*)	93	84
Redhead (*Aythya americana*)	25	32
Lesser scaup (*A. affinis*)	19	37
Canvasback (*A. valisineria*)	11	73
American goldeneye (*Bucephala clangula*)	4	0
Gadwall (*Anas strepera*)	3	100
Ringnecked duck (*Aythya collaris*)	1	0

[1]See Table 1.

Use of the harvested waterfowl

Each family of Slave Indians at Habay appeared to make similar use of the ducks harvested. Without apparent exception the meat was consumed in a fresh condition with no evidence of preservation by salting, smoking, or drying. Any birds killed in excess of the family's immediate needs were shared with other families which, for one reason or another, did not contain hunters.

Carcasses of birds killed were plucked, the feathers being saved in many instances for quilts and sleeping robes. The wings (severed at the distal ends of the humeri), head and upper neck, and entrails were fed in the raw state to dogs. The carcasses were then butchered in various ways depending on the method of cooking and the clean bones also fed to the dogs, either before or after cooking. By preparing the birds in this manner we calculated that about 60 per cent of the total weight of a duck was available as human food and, with the exception of body and flight feathers, virtually all of the balance became dog food. No instance of meat spoilage or wastage was recorded in the two years of this study.

Based on the species' composition and average daily kill of 71.4 ducks per hunter during August and early September of 1966, we calculated that the Slave Indians at Habay were consuming, during this period, about 91 pounds of waterfowl meat daily. This meant that the average consumption per person (man, woman, and child) was about 0.6 pound of meat per day. Thus it is readily apparent that the waterfowl resource was making a significant contribution to the total food intake of these people during the period considered and, by extrapolation, for the season when this resource was available to them, particularly in 1966.

DISCUSSION

The harvest of waterfowl by the band of Slave Indians at Habay was observed to vary over the season and between the two years. In attempting to evaluate the reasons for this variation, we compared the Indian hunters and the waterfowl resources to a predator-prey system.

Predator populations respond to changes in the density of prey populations in either a functional or numerical way, or a combination of both (Holling 1959).

A functional response by the predator to increasing density of a particular prey species is shown when increased numbers of that prey species are killed per unit of time. This increase in kill rate continues to rise with increased prey density until an asymptote is reached. This is the satiation level in the predator, at which point the increase in kill rate ceases to climb even when the prey population continues to do so.

A numerical response is shown when the density of the predator increases with an increased prey population. Such numerical responses in large predators are usually through immigration; their numbers increase until other limitations are imposed on their numbers through such mechanisms as hierarchical or territorial systems. Thus an asymptote is also reached in the numbers of prey taken when a numerical response of predators to increasing prey density occurs. The two responses can also work in combination to take an even greater number of prey per unit time.

Another feature of predator-prey systems is the cessation of predation when prey density falls to a critical level: the "threshold of security" (Errington 1946). When the density of a prey species falls below this level, the predator no longer finds it profitable in terms of energy expended to hunt that prey species. Confronted with this situation, the predator may show the following responses: decline in numbers through death or emigration and/or a shift to alternate prey species. The nature of the response depends on the mobility of the predator, proximity of prey populations of higher density, and the ability to resort to alternate prey.

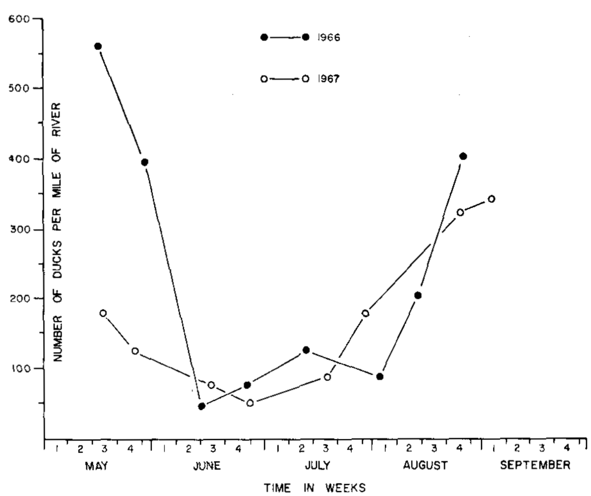

FIG. 3. Indices of waterfowl abundance in the vicinity of Habay in 1966 and 1967, based on the number of ducks counted along the Amber River which flows between levies through much of the marsh complex hunted by the Slave Indians. Ducks were counted from the boat; only those individuals that flushed within 50 yards of the moving boat were recorded.

In this study the number of potential hunters remained constant. Thus any numerical response they might show would involve an increase in the proportion of the potential hunters actively hunting with an increase in prey density. This in turn implies that part of the predator population would have to rely on an alternative food source when waterfowl densities were low. Before either a numerical or a functional response could be shown by the Slave Indians a change in density of the prey species (waterfowl) would have to occur. Such changes were recorded seasonally and annually (Fig. 3). The Amber River was used because it provided the only navigable transect along which ducks could always be counted. A comparison of river counts with aerial surveys over the marsh showed a good correlation except when water levels in the marsh were low and birds concentrated on the river giving an inflated index.

The seasonally high densities of prey in spring and autumn reflect the concentrations of migrating birds at those times. Low numbers recorded during the summer were made up mainly of moulting birds. Yearly differences in abundance are also evident. Although these differences appear significant for the spring only, we believe they were different for the entire marsh complex in the autumn also. During the spring when water levels were high, ducks were as abundant on the open water areas of the marsh as they were on the river. However, in the autumn of 1967 water levels in much of the adjacent marsh were such that

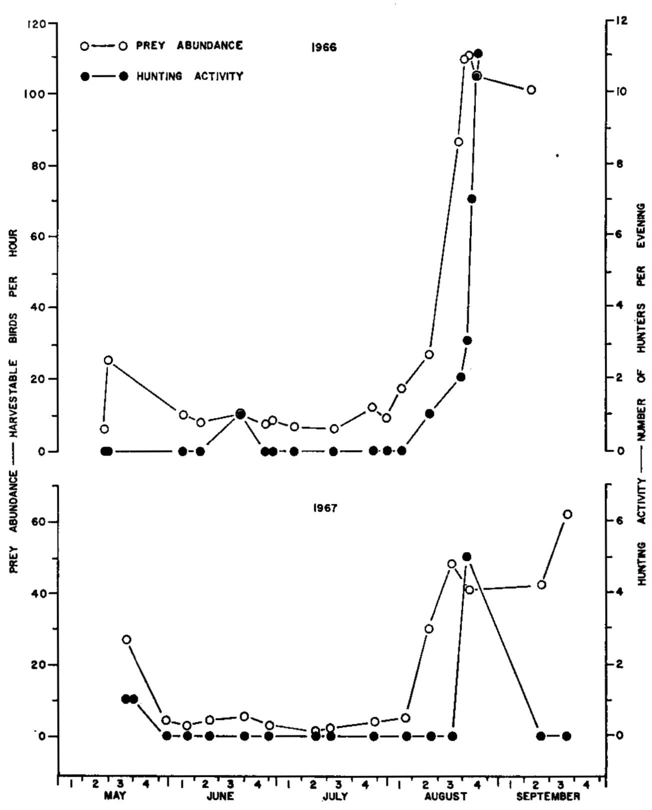

FIG. 4. Number of Slave Indians present during the evening period at one favourite hunting site, in relation to the abundance of harvestable waterfowl, that is, number of potential targets passing the site on an hourly basis.

they were largely devoid of ducks in 1967, having supported large numbers in 1966. Thus in the autumn of 1967 the river system was a point of concentration for ducks, a situation that did not prevail in 1966. Numbers of migrating geese using the marshes, however, were believed to be similar in the two years. We concluded, therefore, that the total density of prey population had declined significantly in the second year of the study.

The response shown by the Slave Indians to seasonal changes in prey density appeared to be largely numerical when shooting was the means of killing. A comparison of Figs. 1 and 3 shows a strong correlation between hunting activity and prey abundance. This correlation reflected a numerical response (Fig. 4). As the abundance of prey rose so did the number of predators. This rise in predator numbers was responsible for the increased number of shots per hour (Fig. 1) with increased prey abundance (Fig. 3). The apparent lack of any functional response in the predators to changing prey abundance is related to the fact that the killing power of each hunter was limited by a set number of shots; in 1966 this limit was 25, the number of shots in a single box of cartridges which we observed was purchased specifically for a given day's hunt. When prey abundance was low, the time involved for the hunt was correspondingly longer but the number of birds taken per hunt appeared to remain constant. In 1966, the hunting efficiency (number of birds retrieved as a percentage of number of shots fired) based on the data in Table 2, was 59 per cent, and based on the mean number of pairs of wings collected per hunt was 65 per cent (16.3 birds per assumed 25 shots). The latter figure may have been biased slightly upwards through the possibility of two or even three hunts being reported as one. This is suggested in bimodal skewed frequency distribution shown in Fig. 5.

Although an upper asymptote in the numbers of predators is not apparent in Fig. 4, it nevertheless occurred when all 29 potential hunters were hunting at various points in the marsh. This level of response was rapidly reached when the prey density index rose to about 100 harvestable birds per hour. A lower limit in the waterfowl density below which hunting with a shotgun did not occur was at an index of about 20 harvestable birds per hour.

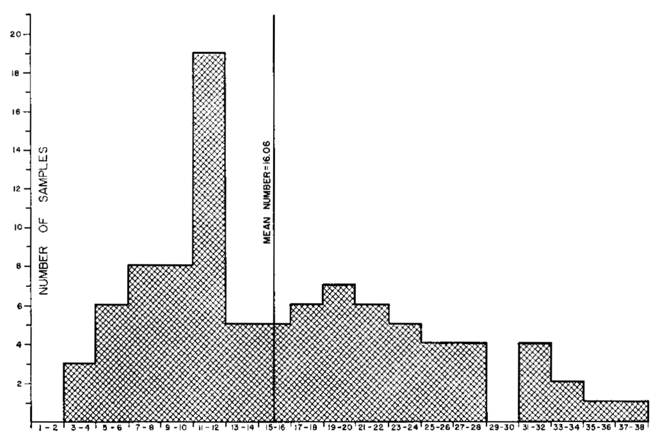

FIG. 5. Frequency distribution of the numbers of pairs of wings reported for individual hunts by Slave Indians.

The cooperative hunts in which flightless waterfowl were killed with sticks seemed to demonstrate a functional response on the part of the Indians to locally increased prey density. Under these circumstances the potential to kill was not limited by the number of cartridges. It is reflected in the average number of birds killed per hunter. During one cooperative hunt witnessed in 1966, 326 birds were killed by 10 men averaging 33 birds per man. This was double the average number taken by shotgun. However, the functional response on the part of the Indians was limited to the relatively short period when the prey was flightless and to areas where the concentration of birds was sufficient to make the cooperative effort on the part of the predators worthwhile.

The difference in the harvest of waterfowl between years appeared to reflect two major causes. The most obvious cause was the decline in density of waterfowl in 1967 when, for proportionately more of the season, the number of waterfowl available was too low to make it worthwhile for the Indians to hunt them. The second major cause was the greater reliance by the predators on an alternative food source, namely commercial produce. The latter had become more available as a result of sudden wage-earning capacity among the Indians through demand for labour in the oilfields discovered in 1967 at Rainbow Lake, 25 miles south of the reserve. This event had the effect of changing the economy of the band from mainly hunting and gathering to mainly trading, with its enhanced dependency on commercially-produced goods. This in turn meant that time previously spent hunting was spent labouring, forcing greater reliance on an alternative food source that had to be bought. A noteworthy change in the attitude of the Indians towards hunting occurred in the second year which seemed related to their newly acquired wage-earning capacity. The efficiency in hunting waterfowl declined by about 10 per cent from the levels of 1966. Observations in the field indicated that the hunters were less selective in the birds they shot at, averaged more shots per bird killed, and more shots per hunt (31 *v.* 25). These observations suggest that waterfowl had become less important as a food source, but that hunting them was more important as a form of recreation. A similar phenomenon had been reported by Thompson and Person (1963) among Eskimos at Point Barrow, Alaska, when they became involved in wage-earning pursuits.

It is concluded from these observations that the Slave Indians at Habay have traditionally made heavy use of the seasonally available waterfowl resource. Their response to changing densities in the waterfowl populations follow those expected in predator-prey relationships. The major response, however, was numerical, mainly because of their present-day reliance on shot guns as killing tools which imposed, in 1966 at least, a limit to the number of killing attempts they made on any hunt. Functional responses were seen in cooperative hunts when flightless birds were killed with sticks. The apparent transition from an economy based on hunting and gathering to one based on wage-earning had reduced this primary food source to secondary importance. Coincident with this change in position has been an apparent realization of a recreational value in the waterfowl resource.

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