

The following are the 53 species caught in the "H" from September 1961, to the end of 1963. Only 6 new species were added in 1963.

| | |
|------------------------------|-------------------------|
| Red-Winged Blackbird | Clay-Colored Sparrow |
| Yellow-Headed Blackbird | Field " |
| Indigo Bunting | Fox " |
| Cardinal | Harris' " |
| Catbird | Lincoln's " |
| Brown-Headed Cowbird | Song " |
| Brown Creeper | Swamp " |
| Black-Billed Cuckoo | Tree " |
| Yellow-Billed Cuckoo | Vesper " |
| Mourning Dove | White-Crowned " |
| Purple Finch | White-Throated " |
| Yellow-Shafted Flicker | Brown Thrasher |
| Least Flycatcher | Warbling Vireo |
| Trail's Flycatcher | Red-Eyed Vireo |
| American Goldfinch | Black and White Warbler |
| Common Grackle | Myrtle " |
| Rose-Breasted Grosbeak | Nashville " |
| Blue Jay | Orange-Crowned " |
| Slate-Colored Junco | Western Palm " |
| Slate-Colored x Oregon Junco | Tennessee " |
| Eastern Kingbird | Yellow " |
| Golden-Crowned Kinglet | Yellowthroat |
| Ruby-Crowned Kinglet | Cedar Waxwing |
| White-Breasted Nuthatch | House Wren |
| Baltimore Oriole | |
| Eastern Phoebe | |
| Common Redpoll | |
| Robin | |
| Chipping Sparrow | |

Rt. 10, South St. Paul, Minn.

Received April, 1964

REGROUPING OF FAMILY MEMBERS OF THE WHITE-FRONTED GOOSE (*Anser albifrons*) AFTER INDIVIDUAL RELEASE

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INTRODUCTION

The purpose of this paper is to document the reformation of white-fronted goose families after they had been released singly during banding procedures. That a strong bond exists between members of a goose family and that this cohesion is important in flock formation of Canada geese (*B. canadensis*) and other species of *Branta*, *Chen* and *Anser* is a well known phenomenon (Elder and Elder, 1949; Lorenz, 1959).

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During a trapping and banding program on white-fronted geese in Saskatchewan, we had not considered the effect of individual release on the integrity of the family group. There was a strong possibility that captured families, released separately, did not reform. Geese that were separated from a family or flock could be made more vulnerable to hunting and other hazards than members of an intact group. Goose trappers in England had recognized this possibility and had held most of their captured geese in pens and released them together to avoid breaking up family groups and flocks (Boyd, 1952). Later Boyd (1955) determined through intensive observations of rocket-netted pinkfooted geese (*Anser fabalis brachyrhynchus*) that disrupted families reunite very quickly.

METHODS

The white-fronted goose is an early fall migrant in western Saskatchewan, usually arriving in early September and departing by mid-October. Peak populations, toward the last week of September, vary from 25,000 to 50,000 birds which are spread over eight to twenty shallow lakes in the Kindersley district (51° N x 109° W). Flocks of geese remain in the area and feed on the small grains from the surrounding uplands for a period of one to four weeks. The lakes and water bodies, especially those in large grazing pasture-game preserves, are utilized as resting areas by migrating geese. Two feeding flights take place into the surrounding uplands, one in the early morning and the other in late afternoon. During the hunting season, starting in late September, the geese are hunted and shot during the morning period only.

During the autumns of 1961, 1962 and 1963, prior to and during the hunting season, we trapped and banded over 5,500 white-fronts, mostly on Teo Lake and Buffalo Coulee Lake, twelve miles apart. The geese were trapped on shore line loafing areas with cannon-projected nets. Before detonation, observations confirmed the presence of geese on the shore line including family groups made up usually of two adults and one or more immatures, recognized by the presence or absence of white foreheads and dark belly bars. After capture, geese were removed from nets and four birds were placed into a jute bag for temporary holding. These bags were moved to a banding area in sight of the lake where the geese were weighed, measured, banded and then released singly.

In order to obtain data on yearly production of young, observations of family groups were recorded wherever the geese concentrated and could be seen. One such site which lent itself well to the observations was a 60-acre saline, mud flat utilized by geese for loafing, immediately adjacent to a 150-acre lake used for banding. Vehicles could be driven to within 100-150 yards of the loafing geese and a 40-power telescope used to determine family group sizes and number of birds banded. Such observations were made every two to four days as time permitted.

We gratefully acknowledge the aid given us in trapping geese by George Schildman, John Sweet, Ross Hanson, Ron Lamont, John

Hatfield and John Black. Arthur Hawkins, Harvey Nelson, Jim Bendell, Don Flook and John Lynch gave much advice during preparation of the paper.

RESULTS

A partial test of the disruptive influence of trapping and banding on the strength of the family bond inadvertently occurred in 1962. In order to follow local population turnover rates and movements, a dye-marking scheme was initiated. Geese were taken at random from the jute bags and every alternate bird was dye-marked on the belly and rump with a saturated solution of picric acid in water (on Teo Lake). On two nearby lakes (Buffalo Coulee and Cutbank Lake) geese were dyed red and green respectively, after a method proposed by Kozlik, Miller and Rienecker (1959). Much to our surprise on subsequent observation, three to five dyed individuals were seen in a group. Closer observations indicated the most of these groupings were composed of one or two adults and several immature birds which behaved as a family unit. They showed no aggressive behaviour toward each other and moved as a family. The lack of aggressiveness toward other members of the group strongly suggested that the family had reformed and that it was more than a simple reshuffling of young between families. Observations of families generally showed a marked hostility toward other lone geese or members of other families, as described by Boyd (1953b). We further substantiated that although some unattached young followed family groups in feeding flights, they were not accepted into the family unit while feeding, swimming or loafing on shore lines. Thus, some if not most family groups of geese broken up by trapping apparently reunited soon after release.

The following are examples of the groupings of dye-marked geese recorded on September 15, one day after twenty-five white-fronts were dyed on Teo Lake ($51^{\circ} 24' \times 109^{\circ} 36'$).

- Group A.: 2 immatures yellow rumped, with 1 immature and 2 adults unmarked—all birds leg banded.
- Group B.: 1 immature and 1 adult yellow rumped, with 2 immatures and 1 adult unmarked—all newly leg banded.
- Group C.: 3 yellow rumped and 6 unmarked adults in a group. This group may have been made up of subadults or unsuccessful breeders.

These two families and the other group were loafing on the mud flat along with about 600 other white-fronts including two other dye-marked birds apparently not associated with a particular group. This was a total of nine dyed birds observed of twenty-five marked the previous day. The low number of dye-marked birds seen on the banding lake was typical; rarely did we observe more than twenty-five per cent still present the day after the marking.

Some of the dye-marked birds, and presumably the unmarked banded birds, moved freely to other lakes in the banding area while others apparently migrated completely out of the district. One ob-

servation at 8:00 A.M., September 16, after twenty additional birds of a catch of forty were dye-marked the previous day on Teo Lake, was of two adults, one unmarked, and two yellow dyed immatures on Buffalo Coulee located about twelve miles north-northeast of Teo Lake. This group behaved as a family and were alone at the time of the observation, other white-fronts being out feeding. The unmarked immature wore a new leg band; however, if the adults were banded, the bands were not seen.

Whether the families and groups reform before moving or the banded and dye-marked birds move from the banding lake then reform, is yet to be determined. Several other observations were made of dye-marked birds associated with unmarked banded birds and others which behaved as families, on other than the banding lakes. However, single dye-marked immatures were seen associating with larger flocks of unbanded and unmarked white-fronts indicating that some families may never reform.

Perhaps the most significant observation of family group reformation occurred following the dye-marking (red) of 43 of the first catch of 86 white-fronts on Buffalo Coulee on September 17. Four of the dye-marked birds showed some signs of impaired flight, apparently due to the shock of capture, and were transported to Kindersley where they were held overnight for observation. On the morning of September 18, they exhibited complete recovery so they were transported back to Buffalo Coulee and released at 9:00 A.M. Three of these flew out of sight and the one remaining, an immature, flew approximately 250 yards to a mud flat, alighted and commenced calling. A subsequent observation at 9:45 A.M. disclosed a grouping of two adults, one red dye-marked and one plain leg banded, with four immatures, two of which were plain leg banded and the other two including the one released at 9:00 were red dye-marked. These birds definitely behaved as a family group on the ground and when later flushed, flew away as a typical family.

Other observations on Buffalo Coulee on September 18 included:

- (a) 7:50 A.M. Two adults including one red-marked and four immatures including two red-marked, returning from feeding and behaving as a definite family group.
- (b) 8:00 A.M. Thirty-one adult-appearing birds including three red-marked birds sighted on lake. Flushed and left as a group.
- (c) 8:05 A.M. Four, including two red-marked birds sighted on shore line, flushed and flew as a group. No age determination made.
- (d) 9:10 A.M. Ten adult-appearing birds including one red-marked, sighted on return flight from fields.
- (e) 10:15 A.M. Two hundred ten white-fronts including one red-marked and one yellow-marked (Teo Lake color) flying out to fields. No age determination made.

On September 20, one day after a series of thirteen geese were dyed successively, a group of one adult and four immature birds, all yellow-marked, were observed on Teo Lake. Another group, which acted as a family, included one adult and five immatures of which three young were yellow-marked. All these geese were leg banded. On September 22, an apparent family group including two adults and one immature, all of which were yellow-marked, was observed on Teo Lake.

In 1963, groups of geese on these lakes were again captured, banded and released separately. No feather dyeing was attempted. During September and October, observations on the mud flats of Teo Lake showed that at least four different family groups had reformed. These family groups were recognized as being newly banded by their bright leg bands, which become dulled by the saline waters in approximately one week.

DISCUSSION

The regrouping of individually released white-fronted geese into families is a reflection of the strong family bond in the species. In several examples given, family groups reunited within one day of banding. After banding and release, lone geese may fly some distance before settling on the lake to preen. Others fly off but soon return to the release area, calling loudly in flight. Some join apparent family members when they are released after banding. Voice recognition appears to be the initial mode of contact between individuals as they fly about over a flock. A very high pitched bisyllabic *klow tyow* or occasionally a trisyllabic call is continually uttered by the searching goose. There is a slight pause between the utterances and it seems higher pitched and is given more often than the regular bisyllabic contact call of flocked geese going out to feed or migrating. A searching bird decoys readily to other calling birds and individual recognition by geese must be accomplished at close quarters. When lone geese are in proximity of a flock, the searching call is replaced by a number of drawn out gagging notes, given before the bird settles. It is much like the "conversation call" of geese, "gangangang" given when a family is moving together (Heinroth, 1911)".

We have not been able to establish what proportion of individually released family members regroup. A certain small percentage of families contain one adult in the fall; most contain two. Some marked birds apparently depart from the vicinity soon after release, while others remain in the district and utilize different water bodies as far as eighty miles from the original site. However, our observations demonstrate that after being separated in banding operations, family members make concerted efforts to regroup and are, furthermore, often successful. Our observations were made on lakes where migrating populations rarely exceeded 6,000 white-fronts and where geese were unmolested for six hours of the day. Larger populations and turmoil associated with hunting might tend to reduce the chances of families reforming and therefore increase the number of separated geese which are apparently more vulnerable to hunters.

Periodic dispersion and disruption of family units takes place in the wild, when large flocks are flushed simultaneously by such disturbances as aeroplanes, predators, and people. After such incidents, when flocks have again settled, lone and grouped birds are seen commonly flying over the flocks calling, as if in apparent search of other family members. In a semitime flock of Greylags (*Anser anser*), Lorenz (1959) observed that if one individual is removed there is a restless looking for the lost goose by the group. Also a drop in aggressiveness and rank-order of the group results with loss of family individuals. John Lynch (*in litt.*) has observed in southwestern Louisiana that in years of excellent production and large broods, adults may have difficulty in keeping the family together after major migration movements and during local feeding flights. At such times the per cent of unattached young or groups of young without parents may rise sharply. By loosely attaching themselves to other family groups, temporarily lost young could also lead to erroneous counts of brood sizes.

Since we were banding on game preserves and geese were being shot after they left these preserves it occurred to us that we might be increasing the local take of birds by breaking up family groups. Over surrounding grain stubble fields, where hunting takes place, separated birds might be more easily decoyed and therefore be more vulnerable to hunters. Our thoughts seemed well founded after the first hunting season when half of the 88 direct band recoveries from 769 white-fronts banded came from within 25 miles of the banding site. Reports from other field workers indicate that such high local recoveries are common around other goose banding stations in North America, especially of bandings conducted during the hunting season. Whether the cause is broken family groups or increased vulnerability associated with capture is yet unexplored. Goose banding might become more meaningful if banded geese were released as captured flocks and not individually.

The tenacity of the bond between members of a family of various genera of geese and the integrity of the family unit has already been discussed by Elder and Elder (1949), Jenkins (1944), Hanson (1953) and Lorenz (1959). Boyd (1952) mentioned that some trapped white-fronts released alone subsequently reunited but others likely lost contact. He indicated that the strong family grouping had some survival value and he later attempted to release his banded geese simultaneously from specially-made "keeping cages". Boyd (1953a) further noted that acceptance of other juveniles into families during winter must be unusual and he remarked on the effectiveness of the mechanism which preserves family cohesion. Unattached juveniles made up only 2.2 per cent of the 1,328 white-fronted geese classified by him. His subsequent study on aggressive responses between families and individuals further substantiates the close ties in any aggregate. In 2,200 encounters between family groups of white-fronted geese, aggressive behavior occurred with any interference of family movement (Boyd, 1953b). However, Lynch (*in litt.*) states that the percentage of unattached young white-fronts in the southwest Louisiana marshes, immediately after arrival from the north,

may be higher than 5 per cent in some years. This could be a result of the rigors of first migration, or a disruption of families by high hunting mortality north of Louisiana.

There was no indication of disruption of the pair or family bonds as a result of the color marking even though, through preening, geese had transferred dyes to their white foreheads, heads and necks. Observations by Guhl and Ortman (1953) indicate that intense color changes in young chickens increased aggressive behaviour, with lack of recognition of young, by parent birds. Ramsay (1951) had also noted such intense aggressive behaviour of hens toward young colored chicks but found that in Muscovy ducks the aggressive actions of hens toward colored ducklings dissipated itself by the end of the second day. In the case of the white-front families, associations had already occurred for ten to fourteen weeks after hatching and other cues beside head color, i.e. body configuration, deportment and voice may be more readily used for intra-family recognition. However, bright head markings may have some effect later in the season at the time of pair bond formation. In many bird groups, features of the head region are most important in individual recognition (Thorpe, 1951). Further Frankel and Baskett (1963) had observed that color marking of the heads of penned, female doves (*Zenaidura macroura*), with yellow aeroplane dope, resulted in breaking of the pair bond. From our very limited observations on families with members having red, green and yellow dyed markings on the rump, belly, neck and head, we cannot substantiate any marked negative effects on recognition between family members or breaking of pair bond between already paired adults.

There is an apparent barrier to adoption of nonfamily individuals existing in various groups of birds. Adoption is easier in the early stages of family history (Cushing and Ramsay, 1947). On the other hand, Hawkins (*in litt.*) remarks on the apparent ease with which groups of newly flying young Canada geese, from distant breeding flocks, have been freely integrated and accepted by local groups of semiwild adults. Cushing and Ramsay (*loc. cit.*) suggest that the recognition of parent and young involves a great degree of learning and is not solely inherent. Ramsay (1951) found that in chickens, Muscovy ducks and Canada geese, vocal and auditory cues were most frequently used in recognition between parents and young but that these were not the only ones involved. Heinroth (1911), in one of the first major studies of family behaviour of geese, observed that very young greylags did not seem to recognize the loud calling of their parents, but were readily aware of them by sight. However, older young grew to recognize the voices of their parents. When the two adults were moved to new ponds the goslings were able to follow by recognizing the voices of their parents.

In summary, members of families of white-fronted geese after having been mixed with other families, color marked, banded and released separately, could and did reform into the original family groups. The full extent of the regrouping is unknown but the banding procedures used did evidently break up an unknown percentage of family units. Our observations point out the need for evaluating

the effects of group releases on survival of banded geese. This is particularly important if the geese are captured during the hunting season.

LITERATURE CITED

- BOYD, H. 1952. Notes on field counts of age-group ratios and brood-size. *Severn Wildfowl Trust Ann. Rep.*, **5**: 14:27.
- . 1953a. White-fronted goose statistics, 1952-53. *The Wildfowl Trust Ann. Rep.*, **6**: 73-79.
- . 1953b. On encounters between wild white-fronted geese in winter flocks. *Behaviour*, **V**, Part 2: 85-129.
- . 1955. The role of tradition in determining the winter distribution of pink-feet in Britain. *The Wildfowl Trust Ann. Rep.*, **7**: 107-122.
- CUSHING, J. E. and A. O. RAMSAY. 1949. The non-heritable aspects of family unity in birds. *Condor*, **51**: 82-87.
- ELDER, W. H. and NINA L. ELDER. 1949. Role of the family in the formation of goose flocks. *Wilson Bull.*, **61**(3): 133-140.
- FRANKEL, A. I. and T. S. BASKETT. 1963. Color marking disrupts pair bonds of captive mourning doves. *Jour. Wildl. Mgmt.*, **27**(1): 124-127.
- GUHL, A. M. and L. L. ORTMAN. 1953. Visual patterns in the recognition of individuals among chickens. *Condor*, **55**: 287-298.
- HANSON, H. C. 1953. Inter-family dominance in Canada geese. *Auk*, **70**: 11-16.
- HEINROTH, O. 1911. Beitrage zur biologie, namentlich ethologie und psychologie der Anatiden. *Verh. Inter. Ornith. Kong.* **5**: 589-702. Berlin.
- JENKINS, D. W. 1944. Territory as a result of despotism and social organization in geese. *Auk*, **61**: 30-47.
- KOZLIK, F. M., A. W. MILLER and W. C. RIENECKER. 1959. Color-marking white geese for determining migration routes. *Calif. Fish and Game*, **45**: 69-82.
- LORENZ, K. 1959. The role of aggression in group formation. In *Group Processes*. Josiah Macy, Jr. Foundation. New York. 266 pp.
- RAMSAY, A. O. 1951. Familial recognition in domestic birds. *Auk*, **68**: 1-16.
- THORPE, W. H. 1951. The learning abilities of birds. *Ibis*, **93**: 252-296.

Received January, 1965

MARKED HERRING GULLS

As part of a study of the behavior of the Herring Gull (*Larus argentatus*) in the Penobscot River region of Maine, gulls are being marked by colored plastic leg streamers and dyed tail feathers. The bander is Ralph W. Schreiber, 9 Coburn Hall, University of Maine, Orono (telephone 866-7485). He would greatly appreciate immediate notification of the sighting of any of these marked gulls, including the color of the marking, whether a leg streamer or tail dye, which leg (in the case of streamers), and, if possible, the age of the gull (full adult, etc.).