matter during the nesting season. For birds in general, egg production requires more protein than does sperm production (King, pp.79–107 *in* Breeding Biology of Birds, Farner, ed., Natl. Acad. Sci., Washington, D.C., 1973). Krekorian (1978) assumed that the heavier bird in each pair was male; the lack of significant sexual dimorphism in the weight of breeding Purple Gallinules in this study suggests that this may not be a reliable criterion for sexing the birds.

In eastern Colombia the amount of land converted to rice culture is steadily increasing. Ricefields present an advantageous nesting habitat for Purple Gallinules by affording an abundant food supply and stable water levels. Some of the insects consumed by gallinules are serious pests in rice (notably the noctuid caterpillars), indicating that food habits of this species are to some extent beneficial. I was informed by local farmers that endrin is used against gallinules in varying quantities and apparently with no established guidelines. Little is known regarding the effect of pesticides of gallinule population dynamics. In view of the potential for crop and environmental contamination, studies integrating damage analysis with feeding habits are needed to assess accurately the impact of Purple Gallinules in tropical ricefields.

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Agonistic behavior of the White-breasted Nuthatch.—My studies of agonistic behavior of White-breasted Nuthatches (*Sitta carolinensis*) were begun in Bethesda, Maryland, in 1953, but generally undertaken in Lyme, New Hampshire, between 1961 and 1973. Previous detailed reports of agonistic behavior of the White-breasted Nuthatch are lacking, although Tyler (Wilson Bull. 28:18–25, 1916), Butts (Bird-Banding 2:1–26, 59–76, 1931), Bent (U.S. Natl. Mus. Bull. 195, 1948) and Brackbill (Maryland Birdlife 25:87–91, 1969) have been helpful.

Agonistic displays.—Included are a spectrum of displays which, as noted for the European Nuthatch (*S. europaea*) (Löhrl, Z. Tierpsychol. 15:191–252, 1958), may merge confusingly. Displays most discernible are:

(1) Tail-fanning. Here the tail is raised and fanned, displaying the black and white markings. It is given frequently by the female when her mate comes close to the nest where she is dominant, as well as in conflicts with rival pairs.

(2) Wing-flicking. This action, combined with raising the tail, was used chiefly against predators.

(3) Threat display. Usually the bill is raised, wings are down and tail is cocked up as shown in Fig. 1 and by Löhrl (1958) for the European Nuthatch. The pose is assumed by a subordinate when threatened by a dominant bird of the same or a different species.

(4) Aggressive threat display. It resembles (3), except for a raising of the back feathers and a pointing downward of head and bill (Fig. 2). It is given in severe conflicts.

(5) Raising back feathers with wings and tail in normal position. This display (Fig. 3) is

FIG. 1. Threat display of a White-breasted Nuthatch.

usually seen just prior to one nuthatch attacking another, as when a male is about to fly at his mate prior to a pursuit flight (Kilham, Auk, 89:115–129, 1972).

(6) Bill pointed forward. A female runs with bill pointed straight forward without any display, either at a male intruder by the nest or at a juvenile she is trying to drive away.

Displacement pecking. Males excited in border conflicts (or, as one seen when disturbed by a Barred Owl [*Strix varia*]), will occasionally peck at places unconnected with food, the head and bill held straight up and down. Brackbill (1969) noted this activity among nuthatches coming to a tray where other birds were feeding. I interpreted it as a displacement activity in which a drive to attack is both activated and thwarted, the pecking being a way of relieving surplus excitation (Bastock et al. Behaviour 6:66–84, 1953).

Vocalizations.—Several kinds are involved as follows:

Tchup expresses mild excitement. *Kun*, *ka-un* and *kaan* all express excitement (Kilham 1972), the degree depending on whether they are loud or soft, or given singly or in a rapid series. As with *tchup*, the excitement may be from any cause.

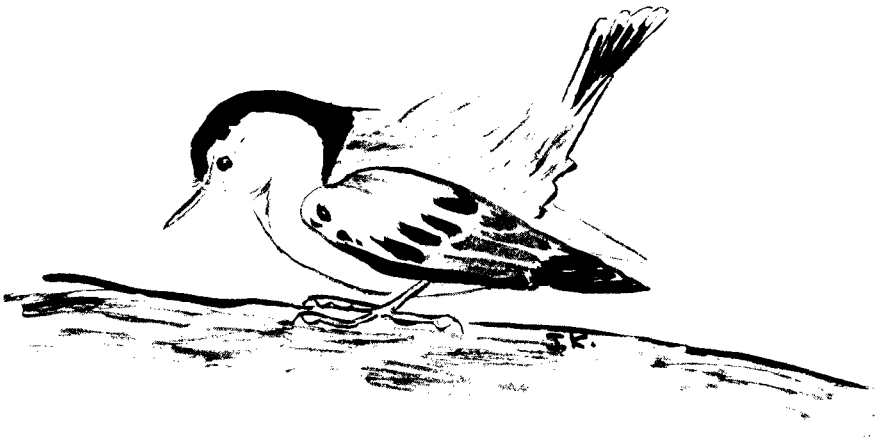

FIG. 2. Aggressive threat display.

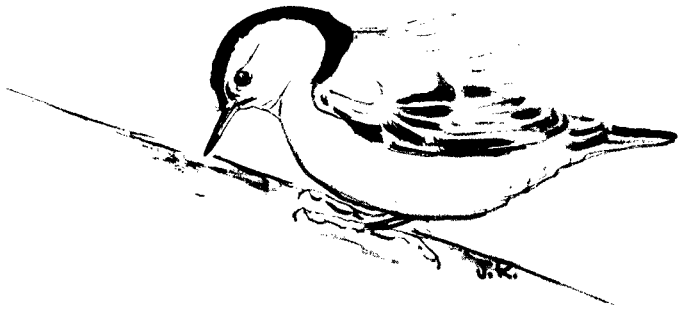

FIG. 3. About-to-attack display.

Grr, grr-n. Various notes take on a harsh quality with an *rr* sound when a nuthatch is aroused by a rival or predator in or out of the nesting season. A nuthatch may start giving them without apparent cause. However, White-breasted Nuthatches can be aroused by a distant rival that is not always perceptible to a human observer.

Brr-a. I have heard this note given by nuthatches coming to a feeding tray, apparently as a warning (territorial) to Black-capped Chickadees (*Parus atricapillus*) or conspecifics.

Medley-of-notes-in-conflict. Mixtures of the vocalizations of 3 or 4 nuthatches in conflict may become staccato or even musical, and include a *qua* or quavering *qua-rr* heard only then.

Agonistic song.—This is a rapid series of *hn-hn* notes generally confined to the breeding season (January–June), regarded by Tyler (1916) as the rarely heard second main song of this species. I heard this song only in agonistic situations. On 17 January, a male made a continuous series of these notes, almost like a buzzer, when close to a Barred Owl. Another male gave these notes several times when I was 6 m from a nest, as if he regarded me as an intruder.

The agonistic song appears at times to be a combination of agonistic and courtship behavior, corresponding to a similar song of the Red-breasted Nuthatch (*S. canadensis*) (Kilham 1973). In *S. carolinensis*, this song usually requires a setting similar to that in which courtship song occurs (i.e., usually early in the day with the female resting close by), plus the presence of a rival at a distance.

Territory and territorial encounters.—White-breasted Nuthatches, even deep in their own territory, appear aware of neighboring pairs. At 06:00 on 10 April, the members of a pair were exchanging low *hit-tucks* when the male switched to *hn-hn* notes. Both sexes then made loud *kun* and *ka-uns* as they flew to the nearest border. I heard a second pair there, but the 2 pairs quickly separated. Other encounters, arranged below by order of severity, were of greater duration.

Grade I. Two severe encounters were in March. At 06:10 on 31 March, the members of 2 pairs were all in aggressive threat displays in a hornbeam (*Carpinus*). The 2 males flew at each other, fluttering beak to beak in midair.

Grade II. At 09:00 on 7 December, a different pair of nuthatches each moved 2–3 m above the gound in saplings on either side of a dirt road. All 4 birds gave aggressive threat displays and uttered a mixture of notes, including buzzer-like *grrs*. Each male remained on his side, only the females crossed over. Whenever a female returned to her mate both birds started displacement pecking. The conflict, occuring before the onset of active courtship, primarily involved the females.

Relation of territorial conflicts to pair bond.—In some species (e.g., Hairy Woodpecker [*Picoides villosus*]) (Kilham, Wilson Bull. 81:169–183, 1969), the pitch of emotion aroused against a rival can be diverted to courtship during lulls in territorial conflict. This antecedent situation was seldom evident for *S. carolinenesis*. On a number of occasions there was an increase in intimate, antiphonal notes between members of pairs following conflicts. I also once saw courtship feeding after a conflict. Generally, however, there were no indications that agonistic behavior stimulated courtship. Severe conflict appeared to have the opposite effect. In some instances, a male attacked his mate during lulls in fighting with a rival, behavior also noted by Löhrl (1959) in *S. europaea*. This would seem to be a case of redirected attack in the sense used by Bastock et al. (1953).

Size and nature of territories.—By following limits of wanderings as well as noting location of conflicts, I estimated that 1 pair of nuthatches had a territory of 15 ha, approximating that given by Brackbill (1969) for a banded pair in Maryland.

Effects of a feeding station.—A feeder with suet and sunflower seeds in the territory of 1 pair in the winters of 1968 and 1969 attracted a second pair whose territorial boundary was only 12 m away. Efforts of the second pair to enter the territory of the first pair led to daily conflicts. The second pair usually gave threat displays when they were by their territorial border and trying to reach the feeder. The male not only drove away the intruders, but often his own mate as well. The feeder disrupted the daily movements of the chickadees and nuthatches to such an extent that studies of natural behavior became impossible. Interestingly, Bock (Ecology 50:903–905, 1969), in discussing White-breasted as well as Pygmy (*S. pygmaea*) nuthatches, stated that: "The artifact of having an abundant food source of precise and predictable localities caused a breakdown in flock organization and a rapid sort of 'competitive exclusion' at the feeders." Present studies were made in woods away from feeders.

Reactions to predators.—The most intense reaction witnessed was at 16:00 on 17 January, when a male nuthatch stayed within 5–7 m of a Barred Owl, alternating bouts of displacement pecking with rapid *hn-hns*. The nuthatch's tail was raised slightly and he occasionally flicked his wings. A pair of Hairy Woodpeckers, present part of the time, also engaged in displacement pecking. Perhaps the intensity of the nuthatch's reaction may have been due to the lateness of the afternoon and the proximity of the owl to the nuthatch's (and the woodpecker's) roosting place.

A male nuthatch travelling with chickadees and a Brown Creeper (*Certhia familiaris*) on 2 March encountered a Barred Owl dozing in the open. The male uttered *kun* and harsh *kaan* notes, but did not come close. After 1–2 min the flock departed. Possibly sleepy owls at mid-day evoke different reactions than alert ones at dusk.

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Evasive behavior of American Coots to kleptoparasitism by waterfowl.—On 17 April 1976, at Dewey's Pasture Wildlife Management Area in northwestern Iowa, I saw American Wigeons (*Anas americana*) and Gadwalls (*Anas strepera*) kleptoparasitizing American Coots (*Fulica americana*). One or 2 wigeon or Gadwalls, but not both species at once, closely attended and followed a coot. At times all the coots present (15–25) were attended by kleptoparasites. Both duck species dabbled at vegetation brought to the surface by coots