GENERAL NOTES

DEVELOPMENT OF A REDWING (*AGELAIUS PHOENICEUS*)

In 1938 I had the privilege of raising 2 families of young birds under the guidance of Dr. Konrad Lorenz in Altenberg, Austria, and since then, have raised over a dozen birds of 4 species in this country. I found that all these passerines followed the same general pattern of development, yet with clear, specific differences. Hand-rearing of birds, combined with careful, continuous observation, gives the student a knowledge of much of the instinctive equipment of a species, as well as information on the learning process. It gives an insight into the character of a species which can be gained in no other way.

Two female Redwings, each removed from its nest at an age of 9–10 days, were hand-raised to study their behavior. Comparing their development with the schedule shown in Nice (1943:15, 34, 57) these 2 Redwings had attained essentially all the motor coordinations of the first 3 stages by the time they left the nest. The most striking of these are as follows: Stage 1, coordinations mainly concerned with nutrition—gaping; Stage 2, first appearance of new motor coordinations—preening, stretching legs up, screaming, cowering; Stage 3, rapid acquisition of motor coordinations—stretching wings up, stretching sidewise, scratching head, shaking self, location call. In the short interval between the time I took F and the time she left the nest, I did not see any fanning or fluttering of the wings.

Comparison of Development of 3 Species

In Table 1 a comparison is given of activities of Stages 4 and 5 as they appeared in the Redwings, in Song Sparrows (*Melospiza melodia*), and in a Cowbird (*Molothrus ater*) that I watched to the age of 25 days (Nice 1939). (From their appearance, when found on July 6, from their spontaneous leaving of their nests on July 8 and 9, and from their attainment of skillful flight on July 15 and 16, the Redwings are assumed to have hatched June 29 and 30. The sex of the birds was known by their comparatively small size, their tarsi measuring 28 mm. on July 8. The older bird, W, was raised by Mrs. Winifred Smith, Two Creeks, Wisconsin.)

Stage 4 in these 3 species is characterized by leaving the nest, establishment of locomotion, and first appearance of independent feeding coordinations. Stage 5 is characterized by attainment of flight and of gradual independence in feeding and social behavior. With some passerines, Stage 4 is passed in the nest. This is true of species nesting in protected places—Group II in Table V (Nice 1943:70): Sittidae, Cinclidae, Sturnidae, Laniidae, Hirundinidae, Regulidae; and Group III: Paridae, Certhiidae, Ploceidae, Troglodytidae, Sialia in the Turdidae, Muscicapidae, Motacilla in the Motacillidae, and also Carduelinae on the Fringillidae. Others leave the nest before they can fly, spending Stage 4 in the open—Group IV: Sylviidae, most of the Turdidae, Anthus in the Motacillidae; and Group V: Alaudidae, Icteridae, Mimidae, Parulidae, and Fringillidae except the Carduelinae. (These observations are based on birds in the North Temperate Zone.)

With the Song Sparrow, Stage 4 means a week of retirement in which the fledgling hides in the undergrowth, calling to its parents with the location note; the bird is independent of nest and siblings, but strictly dependent on its parents for food.

The first 4 instinctive activities in Table 1 appear on the first day. Walking came a few days later with the 2 Icterids. The next 4 activities, concerned with food getting, are largely experimental and might be considered premature manifestations. As to bathing, if by accident a 13- to 15-day old bird blunders into a dish of water and responds with bathing movements, it often does not know how to dry itself.

Stage 5 begins with the attainment of skillful flight and lasts until the independence of the young bird. The little Song Sparrow comes out of retirement, pursues its parents for food, meets its siblings again and quarrels with them, and gradually, through maturation and trial and error, becomes able to feed itself entirely.

The Redwing's development closely paralleled that of the Song Sparrow, the chief difference lying in the fact that the former is less of a ground bird than the latter. Instead of hopping over the floor as did the Song Sparrows, she stepped, hopped, walked, and flew. She also showed more of a tendency to climb than they, something also noted by Mrs. Laskey (per-

TABLE 1

Maturation of Some Instinctive Activities in Three Species

	AGE IN DAYS		
	Redwing	Song Sparrow	Cowbird
Stage 4			
Leaving nest	10	10	11
Hopping	10	10	11
Flying	10	10	11
Sleeping in adult position	10	10	11
Walking	12	10	13, 15
Exploratory pecking	13	12, 13	14
Watching prey	13	12, 13	
Drinking	13	13–16	16*
Picking up food	14	12–14	
Bathing	13	13–15	16*
Stage 5			
Flying well	17	17	
Frolicking	16	17, 18	
Antagonism note	14	17	21
Threatening	17	19	
Fighting	20	19, 20	
Alternate wing motion in bathing	25	20–25	16*
Prying with bill	21		
Shelling seed	30	26	
Adult notes	37	28	
Sunning	39	29–34	
Nest molding	39	35, 52	

* First opportunity

sonal communication) with her hand-raised Redwing. She walked much less than did the Cowbird, but was far more active and skillful in movement than that individual. Another marked contrast lay in the begging behavior of the 2 birds: the Cowbird persistently begged from all the Song Sparrows, young and adult, as long as we had it; the Redwing begged from our adult hand-raised Meadowlark, *Sturnella magna*, the first time they met, but never again, and never from the young Nighthawk, *Chordeiles virginianus*.

Innate and Learned Behavior

All the activities in Table 1 are examples of innate modes of behavior. Learning is concerned with the object of the instinctive reaction. This means—in flying, suitable landing

places; in feeding, that which is or is not edible; in social relations, distinguishing between social companions and enemies.

Motor Coordinations. It was not until F left the nest that she slept with her bill in her scapulars, as W had done the previous night. On July 10 F flew 2.5 feet and climbed a philodendron plant and the window screen. She appeared to have no difficulty in landing. On the 11th I first noted the juvenile behavior of stretching legs up and wings down at the same time; this was occasionally seen until July 19. W had done it July 9. During the first 4 days out of the nest F walked and hopped and took her first bath, thoroughly soaking herself; she shook herself vigorously, but made no attempt to dry herself by preening.

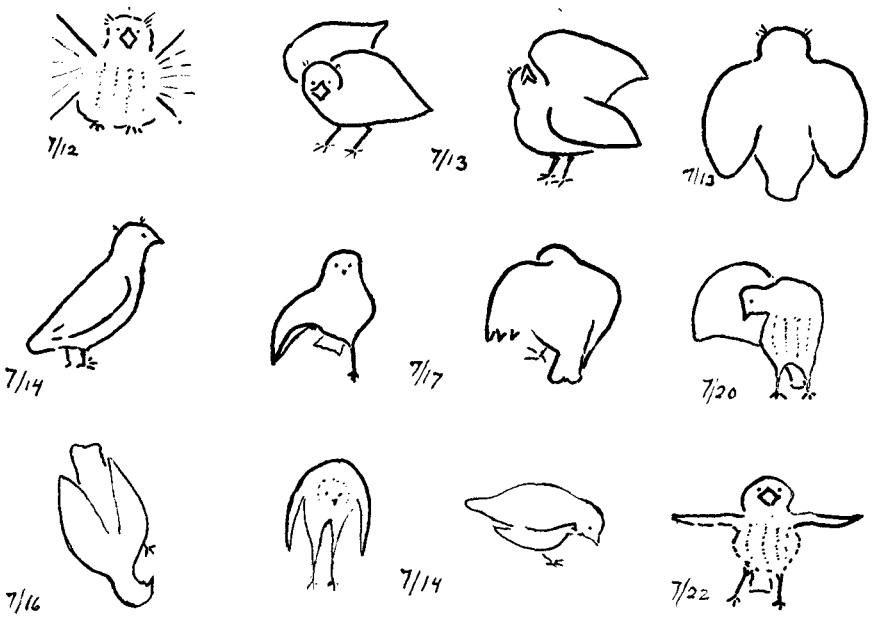

FIG. 1. Instinctive Movements of Young Redwing

Top row: begging, climbing on screen.
Middle row: stretching sidewise, preening.
Bottom row: climbing on screen, stretching legs up and wings down, scratching over wing, begging.

Stage 5 was ushered in on the 15th by "frolicking"; she gave wild hops hither and yon with the aid of her wings. After 4 weeks of age she frolicked entirely on the wing, flying madly back and forth in her cage. On the 16th she flew to the top of the sunporch; she circled about and tried to alight on the wall. (W was released on July 15; she flew well and was adopted by adult Redwings.) On the 17th F walked most of the time, occasionally hopping; at 5 weeks hopping was no longer seen. On July 20 she started to pry with her beak like a Meadowlark, Bronzed Grackle, *Quiscalus quiscula* (Laskey 1940), or Starling, *Sturnus vulgaris;* this became one of her favorite occupations, prying apart the leaves of books or newspapers when held by one of us, and probing under other objects. On Aug. 7 as she lay on my apron, she opened her wings and went through motions of nest molding, picking up the flounce of my dress and tucking it under her. She was a very active, alert bird, constantly busy, examining the objects in her environment, tweaking, pecking, and probing them.

FIG. 2. Development of Redwing

July 8: F crouching in improvised nest; F taken out of nest.

Feeding Behavior. On July 9 I first noted F fluttering her wings when begging. About every 50 minutes she began to call with a single location note. She crouched low to beg. The next day her food call was double and, when she was fed, it became triple. On the 13th she started giving this triple note nearly every time she flew, keeping this up for the next 3 weeks.

The first intimations of independent feeding reactions appeared on July 12; up till now the Redwing had sat motionless between her hourly meals, but now she began to explore her environment with her bill. She pecked at all sorts of things, including a dropping. The next day she picked up food, but dropped it again. On the 14th she tried to catch an ant; on the 15th she picked up and ate a small green insect. On the 18th she readily picked up and ate meal-

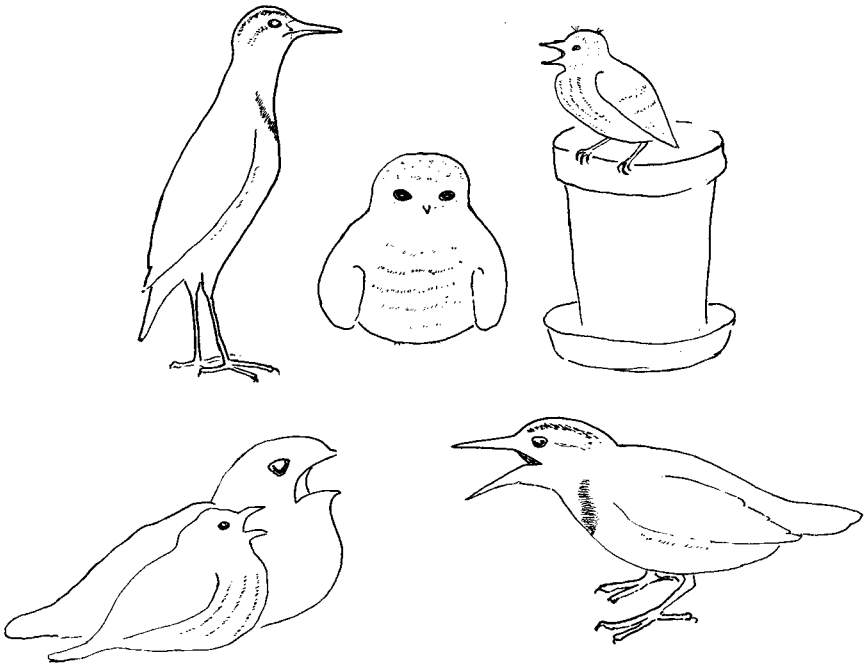

FIG. 3. Social Behavior of Redwing

Above: Redwing begging from Meadowlark as latter cautiously approaches the young birds. (July 12.)

Below: Social bond between Redwing and Nighthawk, antagonism between these two and the Meadowlark. (July 22.)

worms, as well as miscellanious small insects crawling out of the net with which we had swept the grass. Four days later she ate a yellow and black beetle about 6 x 2.5 mm. in size.

Her responses to lady beetles showed some confusion. On the 15th she tried to catch one, then suddenly began to beg loudly *chick-chick-chick-chick-chick* with fluttering wings, her open mouth directed towards the beetle on an upright grass stem! Later she saw the beetle again and approached it begging. The next day she went through the same performance before a bit of cottage cheese hanging from the Nighthawk's breast feathers. On July 22 she again gave the food call to a lady beetle, but did not flutter her wings. She finally took it in her bill but dropped it.

She learned to avoid one insect. On the 18th she took a brown stink bug in her bill; she dropped it, and jumped away, frantically trying to scratch her bill with one foot while getting away from the vicinity of the obnoxious creature. She never touched a brown stink bug again, but a few days later sampled a green one. (Curiously enough, the Meadowlark readily ate stink bugs.)

On July 31 she ate small ants, but did not "ant." She caught and ate a small wasp with no ill effects. She knew very well where the mealworms were kept; she flew to their boxes and gathered up stray individuals.

Social Behavior. The Redwing's social companions were people, the Nighthawk and the Meadowlark. The 2 young birds were at first free on a table on the sunporch, but after July 16 spent most of their time in a cage 60 x 80 x 45 cm, while the Meadowlark lived in a larger cage in the same room.

There was a strong and continuing bond to human beings as parent companions and later as social companions (Lorenz 1937). Till the age of 5 weeks she greeted every person entering the sunporch with her food call, and she begged vigorously whenever food was offered. At 4 weeks it was no longer possible to pick her up at will, but she came to us of her own accord, alighting on our heads or hands and on newspapers and magazines we tried to read. She often lay down on my dress and seemed to enjoy gentle stroking. The hand-raised Song Sparrows had lost the social bond to people at the age of 3 to 4 weeks.

A social bond developed between the Redwing and Nighthawk, despite their very different modes of life. The Nighthawk sat motionless most of the time in contrast to the great activity of the smaller bird. Occasionally F pulled at her companion's feathers or toes, and from July 17 to 23 frequently jumped on her back. (This behavior would seem to correspond to that of the 3 week old Song Sparrow's often landing on their fathers.) The Nighthawk never seemed to resent any of these attentions from the Redwing, although she was markedly antagonistic to the Meadowlark after being rather severely pecked by the latter during their first encounter on July 12. From the time F was 3 weeks old, the 2 young birds often lay side by side. It was a surprise to find that the Redwing enjoyed bodily contact with the Nighthawk and our stroking even at the age of 7 weeks.

On July 12 when I introduced the Meadowlark to the young birds, the Redwing gaped and gave the food call as he approached. The next encounter was on July 16 when F had reached Stage 5. I put the Meadowlark on the windowsill near the Redwing; although she had had no unpleasant experiences with him, she opened her bill, held out her wings and gave her antagonism note, a kind of snarl. The same thing happened the following day, while on the 19th, she and the larger bird started pecking at each other; when he gave her a hard peck, she screeched and I removed him. On Aug. 1 she snatched a grasshopper from his bill. Two days later she entered his cage; he threatened her with open bill and she left. Later she stayed in for some time. Sometimes she alighted beside his cage and a sparring match ensued.

In 1940 I did not succeed in making a social companion out of a Cedar Waxwing (*Bombycilla cedvorum*), apparently because a hand-raised Song Sparrow met the specifications far better than I did; the 2 birds ate together, sunned together, preened at the same time, followed each other in flight, and roosted together. The Nighthawk, on the other hand, shared so few of the Redwing's activities that she did not adequately fulfill the place of a social companion, and the social bond remained strong towards the far more active human beings.

Summary

The development of a hand-raised Redwing from the age of 9 to 42 days closely paralleled that of Song Sparrows, the chief difference being that she was less of a ground bird than they and she did not lose the social bond to human beings after becoming independent.

A table is given showing the ages at which 21 instinctive activities appeared in this bird, in

Song Sparrows, and a Cowbird; these activities belong to Stages 4 and 5 in the development of passerines. The Redwing hopped at 10 days and walked at 12; at 4 weeks she walked exclusively. Exploratory pecking appeared at 13 days; 5 days later she was catching insects. A social bond existed between her and a young Nighthawk, and between her and human beings, but her reactions to a year old Meadowlark were largely hostile.

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A LARGE SANDPIPER CLUTCH

In his "Comments on Recent Literature" relating to clutch size in birds, Amadon remarks that sandpipers "lay 4 large eggs; apparently this is the maximum number that can be covered by the parent" (*Wilson Bull.*, **61(2):** 117. 1949.) In view of this statement it may be of interest to record a nest with 5 eggs of the spotted sandpiper (*Actitis macularia*) that I found in early July, 1948, on the border of Mamagekel River, north of Nictau, New Brunswick. By July 7 the eggs had hatched, but the 5 young were still in the nest. Of the many nests of this species that I have examined from Maine to Maryland none has contained more than 4 eggs. Virginia Orr reports finding 5 newly hatched young "in a marshy bit of tundra" in Newfoundland Labrador on July 8, 1946 (*Auk*, **65(2):** 222. 1948.)

Possibly clutches of 5 eggs of the spotted sandpiper are more frequent in eastern Canada than in the eastern United States. It is worth noting that among plovers the average clutch in North America is 4, in the Antilles 3, and in northern South America (e.g., Trinidad) apparently only 2.—JAMES BOND, Academy of Natural Sciences, Philadelphia, Penna.

SWAINSON'S WARBLER ON COASTAL PLAIN OF MARYLAND

Investigations of remote areas in the eastern United States are continually extending the known breeding range of Swainson's Warbler (*Limnothlypis swainsonii*) northward (e.g., southern Illinois, central West Virginia, and recently into southern Delaware and the portion of Maryland east of Chesapeake Bay).

The "Eastern Shore" records, dating back to Cadbury's sight record in 1942 near Willards, and Stewart's specimen in 1946 at Pocomoke City (Stewart and Robbins, *Auk*, 64: 272, 1947), do not indicate recent invasion of the more northern part of the Atlantic Coastal Plain. Conditions in the Pocomoke Swamp, where this warbler occurs, seem to have been ideal since time immemorial, and there are many records of its occurrence in nearby Dismal Swamp, Virginia, dating back to the latter part of the last century. The occurrence of this species can be correlated with the southern element prevailing in the swamp.

Pocomoke Swamp, which appears to be the northernmost of the true southern swamps on the Atlantic Coastal Plain, extends along the Pocomoke River from lower Sussex County, Delaware, to within a mile or so of Virginia. The plant geographer may think of the Pocomoke as a disjunct (area of discontinuous distribution), since this swamp is separated from similar areas. The long sandy peninsula of the "Eastern Shore" of Virginia and the mouth of the Chesapeake Bay separate the Pocomoke from the Dismal Swamp, while the bay lies between the Pocomoke Swamp and the bottomlands of "Tidewater" Virginia.