struction, and would be used again if the present nest were destroyed, and the same might be said in part for the Osprey's actions, but these do not appear to be at all similar to any normal nest-defense actions, nor does the attempted copulation of the Vermilion Flycatcher.

The ulterior biological function of an irrelevant act is incidental and accidental. In the above incidents, one action—that of the woodpeckers—was once beneficial; one was detrimental—that of the Phainopepla; the others were neutral.

A convincing explanation of this type of behavior is not immediately evident. Huxley (loc. cit.) calls them self-exhausting acts, the performance of which provides satisfaction to the bird; Tinbergen (loc. cit.) says they are parts of one cycle of behavior substituted into another cycle of behavior and suggests a psychological explanation of conflict of drives. In any case it is a type of behavior of widespread, sporadic occurrence. Giving it a name does not explain it, but having a name for it helps in briefly referring to some of its characteristics and correlating it with similar phenomena.

Kirkman (Bird Behavior: 78–80, 213, 1937) has used the term 'substitute reaction'; Tinbergen (loc. cit.), the term 'substitute behavior.' In view of the different uses of the terms 'substitute' and 'substitution' by various authors, as substitution for conditioning (Watson, Behavior, An Introduction to Comparative Psychology: 272, 1911) and for the use of less desirable food when more desirable food is absent, and for the use of a less desirable sex partner when a more desirable one is lacking (Katz, Animals and Men: 157, 195, 1937), it seems advisable to use some other term for this type of behavior. Since irrelevancy is the main criterion for evaluating the behavior, 'irrelevant behavior' seems a more suitable term.

*National Museum of Canada*
*Ottawa, Canada*

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## NESTING HABITS OF THE YELLOW RAIL IN GASPÉ COUNTY, QUEBEC

BY L. MCI. TERRILL

*Plates 5, 6*

WHILE on a holiday in Gaspé in 1939, my wife and I had the pleasure on July 5th of hearing for the first time the unmistakable calls of a Yellow Rail (*Coturnicops noveboracensis*), in a marsh near the coast between Percé and Gaspé. The notes have a decidedly flinty

character which may be imitated rather accurately by striking two pebbles together and might be written: *'teck-teck - - teck teck teck.'* Once the song was reminiscent of hay-cutting—the rapid whetting of a scythe, an implement that is still used on the steep slopes of Gaspé's hills. Again it suggested the action of a hay-raking machine in the distance. These similes are the result of first impressions and were not suggested by Peabody's (1922) experience in the 'Big Coulee' of Benson County, North Dakota, where he generally found nests of this rail hidden beneath wisps of marsh hay left by the rake in the previous season. These sounds, however, lack the rather monotonous rhythm of the Yellow Rail's song. We heard it many times on this occasion and later, but did not record a single variation in time, pitch, tone or inflection.

Walking in the direction of the sound we soon had the satisfaction of flushing the bird and had a fair view of it before it dropped waveringly into the marsh a short distance away. Later, we flushed it again. We attributed our success partly to the undeveloped condition of the vegetation, a conjecture strengthened by experience with Sora and Virginia Rails which are often put up when the sedges are short, but seldom later in the nesting season. In brief, it would appear to be the lack of adequate cover that induces rails to fly when their haunts are invaded by man. Our search for the nest was unsuccessful as was the case on the 7th and 9th. On each occasion the bird called frequently but was not flushed again.

Next year (1940) we decided to learn, if possible, something more about the elusive bird. Reaching the marsh at dusk on the evening of July 19 we heard nothing whatever from the rail, although we remained in the vicinity for an hour. Toads were singing commonly but the only bird notes heard were the cackling of a Wilson's Snipe (*Capella delicata*) and from the neighboring spruce bog the songs of Olive-backed Thrushes (*Hylocichla ustulata swainsoni*). Next morning, however, the rail was calling vigorously in bright sunshine when we arrived about nine o'clock and continued to do so intermittently during our stay of four hours. In our limited experience the vocal activity of this rail is greater in the daytime than at night. We visited the marsh on three occasions after dark and heard it only once, whereas it was always heard during daylight visits. In any case it appears to be decidedly more diurnal in habit than either the Sora or Virginia Rail.

Although we failed to find the nest or even see the bird on this occasion, we did come to the conclusion that it called more frequently

in a certain portion of the marsh than elsewhere. Returning on the 24th, we began a determined search in this area and in less than ten minutes found the nest in a dense patch of the widely distributed bulrush (*Scirpus validus*), the prevailing sedge in this portion of the marsh where it occurs in almost pure stands.

The marsh was part of extensive lowlands at the base of a range of hills, the source of several streams which meandered successively through coniferous bog and open marsh in their tortuous course to the sea, eventually debouching into salt flats whose saline nature was indicated by the presence of such plants as sea milkwort (*Glaux maritima*), seaside crowfoot (*Ranunculus cymbalaria*), the tiny starwort (*Stellaria humifusa*) and its boon companion, the tinier sedge (*Humifusa subspathacea*).

The bulrush beds, apparently the centre of attraction for the rail, occurred in greatest abundance along the margins of shallow water lanes which in some cases were merely backwaters of the streams. Here and there were drier mounds where the bulrushes were partly displaced by shrubbery in which the following plants predominated:—sweet gale (*Myrica gale*), shrubby cinquefoil (*Potentilla fruticosa*), tall meadow-rue (*Thalictrum polygamum*) and American burnet (*Sanguisorba canadensis*). Owing to the presence of much free water, certain other sections were apparently just as unsuitable to the bulrush. Here the buckbean (*Menyanthes trifoliata*) was the prevailing plant with an occasional hoary willow (*Salix candida*). In addition to several sedges and grasses, plants found in the drier portions of the open marsh included Alpine bistort (*Polygonum viviparum*), swamp pedicularis (*Pedicularis palustris*), purple eyebright (*Euphrasia purpurea*), smaller purple-fringed orchis (*Habenaria psycodes*), tall leafy green orchis (*Habenaria hyperborea*), tall white bog orchis (*Habenaria dilatata*), hooded ladies' tresses (*Spiranthes romanzoffiana*) and white adder's-mouth (*Malaxis brachypoda*).

The nest was beneath a flattened swath of dead rushes, further concealed by the living plants which were from four to six feet in height and in fresh flower. It was built between stems of living rushes and partly supported by them, though actually resting lightly on the ground. There was very little other growth in these bulrush beds except about the margins, where a few diminutive sweet gale shrubs and a bedstraw (*Galium*) struggled for existence. Within the beds, clinging to the spongy, water-soaked ground, were a few mosses, straggling plants of bog cranberry (*Vaccinium oxycoccos*) and the flattened, moss-like leaves of a bladderwort (*Utricularia intermedia*)

which only flowered about the margins of free water in the treacherous sink-holes found between the rush beds. I mention this for the reason that the nest was composed of fine, dried grasses and sedges which must have been brought from other portions of the marsh. A very few pieces of the pithy bulrush stems were incorporated in the body of the nest but the lining was entirely of fine material. The preponderance of fine material and the compactness of the structure, which measured in outside diameter 5.4 x 4.9 inches and 3.4 inches in outside depth, suggested the nest of a large finch rather than that of a rail, except for the disproportionate depth.

There were nine eggs of a warm, creamy-buff, eight of them encircled about the large end with compact wreaths of rufous-brown spots, in some cases almost covering the apex. The ninth egg was more lightly wreathed near the smaller end. Otherwise they were practically immaculate.

Photographs were taken of the nest and habitat but we discovered later that the single attempt to snap the sitting bird, by releasing the shutter 150 feet from the nest, was unsuccessful, notwithstanding the fact that there were no 'watch-dog' Red-winged Blackbirds to give the alarm; nor did we at any time, no matter how cautious our approach, succeed in getting even a glimpse of her on the nest although the eggs were invariably warm. One of the birds, presumably the male, called frequently at distances varying from 100 to 300 feet from the nest, as nearly as we could judge, but we heard nothing from its mate until the young were hatched. No further attempt was made to photograph the bird for fear of accident as we wished above all to see the young. One of the eggs was taken to determine the state of incubation which was found to be advanced.

On the 26th there was no apparent change in the condition of the eggs at 11 a. m. Returning at 12:30, we found the crown of one of the eggs lying in the bottom of the nest and the chick making efforts to free itself from the remainder of the shell. On our next visit, at 4:30, one nestling was in the act of disappearing over the side of the nest, a second had already done so, and a third, wings outspread though barely dry, was laboriously progressing towards the edge. The eggshells were still in the nest with the five unhatched eggs. Not a sound was heard from parent or young, but profiting by experience with Sora and Virginia Rails we searched carefully beneath the nest and found the precocious youngsters crouching there.

The chicks were covered with luxuriant coats of long, glossy black down, similar to the down of nestling Sora and Virginia Rails. Apart

(Above) PORTION OF MARSH WHERE YELLOW RAILS NESTED, GASPÉ, QUEBEC.
(Below) NEST OF YELLOW RAIL.

from their smaller size, they differed principally from Sora nestlings in not having the orange goatee or the blood-red, blister-like protuberance at the base of the upper mandible; also in the total absence of a bare patch on the fore part of the head. This suggestion of baldness is very pronounced in Sora nestlings but scarcely noticeable in the young of the Virginia Rail. The feet were grayish-drab and the bill pinkish-flesh color with a tiny ivory egg-tooth near the tip.

Photographing the young in the nest required much patience as they were extremely fidgety and persistently attempted to escape. Efforts to leave the nest were redoubled when the first note of protest was heard from the female—a note that resembled closely the whimper, or murmur, of the Sora. It was more subdued, however, and barely audible, although the bird was moving about in the rushes in the immediate vicinity of the nest. It appeared to be emitted through the nostrils with mandibles closed, in the manner of a whimpering dog, and was evidently for the purpose of inducing the young to follow her. I have near heard a Virginia Rail give this note but both male and female Soras commonly do so when disturbed with young. I have also on two occasions (May 18 and 20, 1932) watched a whimpering Sora, presumably the male, following another Sora persistently. This took place in the late afternoon in a shallow wood-girt pond before nesting had started. The scanty growth at the time enabled me to keep the birds in view without difficulty as they circled the pond, a few feet apart, for several minutes. So absorbed as to appear unaware of, or indifferent to, my presence, they exhibited none of the nervous manner usually observable in rails, alternately wading in and out amongst the isolated grass clumps and without apparent hesitation swimming boldly across deeper portions of the pond. The male whimpered almost continually though, on a few occasions, it paused to give the common spring call, *ker-wee*. I am convinced that this was a courtship performance.

To return to the Yellow Rail, we were satisfied that the whimpering bird was the female because its mate sang occasionally during the performance which was repeated several times. We assumed that only one pair of Yellow Rails was present as we never heard more than a single bird calling at one time.

Experience with many pairs of Sora Rails in the Montreal District provides ample evidence that incubation in that species begins with the laying of the first, or at latest the second, egg, and that the eggs hatch at an average rate of one per day. The Sora is nearly always flushed from its nest as soon as egg-laying starts. The Virginia Rail,

on the other hand, is rarely found on the nest before there are six or seven eggs, and it would appear that incubation starts, as a rule, when the seventh egg is laid. In any case the young are all hatched within two, or at most three, days after the first chick emerges.

I had expected that the Yellow Rail would perform the duties of incubation somewhat in the manner of the Sora and was surprised to find at 9 o'clock on the following morning (July 27) that the remaining eggs had hatched and that all but one of the chicks had left the nest before we reached it. Thus within twenty hours from the appearance of the first chick all of the eggs had hatched and apparently incubation was only commenced after the last egg was laid. We found the egg shells 8 to 10 feet from the nest, the heavily spotted crowns neatly separated from the immaculate portions. Not one was cracked nor even dented and with care they might have been restored almost to their original condition.

Three of the chicks were found hiding beneath the nest and later the querulous *xzwee* of two others drew our attention to them as they moved in the direction of their mother who was more demonstrative on this occasion, whimpering frequently. Thrice she revealed her crouching form as she circled about us. Once she varied the whimper with a muffled *tuck, tuck, tuck,* and several times when near our camera case, in which three of the young were confined, a rapidly uttered *tuk, tuk, took took took,* in the tempo of a domestic hen calling her chickens, reflected her mounting excitement. We left the marsh at 10:30 in order to permit the distracted mother to collect her offspring. I have seen Sora and Virginia Rail nestlings return after being disturbed and clamber into the nest and hoped these Yellow Rail chicks might do likewise. On our return to the marsh at noon, however, when the male was calling a few hundred feet away, we were surprised to hear the familiar whimper about 100 yards from the nest in the dense growth of sweet gale and other shrubbery covering one of the drier mounds previously mentioned. Although we did not see the chicks on this occasion, two of them were heard complaining in the vicinity on the 31st, and the mother's obvious concern in both instances substantiated the assumption that they were being brooded somewhere in the undergrowth about this mound. We visited the nest on the afternoon of the 27th and on succeeding days but found no evidence that the chicks had returned.

A careful search here and elsewhere revealed none of the so-called dummy nests such as are habitually built by Sora and Virginia Rails and at least on occasion used by them for brooding young. This

applies especially to the Sora which frequently lays twelve or thirteen eggs and sometimes as many as fifteen. A supplementary nest must be very useful in such cases—decidedly so when the natal nest is too small to accommodate the eggs in a single layer and in view of the fact that they hatch at the rate of one a day. It would be extremely difficult or impossible for the parent to incubate successfully while brooding an ever-increasing family. In any event, it has been my experience that the male Sora frequently, if not regularly, broods some of the young in a dummy nest while his mate incubates the remaining eggs. The term 'cock nest,' sometimes used to designate these extra nests, would appear to be particularly applicable to the Sora.

It is a comparatively simple matter to find dummy nests of the Sora and Virginia Rail and, in the smaller marshes, it is often possible to determine whether they have been used. Ascertaining the habits of the Yellow Rail in this respect is quite another matter. In this instance it would have been impracticable, if not impossible, and although the bird may not have required or used an extra nest for brooding it may, of course, have built additional nests as do many other birds which have no recognized use for them. Nests for sleeping places are not as a rule needed by perching birds and, with a few exceptions, are not constructed by them. Wrens are probably the most noteworthy exceptions. Skutch (1940) has furnished abun dant evidence that most Central American wrens construct extra nests in which they sleep, either singly, in pairs or in family groups. In Quebec Province, Marsh Wrens, both Long-billed and Short-billed, usually build four or more dummy nests and occasionally as many as ten. Although some of these are poorly made, each pair as a rule lines at least one of the surplus nests with a warm bed of down from the cat-tail heads and it is probable that these indefatigable architects, as in the case of their Central American cousins, employ some of the product of their industry for bed-chambers. Dry sleeping places are not often available ready-made to non-perching, terrestrial birds in a wet habitat and the preparation of these would undoubtedly be of great advantage, especially to birds of a timid, secretive nature. This would obviate any need for seeking a comfortable resting-place in drier situations on the outskirts of the marsh where they would be in greater danger from prowling carnivorous mammals and it may well be the basic reason for the dummy-nest-building habit so prevalent amongst rails and gallinules.

The Yellow Rail is evidently a lover of solitude. Other birds were

rather scarce in this marsh. The songs of two loud-voiced warblers—the Northern Water-Thrush (*Seiurus noveboracensis*) and Tennessee Warbler (*Vermivora peregrina*), reached us occasionally from the border of the spruce bog, but a few Swamp Sparrows (*Melospiza georgiana*) were the only birds heard singing in the open marsh. A nest of the American Bittern (*Botaurus lentiginosus*) was found on July 20 with two young and an egg about to hatch. On July 5 of the previous year we found a nest of this species in the vicinity with four young a day or two old. These dates give some idea of the late nesting of birds on the Gaspé coast.

The other inhabitants included several families of the Black Duck (*Anas rubripes tristis*), an agitated male Blue-winged Teal (*Querquedula discors*) and a brood of Pintails (*Dafila acuta tzitzihoa*) with their mother. The presence of Pintails is notable as I know of no other nesting records for the Gaspé coast. In addition to the solitary Wilson's Snipe already mentioned, we also saw several Black-crowned Night Herons (*Nycticorax nycticorax hoactli*) and on one occasion (July 31) two Greater Yellow-legs (*Totanus melanoleucus*) which probably nested farther inland.

Our knowledge of the breeding range of the Yellow Rail is probably very incomplete, but a study of published records brings out certain facts which I think are worthy of note. In addition to the present record for Gaspé, nests have been recorded only from the following localities:—California (Mono County), one; North Dakota (Benson County), several; Michigan (northern and southern peninsulas), one each; and Ontario (Toronto region), one. It no doubt also nests in several other districts where it has been heard singing and where specimens have been taken in the summer months, notably in central Canada, in the extensive marshes bordering James Bay and Hudson Bay between Moose Factory and Churchill, and in the Lake Winnipeg region. In all of these localities it occurs in marshes of considerable extent. Sora and Virginia Rails nest almost at our back doors in marshes of less than half an acre but the Yellow Rail apparently prefers the more secluded conditions prevailing in extensive marsh lands where, moreover, it is often decidedly gregarious. Gregariousness and a tendency to frequent the same particular stopping places from year to year also appear to be habitual amongst migrants. This is emphasized by Morris (1905) who, with the aid of his dog, found Yellow Rails in some numbers frequenting a certain wet meadow in the Connecticut Valley near Springfield during September and October. He found others in the same meadow in several suc-

YELLOW RAILS A FEW DAYS OLD.

cessive seasons, but none elsewhere in the district though he was in the habit of hunting in many similar meadows. Walkinshaw (1939) records an instance of apparent desertion of the nesting place by a colony of Yellow Rails. In June, 1934, he found this species common in the "large Convis Township marsh" in Chippewa County, Michigan, but found none there in June, 1935. In my experience the Short-billed Marsh Wren (*Cistothorus stellaris*), which has been reported as a frequent associate of the Yellow Rail, is very exacting as to the moisture content of its nesting habitat. In seasons when a nesting haunt is excessively wet, or when drainage, fire, drought or other cause appreciably reduces the moisture content, it is generally unoccupied by the wrens, but they will often reappear in the succeeding years when the former conditions have been restored. It is probable that Yellow Rails are similarly affected by moisture conditions. Presumably they would prefer a habitat with a moisture content that would ensure the best proportion of three essentials:—(1) food; (2) cover for shelter and to provide immunity from attack by predatory birds; and (3) sufficient free water to provide a degree of security from roaming mammals. Some such change in the Convis marsh might offer an explanation for the absence of the rails. On the other hand the repeated use of dogs for the purpose of flushing them might, conceivably, have caused these exceptionally timid birds to seek a haven elsewhere.

Meredith (1935) has collected evidence of the occurrence of the Yellow Rail in the Province of Quebec and gives a number of records of birds secured by hunters during the months of September and October. The only summer records mentioned are three birds taken in Kamouraska County—one at Kamouraska on August 1, 1922, and two at Ste. Anne de la Pocatière on June 23 and 24, 1930. As far as I can learn there are no further records for either locality. The present known status of the Yellow Rail in Quebec Province is therefore as follows:—

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| Fall | —More or less regular migrant in small numbers, principally along the St. Lawrence River near Quebec City. |
| Spring | —No record. |
| Summer | —5 birds—observed in 3 localities (Kamouraska and Gaspé counties). |

Nesting Record—One (Gaspé).

It is the general opinion of observers of this rail in migration that it is one of the most elusive and secretive of birds and rarely flushed

without the use of a dog, and it is, of course, quite possible that it may be a far more common migrant than the records indicate. Those who have heard it in the nesting season, however, agree that its song is very distinctive and could scarcely be mistaken for that of any other bird; also that it sings with unusual abandon. It was the peculiar song of the Yellow Rail that led to the discovery of the summer birds recorded above and it is significant that in three instances their presence was reported to local naturalists by casual observers who were intrigued by the strangeness and persistence of the calls. In view of this and the fact that the song can be clearly heard from a distance of more than 200 yards (Peabody records hearing it a quarter of a mile away under favorable conditions), one can only conclude that the Yellow Rail is either exceptionally selective in choosing a nesting place and confined to a few isolated districts in Quebec or almost entirely absent in the breeding season in the central and southern portions of the Province.

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