

country without seeing it, though in a week one is almost sure to see a number of them. They are very easily identified by a wide white bar across the dark tail near the end, but the really easy way to tell them in migration is by the habit of migrating in flocks, which no other hawk does in Ontario. The flocks are not close, but often they gather in the upper air to float around in astonishing circles, and thus one may see twenty-five, fifty or even a hundred in a single group, and he may have many more in the field of his glass than he can possibly count. Such an amazing number seen in one day, remembering the scarcity of the bird on its breeding ground, impresses strongly on the mind, the vastness of the northern territory it calls "Home"—literally thousands of square miles.

On that memorable day we saw all of the possible hawks except the Red-shouldered and the Red-tailed (*Buteo lineatus* and *Buteo borealis*), including even the rare Duck Hawk (*Falco peregrinus*) (the species that nested or tried to nest on the Sun Life Building in Montreal), of which two were seen; the Osprey, (*Pandion haliaeetus*) again two; Bald Eagle (*Haliaeetus leucocephalus*), four; Marsh Hawk (*Circus hudsonius*) 18; Cooper's Hawk (*Accipiter cooperi*) 22; Pigeon Hawk (*Falco columbarius*) 27; Sparrow Hawk 148; Sharpshin 168 and Broadwing 4,949, making a grand total of 5,340. Of all these birds, none came in flocks except the Broadwing; one might see

a casual two, chasing each other in the air, but there was never any approach to what one might call a flock.

Often the observers were puzzled; as for instance by the Marsh Hawks of which there were two hunting over the field to the east of us, but we counted them once and refused to add to their number unless one flew past going west, and during the whole count, less than a dozen were travelling east. True, the Broadwings seemed to persist in all going in one direction at a time, but that direction changed from time to time and we judged that they were floating against a breeze; and no one ever saw anything done more easily than their floating; it was literally, floating. With wings set, they sailed through the air with no hesitation and with no effort.

In the morning the sky was clouded and colours counted for little, but the sun came out in the afternoon and identification by colour was much easier. Then we were able to distinguish much more easily between the Pigeon Hawks and the Sparrow Hawks. One may imagine (I do it myself) that he can tell these two apart by their flight, but, many times the species is in doubt.

On that day the number of Pigeon Hawks seen was almost unprecedented, totalling 27, besides those that we could not be sure of and which were listed as the more common Sparrow Hawk.

NOTES AND OBSERVATIONS

SASKATCHEWAN WILD LIFE.—The first two numbers of a new mimeographed publication "The Blue Jay," Official Bulletin of the Yorkton Natural History Society, has just come to hand. The objects, as set forth on the cover are,— "To foster an active interest in every branch of natural history, and to promote the conservation of all wild life; also to act as a connecting link between nature lovers in Saskatchewan". It is to be published quarterly, the secretary's address is Box 642, Yorkton, Saskatchewan, and the membership fee .25c per year.

No. 1, (Oct.-Nov.-Dec., 1942, pp. 1-7) contains an editorial on the season, local notes such as a bear seen locally, an albino black-bird, a godwit attacking a passing crow and

killing it, Ducks Unlimited wild fowl program, Indian relics, formation of junior Audubon clubs and additions and corrections to the local list of birds that was distributed in mimeographed form last year.

No. 2 (Jan.-Feb.-Mar., 1943, pp. 8-15) has an editorial, local notes, and requests for further information on wild life, an article on wild bird pets, the results of the Christmas bird censuses, and an item on the status of the sharp-tailed grouse, which is apparently common in some areas, scarce in others.

The Yorkton Natural History Society was formed last September, and now numbers about 124 members. Mrs. I. M. Priestly is president, and C. Stuart Houston is secretary-treasurer. We wish the Society every success in this new venture. A. L. RAND.

SUSPECTED BOTULISM IN WILD DUCKS IN ONTARIO ¹

By A. MURRAY FALLIS,
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THIS REPORT OF SICKNESS among wild ducks on marsh lands in Dover Township, Kent County, Ontario, in the autumn of 1941 was made possible through the co-operation of a number of individuals.

Sick as well as dead ducks were observed by Messrs. William and Metro Sass. The latter suspected the birds were suffering from botulism and therefore sent a Teal and later a Shoveller (*Spatula clypeata*) to Prof. J. R. Dymond, Director of the Royal Ontario Museum of Zoology, who sent the birds to the Ontario Research Foundation for post-mortem examination. A Mallard duck (*Anas platyrhynchos*) was collected by Mr. William Keller game overseer of the district, who submitted it to Mr. H. H. MacKay, Provincial Biologist. This bird was also sent to us for examination.

An account of the outbreak has been given by Mr. Keller (personal communication), who found dead ducks on one side of an artificial marsh which was about 600 acres in area. It had been created by placing a dyke around an area of pasture marsh and then pumping water on to it. The water on the marsh was shallow, hot and stagnant at the time of the outbreak. Many of the dead ducks showed evidence of bleeding at the nose and sick birds were partially paralysed. Mr. William Sass began pumping water onto the marsh as soon as dying ducks were found after which mortality among the ducks was not observed.

These conditions are similar to those which Kalmbach (1934) described as being associated with botulism in ducks. He pointed out that botulism being an intoxication rather than an infectious disease is contracted by the ingestion of toxin produced by the growth of *Clostridium botulinum* type C in suitable media. Dead organic matter, such as that found in any marsh, mud flat or area of overflowed land, provides suitable material for the growth of the organism. The disease has also been found to be closely related with areas of shallow, stagnant water, and outbreaks have terminated following the raising of the water level. Epizootics seldom occur where the water is kept more than a foot or more in depth.

Other important factors associated with the disease are the degree of alkalinity and salinity, the temperature and the abundance of birds in the area.

Post-mortem examination of the three ducks sent to us revealed few striking lesions common to all. The intestines of the Teal and Mallard were practically empty and the walls contracted. The feathers around the vents were soiled with a greenish excrement. The blood vessels of the small intestines were congested and there was some inflammation in the intestinal walls. None of these symptoms were as marked in the Shoveller. It may be significant that this bird, although partially paralysed, was still alive when collected. The heart was in systole in all birds. There were haemorrhages in the meninges of the upper part of the spinal cord of the Mallard (the heads of the others had been removed before they were received). These symptoms are, according to Dr. Kalmbach (1934), suggestive of botulism.

Bacteria-free aqueous extracts were made from the livers of each of the birds. A small intraperitoneal injection of that from the Teal was lethal to guinea pigs, but not that from the Mallard or Shoveller. However, anaerobic incubation at 37°C of a portion of the liver from the Shoveller in a glucose-meat-infusion broth for 17 days produced a toxin which was very lethal to guinea pigs.

Dr. H. Sommer of the Hooper Foundation, California, kindly supplied some *Clostridium botulinum*, type C antitoxin against which we were able to test the two samples of toxin. The details of these experiments will be omitted. It was found however that guinea pigs survived lethal doses of the toxins if sufficient amounts of *Cl. botulinum* type C antitoxin were mixed with the toxins beforehand. Moreover injections of sufficient amounts of antitoxin into guinea pigs protected them against injections of lethal doses of toxin two hours later.

It appears probable on the basis of the above evidence that this sickness in ducks was due to botulism. However Drs. Kalmbach and Quortrup in personal communications point out that the presence of *Cl. botulinum* type C

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