The Goosander and Red-breasted Merganser in Scotland

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Summary

THE spread of the Goosander and the Red-breasted Merganser in Scotland is reviewed and their present breeding distribution is described. The Goosander occurs on the upper reaches and small tributaries of rivers, while the Red-breasted Merganser occurs mainly on sea lochs and firths and on the lower reaches of rivers, except in the case of the larger river systems, where it occurs far inland. During the autumn, winter and early spring the Goosander is found on the lower reaches of rivers and on lochs and reservoirs, while the Red-breasted Merganser occurs in very large flocks in the firths and estuaries. The population density of Goosanders on some northern Scottish rivers in summer is of the order of two to three birds per ten miles.

The feeding methods of the two species are described. Their enemies are noted, man being much the most important. Reasons for the Goosander becoming a breeding species in this country after 1870 are briefly discussed. The present methods of control have caused little change in their distribution. A study of the birds' feeding behaviour and migrations would be of great value in assessing their importance as salmon predators.

Introduction

The distribution and dramatic spread of the Goosander *Mergus merganser* and the Red-breasted Merganser *M. serrator* in Scotland since the end of the last century has been referred to periodically. Harvie-Brown and Buckley (1887, 1892 and 1895) speak of the Goosander, first recorded as a breeding species in Scotland in 1871, as "being one of the most rapidly advancing amongst the breeding species of Anatidae in Scotland." Further mention is made of the rapid extension of its breeding range by Harvie-Brown and Macpherson (1904) and Harvie-Brown (1906). Millais (1913) describes its spread and Baxter and Rintoul (1922) review the distribution of both species in Scotland and draw attention to a similar rapid increase in the distribution of the Red-breasted Merganser.

The latter species, although a resident in this country for centuries, exhibited a marked change in its status about 1890, some years after the colonisation of Scotland by the Goosander. Berry (1939) and Baxter and Rintoul (1953) both describe in detail the distribution of both species and note further extensions in their breeding range since the publication of earlier records. Although mention is made of the control of both species in the interests of freshwater fisheries (Baxter and Rintoul, 1922 and 1953; Jackson, 1937 and Berry, 1939) no assessment has been made of their present distribution after a period of years during which control has been attempted. The purpose of this paper is to summarise recent information and observations on the numbers and seasonal distribution of Goosanders and Red-breasted Mergansers. And an account of an investigation of their food and the effects of their diet on salmonid fisheries will be published separately.

Distribution

The distribution of the Goosander and Red-breasted Merganser in Scotland is shown in Figures 1 to 4. The figures showing the breeding distribution (1 and 2) have been compiled from (1) records given by Baxter and Rintoul (1922 and 1953), Berry (1936 and 1939) and Venables and Venables (1955); (2) the nest record scheme orgainsed by the British Trust

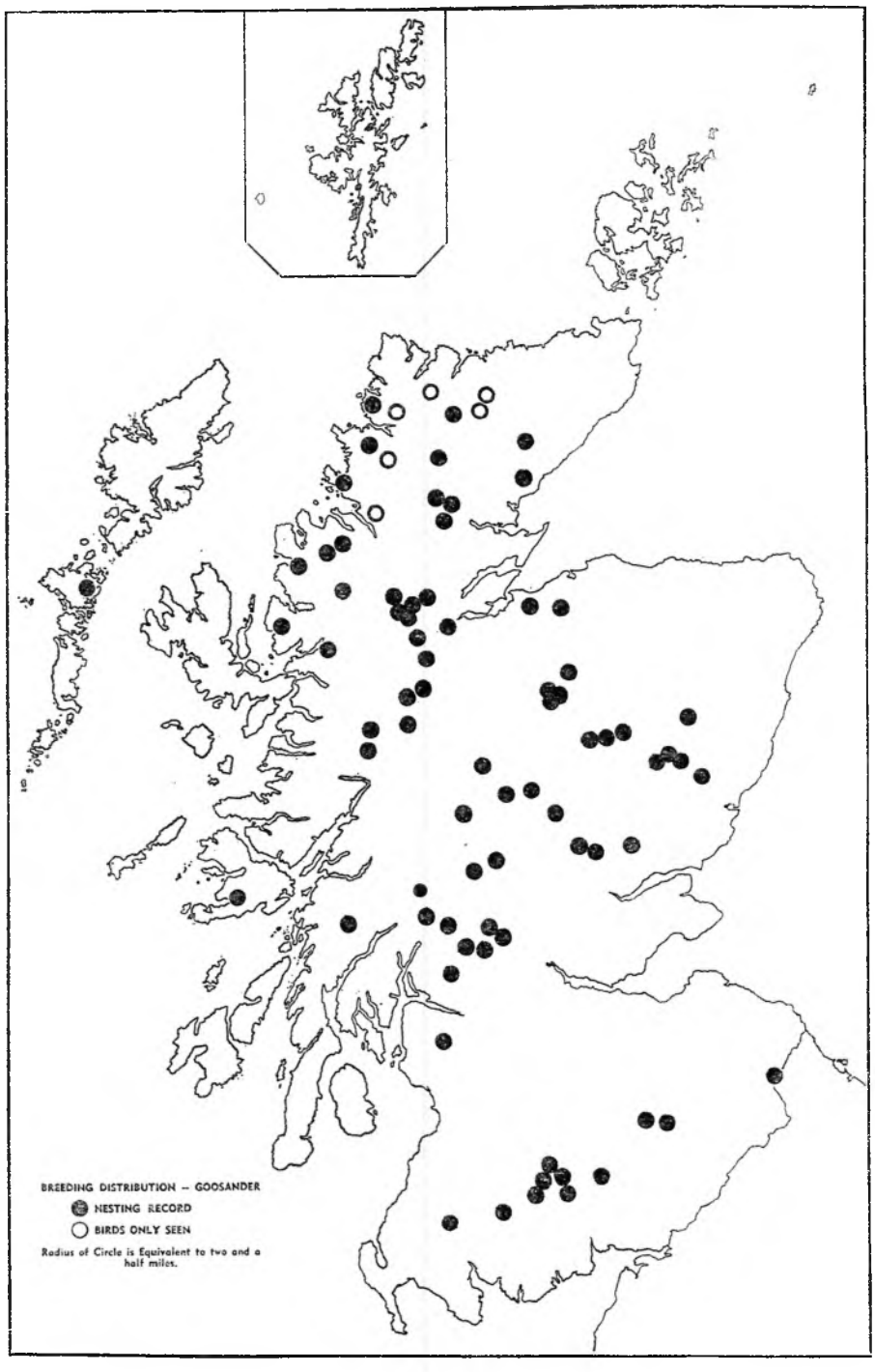
BREEDING DISTRIBUTION — GOOSANDER
NESTING RECORD
BIRDS ONLY SEEN
Radius of Circle is Equivalent to two and a half miles.

Figure 1

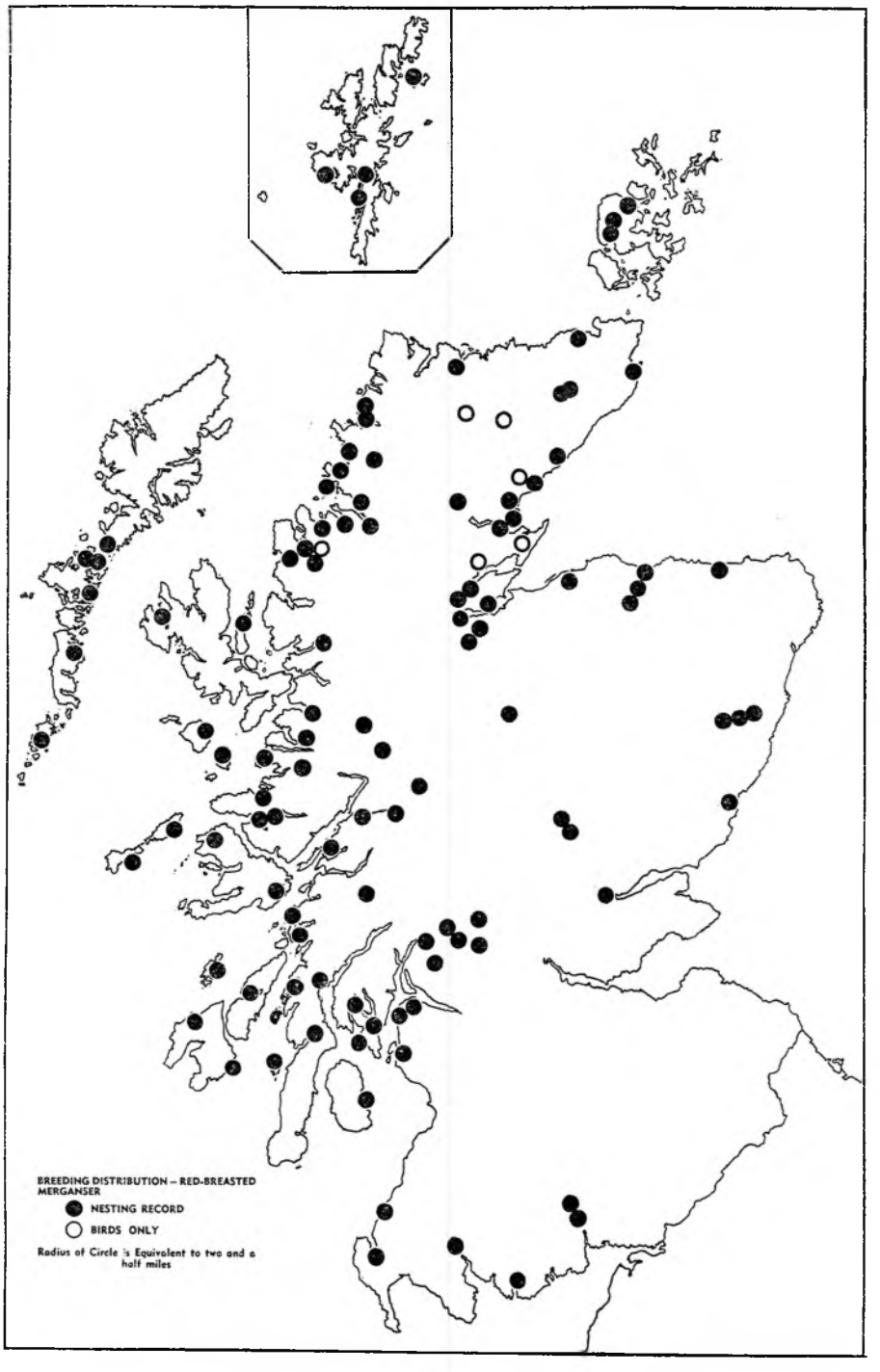
BREEDING DISTRIBUTION – RED-BREASTED MERGANSER
NESTING RECORD
BIRDS ONLY
Radius of Circle is Equivalent to two and a half miles

Figure 2

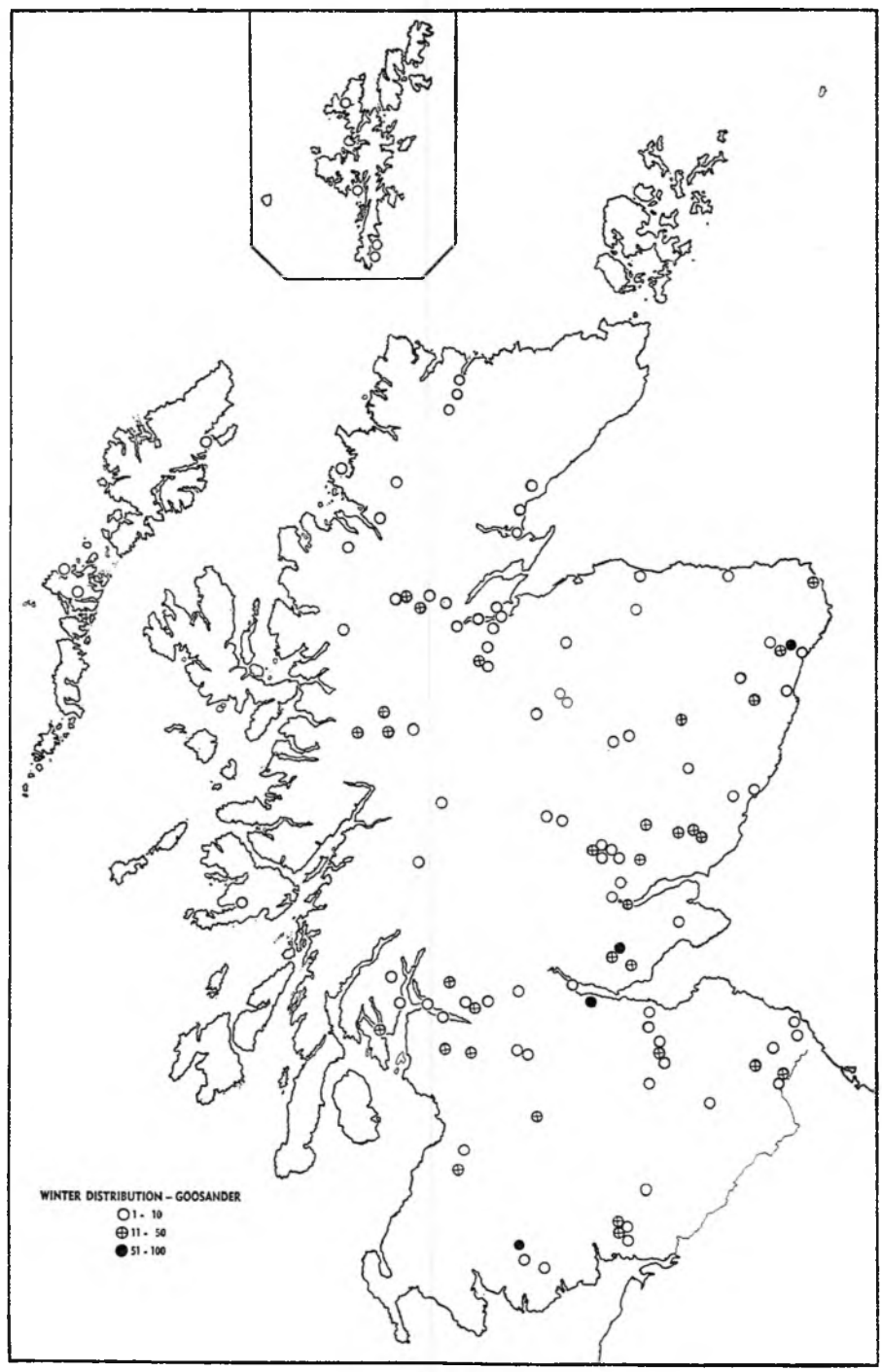

Figure 3

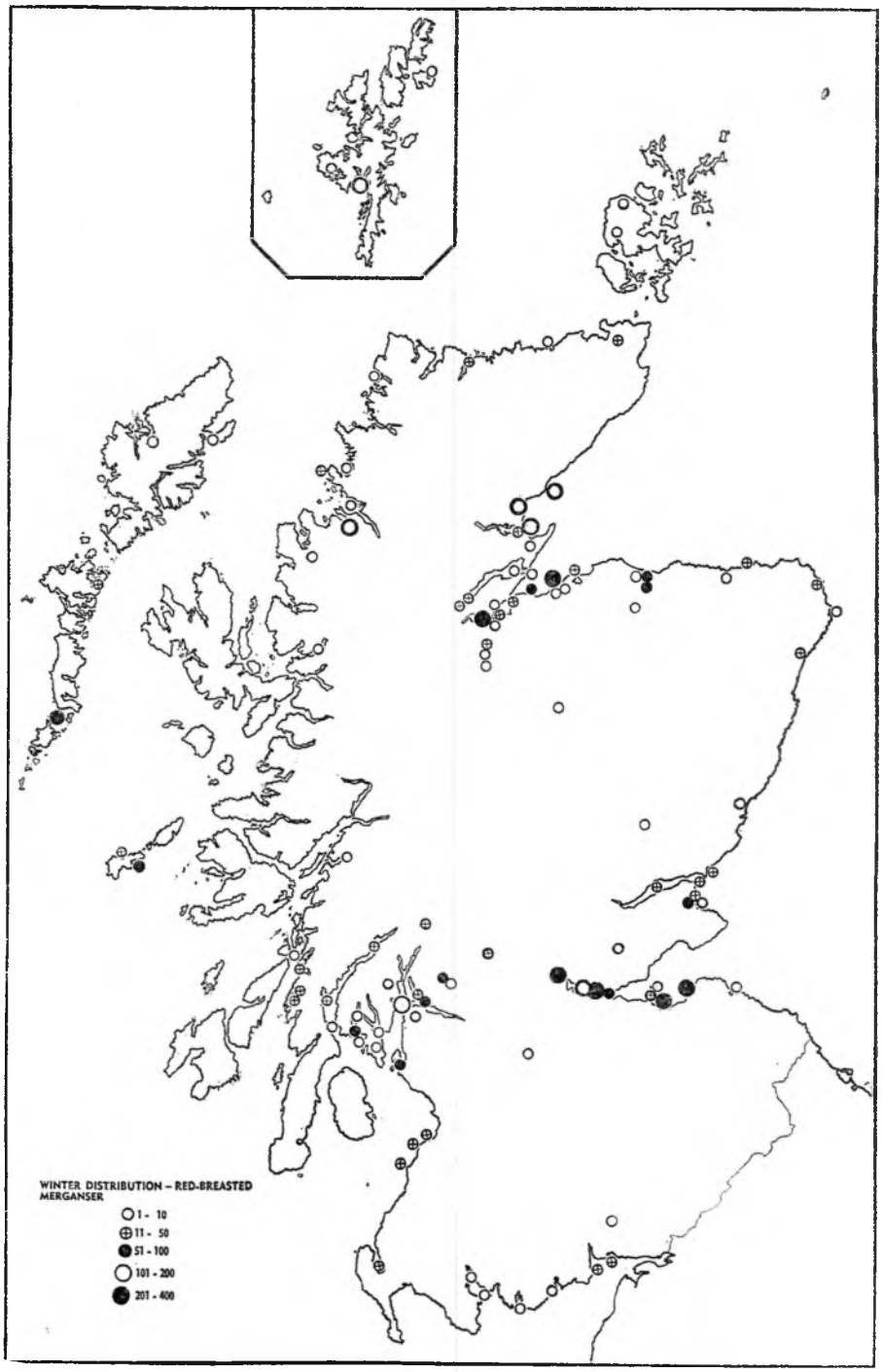
WINTER DISTRIBUTION – RED-BREASTED MERGANSER
1 - 10
11 - 50
51 - 100
101 - 200
201 - 400

Figure 4

for Ornithology; (3) information kindly supplied by fellow regional representatives for the British Trust for Ornithology; (4) extracts from Arthur Whitaker's diary; (5) personal observations; (6) information given with young birds sent in for examination and (7) records of broods seen by Boyd and Eltringham (personal communication) during their aerial survey of Caithness, Sutherland and Ross during the period 27th May to 4th June, 1959. The radius of the symbol indicating a breeding record represents two and a half miles so that in some cases one symbol may indicate more than one pair of birds breeding in the area. This method has been adopted for this reason, and where only broods have been recorded this is also necessary to allow for some movement from the breeding site. Furthermore the breeding site may change slightly from year to year although Baxter and Rintoul (1953) mention that the same hole was used by Goosanders as a nesting site for 40 years. Figures 1 and 2 can only represent the main breeding areas, as records of the breeding status in certain districts are still obscure. However, it is felt that the figures do give a reasonably accurate picture of the distribution of both species.

Figures 3 and 4 show the distribution of these birds during the autumn, winter and early spring. The information used to compile them has been abstracted mainly from Wildfowl Count data, most generously made available by George Atkinson-Willes. Further information was forthcoming from Baxter and Rintoul (1922 and 1953); Berry (1939); Darling (1947); "*Scottish Birds*"; regional representatives for the British Trust for Ornithology; and personal observations. The information from the Wildfowl Count data was for the years 1948 to 1961, and the other information refers to observations over a number of years. These figures therefore do not depict the distribution in any one year or at any one time but only show the areas where these species generally congregate during the autumn, winter and early spring and the areas are not all necessarily occupied at one and the same time.

(1) Breeding Distribution

(a) Goosander

Prior to 1870 the Goosander was a scarce winter visitor. In 1871 it was first recorded as breeding in Scotland, and four years later, in the winter of 1875-76, there was a mass influx of Goosanders. Within twenty years of this invasion it had become a common nesting species in the north of Scotland, especially in the western watershed from Eddrachillis to Loch Awe, the upper Tay, Argyll and the Moray Basin. Since then there has been a gradual dispersal over the mainland of Scotland to the counties of Aberdeen, Angus, Dunbarton, Stirling, Renfrew, Selkirk, and lastly the Galloway country in the south-west corner of Scotland in the late 1940s (McLure, 1949), where it now breeds in the upper waters of the rivers in Dumfries, Kirkcudbright and Wigtown. It has still not been recorded as a breeding species in Kinross, Fife, Clackmannan, Lanark, the Lothians, Peebles and Roxburgh. Its breeding status in Caithness is obscure and, while there are reasons for believing that it nests in that county, there are no known records of its breeding there. Baxter and Rintoul (1953) mention it being resident in Banffshire but give no breeding records. A ghillie on the River Tweed mentioned its nesting at Coldstream in Berwickshire up to fifteen years ago, since when regular shoots have resulted in its disappearance as a breeding species. In the Outer Hebrides the only breeding record is near Loch Maddy, while in the Inner Hebrides it has only been known to nest on Loch Scridain in Mull.

One apparent change in its distribution is in the north-west, in south-west Sutherland and Wester Ross, where its numbers appear to have declined considerably, judging from earlier records. In Wester Ross it is now most often seen as an occasional visitor in the autumn, although Boyd and Eltringham recorded a duck with nine young on Feur Loch in north-west Ross in 1959. In Sutherland it still occurs on the rivers Inver, Assynt, Hope and Naver but its numbers are kept down, it has been said, by " super-efficient river keepering."

The Goosander is generally a bird of the upper reaches of the rivers and frequently nests near the smaller tributaries, building its nest in holes in trees and banks or dense undergrowth. Baxter and Rintoul (1922) describe it as colonising the upper reaches of the river and gradually extending its range downstream. Similar habits were noted in Sweden by Lindroth (1955) and in eastern Canada the American Merganser was recorded by White (1957) as frequenting the upper parts of the rivers.

(b) **Red-breasted Merganser**

The Red-breasted Merganser was known to have inhabited Scotland for many centuries from the evidence of its remains being found in an early Neolithic or Azilian kitchen midden on Oronsay, a small island off the coast of Argyll. In the nineteenth century it was known to breed on the Outer and Inner Hebrides, Shetland, Orkney and on the west coast of Scotland from northern Sutherland to Dunbartonshire. On the east coast it bred in Caithness, Sutherland and Ross. In central Scotland it occurred in Perthshire. The species spread rapidly from these areas, and possibly also as a result of overseas migration, to colonise the Moray Basin, Banff, Aberdeen in the east and Renfrew and Galloway in the south-west from about 1890 to 1920 (Figure 2). It has not been recorded as a breeding species in Lanark, Clackmannan, Fife, Kinross, the Lothians or the border counties of Peebles, Selkirk, Roxburgh and Berwick.

This species tends to be more marine in its habits, especially on the west coast, where it nests in thick heather or bracken on islands in the many sea lochs, inlets and firths. In the east and the south-west it is an estuarine species nesting on the lower reaches of the rivers. However, there is an overlap in the habitat of this species with the Goosander, and the Red-breasted Merganser nests far inland on the larger river systems of the Ness, Spey and Tay. Birds with young broods have been seen on the Tummel near Pitlochry and on the upper reaches of the Rivers Moriston and Garry in Inverness, an area where Berry also recorded them in 1936. On Speyside, they have been recorded nesting on Loch Gynack near Kingussie and Loch Morlich near Aviemore.

(2) " Winter " distribution

(a) **Goosander**

During the summer and early autumn there is a dispersal from the breeding sites and the ducks usually bring their broods downstream from the upper tributaries. On the River Meig in Ross-shire broods, some still covered with down and others with their first feathers, have been traced over a period of days moving down the river and eventually observed congregating on Meig Loch. This has also been observed on the River Bran in Ross-shire and Mr. Donald Watson has noticed the assembly of broods on Loch Ken on the Kirkcudbrightshire Dee. An increase in the numbers of Goosanders in autumn

has also been noticed on the Tay and Ness. White (1957) observed the same pattern of behaviour in the American Merganser, the birds assembling on the lakes and estuaries. He noted that by mid-August when the ducklings are well-grown all the broods are on the main streams and have deserted or been deserted by the moulting females. He also found that the broods tend to gather and form large flocks, which range for miles up and down the river. A comparison of Figure 1 and Figure 3 gives an indication of this dispersal, as the latter figure shows that concentrations of Goosanders are to be seen near the coast and are generally spread over other areas of Scotland where they do not breed, especially in the south-east. Many of these concentrations have been counted on lochs during the Wildfowl Count periods only (September to March, inclusive, in recent seasons), so that it is not known whether Goosanders are definitely absent at other times. However, observations on certain lochs throughout the year confirm that these gatherings are only seasonal and usually at a time covered by the Wildfowl Counts. This downstream dispersal does of course bring the birds into non-breeding areas, as is obvious in Figure 3. Large concentrations have been noted on Loch Leven and the Edinburgh reservoirs, particularly Gladhouse. This reservoir is under almost constant observation by members of the Scottish Ornithologists' Club and the autumnal appearance of Goosanders is confirmed here among other places. Numbers also occur on the River Tweed from Dawyck in Peebles to Coldstream in Berwick. As well as a dispersal of residents there is believed to be an increase in the winter population produced by an influx of winter visitors from Scandinavia (Venables and Venables, 1955) and Boyd (1959) records a bird ringed in Sweden being recovered in Perthshire.

(b) **Red-breasted Merganser**

From late autumn to early spring this species is almost entirely marine. Those birds breeding on the lower reaches of the river bring their broods down to the estuary (Berry, 1933; Baxter and Rintoul, 1953) and large flocks are to be seen on the firths on both sides of the country. On the west coast Darling (1947) has recorded a flock of 123 on Little Loch Broom and Baxter and Rintoul (1953) recorded one of about 200 off Nairn on the southern shore of the Moray Firth in July. Flocks of up to 400 have been counted in the Beauly Firth and *Scottish Birds* (1960, 1961) gave details of large numbers in the Firth of Forth in 1960 and 1961. In 1960 over 250 were counted at Aberlady Bay in July and more than 300 in August; off Musselburgh flocks had increased from 100 birds in July to 400 in October and in the same month over 250 were counted at Skinflats, east Stirling, on the upper reaches of the Firth of Forth. Again, in 1961 200 Red-breasted Mergansers were counted at Musselburgh in September and at Barnbougle, West Lothian there were 300 on 14th October and 350 on the 22nd October. At Longannet in Fife 14 were counted in July and these were described as 'summering' birds; by 29th September 320 were counted here and Hoy (1961) suggests that this is a 'moult' area.

Those flocks occurring in July and August most probably consist of birds which have dispersed from their breeding sites elsewhere in Scotland but by October these have been supplemented by an influx of migrants from abroad. Boyd (1959) records five recoveries of ringed birds in Scotland, all of Icelandic origin. Venables and Venables (1955) describe autumn flocks gathering in the Shetland voes in early September and reaching a considerable

size (up to 130) in October, which they believe strongly suggests a passage migration from elsewhere. Salomonsen (1950-51) states that there is no doubt that the greater part of the east Greenland population winters in the British Isles. The flocks in the Shetlands are considerably smaller after October and the birds remaining gradually break up into pairs. Similarly the flocks occurring from July to September in the Kyle of Tongue (30-50), Loch Fleet, Golspie Bay, Dornoch Firth (150-200) and Kintradwell Bay, Brora (40-50) break up into small parties at the end of this period. However, the large flocks of up to 400 occurring in the Beauly Firth are present throughout the winter: this may be due to the presence of the 'Kessock' herring which provides a fishery for local boats. Munro and Clemens (1939) described the Red-breasted Merganser feeding on the herring on the western seaboard of Canada; Berry (1939) records small herring from birds shot in the Firth of Tay, where flocks of these birds occur during the winter; and Brooks (1934) gives a description of these birds feeding on spawning herring shoals.

In the spring these large flocks disperse to their breeding sites. Slight evidence for a northerly movement in the spring was obtained from a numbered salmon smolt tag found in the stomach of a drake shot on the River Ness in May 1960. The tag had been attached to a hatchery-reared smolt released a month previously in the River North Esk, about 80 miles to the south-east " as the crow flies."

Mr. Peterson (personal communication) of the Bergeforsen Salmon Rearing Station, Sweden, describes a similar recovery from the Goosander. A " diving duck " was shot in the White Sea and examined by a Russian biologist in Petrozavodsk. The bird contained salmon smolt tags which had been attached to smolts released in the Swedish River Indalsälven a few weeks previously. Mr. Peterson was able to confirm that the " diving duck " was a Goosander.

Population Density

It is difficult to determine the numbers of both species occurring at times on Scottish rivers. However, it would appear from the information for the Rivers Oykell (Sutherland) Conon, Meig, Bran (Ross and Cromarty) and Dee (Aberdeenshire) that there are, on an average, from one to two pairs of Goosanders per 10 miles of river and perhaps considerably more on the Tay system. More detailed observations have been carried out on the Goosander population on the Rivers Bran and Meig and the information is summarised in Tables 1 and 2. Both the stretches of river concerned were approximately

Table 1. Goosanders on the Rivers Bran and Meig, Ross-shire, 1959.

Period	No. of visits		No. of visits on which Goosanders were seen		Average number of Goosanders seen	
1959	Bran	Meig	Bran	Meig	Bran	Meig
24th February-30th April ..	30	15	9	12	3(4)[a]	4(10)
1st May-31st August	16	40	1	6	1	2(6)
1st September-30th September ..	4	10	2	3	6(7)[a]	3(5)
1st October-30th November ..	20	8	6	3	2(3)	1(2)
	70	73	18	24	3.0(7)	2.5(10)

Figures in brackets indicate the largest number seen at any one time.
[a] Two birds shot.

Table 2. Goosanders on the River Bran, Ross-shire, 1960-61.

Month	No. of visits		No. of visits on which Goosanders seen		Average no. of Goosanders seen	
	1960	1961	1960	1961	1960	1961
January	6	10	1	4	2(2)	2(6)[c]
February	3	4	0	2	0	2(2)
March	11	6	5	3	2(5)	1(2)
April	26	21	15	11	2(5)[a]	3(7)[d]
May	26	31	x	3	x	2(3)
June	23	15	9	0	0	0
July	24	5	9	0	0	0
August	19	6	9	0	0	0
September	13	8	3	3	4(5)	4(10)
October	14	8	6	2	4(7)	3(4)
November	12	10	7	1	1(2)	1(1)
December	9	8	2	3	2(2)[b]	2(2)
	160	132	39	32	2.4(7)	2.2(10)

Figures in brackets indicate the largest number seen at any one time.
[a] 4 birds shot; [b] 1 bird shot; [c] 2 birds shot; [d] 3 birds shot; x No information.

10 miles long with an average width of 20 yards and were almost completely free from tree cover. Further their physical nature—the type of rock formation, river bed, flow and surrounding vegetation—was similar. These tables show that Goosanders occur on these two rivers for most of the year although none were observed in June, July and August. The average number seen on these two 10 mile stretches of river was of the order of two to three.

Feeding Methods

(a) Goosander

The Goosander is primarily a fish eater and has a bill well-adapted for seizing and holding fish and which, being long and tapered, makes for ease in extracting small fish from under stones. White (1957) describes the American Merganser fishing successfully by swimming on the water but with its eyes and most of its head below the surface; when a fish is sighted it pursues the prey by swimming on the surface with head submerged. The bird will then submerge, return to the surface and swallow the fish. Lindroth and Bergstrom (1959) describe the feeding technique of the Goosander and confirm this method of feeding, also noting that the fish is seized across the middle and swallowed under water. Salyer, Clark and Lagler (1940) also describe the fish being swallowed under water. Both White and Lindroth and Bergstrom describe the bird diving to hunt fish and probing beneath stones with its bill. White describes the method of swallowing fish in detail and notes that, while herons, bitterns and cormorants all stretch their necks when swallowing large fish, an American Merganser can swallow a large fish and still retain the neck in a sigmoid shape. In the birds examined by Mills (in the press) all undigested fish were found to have been swallowed head first with the exception of one perch. This had been swallowed tail first and the spiny dorsal fin rays had become lodged in the oesophagus wall.

On the River Bran, flocks of Goosanders have on a number of occasions been watched fishing in an apparently organised way. The flock swims downstream stretched out in line abreast across the whole width of the river, then

works into one shore in an arc in much the same way as a sweep-net is operated. After reaching the shore they swim out in line abreast and repeat the operation. White (1957) describes a similar method in the American Merganser and Tebbutt (1961) describes a flock of Goosanders acting coherently, all the birds moving in the same direction and diving at the same moment.

In deep and turbid water sight might well be of no use to the bird while fishing and Heard and Curd (1959) have suggested that hypersensitivity to motion in the water may enable the Goosander to locate its prey. The workers have recovered these birds, caught in gill nets, 35 ft. below the surface of turbid water.

(b) **Red-breasted Merganser**

Curth (1954) describes the Red-breasted Merganser fishing like the Goosander by swimming on the water with its head partly submerged. Saxby (1874), Seebohm (1885) and Venables and Venables (1955) have observed these birds also using their wings under water.

Enemies

Man appears to be the only serious enemy of the Goosander in this country. This is because of the amount of damage it is believed to do to salmon and trout stocks and not because of any culinary interests. Seton Gordon (1959) saw an unsuccessful attack on a Goosander by a Golden Eagle. Greater Black-backed Gulls probably take the young occasionally. Berry (1959) believes that gulls are the most serious enemies of Red-breasted Mergansers and predation of eggs and young by Great and Lesser Black-backed Gulls has been recorded by Gray (1871), Collier (1904) and Phillips (1926). A Great Black-backed Gull was seen taking a young bird from a brood on Loch Carron in Ross-shire. Glegg (1945, 1947) records the angler fish *Lophius piscatorius* taking the Red-breasted Merganser.

Discussion

Before 1870 the Goosander was a rather scarce winter visitor to Scotland and there was no record of breeding before 1871. Berry (1939) says that there was evidence of drift immigration from 1870 which increased rapidly, and throughout the autumn and winter of 1875-76 it amounted to a mass immigration. He thought it probable that the immigrants came from Scandinavia or north Russia and that possibly a cycle of dry, warm seasons had allowed an unusually high number of ducklings to survive. These conditions, however, would also have tended to reduce their food supply. Thus emigration or starvation might be the only alternatives in the following breeding seasons. However, another explanation, perhaps equally speculative, might be that unusually severe conditions on the Continent caused more birds to move to this country, and the prolonged winter in the British Isles prevented birds from returning north at their usual time and when conditions became favourable the advanced stage reached in the breeding cycle led some birds to nest in this country. It is clear from Veryard (1962) that the winters were severe over the whole of the period under discussion and the information given by Fisher and Lockley (1954, p.124) gives some idea of the effects of such climatic conditions. They point out that in King Charles Land, east of Spitzbergen, only nine species of sea and shore birds were

present in 1889, when the ice conditions were severe, whereas twenty-one species were reported in 1898, when ice conditions were less severe.

A similar rapid increase in the spread of the Red-breasted Merganser, which was already a breeding species in this country, was noted from 1885 onwards. The reasons just put forward for the start of breeding in this country by the Goosander could also explain the spread of the Red-breasted Merganser. The " starvation " hypothesis of Berry (1939) would not, as this species lives in a more marine environment where shortage of food is less likely. Indeed, a marine environment should be capable of maintaining a very high population of these birds and the rapid spread after 1885 seems best explained by the nesting of winter migrants in this country. Berry (1939) suggests that the Wild Birds Protection Act may have helped the increase of this duck, for it was not until the Merganser had become locally plentiful that efforts were made to destroy it at all seasons. Further, he agrees that " the available data are complicated in several ways. The increasing popularity of trout fishing in remote Highland lochs led to reports from many districts in which formerly this and other species may have been overlooked. Then to judge only from lists of records, it would appear that a sudden increase of Goosanders and Mergansers had occurred in districts where this was not the case, owing to the much larger number recorded when a reward of half-a-crown was offered for their beaks by proprietors of fishings."

Neither the Goosander or the Red-breasted Merganser are protected in Scotland by the Protection of Birds Act, 1954, and both species are shot on most salmon rivers. In the north the local estates are responsible for their control, while on the larger rivers, with active District Fishery Boards, control is carried out by bailiffs and angling clubs and organised drives are held. Rewards are given to individuals sending in the corpse or beak of either species. The rewards are of the order of two shillings or two shillings and sixpence. Berry (1939) quotes a similar price being paid in the late 1930s, so that the value of these birds has dropped, perhaps unintentionally. Baxter and Rintoul (1953) refer to 250 Red-breasted Mergansers being shot on the Ness estuary in the course of a year and numbers of the order of 100 may be shot in the Tay area each year. Unfortunately, other birds are sometimes killed in " Merganser drives." These have included the Red-necked Grebe *Podiceps griseigena,* (Mills 1960), the Goldeneye *Bucephala clangula,* the Black-throated Diver *Gavia arctica* and the Red-throated Diver *G. stellatus.*

Although numbers of Goosanders and Red-breasted Mergansers are shot each year their status remains unchanged, with the exception of a possible decline in the number of Goosanders in the north-west and an increase in this species on rivers in Dumfries and Kirkcudbright. White (1957) is against the institution of a bounty system with its inherent abuses and Munro and Clemens (1939) and Sayler, Clark and Lagler (1940) believe that control is only necessary during the presence of " unusual " numbers on salmon and trout waters and should only be a corrective measure for a temporary condition. It seems unwarranted that a bird should be killed because it may be a predator at some time or place.

The Goosander and Red-breasted Merganser are both fish eaters and, as they occur on many salmon rivers in Scotland where few other species of fish occur in the particular habitats frequented by these birds, salmon will obviously be taken. Mills (in the press) has shown to what extent they are

eaten. Lindroth believes that Goosanders show a preference for young salmon as in areas where other fish, such as grayling, were more abundant, the birds had eaten mainly salmon. White (1957) suggests a preference for young salmon and that they are selected by the American Merganser as food. He qualified the suggestion, however, by the fact that Mergansers feed by sight and need clear water which is just the kind that is typically salmon and trout habitat. Where other species of fish are more abundant these are taken more frequently than salmon (Munro and Clemens, 1937 and 1939); and Aass (personal communication).

A detailed study of the feeding behaviour of these birds would be of great value. Furthermore, the migrations of these birds need closer investigation as the possibility arises that if birds are killed at certain times of the year their territories may be filled by migrants. Little is known of the factors that caused the Goosander to become a breeding species in Scotland in the first place and control at the wrong time of the year may only make room for birds which might normally return to breeding areas outside Scotland.

Acknowledgements

I should particularly like to thank George Atkinson-Willes for so generously allowing me to abstract information from the Wildfowl Count data; Hugh Boyd and Dr. S. K. Eltringham for making available the results of their aerial survey of northern Scotland; the Nest Records Sub-Committee of the British Trust for Ornithology for use of the nest record cards; and Dr. P. Aass and Hans Peterson for their personal communications. I am also most grateful to the following for their kind help: Dr. J. W. Campbell, R. N. Campbell, G. Dick, T. Douglas, Sir Arthur Duncan, Miss W. U. Flower, Miss E. A. Garden, Seton Gordon, J. Gunn, Dr. D. Jenkins, the late Rev. J. Lees, Dr. T. G. Longstaff, H. Mayer-Gross, C. E. Palmar, Dr. I. D. Pennie. Rev. F. Routledge-Bell, Dr. Maeve Rusk, D. Watson and J. Wood.

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