

# THE REDPOLL and N.Z. AGRICULTURE

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## Introducing the Redpoll

It may arouse surprise, even disbelief, in most people to be told that the Redpoll is one of the most numerous birds in New Zealand—yet this is fairly certainly the case. Leaving aside for the moment the question of how it can be established that the bird in fact is very common, let us consider the reasons why it should (erroneously) appear to be uncommon.

The Redpoll is an inconspicuous brown bird, and from a distance appears not unlike a small female sparrow. The name Redpoll (sometimes incorrectly given as Red-pole) refers to the small dull-red cap on the head or "poll". This red cap is obvious enough at close quarters, but is difficult to detect at a distance of more than about twenty yards—and it is seldom that a Redpoll can be examined under natural conditions within this range! In the breeding season the male displays a conspicuous and flamboyant red breast, a rich matt crimson, but at this time of the year is even less likely than usual to allow close approach by a human observer. Both male and female at this time have a patch of red on the rump as well as the red cap which is present throughout the year. But it must be emphasized that recognition of the Redpoll in the field depends more on a knowledge of its characteristic calls and characteristic mannerisms of flight and posture than on a knowledge of the colour of its plumage. Redpolls are tiny birds, weighing only 10 to 14 grammes, but they are amazing fliers. They travel far and high, often so high as to be almost invisible, and their disposition is retiring—they seem to enjoy flying so much that they seize any excuse to take-off for the upper regions of the sky.

The Redpoll has suffered under a

variety of Latin names, but its present generally-accepted scientific name is *Carduelis flammea*. This is regarded as being the name given to the species by the great Swedish naturalist, Linnaeus, the originator of the modern system of classification of plants and animals. Under this system, the name of the discoverer of an animal or plant is given after the name of what was discovered. Linnaeus is honoured in that only the initial "L", not his full name, is given after the species he discovered—so that the full title of the Redpoll is: *Carduelis flammea* L.

The Redpoll is a member of the Finch family (Family Fringillidae), which also includes the Goldfinch, Greenfinch, Chaffinch, Yellowhammer, and others. These are all birds whose diet consists mainly of seeds of various kinds, and whose anatomy and habits have been modified in accordance with their food preferences. The Goldfinch is a very close relative of the Redpoll, in fact, they are both members of the genus *Carduelis*, the specific name of the Goldfinch being *Carduelis carduelis*. In 1953 Westerskov determined the status of the New Zealand Redpoll at the subspecific rank of *Carduelis flammea cabaret*, the Lesser Redpoll; recently, however, it has been shown that at least one other subspecies, notably, *C. f. flammea*, the Mealy Redpoll, is present and interbreeding with the *cabaret* populations (Stenhouse, in litt.).

To return to the contention that the Redpoll is one of the most numerous birds in New Zealand:

The Chaffinch is not one of the most noticeable of birds—it is not usually taken so much for granted as, say, the sparrow or the blackbird. It has seemed, to a number of trained observers, to be roughly as numerous in this country as it is in Britain. Yet

in Britain it has been established that the Chaffinch is the most numerous bird of all; large-scale census investigations have shown this fairly conclusively. Now, in New Zealand all the evidence so far obtained on the relative abundance of the various bird species seems to point to the conclusion that the Redpoll is not far behind the Chaffinch in total numbers. It must, of course, be emphasized that the evidence at present is far from complete; nevertheless, a careful consideration of what there is, does seem to lead to the conclusion above. Perusal of published records shows that there are few regions totally devoid of Redpolls, the built-up areas being a significant exception. Significant also is the fact that the proportion of Redpolls in the total bird population generally is great for all the vast area of the high country, bush-, tussock-, or scrub-clad, and Redpolls may in fact be the most numerous birds in the sub-alpine vegetation of the open tops above the tree-line. Over most types of farm land they occur in fair though unnoticed numbers, but in highly developed intensively-worked districts, where there is little waste land and few hedges or other shelter, they may be absent. Such districts, however, are not widespread. Taken all round, it seems fairly certain that the Redpoll would be present on a list of the ten most numerous birds of New Zealand.

#### **Establishment in New Zealand**

The introduction of the Redpoll into New Zealand was in the first place a deliberate attempt to establish free and wild populations of these birds as a permanent component of the fauna. The Acclimatisation Societies made the first importations. Two birds arrived in Nelson in 1862, and in 1868 ten were liberated in Otago and 14 in Canterbury. Other introductions followed in different parts of the country, and by the early years of the present century they were reported as common in many districts. In 1922, G. M. Thomson (whose account of the Redpoll introductions is followed in this bulletin) could write: "This species . . . is abundant in both islands, especially in open upland country at moderate elevations."

It seems likely that the wild Redpoll populations have been accidentally

augmented by birds escaped from aviaries and cages. Most such birds would now, of course, have been derived originally from the wild New Zealand populations, but some may have been birds imported for show and competition purposes direct from Europe; and these may have been, and may yet be, vehicles for the introduction of new genetic material, new behaviour patterns, new parasites and diseases, into the wild populations.

#### **Ecology and Life History**

The Redpoll nests in shrubs, usually near the ground. The nesting season is given by Oliver ("New Zealand Birds", p 634) as "September to January", but in fact few nests would be found before November, and the season certainly extends into February. The clutch is of four to six eggs, and probably two broods would be raised each season. Nothing is known, as yet, of the deathrate in nestlings and young birds, or of the movements of young after they leave the nest.

At the end of the breeding season, Redpolls, often in company with other finches, form flocks which forage over the countryside in search of food, returning each night to some group of trees or other cover to roost.

The food of the Redpoll varies according to the season of the year and what is available locally. Small seeds are the main food when available, but other parts of plants, such as buds, are also eaten; and insects are sometimes eaten in great quantity, e.g. aphids on a chou moellier paddock in August. Redpolls have been recorded feeding on the following: seeds of rushes, various grasses (*Phalaris*, cocksfoot, *Poa annua*), dock, "fat hen", thistle, gall-forming insects on willow leaves, aphids, buds of fruit trees.

Experiments are in progress at Lincoln College to determine the food preferences of various finches, and the results so far obtained with regard to Redpolls are summarized as Table I. As an inspection of the table will indicate, these birds will eat, and are even fond of, several seeds which are often raised as valuable commercial crops. It might be expected that damage to such crops would therefore result. This expectation has seldom, however, been realised, probably because at the time of harvest of the crop the birds are

still engaged in various breeding activities which keep them relatively dispersed: heavy localized damage is likely to occur only at a time when the flocking instinct results in a concentration of feeding activity.

### **Economic Status**

This raises the question of the economic status of the Redpoll. Thirty years ago anyone who had ever opened a dozen bird gizzards was prepared to pontificate on the economic value of whatever bird species he was interested in; today, largely as a result of the considerable knowledge gained in the meantime, we are much more cautious. Seemingly clear-cut and simple problems of economic biology have so often turned into labyrinthine nightmares of unexpected complications! The relative values of, say, a dozen aphids and a dozen chou moellier seeds might appear a simple matter to elucidate; one would perform some experiments to determine what reduction in yield of seed resulted from a given infestation of aphids, and so on. But what of the diseases which might be transmitted by the aphids? What of the predators which live on the aphids and which might be available to check the expansion of a population of some more dangerous animal than the aphid? The simple truth is, that we do not yet know enough, in most cases, to arrive at any very definite conclusion as to the economic value of an animal species. In some cases, it must be admitted, a decision of this sort is more or less forced upon us. The rest of this paper is a short preliminary account and discussion of a situation of this kind which is occurring in New Zealand at present. It must be emphasized, however, that the conclusions which can be arrived at within this type of limited "emergency" situation are always, and must be, conclusions of limited range and only tentative validity—for the processes of nature link up together into such complex and far-spread chain-reactions that we seldom know what or where will be the reaction to a change which we initiate.

### **The Fruit-Blossom Problem in Central Otago**

"Redpolls and finches have destroyed as much as 75 per cent of fruit crops"; this statement appeared as part of a

newspaper report on bird damage to fruit blossom in Central Otago in September 1959. It is, of course, grossly exaggerated, as will be shown below; nevertheless, the economic loss occasioned by this type of damage can be, and in Central Otago over the last few years has been, significant and in a few cases severe.

Occasional minor bird damage to fruit buds has long been known and accepted. Sporadic cases of heavy damage in restricted localities have been reported from Britain for many years past, the Bullfinch, *Pyrrhula pyrrhula* being the main avian delinquent. The outbreaks of damage in Central Otago seem to be due mainly to the Redpoll (the Bullfinch did not establish itself successfully in this country), and appear to be heavier and more sustained than similar occurrences in Britain.

### **The Damage Done, and its Significance**

It is necessary at this point to give a brief summary of the course of a Redpoll attack on an orchard, to serve as a basis for further discussion.

In early September the Redpoll flocks, which have spent the winter ranging the high country of Central Otago for food, and which by this time have exhausted most of the easily-accessible sources, begin to congregate in the orchards and other cultivated areas. Here they concentrate on eating the various weed seeds lying on and in the cultivated soil; also to some extent the *Poa annua* seed which may have already been formed due to the accelerated life cycle of this plant. In the intervals between feeds the birds fly up into the fruit trees, where they peck holes in the calyx of the fruit bud, and sometimes peck off and possibly eat the ovary (the basis of the potential fruit). There is a certain amount of pattern in the damage, in that buds on vertically up-standing fruit spurs are generally much less attacked than those on horizontal, or at least non-vertical, spurs. There appears to be no other position-affect involved except that in an orchard which has been only slightly attacked the damage may be greater at the edges of the fruit-tree block, i.e., near to the wind-break shelter-belts.

When assessing the damage in terms of loss of potential fruit, it is important to bear in mind that not more

than 10 per cent. of the fruit buds are ever allowed to turn into crop fruit. If birds and frost did not remove some, the remaining 90 per cent. would have to be thinned-out by hand. It is essential, however, that the 10 per cent. of buds destined to become crop fruit should be evenly distributed over the tree, with two to three left on each spur. Economically important damage has occurred in one of two possible ways:

(a) through the almost total destruction of buds on a tree—this has usually occurred on small young trees; or

(b) through the total destruction of buds on part of trees.

It should be noted that destruction of fruit buds by Redpolls may occur either directly where the ovary of the bud is pecked off, or indirectly, where the calyx is opened by the bird and the ovary later killed by frost. To obtain an accurate measurement of the effect of the birds some way would have to be discovered of distinguishing buds which would have been destroyed by frost quite independent of bird damage.

It will be seen, then, that damage will be of economic consequence only if the end result of birds, frost, and other hazards is to leave an appreciable number of fruit spurs devoid of developing fruit or with less than the optimum number. (The question of bird damage to the formed fruit is outside the scope of this paper, since the Redpoll is not involved). Unfortunately, even taking all this into consideration, it still appears that many orchards suffer economic loss which is attributable to the activities of the Redpoll flocks.

The reasons directly responsible for this are almost certainly to be found in the ecological and behavioural peculiarities of the Redpoll. The fact that the flocking impulse is still fairly strong at the time of year concerned means that if any Redpolls come to an orchard, a lot come. (This generalization is not of universal literal truth, but it emphasizes the significance of a behavioural trait.) Also, an individual bird perching on a fruit spur tends to work along the spur pecking, from the upper side, at every bud on the spur (the stimuli involved here have not so far, due to lack of opportunity,

been investigated) so that, unless the bird is disturbed, all the buds on that spur will probably be damaged. And that, as we have seen, is exactly what makes Redpoll damage of significance from the economic point of view; its **distribution** is too concentrated.

### Preventive Measures

So much for a general picture of what the Redpoll damage to fruit blossom amounts to, and how it occurs. What can be done about it? Several methods of combating Redpoll attack have been tried over the last few years without much apparent success; several new methods are contemplated, and some of these may have considerable effect.

Shooting is the method generally favoured by orchardists in their efforts to solve the Redpoll problem. Consistently used, and in relation to only one or two orchards or blocks of trees, this probably has a certain extremely-limited usefulness. As an attempt to tackle the problem as a whole, however, shooting has so many disadvantages as to be almost useless, or worse: cartridges are expensive; the greater part of each day must be spent on watch, otherwise no result at all will be obtained; birds must be shot in flight (and this is not always a simple matter) otherwise trees will be damaged. Useful birds may be, and are, shot by mistake; and protected birds may be shot, thus laying the shooter open to prosecution. Worst of all, shooting is inefficient. New birds stream in tomorrow to replace those shot today, and there is certainly a huge reservoir of Redpolls in the hills of Central Otago.

Bird scarers of various sorts have been used, apparently with little success as far as Redpolls are concerned. The use of auditory devices of this sort based on the distress or alarm calls of the birds involved would probably be successful but would always be expensive (though the expense might well be small relative to the saving effected. But the necessary research into the behaviour of the birds and the reproduction of suitable sounds would inevitably take considerable time, money, ingenuity, and specialist knowledge, none of which have so far been applied to this problem.

Poison has been tried, and high hopes are held for the efficacy of 1080. There is no doubt that large numbers of Redpolls could be killed by using 1080, but there are two very serious objections to its use.

(i) Even though large numbers may be killed round the orchards, the surrounding Redpoll population is so large that the resulting biological "vacuum" would be filled up very quickly.

(ii) Redpolls could contain in their crops a large quantity of the poison before death ensued, which could then be eaten by cats and dogs along with the body of the Redpoll. Fairly heavy mortality of these domestic animals, many of them valuable from various points of view, would almost certainly follow large-scale use of 1080. Also there would appear to be at least some danger of poisoned birds carrying their relatively heavy load of poison, via open tanks and troughs, to farm and domestic water supplies.

What seems to be the most promising measure of control has been in operation for reasons unconnected with the Redpoll problem. In orchards which have been grassed down, the evidence so far suggests that Redpoll damage is absent or negligible. That this is so fits in well with what little is known of the biology of the species in this region. The birds seemingly begin to run short of food towards the end of winter, and before the spring food supplies are ready. (Evidence of a similar state of affairs in Canterbury has been obtained in the course of the author's investigations around Lincoln College.) The initial movement of birds into the orchards is in order to feed upon the seeds exposed on the bare cultivated floors of the orchards. If this source of food is absent, there seems no reason why the birds should enter orchards, at least in any number. This is supported by the fact that of eight shot birds opened by the author in 1959, seven contained only a small clover-like seed which must have overwintered on the ground, and the eighth contained some of this seed and some plant fragments. In a grassed-down orchard, very little food would

be available, and there would be no reason for the birds to enter at all. Besides grassing-down the orchards, a further reinforcing measure which could be taken, perhaps by groups of orchardists in collaboration, is to obtain sacks of seed-cleaning offals and distribute these at set points, well away from the orchards, as feeding places to which the birds would be attracted. The danger-period is, after all, only six weeks or so, and the expense of maintaining these feeding points for that time would possibly be less, in terms of time, energy, and money, than goes into the unsatisfactory measures practised at present. Such action would be fairly sure of success; what has not been determined as yet is what quantity of seed offals would be required and how far it would have to be away from the nearest orchard.

### Conclusion

The eminent ornithologist, E. M. Nicholson, summed up the present state of knowledge of the economic status of birds very well when he said, "It would be wise to assume until much more contrary evidence can be brought forward that wild birds do us very great harm and also very little good." The Redpoll, however, is one of the few birds which can be said to do definite harm though this is only to a certain type of agriculture at a particular place over a short period of the year. Generally, over most of the country, Redpolls are likely to do nothing but good—but, of course, we do not know exactly what they do, still less what their long-term economic effect may be. Of one thing, however, we may be fairly sure: there are a lot of them, and they are here to stay.

Table I

#### Food Preferences of Captive Redpolls

**Preferred:** Phalaris, Self-heal, Cocksfoot, Sheep's sorrel, Per. ryegrass, Turnip, Crested dogstail, Yarrow.

**Accepted:** Hairgrass, Timothy, Rape, Kale, Linseed, Bindweed, Chou moellier.

**Unacceptable:** Sub. clover, Strawberry clover, Lucerne, Cowgrass, Mustard, Red clover, White clover, Suckling clover.

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