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The taxonomy of redpolls has long been a subject of much discussion, and the specific status of Redpoll *Carduelis flammea* and Arctic Redpoll *C hornemanni* is still debated (Molau 1985, Troy 1985). Knox (1988) has shown that claims of hybridization between Redpoll and Arctic Redpoll are either unfounded or misinterpreted. He concludes that these taxa constitute good species. His conclusions are supported by my findings that Redpoll and Arctic Redpoll are distinct in a discriminant analysis of four standard body measurements: only 5% of the birds in a sample of over 500 Redpolls and Arctic Redpolls were in the area of overlap (Herremans in prep).

It has been pointed out by Soviet ornithologists that the vocalizations of Redpoll and Arctic Redpoll show distinct features (see Knox for review). So far, no detailed descriptions of these vocalizations have been published in the 'western' ornithological literature. It seems, therefore, useful to present here my data on the vocalizations of Common Redpoll *C f flammea*, Lesser Redpoll *C f cabaret* and Arctic Redpoll of the subspecies *C h exilipes* occurring as migrants in Belgium. The data confirm the existence of differences in their nonbreeding vocalizations.

methods

Since 1975, at Heverlee, Brabant, Belgium, I have ringed c 500 Common Redpolls, c 400 Lesser Redpolls and six Arctic Redpolls. This and the keeping of decoys enabled me to become familiar with their vocalizations. During the large irruption of redpolls in western Europe in the winter of 1986/87, I have sound recorded several Commons (including *holboellii*-type birds, representing the longer-billed individuals from the skewed and very broad bill length distribution of Common Redpoll) and Lessers and two Arctics when kept temporarily in captivity. During the following spring and summer of 1987, I kept two Commons (male and female) and one Arctic (female) as decoys in a 40 m³ outdoor aviary, making it possible to obtain tape recordings of their breeding vocalizations.

non-breeding vocalizations

One of the most striking features of Arctic Redpoll was its extreme reticence, sharply contrasting with the almost continuous chattering of Common Redpoll. When calling, it became apparent that the non-breeding vocalizations of Arctic were distinct from those of Common. After some practice, the differences in both flight and perching call were found to be useful clues in separating the species.



FIGURE 1 Flight chatters of two Common Redpolls Carduelis flammea flammea (D-E) and two Arctic Redpolls C hornemanni exilipes (A-C, A and C refer to same individual)

flight call

The common flight call (chatter) of Arctic Redpoll had a small frequency range and individual notes were bisyllabic or nearly so: each note consisted of an introductory descending syllable, immediately followed by a second syllable which was either rising or descending parallel to the first (figure 1A-C). In contrast, the flight call of Common Redpoll showed syllables which fell steeply over a broader frequency range to an energetically emphasized low-frequency component, shaped on the sonagrams like a hook (figure 1D-E). Together with its more rapid delivery (in the same time span, five notes by Common and four by Arctic), this gave Common its characteristic 'machine gun'-like low and pure chatter, *che-che...che-che-che-che-che-che-che*. Arctic sounded clearly slower, higher-pitched and less pure, *djeet...djeet-djeet...djeet-djeet.* As well as a single note, solitary Arctic typically used a number of composite calls, such as two notes in which the second one had more emphasis, *tjee-djeet* (figure 1C, left).

The flight chatter of Lesser Redpoll was distinct from that of both Common and Arctic Redpolls. It was higher-pitched than either, and lacked the broad frequency span of Common and the strongly emphasized 'hook', which made the chatter of Lesser, although of a similar rhythm, less staccato than that of Common, *tji-tji...tji-tji-tji-tji-tji-tji* (figure 2A).

perching call

The perching calls of Common Redpoll and Arctic Redpoll were even more different. One should, however, clearly distinguish between the perching call, which was frequently given by a perched bird to lure flying conspecifics to join it, and the rather similar alarm call, which seemed not to differ between Common and Arctic. The perching call had a complex structure. In Arctic, it was

FIGURE 2 Flight chatters (A) and perching calls (B-C) of two Lesser Redpolls Carduelis flammea cabaret

FIGURE 3 Perching calls of three Common Redpolls Carduelis flammea flammea (C-E) and two Arctic Redpolls C hornemanni exilipes (A-B)

broken up into several smaller syllables, of which the last was emphasized and clearly descending (figure 3A-B). This was different from Common which showed one main note, with a generally ascending trend throughout the call (figure 3C-E). Although some variation was obvious, the essential features were present in all full calls analysed. To human ears, the call sounded in Common like a pure whistle rapidly increasing in pitch, *pweet*. In Arctic, it sounded somewhat hesitating and hoarse, *pwljeeu*, the descending final syllable being obvious. *Holboellii*-type redpolls gave calls structured like those of Common. The perching call of Lesser Redpoll was essentially similar to that of Common Redpoll but the main note was generally more S-shaped which could also be distinguished by human ears (figure 2B-C).

Vocal isolation between Common and Arctic seems well developed. A decoy Arctic showed hardly any vocal reaction when a flock of Commons was flying over. It only once called vigorously, just before it was joined by another Arctic which called very similarly. These observations give support to the statement

FIGURE 4 Breeding-call adoption by female Common Redpoll *Carduelis flammea flammea* (B, same individual as in figure 1D) and female Arctic Redpolls *C hornemanni exilipes* (C, same individual as in figure 1A,C) when paired with same male Common (A)

by Molau that Redpoll and Arctic Redpoll have a strong tendency to flock separately.

breeding vocalizations

In spring, the decoy male Common Redpoll started to sing and display to the decoy female Common, using a new and very distinct call, a pure *tin-tin-tin...tin-tin* (figure 4A). During the next two weeks, the female adopted a very similar call (figure 4B) which was exchanged almost continuously. After a month of extensive food begging and courtship feeding, the pair separated. Now, the male Common began to sing and display to the decoy female Arctic Redpoll. Within a week, the female Arctic also adopted a very similar call (figure 4C), and the new mates almost continuously called to each other.

In summer, the male Common x female Arctic Redpoll pair remained intact, and the female Common tried to socialize with them. All three continued to use the same contact call. However, when the decoys responded to overflying (unidentified) birds, they invariably used their non-breeding call. This was also the case when young Linnets *C cannabina* were flying over, still uttering their typical *chin-chin-chin* begging call that resembles the breeding calls of Common and Arctic more closely than the non-breeding calls of either species. These observations suggest that the breeding contact call is only used between the members of a pair (or trio as in this case). After the post-breeding moult, during which the redpolls were very quiet, they only used their nonbreeding call.

discussion

Although the origin of the studied redpolls was unknown and the number of birds was low, my data indicate the existence of vocal differences between Common, Lesser and Arctic Redpoll. In view of the recent 'devaluation' of a number of morphological characters (Molau, Knox), I think that the differences in non-breeding vocalizations provide useful additional clues to separate these taxa. My data do not support Molau's statement that the vocalizations of Common and Lesser Redpoll are completely identical.

In case of the breeding vocalizations, however, the diagnostic value is limited. It has been reported that Redpoll and Arctic Redpoll use several calls only during the breeding season (Zablotskaya 1981, Veprintsev & Zablotskaya 1982). Furthermore, call sharing in pairs or even in flocks has been recorded in several cardueline finches, including redpolls (Mundinger 1970, 1979, Marler & Mundinger 1975). Call sharing between Redpoll and Arctic Redpoll seems not to have been previously described, yet it has been documented for Redpoll in mixed pairs with Siskin *C spinus* or with Pine Siskin *C pinus*. Additionally, Alan Knox (in litt) found my recordings dissimilar to his recordings from northern Finland where Redpoll and Arctic Redpoll both breed. There are also differences between our recordings and those in Bergmann & Helb (1982). The recordings in that work, however, are difficult to interpret because neither the seasons nor the subspecies are clearly indicated. The breeding vocalizations may mainly serve to underline the very complex structure of the vocalizations

of redpolls.

It is evident that more research is needed before the whole range of breeding and non-breeding vocalizations is fully appreciated.

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samenvatting

GELUIDEN VAN GROTE, KLEINE EN WITSTUITBARMSIJS Verschillen in geluid tussen Grote Barmsijs Carduelis flammea flammea, Kleine Barmsijs C f cabaret en Witstuitbarmsijs C hornemanni exilipes worden besproken aan de hand van geluidsopnamen en sonogrammen (figuren 1-4) van op trek gevangen en tijdelijk als lokvogel aangehouden vogels in België. Onderscheid is gemaakt tussen geluiden in het broedseizoen en daarbuiten. In het algemeen waren de twee gevangen Witstuitbarmsijzen zwijgzaam maar indien zij riepen waren er verschillen met de Barmsijzen. Buiten het broedseizoen: vluchtroep bij Grote Barmsijs een snelle opeenvolging van vrij lage tonen, een zuivere ratel tjè-tjè...tjè-tjè-tjè-tjè-tjè-tjè-tjè; bij Witstuitbarmsijs trager, hoger en minder zuiver dijet...dijet-dijet...dijet-dijet-dijet; bij Kleine Barmsijs gua ritme in zit Grote Barmsijs een zuiver fluitend pwiet, snel in hoogte toenemend; Witstuit een aarzelend hees pwlice, laatste lettergreep duidelijk dalend; Kleine Barmsijs sterk gelijkend op Grote. Broedseizoen: in de volière was sprake van balts en paarvorming tussen Grote Barmsijzen en later van zelfde mannetje met vrouwtje Witstuitbarmsijs; hierbij werd een kenmerkende contactroep geuit die bij beide paartjes identiek was, tin-tin-tin...tin-tin. Op overvliegende vogels werd echter steeds gereageerd met de soorteigen 'niet-broedseizoen'-roep. De gegevens illustreren het bestaan van verschillen in roep tussen Grote, Kleine en Witstuitbarmsijs, hetgeen bij de determinatie van belang kan zijn.

references

Bergmann, H-H & Helb, H-W 1982. Stimmen der Vögel Europas. München.

Knox, A G 1988. The taxonomy of Redpolls. Ardea 76: 1-26.

Marler, P & Mundinger, P 1975. Vocalizations, social organization, and breeding biology of the Twite, *Acanthis flavirostris*. Ibis 117: 1-17.

Molau, U 1985. Gråsiskkomplexet i Sverige. Vår Fågelvärld 44: 5-20.

Mundinger, P 1970. Vocal imitation and individual recognition of finch calls. Science 168: 480-482.

Mundinger, P C 1979. Call learning in the Carduelinae: ethological and systematic considerations. Syst Zool 28: 270-283.

Troy, D M 1985. A phenetic analysis of the redpolls *Carduelis flammea flammea* and *C hornemanni exilipes*. Auk 102: 82-96.

Veprintsev, B N & Zablotskaya, M M 1982. [Acoustic communication of the Hornemann's Redpoll Acanthis hornemanni (Holb.).] Pushchino. (In Russian.)

Zablotskaya, M M 1981. [Acoustical communication of the Common Redpoll Acanthis flammea flammea (L.).] Pushchino. (In Russian.)

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