Tiedonantoja • Brief reporst

Longitude specific difference in timing of seasonal functions in two northern populations of the Common Redpoll *Carduelis flammea*

H. Pohl & G. C. West

The influence of light conditions at different latitudes on onset and end of daily activity of birds has been widely recognized (cf. Aschoff 1969, Daan & Aschoff 1975, Pohl & West 1976). In addition to these effects, innate differences in timing of seasonal functions (e.g. migratory restlessness, gonadal activity, juvenal plumage development, postnuptial moult) have been found in several latitudinally separated subspecies of White-crowned Sparrows *Zonotrichia leucophrys* (Mewaldt et al. 1968), Palearctic warblers Sylviidae (Gwinner et al. 1972, Berthold et al. 1974) and Redpolls *Carduelis flammea* (Pohl & West 1976). The following report shows that Common Redpolls *C. f. flammea* from two northern populations, separated by nearly 180 degrees of longitude, also differ in timing of seasonal changes in activity parameters when being studied at the same locality (ca. 48°N, 11°E).

Methods. Redpolls (adults and juveniles of both sexes) from central Alaska were caught in late summer 1971 near Fairbanks (ca. 65°N, 148°W) and studied from November 1971 until March 1973. Redpolls from a Fennoscandian population were captured as juveniles (both sexes) at Kevo in Finnish Lapland (ca. 70°N, 27°E) in summer 1973 and were studied from August 1973 to August 1974. Six to 8 birds of each population were maintained individually in small cages (40×20×30 cm), equipped with microswitches mounted on the perch for recording locomotor activity. The cages were located outdoors in a larger enclosure and were protected from direct sunlight and wind. The activity data were recorded on event-recorder channels. For further experimental details see Pohl & West (1976).

Results and discussion. The onset of activity was advanced relative to the beginning of civil twilight (sun 6° below horizon) and the activity-time (α) was lengthened during early spring (March) in the birds of the Fennoscandian population. The same changes occur-

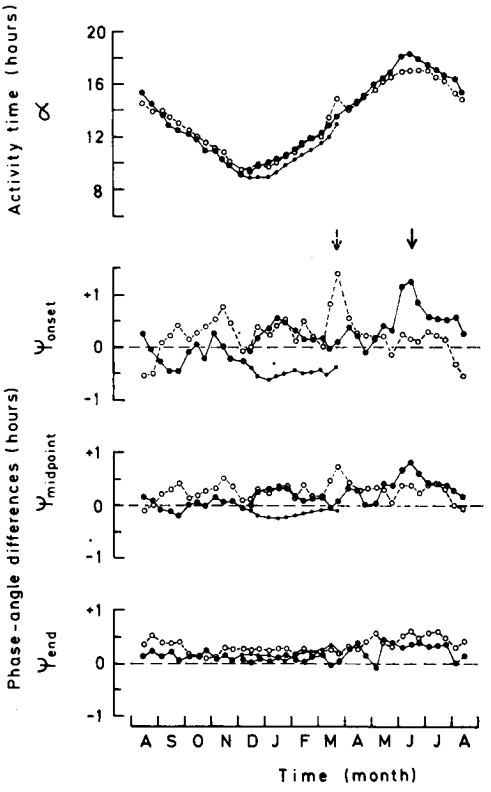

Fig. 1. Mean phase-angle difference for onset, end, or mid-point of activity-time (related to onset and end of civil twilight or midpoint of light-time, respectively), and mean duration of activity-time of 5—6 Common Redpolls from interior Alaska (closed symbols) or northern Finland (open symbols) maintained under natural light and temperature conditions at 48°N, 11°E. Small closed circles are measurements after one year's captivity. The difference in the time of maximally advanced onsets of activity of the populations is indicated by the arrows.

red 3 months later (mid-June) in the birds from interior Alaska (Fig. 1). In both populations, the time of end of activity changed much less throughout the year than the time of onset of activity (see also POHL & WEST 1976).

Although the mean monthly temperatures during winter are almost 10°C higher in northern Scandinavia than in central Alaska, breeding of Redpolls has not been reported to occur much earlier in northern Finland and Norway (PEIPONEN 1967, HILDÉN 1969) than in interior or northern Alaska (IRVING 1960, CLEMENT 1968). It has been suggested, however, that Redpolls which arrive in northern Finland after mid-June may have already finished raising a first brood in southern parts of Fennoscandia (PEIPONEN 1957, 1967, HILDÉN 1969). In the years of southern breeding in Fennoscandia, egg-laying usually begins in April, but most birds leave the area by early June (PEIPONEN 1967, HILDÉN 1969, LEINO 1973). Similar occurrences are not known from Redpoll populations in North America.

The earlier maximum in the phase-angle difference (Ψ) between onset of activity and the light cycle and the corresponding peak in α may be related to gonadal growth at the time when Fennoscandian Redpolls normally start their first brood in subarctic regions. A correlation between such changes and testis size has been found in captive Starlings *Sturnus vulgaris* by GWINNER & TUREK (1971). The absence of a second peak (maximum Ψ or α) around midsummer does not necessarily contradict this hypothesis since it might have been suppressed because of the conditions of captivity. These conditions prevented first nesting which may be a prerequisite for changes in activity parameters associated with second nesting. In this context, it is worth noting that the Redpolls from Alaska showed delayed onsets of activity during their second winter and spring in captivity.

Although some difference in timing of the observed functions may be attributed to a difference in mean age of the two populations, it is strongly suggested that the main difference in the advanced onset of activity corresponds to different times of first breeding. This reflects an innate (genetic) capability adapting physiological functions of a population to seasonal changes in its environment.

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Selostus: Vuodenaikaistoimintojen ajoituksen maantieteellisistä eroista kahdessa pohjoisessa urpiaispopulaatiossa

Urpiaisten päiväaktiivisuuden alkamista ja päättymistä tutkittiin yli vuoden ajan samalla paikkakunnalla (48°N, 11°E) ulkohäkeissä pidetyistä yksilöistä, jotka olivat peräisin kahdesta, lähes 180 pituusasteen erottamasta populaatiosta (Suomi ja Alaska). Suomalaisilla urpiaisilla päiväaktiivisuuden alun siirtyminen aikaisemmaksi suhteessa päivän valkenemiseen tapahtui 3 kuukautta aikaisemmin (maaliskuussa) kuin alaskalaisilla urpiaisilla (Fig. 1, nuolet). Tämä synnynnäinen ero liittynee näiden kahden populaation vuosittaisen pesimäkierron eriaikaisuuteen. Fennoskandian urpiaisten on todettu pesivän kahdesti vuodessa: ensimmäinen pesintä tapahtuu varhain keväällä havumetsävyöhykkeessä, minkä jälkeen linnut siirtyvät pohjoisemmaksi ja pesivät toisen kerran tunturiseuduilla. Vastaavaa käyttäytymistä ei ole todettu Alaskan sisä- ja pohjoisosissa pesivillä urpiaisilla.

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Population decrease of Starlings in northern Finland

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The Starling *Sturnus vulgaris* is one of the species whose populations have greatly increased and expanded in Europe from about the middle of the 19th century. In Scandinavia the species expanded its range along the coast of Norway and along both shores of the Gulf of Bothnia (MERIKALLIO 1916, JÄGERSKIÖLD 1919). By the turn of this century, the Starling had stabilized its position as a breeding species from SW Finland up to Oulu and Kuopio. Expansion continued northwards, and large areas were occupied in northern and eastern Finland around the 1950s (v. HAARTMAN et al. 1967—72). In SW Finland the populations continued to increase during the 1960s, and even poor habitats were occupied (TENOVUO & LEMMETYINEN 1970).

In the Oulu area (ca. 65°N, 25°30'E), the Starling is a common breeding species around human settlement, where nest-boxes are available. But observation of six different populations since the early 1960s has revealed that a strong decrease has taken place in recent years.

The study areas were: 1) Hietasaari, an old suburb near the centre of Oulu containing old houses, gardens and small fields; the nest-boxes, placed in gardens, varied in number from 10—12 in 1963—68 to 6 in 1977. 2) Hupisaaret, a large park in the centre of Oulu; the habitat has not changed significantly during the last two decades, but the number of nest-boxes decreased in 1963—77 from ca. 50 to 15. 3) Loppula, a typical agricultural area 15 km east of the town, consisting of small fields surrounded by forests, which has not changed significantly during the last 15 years; in 1963—77 the nest-boxes decreased from 15 to 7. 4) Taskila, a suburb of Oulu, where the boxes are situated in gardens and around small fields. The central field was abandoned in the late 1960s and soon became covered with dense vegetation of bushes, but some hundred metres away suitable fields still exist for Starlings, and gardens are also available. In 1969—77 the nest-boxes decreased from ca. 30 to 15. 5) Liminka (ca. 64°N, 24°25'E), an area surrounded by fields and meadows; since 1967 the number of nest-boxes has been 30 (HIRVELÄ 1977), and the habitat has not changed. 6) Utajärvi (ca. 64°48'N, 27°E), an area similar to that in Liminka; in 1968—77 the number of nest-boxes varied between 10 and 12.

The numbers of breeding pairs have declined in all the areas, but not simultaneously (Table 1). The population decrease evidently dates from the mid 1960s in Hupisaaret, from the late 1960s in Hietasaari, from 1972 in Taskila and Utajärvi, and from 1974 in Liminka. The suboptimal habitats were probably abandoned first. The population decline may be partly due to the decrease in the numbers of nest-boxes. However, in all years every area has contained more boxes than nesting pairs. When the population was dense (e.g. at Taskila, Utajärvi), Starlings also occupied boxes in poor condition