Exotic *Calidris* species of the Siberian tundra

J. P. Myers, Olavi Hildén & P. Tomkovich

Myers, J. P., O. Hildén & P. Tomkovich 1982: *Exotic* Calidris *species of the Siberian tundra.* — Ornis Fennica 59:175—182.

The article presents seven *Calidris* species of NE Siberia *(ptilocnemis, bairdii, mauri, acuminata, tenuirostris, subminuta* and *ruficollis),* with a selection of photographs taken on their remote breeding grounds. The species accounts give some basic information on the distribution, habitat, density, display, mating system, nesting and migration, obtained mainly in recent studies by Soviet ornithologists. Least known is the biology of *subminuta* and *tenuirostris.* Occurrence in Europe is briefly discussed.

J. P. Myers, Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia PA. 19103, USA

Olavi Hildén, Zoological Museum, University of Helsinki, P. Rautatiekatu 13, SF-00100 Helsinki 19, Finland

P. Tomkovich, Department of Ornithology, Zoological Museum, Herzen Street 6, 103009 Moscow K-9, USSR

Introduction

The vast Siberian tundra is an "El Dorado" for waders. Its endless marshes, sedge meadows, lichen heaths, coastal plains and river deltas provide suitable breeding habitats for millions of waders during the short arctic summer. Of the 15 Siberian species of the genus *Calidris,* some are regular passage migrants in Western Europe, even occurring in large numbers, e.g. the Dunlin *C. alpina,* the Knot *C. canutus* and the Little Stint *C. minuta.* Several others migrate south or southeast along the Pacific coasts and visit Europe only occasionally, if ever.

For those hunting for rarities, the exotic *Calidris* species of northeast Siberia are real gems. But 'twitchers' will merely be concerned with the problem of recognizing these exciting strangers among the thousands of common waders swarming on European mudflats each autumn, and with placing a new tick on their 'life lists'. More serious ornithologists, particularly those interested in the comparative ecology and behaviour of waders, will be occupied with quite different questions. In what kind of habitat do the Siberian sandpipers live? Do they show strong site attachment from year to year or an opportunistic strategy? Do the pairs breed widely dispersed or in high densities? How do their breeding display, vocalization and mating system compare with those of the familiar European and American species?

The problems of identifying exotic sandpipers have been treated in several papers and field-guides. Very little is known, however, about the breeding biology on the Siberian tundra, and very few West-European ornithologists have been able to visit these remote regions. The subject of this article is the Siberian sandpipers' life

on their breeding grounds. The following set of photographs and short descriptive texts are intended to provide some basic information on the distribution, habitat, density, display, mating system, nesting and migration of seven species: *Calidris ptilocnemis, C. bairdii, C. mauri, C. acuminata, C. tenuirostris, C. subminuta* and *C. ruficollis*. Of these, *bairdii* has its main distribution in North America, and *mauri* also occupies a small breeding range in Alaska.

For the occurrence in Europe, the information is based on the records made in Britain and Ireland up to and including 1981 (Sharrock & Sharrock 1976, the annual reports of rare birds in British Birds), and those available from Sweden (L. Risberg, in litt.), Finland (Karno Mikkola, in litt.) and the Netherlands (E. Osieck, in litt.). The records outside these countries are from Glutz et al. (1975). The numbers in the headings for each species refer to the plates.

Rock Sandpiper *Calidris ptilocnemis* (1, 2)

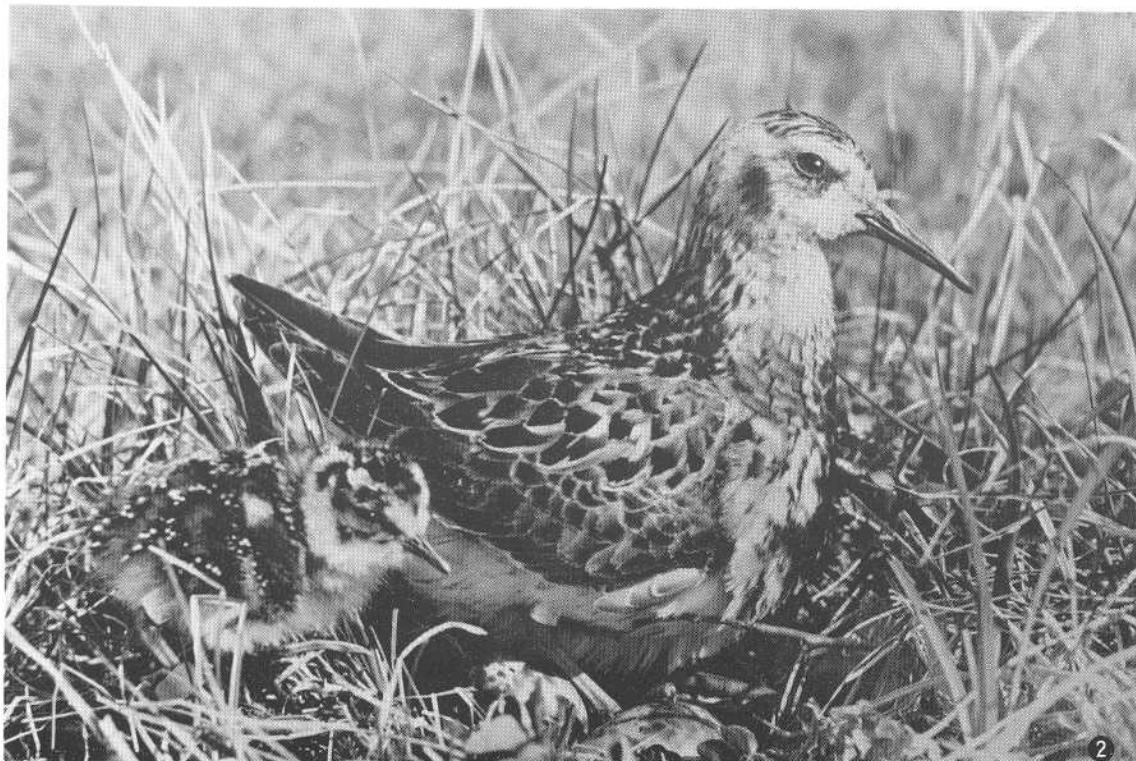
This species is a close relative to the Purple Sandpiper *C. maritima*. It breeds along both coasts bordering the Bering Straits, as well as on the Aleutian Island archipelago and Commandor Island. Even within this restricted range, at least four subspecies are recognized: *ptilocnemis, tschukschorum, couesi* and *quarta*. The Aluetian race *couesi* appears to be resident year-round on islands from Attu to Unimak, while other races migrate to winter quarters on the Kuril Islands in the western Pacific and as far south as central California in the eastern Pacific. Most, however, remain well to the north on ice-free rocky coasts of the Bering Sea and Gulf of Alaska (Gill & Handel 1981). As far as is known, the species has never been recorded in Europe.

On its breeding ground *ptilocnemis* uses an array of habitats that may vary regionally. On the Chukotski Peninsula it inhabits mesic tundra with mosses, lichens and dwarf willows on rolling plains and in low mountains, usually within 13 km of the coast (Tomkovich, pers. obs.). In its island domains *ptilocnemis* occurs frequently on windy, exposed knolls, as well as along stream beds and on grassy wet tundra (Portenko 1972). Juveniles use pebbled banks of streams coming down from island highlands.

Movement to the breeding ground begins as early as mid-April, with large congregations building on ice-free outer flats of the Yukon Delta and Alaska Peninsula (Gill & Handel 1981). By early July the first adults have returned to tidal flats after breeding, and they are followed by juveniles in late July and early August. This species undergoes prebasic moult at staging areas during September and October, and along with the Dunlin *C. alpina* it is the last of the caldridines to depart from the northeastern Bering Sea region in autumn. A few birds remain until November.

Mating in *ptilocnemis* is monogamous. Males defend large territories (3 to 8 ha) with up to 12 pairs/km^2 near Uelen on the Chukotski Peninsula (Tomkovich 1982b). Egg-laying occurs mainly during the first half of June, and incubation is normally shared by male and female, although occasionally one or the other sex may assume full duties. Most parental care following hatching falls on the male, as only rarely are chicks accompanied

Plates 1—2. The Rock Sandpiper *Calidris ptilocnemis* showing distraction display ('rodent-run'), and at nest with newly hatched young. Note the dark ear-covert spot and black patch on the lower breast. — Uelen, Chukotski Peninsula, July 1979—80. Photo P. Tomkovich.



Plates 3—4. Baird's Sandpiper *Calidris bairdii* (above) and male Western Sandpiper *C. mauri* on nest. Note the difference between the two species in the shape of the dark centres of the scapulars. — Uelen, Chukotski Peninsula, July 1979. Photo P. Tomkovich.

Plate 5. Female Sharp-tailed Sandpiper *Calidris acuminata* (above) on nest, placed in dense sedges in wet habitat. Only the female incubates. — Indigirka tundra, Yakutia, June 1973. Photo P. Tomkovich.

Plate 6. Female Great Knot *Calidris tenuirostris* on nest in dry alpine tundra. Very few nests of this species have been found. — Koryakskoye Highland, Chatyrka River, June 1976. Photo P. Tomkovich.

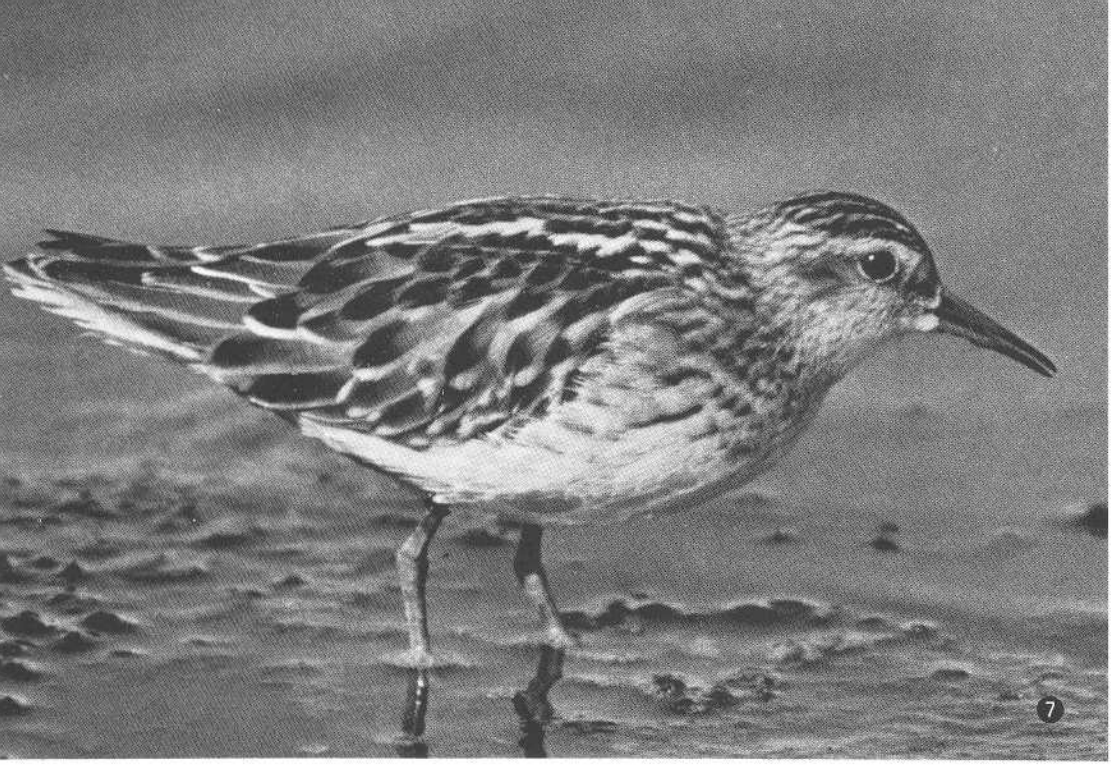


Plate 7. The least known of all Siberian *Calidris* species is the Long-toed Sandpiper *C. subminuta* (above). This bird, the second one recorded in Europe, was photographed on 1 September 1982 at Saltholme Pools, Teesmouth, England. — Photo P. A. Doherty.

Plate 8. The Red-necked Stint *Calidris ruficollis* in summer plumage is distinguished by the brick-red coloration of the cheeks and throat. — Uelen, Chukotski Peninsula, July 1978. Photo P. Tomkovich.

either by pairs or by solitary females. Adult philopatry is very strong (Tomkovich 1982b).

The flight display (circling with alternation of wing vibration and glides) and song (trill) are very like those of *alpina* and *bairdii*, but the call uttered between song and during chases is different: a quickly repeated *buri-buri-buri* ... The ground territorial call of males is a rapid *drr-drr-drr* ... The "wing-lifting" demonstration is typical of this species (Tomkovich, pers. obs.).

Baird's Sandpiper *Calidris bairdii* (3)

Baird's Sandpipers breed across the high North American arctic from Ellesmere Island and adjacent Greenland (c. 80°N, 60°W) as far west as the base of the Chukotski Peninsula in NE Siberia (c. 66°N, 180°W). Only along the Bering Sea do they spread into the subarctic. Their breeding distribution thus places them among the most northerly of *Calidris* species.

On the breeding ground, these sandpipers use dry upland habitats: dry lichen tundra with patches of bare ground. Around Barrow, Alaska, they remain in highly polygonized microhabitats or beach ridges. Inland they are found sparingly along river bluffs in the main coastal plain tundra, and into the mountains of the Brooke Range. They avoid most of the wet sedge meadows used heavily by other North Slope *Calidris* (e.g. *melanotos, alpina).*

In winter *bairdii* occurs exclusively in southern South America. Migration carries it quickly south through the central and western United States, and by unknown routes into Peru, Paraguay, Bolivia, Chile and Argentina (Jehl 1979). It appears particularly abundant during the boreal winter in high Andean lakes, along the Chilean desert coast, and south to Tierra del Fuego. In this regions it favours bare mud and sand, especially along drying lake margins. On occasion it also moves into upland habitats (Myers & Myers 1979). Of the *Calidris* species treated here, *bairdii* is the most regular visitor in Europe. Nowadays some individuals are observed each year in Britain and Ireland, usually between mid-August and October, and by the end of 1981 the grand total approached one hundred (Rogers 1982). The few records outside the British Isles include four from the Netherlands and three from Finland.

At Barrow the *bairdii* season commences in early June with a flurry of concentrated male display, in fact so concentrated as to be almost lek-like, on exposed sites right on the coast (Myers, pers. obs.). These events involve intense territorial display among males, described by Drury (1961), and much aerial song. They abate as the snow melts on the adjacent tundra and exposes the first bare tundra, thereby allowing males to occupy their nesting territories. Whether pairing occurs on these temporary display arenas is unknown.

The song of *bairdii* is a complex repertoire with recognizable elements drawn from the vocabulary of several different *Calidris* species. It flies high above the ground at Barrow, higher than any other calidridine save *C. canutus,* and while flying with a continuous, deep wingbeat it gives a call similar to *C. alpina*'s trill (described by Holmes 1966): a short, rising, raspy note repeated once per second for several minutes on end. Another call resembles *C. pusilla*'s incessant motorboat trill. This is heard during

the excitement of sexual and aggressive chases, when not only the frequency of the basic trill note is changed, but also the rate at which the basic note is repeated within the trill. In winter *bairdii*'s call resembles the churr of *C. melanotos*, but is less throaty.

Mating in *bairdii* is monogamous with shared parental care of young, at least through the early stages of brooding (Pitelka et al. 1974, Witt & Morrison 1981). Females on early nests on the Chukotski Peninsula remain with the chicks for several days; females from late nests leave at or prior to hatching (Tomkovich, MS). Breeding density varies widely. At Barrow in prime habitats it averages 0.8 pairs/10 ha (over 5 years), but can rise to 1.8 pairs/10 ha in some years. In arctic Canada, densities as high as 5—6 pairs/10 ha have been recorded in suitable habitats (Parmelee et al. 1967). In mountains near Uelen, at the tip of the Chukotski Peninsula, the breeding density during three years was much lower; only 0.14—0.28 pairs/km^2 (Tomkovich, MS). Of the common calidrines at Barrow, *bairdii* is the least studied. No detailed work on its behaviour or ecology has been completed. For information on incubation schedules, see Norton (1972).

Western Sandpiper *Calidris mauri* (4)

Western Sandpipers occupy a small breeding range in NW Alaska and the NE portion of the Chukotski Peninsula, while in winter they spread southward from California and the SE United States to northern South America as far as Peru. On the breeding ground they nest in heath-covered tundra, especially well-drained sites with dwarf willow in a mosaic of sedge marshes (Holmes 1971). In winter they move to mudflats along the coast, and to a lesser extent to inland marshes (Ashmole 1970, Page et al. 1979). In Europe, the species is an extremely rare visitor, so far recorded only five times in the British Isles.

Western Sandpipers mate monogamously and in Alaska both adults incubate and care for the young (Holmes 1973). But in Siberia often females (but sometimes males) abandon their mate during incubation (Tomkovich & Morozov 1980). On the Chukotski Peninsula usually only males attend the young, and even they depart before fledging.

In western Alaska, breeding dispersion in this species approaches a colonial pattern, like in *C. temminckii* (cf. Hildén 1979). Densities may reach 5—8 pairs per ha, much higher than the 0.32 per ha reported from Siberia (Holmes 1971, Tomkovich & Morozov 1980) and also higher than a 3-year average of 0.27 in the interior of northern Alaska near Atkasook (Myers & Pitelka, MS).

The male's display during courtship involves prolonged flights low, usually no more than 10 m, above the tundra, accompanied by soft buzzy vocalizations (Holmes 1973). Most breeding commences with snow-melt, so the timing of egg-laying varies across its range from late May to late June. At Barrow, Alaska, there appears to be a second movement of *mauri* reaching the coast in late June, and some of these individuals breed locally (Myers, pers. obs.). Departure for the wintering ground occurs swiftly in July and early August (Connors et al. 1979).

Sharp-tailed Sandpiper *Calidris acuminata* (5)

Sharp-tailed Sandpipers inhabit the arctic coastal plain tundra of eastern

Siberia, from the Lena River Delta (72°N, 125°E) eastward to the Chaun Gulf (70°N, 170°E). They feed in low wet tundra and place their nests in dense sedges, selecting the wettest habitats of all the calidridines.

Mating by *acuminata* resembles the behaviour of *C. melanotos* (see Pitelka 1959, Myers 1982), and is either polygynous or promiscuous. Egg-laying takes place in the first half of June. Females bear all responsibilities for incubating eggs and brooding young.

The similarity continues farther. Like *melanotos, acuminata* has a large breast sac important in the flight display. The species' displays are quite different, however. The male *acuminata* quickly rises high over the tundra (some 30—40 m) and then glides downward while giving a dry, crackling warble unlike any other calidridine vocalization.

Territory sizes vary greatly, from 0.9 ha to 7.1 ha, and there are corresponding variations in local densities. These can range up to 20 birds/km² (including 12.5 females). The sex ratio of local breeding populations also fluctuates markedly (Tomkovich, pers. obs.).

The flyways of adults during autumn migration pass inland across eastern Mongolia and China, while young birds move along the Pacific Coast (Tomkovich, 1982a), and also into Alaska (Gill & Handel 1981). Occasional vagrants stray into Europe, mainly in August-October. The records include 17 from Great Britain, 3 from Sweden and 2 from the Netherlands. Surprisingly, a summer observation clearly indicating nesting (one of the two birds showing distraction display, for instance) was made in the Dovre-fjell area, S Norway, in 1970 (Bauer & Persson 1971). During winter, *acuminata* is found in the SW Pacific: Australia, New Zealand and New Guinea north into Melanesia. Their similarity to *melanotos* extends to habitat use in the winter, with *acuminata* occurring in marshes and wetlands, coastal swamps, estuaries and tidal mudflats, particularly with vegetation.

Great Knot *Calidris tenuirostris* (6)

This largest of all sandpiper species breeds in the NE Siberian highlands (c. 62°N, 180°E), and from there west to the Verkhoyanski Mountains (62°N, 130°E). It winters from the Bay of Bengal southeast into Australia and also along the Asian Pacific coast. No records are known from Europe, but one bird has been seen in Morocco (Prater & Grant 1982). The nesting habitat of the Great Knot lies in dry alpine tundra, and the birds feed alone or in small flocks in mossy bogs at some distance from their nests. For example, a bird colour-marked by Tomkovich was located feeding 3 km from its nest (Flint et al. 1980a). Later the males lead their broods to the same wet places.

Adults reach the breeding ground in late May or early June as snowmelt commences. During flight display the males hover high over their territories uttering a gutteral *kurru ... kurru ...* (A. Kistchinski, cited by Johnsgard 1981). They also chase other birds with a quickly repeated call *chirri* during a short glide with raised wings. Great Knots mate monogamously, and the mates share the parental duties, until the females abandon the nest shortly before hatching. Only males have been found with broods (A. Kistchinski op. cit.). The females migrate southward long before the males. On the whole, very little is known about the breeding biology of

the species and only a few nests have been found.

The Great Knot has been considered uncommon (Johnsgard 1981), but recent sightings during spring migration on the Kamchatka Peninsula revealed more than 20,000 individuals at one site (Gerasimov 1980). Thus the rarity of sightings may be due more to the remoteness of its distribution than to its numerical status.

Long-toed Stint *Calidris subminuta (7)*

Less is known of the Long-toed Stint than of any other sandpiper. In habitat and distribution, it seems an Asiatic version of the American Least Sandpiper *C. minutilla*. Both breed in the taiga of their respective continents, using boggy openings amidst the trees for nesting locations. Even in winter this similarity persists: like *minutilla*, *subminuta* prefers marshy inland areas with vegetation rather than bare intertidal sites.

The breeding distribution of *subminuta* is poorly substantiated. Records document a range from the Kamchatka Peninsula and Koryak Highlands along the west side of the Bering Sea westward to western Siberia near the Ob River (c. 65°N, 65°E). Nowhere does it reach the Arctic Ocean. Nonbreeding birds occur commonly south of the breeding range. In winter *subminuta* migrates south along the shores of the Indian Ocean, into China, Taiwan, the Philippines and occasionally Australia (Johnsgard 1981). Only two confirmed records are known from Europe, one from Sweden (4 October — 5 November 1977, Petterson et al. 1978) and one from Britain (28 August — 1 September 1982, Hume & Allsopp 1982).

Leonovich's (1973) description of the *subminuta* display flight sounds quintessentially calidridine: a repeated trill given while circling up to 100 m over the tundra, alternately fluttering and gliding. The mating system is uncertain, but thought to be monogamous (Pitelka et al. 1974). However, there are no records confirming incubation by the females, which migrate southward as early as late June and early July, leaving the care of the young to the males (Tomkovich 1980, see also Johnsgard 1981). Typical territory sizes and densities are unknown. Clearly, many gaps remain in the biology of *subminuta*.

Red-necked Sandpiper
Calidris ruficollis **(8)**

This close relative to the Little Stint *C. minuta* breeds in the low mountain landscape of Siberia, mainly on the Chukotski Peninsula (c. 66°N, 180°E) and near the Lena Delta (c. 72°N, 128°E). In North America, it has been recorded breeding in Alaska on the Bering Straits near Wales and at Barrow.

In Siberia, *ruficollis* chooses high ground away from flat, low tundra (Portenko 1972). It inhabits foothill and mountain landscapes with a complex of tundra vegetation types, preferring for its nest site mossy places with shrubs, in areas near dry ridges, rocky debris, and exposed knolls. Individuals will fly long distances from their nests in order to forage in wet microhabitats. The densities in a favourable habitat near Uelen (Chukotski Peninsula) usually range from 4 to 6 pairs/km^2 but can rise locally to 28 pairs/km^2. The territories are small: 0.5 to 5.4 ha, averaging 1.3 ha. Adults colour-ringed here have shown low site tenacity (Tomkovich 1982b).

During the nonbreeding season *ru-*

ficollis migrates south into the Pacific Basin, from China and Taiwan through the Philippines to Australia and New Zealand. It is one of the commonest sandpipers at the southern limit of arctic shorebird migrations (Thomas 1970a). Its habitat use in winter is quite eclectic, ranging from sandy seashores to inland swamps (Thomas 1970b). In Europe, confirmed observations are known only from West Germany (10 August 1968, Ringleben 1969) and Fair Isle in Britain (11—13 August 1982, Hume & Allsopp 1982), but difficulties in field-identification make this species easily over-looked.

Red-necked Sandpipers mate monogamously. Egg-laying occurs in June, and incubation is shared by male and female. Females breeding early in the season often aid in chick rearing immediately after hatching, while late breeders abandon the nest earlier. Adults have disappeared from the breeding ground by August while young remain common throughout the month (Flint et al. 1980b).

The flight display by male *ruficollis* is typically calidridine, with a repetitive call given from the air as the male alternates between fluttering and gliding. The call is intermediate between *alpina* and *minutilla* in fundamental frequency, a strongly nasal, rising *wannh wannh wannh*. At the end of a display the male falls to the ground with its wings high in a V (Myers, pers. obs.).

Acknowledgements. We thank Karno Mikkola, E. Osieck, L. Risberg and J. T. R. Sharrock for information on the occurrence of Siberian sandpipers in Europe, and P. A. Doherty for the photograph of *C. subminuta*.

Selostus: **Siperian tundran eksoottisia sirrejä**

Kirjoituksessa esitellään seitsemän Itä-Siperiassa pesivää, Euroopassa satunnaista tai tuntematonta sirrilajia. Valokuvat ovat yhtä (kuva 7) lukuun ottamatta kirjoittajista PT:n ottamia lajien pesimäpaikoilla kesäpukuisista linnuista. Tekstissä annetaan tiivistä tietoa kunkin lajin levinneisyydestä, elinympäristöstä, tiheydestä, soidinmenoista, parinmuodostuksesta, pesinnästä ja muutosta, joista aikaisempi tieto eurooppalaisessa kirjallisuudessa on ollut vähäistä. Euroopassa näistä lajeista esiintyvät säännöllisimmin bairdinsirri *Calidris bairdii* (mm. lähes 100 havaintoa Brittein saarilta) ja suippopyrstösirri *C. acuminata* (17 havaintoa Brittein saarilta), kun taas tundrasirristä *C. mauri*, siperiansirristä *C. subminuta* ja rusokaulasirristä *C. ruficollis* tunnetaan vain 2—5 havaintoa kustakin; beringinsirriä *C. ptilocnemis* ja kaitanokkasirriä *C. tenuirostris* ei ole tavattu Euroopassa.

References

ASHMOLE, M. H. 1970: Feeding of Western and Semipalmated Sandpipers in Peruvian winter quarters. — Auk 87:131—135.

BAUER, C-A. & B. PERSSON 1971: Spetsstjärtad snäppa, Calidris acuminata, funnen i Norge (Summary: A record of the Sharp-tailed Sandpiper in Norway). — Sterna 10:57—62.

CONNORS, P. G., J. P. MYERS & F. A. PITELKA 1979: Seasonal habitat use by arctic Alaskan shorebirds. — Stud. Avian Biol. 2:101—111.

DRURY, W. H., Jr. 1961: Breeding biology of shorebirds on Bylot Island, Northwest Territories, Canada. — Auk. 78:176—219.

FLINT, V. E., A. A. KISTCHINSKI & P. S. TOMKOVICH 1980a: Breeding biology of the Great Knot, Calidris tenuirostris (in Russian). — *In* V. E. FLINT (ed.): Novoe v izuchenii biologii i rasprostranenii kulikov, pp. 176—178. Moscow.

FLINT, V. E., P. S. TOMKOVICH & A. A. KISTCHINSKI 1980b: New information on spreading and breeding biology of the Rufous-necked Stint, Calidris ruficollis (in Russian). — *In* V. E. FLINT (ed.): Novoe v izuchenii biologii i rasprostranenii kulikov, pp. 178—180. Moscow.

FLINT, V. E. & P. S. TOMKOVICH 1982: Ecological and ethological isolation in the Pectoral Sandpiper and the Sharp-tailed Sandpiper. — *In* V. M. GAVRILOV & R. L. POTAPOV (eds.): Ornithol. Stud. USSR, Vol. 2:241—261. Moscow.

GERASIMOV, N. N. 1980: Spring migration of the Great Knot (Calidris tenuirostris) and Knot (Calidris canutus) along the coast of Kamchatka (in Russian). — *In* V. E. FLINT (ed.): Novoe v izuchenii bio-

logii i rasprostranenii kulikov, pp. 96—98. Moscow.

GILL, R. E. & C. M. HANDEL 1981: Shorebirds of the eastern Bering Sea. — *In:* D. W. HOOD & J. A. CALDER (eds.): The eastern Bering Sea shelf: oceanography and resources. Washington.

GLUTZ v. BLOTZHEIM, U. N., K. M. BAUER & E. BEZZEL 1975: Handbuch der Vögel Mitteleuropas. Band 6. — Wiesbaden.

HILDÉN, O. 1979: Territoriality and site tenacity of Temminck's Stint Calidris temminckii. — Ornis Fennica 56:56—74.

HOLMES, R. T. 1966: Breeding ecology and annual cycle adaptations of the Red-backed Sandpiper (Calidris alpina) in northern Alaska. — Condor 68:3—46.

HOLMES, R. T. 1971: Density, habitat, and the mating system of the Western Sandpiper (Calidris mauri). — Oecologia 7:191—208.

HOLMES, R. T. 1973: Social behaviour of breeding Western Sandpipers Calidris mauri. — Ibis 115:107—123.

HUME, R. A. & K. ALLSOPP 1982: Recent reports. — Brit. Birds 75:543—546.

JEHL, J. R., Jr. 1979: The autumnal migration of Baird's Sandpiper. — Stud. Avian Biol. 2:55—68.

JOHNSGARD, P. A. 1981: The plovers, sandpipers, and snipes of the world. — Lincoln.

LEONOVICH, V. V. 1973: Some special features in the occurrence of sandpipers (in Russian). — Fauna i ekologiya kulikov, pp. 17—20.

MYERS, J. P. 1982: The promiscuous Pectoral Sandpiper. — Amer. Birds 36:119—122.

MYERS, J. P. & L. P. MYERS 1979: Shorebirds of coastal Buenos Aires Province, Argentina. — Ibis 121:186—200.

NORTON, D. W. 1972: Incubation schedules of four species of calidridine sandpipers at Barrow, Alaska. — Condor 74:164—176.

PAGE, G. W., L. E. STENZEL & C. M. WOLFE 1979: Aspects of the occurrence of shorebirds on a central California estuary. — Stud. Avian Biol. 2:15—32.

PARMELEE, D. F., H. A. STEPHENS & R. H. SCHMIDT 1967: The birds of southeastern Victoria Island and adjacent small islands. — National Mus. Canada Bull. 222:1—229.

PETTERSON, J., J. ÖSTERBERG & N. KJELLÉN 1978: Långtåsnäppa Calidris subminuta funnen vid Ottenby — en ny art för Europa (Summary: Long-toed Stint Calidris subminuta at Ottenby — a species new to Europe). — Vår Fågelvärld 37: 333—338.

PITELKA, F. A. 1959: Numbers, breeding schedule, and territoriality in Pectoral Sandpipers of Northern Alaska. — Condor 61:233—264.

PITELKA, F. A., R. T. HOLMES & S. F. MACLEAN, Jr. 1974: Ecology and evolution of social organization in arctic sandpipers. — Amer. Zool. 14:185—204.

PORTENKO, L. A. 1972: Birds of the Chukchi Peninsula and Wrangel Island (translated from Russian, publ. 1981). — New Delhi.

PRATER, A. J. & P. J. GRANT 1982: Waders in Siberia. — Brit. Birds 75:272—281.

RINGLEBEN, H. 1969: Ein Rotkehlstrandläufer, Calidris ruficollis, in Deutschland. — J. Ornithol. 110:108—109.

ROGERS, M. J., RARITIES COMMITTEE & D. J. BRITTON 1982: Report on rare birds in Great Britain in 1981. — Brit Birds 75: 482—533.

SHARROCK, J. T. R. & E. M. SHARROCK 1976: Rare birds in Britain and Ireland. — Berkhamsted.

THOMAS, D. G. 1970a: Fluctuation of numbers of waders in south-eastern Tasmania. — Emu 70:79—85.

THOMAS, D. G. 1970b: Wader migration across Australia. — Emu 70:145—154.

TOMKOVICH, P. S. 1980: Territorial behavior and pair formation of the Little Stint (Calidris minuta) during migration. — *In* V. E. FLINT (ed.): Novoe v izuchenii biologii i rasprostranenii kulikov, pp. 170—172. Moscow.

TOMKOVICH, P. S. 1982a: Peculiarities of the autumn migration of the Sharp-tailed Sandpiper (in Russian). — Byull. Mosk. Obshch. Isp. Prir. Biol. 87, 4:56—61.

TOMKOVICH, P. S. 1982b: Territoriality of some monogamous species of Calidridinae sandpipers. — Abstracts of symposia and poster presentations of XVIII Congr. Int. Ornithol., p. 300. Moscow.

TOMKOVICH, P. S. & V. V. MOROZOV 1980: Breeding biology of the Western Sandpiper (Calidris mauri) in Chukotka. — *In* V. E. FLINT (ed.): Novoe v izuchenii biologii i rasprostranenii kulikov, pp. 173—175. Moscow.

Received June 1982