

# Moult and its relation to taxonomy in Rock and Water Pipits\*

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TWO SUCCESSIVE list-committees of the British Ornithologists' Union have held widely divergent views on the taxonomic treatment of the Rock Pipit populations of the British Isles, and there is clearly a little-understood problem of geographical differentiation in this interesting group which it is hoped the following study will help to clarify.

In the 1952 *Check-list of the Birds of Great Britain and Ireland*, two native and three extra-limital forms were included under *Anthus spinoletta*. Leaving aside for the moment the question of whether or not the Rock and Water Pipits should be regarded as conspecific, the native forms admitted were *meinertzhageni* of the Outer Hebrides and *petrosus* over the remainder of Britain and Ireland; and the extra-limital forms were the Water Pipit *spinoletta*, its American counterpart *rubescens*, and the Baltic Rock Pipit *littoralis*. Later, Meinertzhagen and Williamson (1953) mentioned their inability to separate the Rock Pipits of the Outer Hebrides, Orkney, Shetland and the north Scottish mainland from *kleinschmidti* of the Faeroe Islands. Subsequently, a new B.O.U. Taxonomic Sub-Committee looked at these forms, together with two others described by P. A. Clancey (*ponens* from Ushant in north-west France, and *besperianus* from the Isle of Arran in the Clyde estuary) and lumped them all together under the oldest available name *petrosus*, saying they 'could not see the alleged differences between populations from the Faeroes to Ushant' (*Ibis*, 98: 166).

Witherby *et al.* (1938) accepted *meinertzhageni* as a valid form, but excluded *kleinschmidti* on the grounds that it was restricted to the Faeroe Islands. Baxter and Rintoul (1953) also accepted *meinertzhageni* as the Outer Hebrides bird. Bannerman (1953) refused to accept the conspecificity of the Rock and Water Pipits: of the former he included as 'British' nominate *petrosus* and the forms *meinertzhageni* and *littoralis*. Vaurie (1954) acknowledged 'three slightly differentiated races: *kleinschmidti* in the Faeroes, *petrosus* in the British Isles and coasts of northwestern France, and *littoralis* in the Baltic and White Sea.' He was noncommittal concerning Norwegian birds, including them (with a

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query) under *petrosus* (Vaurie 1959). Hall (1961) extended the range of *kleinschmidti* to the Hebrides, otherwise recognising only *petrosus* and *littoralis* among the Rock Pipits.

Before embarking upon a taxonomic comparison of Rock Pipits from various localities it is necessary to bear in mind that these birds moult their contour feathers twice a year, and that in this species the taxonomy is inseparably linked with moult. Adults have a complete moult, including wings and tail, in the autumn (August-September), while juveniles have a change of body-feathers and some wing-coverts which gives them a first-winter plumage identical with that of adults. A partial moult of body feathers and some coverts (not the greater coverts), also occasionally the middle pair of rectrices and one or more tertials, takes place early in spring (late January-early March). This moult is individually variable in extent within all populations, as pointed out by Mayaud (1942) and repeated by Hall (1961); but it is important to understand the nature of the change for it does not appear to be on record that the moult is of a different kind in different populations, resulting in a distinctive dress in some, and in a new plumage much like the winter dress in others. The extremes of these plumage-types among the Rock Pipits are *littoralis* (fully-moulted examples of which resemble partially-moulted *spinoletta*) and *kleinschmidti* (which shows very little plumage-change from one season to the other).

It is therefore essential, if satisfactory results are to be obtained, to compare only birds from the same season, and the most valid comparisons are between late spring ones. There are two reasons for this. Firstly, the winter plumage is similar in all populations; and, secondly, there is much movement, of northern birds especially, at that season, so that one can never be sure that a series collected at any given locality represents a discrete population. In stating an opinion that they could find no constant difference between the named forms in the British area, some workers clearly based their examination on freshly-moulted autumn birds, which is a fairly usual taxonomic practice; it is difficult to see how they could have reached any other conclusion with such material. The opposite situation is provided by late spring birds which are well advanced in pre-nuptial moult, and can reasonably be assumed to be on, or on the way to, their breeding-grounds, for appreciable differences between certain populations can then be found.

When such an examination is made, three groups appear to be acceptable as native to the British Isles. The birds of Shetland and Fair Isle, and perhaps those of St. Kilda and the northern isles of Orkney, agree well with the Faeroe Islands *kleinschmidti*, while the greatest contrast with these is provided by *meinertzbageni* from the Outer Hebrides. Over the rest of the British Isles and Ireland the name *petrosus* can be used, though some populations (e.g. western Scotland, Inner Hebrides and the southern part of Orkney) show the

intermediate characteristics which one would expect to find in birds with a nearly continuous range.

## WEST EUROPEAN RACES OF ANTHUS SPINOLETTA

**Anthus spinoletta spinoletta** Linnaeus, 1758, Syst. Nat. ed. 10, p. 166, Italy. Mountainous country in central and southern Europe, eastwards to Asia Minor.

*Autumn.* The Water Pipit has a more distinctive winter dress than the Rock Pipits, being browner above, the feather-centres darker brown than the fringes but not markedly contrasting, and the ground-colour of the under-parts off-white. There is a faint salmon-pink blush in the white of the belly, which has a more immaculate appearance than in the Rock Pipits owing to the reduction of the flank streaking. Specimens from the Pyrenees in the British Museum (Natural History) differ from other European ones in having a pale primrose suffusion on the underside; this might, however, be due to a difference in the method of preparation.

*Spring.* The pre-nuptial moult is mostly confined to the head, nape, throat and breast, sometimes extending to the mantle and belly. The breast-spots are either entirely or only partially lost when the dark-centred winter feathers are cast, and new unspotted vinous-pink feathers take their place. Rarely the whole underside is pervaded by this colour; more usually some brown streaking remains on the breast and flanks. Those birds in which a fair number of dark-centred feathers remain are very like spring *littoralis*, even to the new greyish-fringed feathers of the head and nape, but the general tone of the under-parts remains off-white in the Water Pipit, and creamy-buff or yellowish in *littoralis*. There is a pronounced creamy-white supercilium. The outermost tail-feather has a long white wedge on the inner web, extending to a point near the shaft about two-thirds of the way along the feather, the outer web being white. There is a smaller white triangle on the inner web at the tip of the penultimate feather, and a white notch at the tip of the next innermost. It should be stressed here, however, that the pattern on the penultimate rectrix is not a good taxonomic character, being variable within the group as a whole (Hall 1961).

**Anthus spinoletta littoralis** C. L. Brehm, 1823, Lehrb. Naturgesch. aller eur. Vogel, pt. 1, p. 239, Oehe Island, Schleimunde, Baltic Sea (often given as 'the Danish islands').

Coasts and islands of the Baltic north to Lapland; western and northern Norway east to the Kola Peninsula. Winters mainly on the Channel coasts of England and France.

*Autumn.* There is little difference from the Water Pipit in the brownness of the upper-parts, the fringes being slightly more olive. The main difference is in the under-parts: the breast-spots are larger and more diffuse, the flanks more heavily streaked, and the ground-colour creamy-buff, not off-white.

*Spring.* The individually variable spring moult is similar to that of *spinoletta*, a number of dark-centred feathers with greyish-olive fringes coming into the head, nape and mantle, and vinous-tinged feathers replacing the brown-spotted ones on the breast. However, a number of new pale yellowish feathers also appear, and there are two broad kinds as pointed out by Mayaud (1952)—yellowish birds with comparatively few spots and a good many vinous feathers on throat and breast, and whitish birds retaining many worn dark-centred breast-feathers with little or no vinous colouring. A series from Vadsö, Varangerfjörd, north Norway, illustrates this disparity well, the 'moulted' birds being greyer and the 'unmoulted' ones browner on the mantle. Of two from Smölen Island, north Norway, one is decidedly yellowish, the other only slightly so; and there are whitish birds with a fair amount of spotting from other parts of the Norwegian coast. This diversity is discussed further on page 498. There is a noticeable creamy-white supercilium. In the

outermost tail-feather the pale wedge seldom reaches more than half-way along, and only the distal part is white, the inner portion being dusky. Similarly, the white triangle at the tip of the next feather is somewhat reduced and less pure. A pale notch is usually present at the tip of the third.

***Anthus spinoletta petrosus*** (Montagu), 1798, Trans. Linn. Soc. Lond., 4, p. 41, coast of Wales.

Coasts of north-west France, Great Britain and Ireland (except the Outer Hebrides and Shetland).

*Autumn.* Very like *littoralis*, the mantle fringes generally a purer olive, the belly perhaps a rather brighter, pale yellow.

*Spring.* There is a fairly extensive body moult, but only rarely is this of *spinoletta*-type, except in the Breton and Vendée populations of France as pointed out by Mayaud (1952). The new feathers are similar to those of autumn plumage, and the breast-spotting shows hardly any reduction. The mantle, nape and head are a greyer olive. In those specimens which develop the vinous feathers these usually appear as a fringe surrounding the whitish throat. The supercilium is reduced and is not very noticeable. The wedge on the inner webs of the outermost and penultimate tail-feathers is very dusky, and white-tipped only in the new plumage.

***Anthus spinoletta meinertzhageni*** Bird, 1936, Bull. B.O.C., 56, p. 55, Lochboisdale, South Uist.

Outer Hebrides (except perhaps St. Kilda).

*Autumn.* Above very similar to *petrosus*, but yellower and more like *kleinschmidti* below, and only distinguishable from that race by the browner fringes and darker feather-centres of the upper-parts.

*Spring.* The new spring plumage is altogether darker than in either *petrosus* or *kleinschmidti*, the feather-centres of the upper- and under-parts being blackish rather than dark brown. The fringes of the mantle feathers are greenish-olive, brighter than in *petrosus*, this colour being especially noticeable on the uniform rump. The ground-colour of the under-parts is creamy-buff, paler than in *petrosus* and not nearly so bright as in *kleinschmidti*. A few vinous feathers appear around the whitish throat in most birds and (as in *petrosus*) an occasional specimen acquires some *spinoletta*-type nuptial plumage on the breast. The ear-coverts and sides of head are greyish-brown as in *petrosus*, and the supercilium and outer tail-feathers are as in that form. The blacker mantle and breast-markings are also obvious when juvenile specimens are compared with unmoulted juveniles of *petrosus* and *littoralis*.

***Anthus spinoletta kleinschmidti*** Hartert, 1905, Vögel pal. Fauna, p. 284, Nólsoy, Faeroe Islands.

Faeroe Islands and Shetland (including Fair Isle) and possibly St. Kilda. Some winter on the west and north-east Scottish coasts and in Ireland.

*Autumn.* This form is a yellower olive on the feather fringes of the upper-parts than the other races; the centres are a little darker than in *petrosus* and *littoralis*, but not blackish as in *meinertzhageni*. It is more heavily suffused with a deeper, brighter yellow below, especially on the belly, and heavily washed with olive on the flanks. The breast-spots are large and often coalesce to give a 'clouded' effect. The chin and throat are yellowish-white.

*Spring.* There is a fairly full body-moult, but the new feathers are very similar to the old, so that the bird is still yellowish-olive above, especially marked on the unstreaked rump, and a brighter yellow below than the other races. Some acquire a few small vinous-tinged feathers surrounding the pale throat, but this seems to be the only concession to the *spinoletta*-type of nuptial dress. The ear-coverts and sides of head are yellowish-brown, not greyish-brown. There is practically no supercilium and the pale portions of the outer tail-feathers are brownish-white.

## CONSPECIFICITY OF WATER AND ROCK PIPITS

The pipits customarily included under *A. spinoletta* fall into two distinct ecological groups—the alpine Water Pipits, which have representatives over much of Eurasia and North America (including West Greenland), and the littoral Rock Pipits, which are uniquely west European. The breeding ranges of the two groups do not overlap, so that a potential incompatibility arising from differences in habitat, food-preferences, song and other behaviour has never been put to the test. Contrary to other authors, Bannerman (1953) treated the two groups as distinct species, the Water Pipits under *A. spinoletta* and the Rock Pipits under *A. petrosus*. If geographical replacement were the sole criterion of conspecificity, then there would be every justification for Bannerman's view.

However, a more cogent factor in this case is surely the near relationship expressed by their morphological likeness and the similarity in the pattern of moult. To take the latter first, the post-nuptial moult is complete in all populations, while the pre-nuptial moult comprises two variables—the extent to which moult takes place at all, and (when it does) the extent to which it produces a distinctive nuptial dress, or one which closely resembles the off-season plumage. Passing from one extreme to the other, we have an orderly arrangement of *spinoletta*, *littoralis*, *petrosus*, *meinertzhageni* and *kleinschmidti* so far as the second variable is concerned.

Bannerman attached importance to the supercilium (prominent in the Water and greatly reduced in the Rock Pipits) and outer rectrices (white in the former, dusky in the latter); but here too we find a progression from *spinoletta* through *littoralis* (supercilium well-marked, the white in the tail not entirely suppressed), *petrosus* and *meinertzhageni* to *kleinschmidti* (supercilium vestigial, pale portions of the tail-feathers always brownish). In these characters as well as the moult-pattern, therefore, we find intermediacy of the kind which characterises related populations with a continuous or nearly continuous range. This, combined with the fact of allopatry, seems more to favour the conservative view that the alpine and littoral groups should be regarded as geographical representatives of one species, the oldest name for which is *spinoletta*.

## COMMENTS ON THE RACES

Meinertzhagen (*Ibis*, 1934: 56) collected an autumn series in the Outer Hebrides and hinted that, as some specimens resembled *kleinschmidti*, this might be the breeding form; it occurs there, however, as a migrant. Bird (1936) gave a correct diagnosis of this new form *meinertzhageni*, stressing the general darkness of both upper- and under-parts, the much darker breast-spots, and the virtual absence of yellow from the belly. Clancey (1942) synonymised *meinertzhageni* with *kleinschmidti*,

but did not say to what season his comparative material belonged: one suspects that his opinion was founded on autumn birds, a mistake which was later repeated by Meinertzhagen and Williamson. Vaurie (1954, 1959) synonymised *meinertzhageni* with *petrosus*—with rather more justification, since the two are certainly closer than is *kleinschmidti* to either; but the characters given by Bird and reiterated here are constant in the breeding birds I have examined (upwards of 20) and the race merits acceptance.

Two names have been applied to the Breton population—*immutabilis* Degland, 1849, and *ponens* Clancey, 1942: the type of *ponens* is a moulting male dated 20.ix.1933, and a co-type in the Meinertzhagen collection is an abnormal bird in a *spinoletta*-type nuptial plumage although dated 22.ix.1933. These can hardly be said to provide a sound basis for a new race of Rock Pipit. Similarly, Clancey's description of *hesperianus*, the type of which is an adult female collected in the Isle of Arran on 14.viii.1940, is not well founded: breeding birds from Argyll appear to be *petrosus-meinertzhageni* intergrades, and it seems unlikely that Clyde birds will be different from these or perhaps from *petrosus*. Degland's birds were from Dieppe (though said to breed in Brittany 200 miles to the west) and so might have been *littoralis* on passage or wintering; Clancey restricted the type-locality to Dieppe in order to establish *ponens* for the Breton birds. This is a variable population in respect of its breeding-dress: in his study of the species Mayaud (1952) showed that many in south Brittany and Vendée have a *spinoletta*-type nuptial plumage, while others are similar to *petrosus*, and it would seem best to include this highly variable group under the latter name.

This diversity within the same population occurs also in Norway, as we have seen, and would be very noticeable in the field. This fact was well known to Henry Seebohm and others many years ago and was discussed in some detail by Aplin (1907). It is the probable explanation of an observation by Blair (1936) who found two pairs of *littoralis* near the estuary of the Storelv, ten miles east of Vadsö, which fed among heaps of washed-up seaweed and carried food inland to a scrub-covered flat where Red-throated Pipits *Anthus cervinus* were also nesting. They were conspicuously washed with vinous on throat and breast and 'were distinguishable at a glance from a pair of *petrosus* which had a nest in a nearby sand-cliff and regularly fed on the same stretch of shore'. He did not further describe these birds, but it would seem likely that they were comparatively unmoulted examples with spotted breasts, and that his two kinds could be equated with the two kinds represented among the Vadsö skin material described under *littoralis* above.

Some authors, including Mayaud (1952) and Hall (1961), have restricted the range of *littoralis* to the Danish islands and Baltic Sea, and the north-west coast of Europe from Varangerfjord east to the Kola

Peninsula, regarding west-coast Norwegian birds as *petrosus*. These west Norwegian ones have in fact received a name, *schiaeleri* Christiani (D.O.F.T., 1920: 157), usually placed as a synonym of *petrosus*. Throughout Scandinavia, birds are so variable in the extent of the *spinoletta*-type nuptial plumage they acquire that it is probably best to regard them all as belonging to *littoralis*, while recognising that some west Norwegian birds are more closely similar to *petrosus*.

There must always be some difficulty in the correct identification of races of *Anthus spinoletta*. In autumn, plumage differentiation between *petrosus* and *littoralis* on the south coast of England and north coast of France (including the Channel Islands), where the two mix as wintering birds, is well-nigh impossible. A good eye could discriminate between the richly-coloured local form *kleinschmidti* and the paler migrant *littoralis* from Scandinavia in the far north of Britain, where *petrosus* is unlikely to occur. There are in the Royal Scottish Museum two Rock Pipits of W. Eagle Clarke's collecting at Fair Isle, males dated 30.ix. 1905 and 7.ix.1908, in which the colouring is more diluted than in other Fair Isle birds, and which can with some confidence be placed as migrant *littoralis*.

The northern *kleinschmidti*, by virtue of retaining a winter-type plumage after the spring moult, is easily recognisable at that season; *meinertzhageni* of the Outer Hebrides is altogether darker and has a distinctly greenish, not yellowish, tinge above, especially on the rump, while the sides of the head and the ear-coverts are greyish, not brown. The Outer Hebridean bird is connected to *petrosus* by intermediate populations in the Inner Hebrides (specimens seen from Muck dated 3.iv, and Sleat, Skye, dated 22.iii), southern Orkney (breeding males examined from Pentland Skerries dated 13.v and 14.v) and probably the north and west coasts of Scotland. Birds from Wales and the West Country, nearest the type-locality of *petrosus*, differ from *meinertzhageni* in having the feather-centres of the upper-parts and breast brown not blackish-brown, the under-parts pale yellow rather than creamy, and the fringes of the mantle olive not greenish.

There is a danger of confusion in sight records between partially moulted vagrant Water Pipits *spinoletta*, and returning migrant *littoralis*, along the south and east coasts of England during March and April (see page 502). There is more white in the outer tail-feathers and a better supercilium in *littoralis* than in other Rock Pipits, and in these characters the difference from Water Pipits is slight. The Scandinavian bird tends to have pale yellowish, not off-white, under-parts—as has one in the British Museum (Natural History), which was taken at Brighton and misidentified as a Water Pipit.

#### THE MOULT

Since taxonomic differences in this group are clearly vested in regional

differences in the pattern of moult, this aspect of the seasonal cycle should be considered in greater detail.

#### *Post-nuptial moult*

The only full data on the complete autumn moult of adults is in respect of *kleinschmidti* at Fair Isle, of which there are 18 records showing a time span from mid-July to early September, all noted on B.T.O. Moult Record Cards.

The first in change were trapped on 13th and 15th July, with primaries 1-3 (descendant numbering) and the greater coverts in pin; a late starter on 24th July has primary 1 only in sheath. Analysis of the cards suggests that the body-moult is delayed until after the start of primaries 1-2, which slightly precede the tertials and major coverts. The first to show tail-moult, with some feathers in sheath but a few old ones remaining, is dated 2nd August, and primaries 1-3 have been renewed. Birds appear to be half-way through the moult of primaries, and to have begun the tail, before replacement of the secondaries begins. Birds dated 26th, 27th and 31st August are completing the growth of the outermost long primaries 8-9 and the innermost secondaries 5-6 and have practically completed body moult.

A *meinertzhageni* from Benbecula, dated 28th August, is at a similarly late stage, while a male from Balranald, North Uist, dated 2nd September, is a little behind; these suggest that the moult has much the same timing as in *kleinschmidti*. There are, however, two late birds only just finishing on 15th and 16th October.

A *petrosus* from St. Tudwal's Isle, north Wales, dated 17th August, is the only moulting example I have seen from the southern part of the Rock Pipit's total range, and it is a week or ten days ahead of the northern birds.

Three juveniles changing to first-winter at Fair Isle at the end of August were renewing the tertials and wing-coverts (except the primary and outer greater coverts), and showed considerable moult on body and head. Young *petrosus* from Skokholm and the Calf of Man on dates between 4th and 23rd August were also replacing the middle pair of tail-feathers.

#### *Pre-nuptial moult*

The extent of the spring moult, as emphasised, is individually variable. I have examined a series of migrant *littoralis* collected on Heligoland (April-May 1877-80) and a series of *kleinschmidti* collected at Tarbatness, East Ross-shire (February-early April 1916), as well as individual birds from other localities.

In general terms, it appears that moult of the middle or middle and distal (rarely all three) tertials, plus the middle pair of tail-feathers, is usual, and that the birds which change these feathers have a more ex-

tensive body-moult than those which do not. A substantial proportion of *littoralis* appears to have the moult suppressed, and this is true also (as pointed out by Mayaud) of Breton *petrosus*, but less true of birds from Britain and Ireland. Four Ushant birds, dated 13th-15th April, show little change and are very worn above and below. A male from Vadsö, Varangerfjord, dated 28th May, had changed the distal tertials and middle rectrices, and had undergone considerable body-moult; but birds from Smölen Island, dated 26th, 27th and 31st May, had not changed any of these feathers, and had undergone very little body moult, so resembling a worn *petrosus* type.

None of the Tarbatness series shows moult of tertials or rectrices until 18th March, though body moult is evident from mid-February; one, dated 5th April ('testes large'), is very worn and does not appear to have had any moult. I have seen only three spring birds from Nólsoy, Faeroe Islands, the type-locality of *kleinschmidti*. Of these, a male dated 19th February was in full winter dress; of two other males dated 28th March, one had undergone a fairly full body moult with new feathers similar to the winter plumage covering upper-parts and breast, but those of the throat white and with a soft vinous-pink bloom, while the other had changed only a few feathers at the sides of the throat. By contrast with these northern birds, two *petrosus* from Achill Island, Co. Mayo, dated 10th and 12th January, had already progressed some way with the pre-nuptial body moult, having new vinous-tinged feathers at the sides of the breast.

#### ABNORMAL MOULT

A specimen of *petrosus* from Waterville, Co. Kerry, dated 16th October 1945, has *spinoletta*-type nuptial plumage on the sides of throat and breast; so also has an adult male from Ushant, dated 22nd September 1933. Both are in the Meinertzhagen Collection, and the latter was selected by Clancey as a co-type of his Breton race *ponens*.

#### MOVEMENTS OF ROCK PIPITS

As indicated, the northern Rock Pipits are migratory, *littoralis* strongly so, many travelling to northern and western France. A bird ringed at Revtagen, southern Norway, on 22nd September 1952 was shot on 7th March 1954 at Mortagne in Gironde; but some apparently winter much nearer home, since one marked at Fjell, Hordaland, Norway, was recovered at Anstruther in Fife on 2nd January 1961. An autumn migrant ringed at Mellum, East Frisian Islands, on 1st October 1960, was at Cliffe, Kent, in February 1962. A bird ringed at Seahouses, Northumberland, on 3rd January 1962, and recovered on board a ship north of the Faeroe Islands on 9th May in the same year, may have been a drift-migrant *littoralis*; but equally it is possible that it was a late-returning example of the Faeroese *kleinschmidti*.

Birds which I cannot separate from *kleinschmidti* occur in winter and early spring at least as far south as Tarbatness on the east coast of Scotland, the Clyde and Ayrshire on the west coast, and in the west of Ireland. The only recoveries of this form are of birds, mainly juveniles, ringed by the Fair Isle Bird Observatory: these show movement to Stronsay, Orkney (40 miles south-west, late November); Canisbay near Duncansby Head, Caithness (80 miles south-west, late January); Wick, Caithness (120 miles SSW, December); Macduff, Banffshire (132 miles SSW, January) and Buchanness near Peterhead, Aberdeenshire (150 miles south, mid-April). Another Fair Isle juvenile was reported to have alighted on a trawler 60 miles south-west of the island about 1st April 1956; and there is one foreign recovery, a juvenile ringed on 3rd July 1956 and found at Den Helder, Noord-Holland, on 10th March 1958. These recoveries suggest that autumn movement of *kleinschmidti* southwards into the range of *petrosus* is not unusual among Shetland birds, though crossings of the North Sea are probably rare. Nothing is known about the Faeroe Islands stock from ringing, but it is worth mentioning that Venables (1939) recorded 'assisted passage' of one bird to Orkney.

Such St. Kilda birds as I have examined critically were collected in autumn and are not separable from *kleinschmidti*; no breeding birds are available for comparison with other forms, but when there in 1957 my impression was that *kleinschmidti* and not *meinertzhageni* is the breeding form. One juvenile ringed on 28th August in that year was recovered the following February in Benbecula, 50 miles ESE. I have examined spring specimens of *kleinschmidti* from Lochboisdale, South Uist, collected along with local *meinertzhageni*.

The recoveries of birds ringed within the range of *petrosus*—except for that at Seahouses, mentioned above—show very little movement. Isle of May breeders have been recovered in Fife at Craill (six miles west), Elie (ten miles west) and St. Andrews (14 miles north-west), and there is one from the North Carr Lightship (eight miles north). The only other movements of note are from Pram Sands to Falmouth in Cornwall (13 miles ENE), Great Saltee to Dungarvan, Co. Waterford (45 miles west), and Beadnell, Northumberland, to Burnmouth, Berwickshire (25 miles north-west).

Birds which are sometimes identified as Water Pipits, sometimes as Scandinavian Rock Pipits, are not infrequent spring visitors to parts of the south and east. Numbers were recorded in 1958 and 1959 from Somerset east to Sussex and Essex, with records in Norfolk and Lincolnshire, and in 1959 the movement was most noticeable between 22nd March and the end of the month, there being a peak of a dozen birds at Chew Valley Reservoir, Somerset, on 29th (*Brit. Birds*, 52: 176). These occurrences fall along the return migration route of *littoralis* and seem more likely to belong to that race than to *A. s. spinoletta*. (There

## MOULT AND TAXONOMY IN ROCK PIPITS

was, incidentally, an unusual autumn passage of this species at Dungeness, Kent, in 1958, between 12th October and 14th November, with 15 on 19th October and 20 on 7th November; usually only single or very few birds are involved in autumn.) I have seen north-bound passage of *littoralis* at Monks' House on the Northumberland coast in late March, but the form is extremely rare as a spring migrant at Fair Isle and Shetland.

The ringing records given above are taken mainly from the 'Report on bird-ringing' by Robert Spencer and 'Recoveries in Great Britain and Ireland of birds ringed abroad' by Miss E. P. Leach, for the appropriate year, published as a supplement to *British Birds* in each case.

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### SUMMARY

An outline is given of the divergence of opinion in recent years on the racial groupings within *A. spinoletta*. The key to subspeciation is the geographical variation in the pre-nuptial moult. This, though individually variable in extent within all populations, is of a different kind in different areas, resulting in a distinctive dress in some, but in a new plumage much like the winter dress in others.

On the basis of a comparison of spring material the races recognised in this study are *A. s. spinoletta* (alpine Europe), *A. s. littoralis* (Scandinavia), *A. s. meinertzhageni* (Outer Hebrides), *A. s. petrosus* (north-west France, England, Wales, Ireland, and most of Scotland), and *A. s. keinschmidti* (northern isles of Scotland and Faeroe Islands). Comments on these races and the difficulties of segregation, especially of migrants, are given.

The post-nuptial and pre-nuptial moults are described in detail, and movements of the various races of Rock Pipit are discussed, mainly in the light of ringing recoveries.

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