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Cover photo Grey Plover *Pluvialis squatarola*.
A flock in spring migration towards tundra.
Söderskär, Porvoo, Finland 26 May 2012 (c)
Annika Forsten

Problematic Yellowhammers and Pine Buntings in Finland

JARMO PIRHONEN

Background

In Finland, we have had several observations of birds suspected to be hybrids of Pine Bunting *Emberiza leucocephalos* x Yellowhammer *Emberiza citrinella*. The hybridisation zone between these species lies in Siberia. In part I of this article I discuss individual variation of male Yellowhammer and which characters are marks of hybridisation and which are not.

During recent years, very pale female-plumaged Buntings have been observed among Yellowhammers in Finland, especially in winter flocks. These individuals seemed to resemble female-plumaged Pine Buntings closely. In part II, I discuss some cases.

Material

In December 2010 I visited the Natural History Museum, Tring, UK (NHM) and analysed several dozen skins of adult male Yellowhammers (+2cy) collected from the UK. This collection represents the western population of Yellowhammer (ssp *caliginosa*). I also analysed some adult male Yellowhammers of the eastern ssp *erythrogenys*. In 2008 I visited the Finnish Museum of Natural History, Helsinki, Finland (FMNH) and studied several dozen skins collected in Finland representing populations of nominate *citrinella*. Ageing and sexing was done using criteria described by Svensson (1997) and the main criteria were: colouration of feathers on crown, overall appearance and the shape and wear of tail feathers. Atypical or extremely worn individuals were excluded. I analysed the coloration and shape of chestnut on the submoustachial areas using the criteria of Panov *et al* (2003). I also measured the width of the chestnut-brown breast band. Also other parts of the head were examined and classified, if there was any chestnut colour outside the submoustachial area.

For the second part of this article, I analysed all the skins of Pine Buntings in NHM, especially female-plumaged, and sexed and aged them using criteria outlined by Svensson (1997). After a review of the literature I compared Finnish pale female-plumaged buntings suspected to be Pine Buntings with the skins.

Hybrid characters in males

When studying male Yellowhammers in the field and also skins from Finland, I noticed that in some males there was much chestnut colouration on the submoustachial area. According to the literature this character is very variable. My aim was to compare this character for the western and more eastern populations. The purpose was to find out which patterns are within the normal variation and when we should suspect a hybrid between Pine Bunting and Yellowhammer.

The western and eastern Yellowhammer

Three different subspecies have been described (Byers *et al* 1995). The geographical variation is rather slight and mostly clinal. Yellowhammers in Scandinavia have been classified as the nominate subspecies *citrinella*. It intergrades with the eastern subspecies *erythrogenys* (Russia and east to Siberia) in a wide zone, which starts from Western Russia, the Baltic states, Belarus, Ukraine, Romania, Serbia and eastern Hungary. There are populations of the subspecies *caliginosa* in Ireland, Scotland, Wales and N and W England. The typical *caliginosa* individuals are slightly smaller than nominate birds. They are also darker and more heavily streaked, with a greenish tinge

Photo 1. Yellowhammer, +2cy male. Typical submoustachial area of Yellowhammer male of the western population (ssp *caliginosa*). Most males have a poorly marked chestnut-colour on submoustachial area, while others may have quite an obvious one. Collected 5 August 1898, UK. © Jarmo Pirhonen, NHM.

Photo 2. +2cy male Yellowhammer with obvious chestnut on submoustachial area. This is 2/7 in Panov´s score. Wear also affects the clarity of the chestnut colouring. February 1898, England (ssp *caliginosa*). © Jarmo Pirhonen, NHM.

Photo 3. Hybrid male Yellowhammer x Pine Bunting, +2cy, collected from Yenisey, Siberia in May 1900. Note that the so-called 'yellow hybrids' are very variable. This male has a head pattern resembling male Pine Bunting (submoustachial score 6-7/7 and also chestnut around eye score 4/7). The breast band is not obvious in this individual, see text about the colour correlation between these two tracts. © Jarmo Pirhonen, NHM.

Photo 4. 2cy male Yellowhammer from Krasnoyarsk Siberia, May 1928 from NHM. Note very obviously chestnut breast and flanks, but chestnut on the submoustachial area is not obvious (Panov´s score 0). This bird is from a ssp *erythrogenys* population. © Jarmo Pirhonen, NHM.

to the yellow on the head and underparts. The olive breast-band is reduced compared to nominate birds and the chestnut pattern on the flanks is more extensive. The eastern subspecies *erythrogenys* has been described as follows: 'Yellow colour on crown and throat often brighter. Mantle paler than nominate, more sandy or pinkish-brown and less greenish-olive (and slightly less heavily streaked). Nape and scapulars somewhat greyer. Wing-bars usually somewhat whiter. Pale edges to feathers of rump whiter. Flanks and undertail-coverts often whiter, with rufous streaking on average more extensive.' (Byers *et al* 1995).

Chestnut (or rufous) colouration on the head in typical individuals of subspecies *caliginosa* and *citrinella* is restricted to the submoustachial region. According to Byers *et al* (1995), adult male Yellowhammers in breeding plumage have no very obvious lateral throat stripes, but the submoustachial area may be rufous and quite prominent. According to Cramp & Perrins (1994) birds with chestnut spots or a totally chestnut submoustachial area occur frequently in various populations, without a clear trend; birds with patches of rufous elsewhere on head, throat or upper breast occur mainly in European Russia and Asia, probably due to introgression with Pine Bunting.

According to Panov *et al* (2003) the chestnut colouration on the head increases towards the east in male Yellowhammers. This is because of the increase in so-called 'yellow hybrids' within the population. There is probably more influence of Pine Bunting genes in the eastern population of Yellowhammer. They also suggested that the subspecies *erythrogenys* may even be of hybrid origin.

The intensity and width of rusty-red colour on the breast of adult males is described more or less correctly in the literature. The breast is yellow with variable rusty-red mottling, particularly on the sides, forming a breast band in many individuals (Byers *et al* 1995).

Panov *et al* (2003) classified the amount of chestnut on submoustachial and orbital areas to eight classes If both characters are scored high, it is more probable that the individual is a 'yellow hybrid'. For their hybridisation index (HI) they also combined the background colour of body and wings.

In my study, I used Panov´s classification to estimate the difference in the amount of chestnut colouration of the head between western populations (classes 0-7 on the submoustachial, and classes 0-7 in the orbital and loral areas). I also classified birds to three groups according to the width of the chestnut breast band measured from the middle of the breast (width less than 1cm, more than 1cm or more than 2 cm). Also other areas of the head were checked and scored if there was any chestnut colour. The influence of Pine Bunting genes in the westernmost populations should not occur, and they can therefore be considered as "pure" Yellowhammers.

Discussion

The major aim was to understand which chestnut patterns on the heads of buntings are within the normal variation and which would be indicative of a hybrid. Quite extensive chestnut on the submoustachial area is not rare among the western male Yellowhammers. When observing a problematic individual looking like a 'yellow hybrid', more characters than the submoustachial area should be checked. A very obvious chestnut breast band and largely chestnut flanks are rare in Yellowhammers. The mainly chestnut area. resembling the corresponding areas of Pine Bunting, indicates that the individual is a yellow hybrid. According to this study, Panov´s criteria (2003) to separate 'yellow hybrids' from the normal variation seems to be valid.

I did not find any earlier results about the lack of obvious correlation concerning the intensity of chestnut colour between the breast and submoustachial areas. This lack of correlation may be a helpful criterion for judging possible 'yellow hybrids'.

One very interesting skin was found in the FNMH collection (Photo 5). Its patterns (chestnut colour behind the ear-coverts extending upwards, and intensive colour in the breast and flanks) may

	LJ 0	LJ 0,5	LJ 1	LJ 2	LJ 3	Total
RV 0	11	6	5	1		23
RV 1	6	2	5		1	14
RV 2		1				1
Total	17	9	10	1	1	38

Table 1. Width of breast band (chestnut area), and score of chestnut on submoustachial area - +2cy male Yellowhammers, subspecies *caliginosa*. The intensity of colour and extent of chestnut on the submoustachial area are largely independent of the intensity and width of chestnut on breast and flanks (Spearman's rank correlation coefficient 0.1214). The largest score (0-7) in western males was 3/7. C=ssp *caliginosa*, RV=breast band, 0=0-1 cm, 1=1-2 cm and 2=over 2 cm width. LJ=submoustachial area 0-7.N=49. (Skins from NHM).

	LJ 0	LJ 0.5	LJ 1	LJ 2	LJ 3	Total
RV 0	2	1	2	2		7
RV 1	1		1			2
RV 2		1				0
Total	3	1	3	2		9

Table 2. Width of breast band and score of chestnut on submoustachial area in adult male (+2cy) Yellowhammers of ssp *erythrogenys* . The distribution seems to be very similar to ssp *caliginosa* and again no correlation (Spearman's rank correlation coefficient -0.2152). In some males, the breast band was very wide, but there was hardly any chestnut colouring on the submoustachial area. N=9, codes see Table 1. (Skins from NHM).

indicate influence of genes from Pine Bunting. This individual can quite certainly be classified as a "yellow hybrid". The phenotype of this individual is quite close to Yellowhammer, but according to this study, the head pattern is not typical for a normal male Yellowhammer of the western population. Also about 100 skins studied at FNMH showed that normally the chestnut colour is restricted to the submoustachial area. Also no skin of ssp *erythrogenys* showed chestnut colour behind the ear-coverts extending upwards.

According to Panov *et al* (2003), the chestnut extending up behind the ear-coverts is typical for a 'yellow hybrid' (Figure 2, E in the original article). The colour pattern of the submoustachial area of this individual is identical to this figure in the article.

Also the very intensive breast and flank colour (resembling Pine Bunting) is indicative of a 'yellow hybrid'. The probability of a 'yellow hybrid' is higher if abnormal head and flank patterns occur together.

In conclusion:

1) Chestnut colour on the submoustachial area may form a wide and obvious line, even in the western population. In this study, up to grade 3/7. In many males, the submoustachial area shows only a small amount of chestnut coloration. Extensive chestnut on the submoustachial area is not alone a sign of a 'yellow hybrid'.

2) If the chestnut colour continues further, to behind the ear-coverts, and extending upwards, the bird may be a hybrid. Identifying a bird as a

Photo 5.a, b and c. An interesting adult male Yellowhammer collected in Finland over a century ago (Kemi, May 1898, in a and b with another male on the left). See also the discussion part. Note that the chestnut coloration is turning upwards behind the ear-coverts. Note also the largely chestnut coloured flanks (compare with adult male Pine Bunting) and large breast band. In fact, the pattern resembles the coloration of a male Pine Bunting. This individual is probably a 'yellow hybrid'. Even the pattern of chestnut on the submoustachial area and its surroundings indicates a 'yellow hybrid' according to Panov´s *et al* article (2003). For comparison, a Yellowhammer male with extensive chestnut on submoustachial area (Panov´s class 3), but note that the breast and flanks are less chestnut-coloured and also that the chestnut colouring is confined to a smaller area. There are very few known records of hybrids in Finland. © Jarmo Pirhonen, FNHM.

'yellow hybrid' is easier, if the chestnut pattern or parts of other male Pine Bunting pattern are present in the bird.
3) An atypical amount or placement of chestnut colouration on the head, and also together on the breast or flanks, may be sign of a 'yellow hybrid'. One should be aware of individuals with a genetic error causing aberrant plumage colouration.
4) The amount of chestnut on the submoustachial area is mostly independent of the chestnut colour on the breast and flanks. If a male Yellowhammer has a large chestnut area on the submoustachial area, and also elsewhere on the head, and also broadly chestnut breast and flanks, the individual may be a 'yellow hybrid'.

Drawing the line between female Pine Buntings and pale female Yellowhammers

The identification of female Pine Bunting

In the literature, female-plumaged Pine Bunting is described as similar to Yellowhammer, but lacking any yellow colour in the plumage, making it slightly more contrasting brown and white. The median crown-stripe is described as whitish. The breast is washed brownish, streaked dark, contrasting with whiter belly and throat. In Yellowhammer, the underparts appear more uniform, with little difference in ground colour between the breast and belly (Occhiato 2003). According to Occhiato (2003), female Pine Bunting, at any age, shows no trace of yellow anywhere in its plumage. A very interesting phrase (for the Finnish cases) is as follows: "Even those individual Yellowhammers apparently lacking yellow pigments show at least a trace of yellow on the underparts, especially the lower belly, while the fringe of the outer web of the exposed primaries is always yellow. According to Harris *et al* (1996) most `non-yellow` female Yellowhammers are apparently 1st-years. Also Bradshaw *et al* (1993) suggested that the most important identification criteria are lack of yellow and overall white ground colour. According to Svensson (1997) some 1-2 cy female Yellowhammers have only a weak yellow and green tinge, which is difficult to judge in the field, but it is visible in the hand.

Most female Pine Buntings tend to have a conspicuous brownish patch on the rear lateral crown area and side of upper neck. This area is composed of denser streaking and browner rufous fringes. It is lacking in most Yellowhammers (Harris 1996). The grey neck-sides are usually faintly streaked, but more uniform in Yellowhammer (Duivendijk 2011). Also the supercilium is clearly wider and paler than in female Yellowhammer (especially above the lores). In first-winter female Pine Buntings the ear-coverts are darker and the contrast is obvious. The pattern of the lateral throat-stripe overlaps between the species. Yellowhammer normally shows three to four series of streaks and Pine Bunting four to six. The latter also has more conspicuous streaks. The submoustachial stripe is always wider and paler in Pine Bunting, regardless of age (Occhiato 2003). Still, the streaking is usually broad and quite obvious (Duivendijk 2011).

Adult female Pine Buntings have many diffuse reddish spots on the underparts, and the background colour is whitish. On the upper breast, females also have blackish spots and a white half-collar, not seen in Yellowhammer. Winter females are duller, the necklace of blackish spots is still obvious but the whitish necklace less so. In first-winter females the underparts are more heavily streaked or spotted with dark brown and black on a whitish background, which becomes buffy towards to the flanks. Generally, first-winter females lack red-brown on head and breast. A very important thing to notice is that the background colour is still white or whitish, while Yellowhammer is said to always have some tones of yellow, especially on the lower belly. Byers *et al* (1995) also mention that if Pine Buntings have less rufous on breast, the streaking appears to be more contrasting. Yellowhammers (also juveniles) have more extensive dark streaking and a more uniform look,

Photo 6. A juvenile Pine Bunting from the NHM skin collection, collected in August 1910, Tannu-Ola Mts NW Mongolia. This individual has an obvious off-white background colour. There is also a variable amount of streaking on the flanks and breast. Note that the submoustachial stripe and supercilium are obviously whitish and contrasting with other areas of the head. In first-winter plumage there is an obvious rufous breast and flanks contrasting with whitish underparts, no trace of yellow, and a blackish necklace. Note also that streaks on the flanks contrast with off-white underparts. © Jarmo Pirhonen, NHM.

Photo 7. 1cy Pine Bunting Tannu-ola, Mongolia August 1910. This individual has a more streaked appearance but the post-juvenile moult is not yet complete. However, note the off-white background even in a juvenile and also a whitish supercilium and submoustachial-stripe contrasting with the rest of the head. Underparts are white. © Jarmo Pirhonen, NHM.

Photo 8. Pine Bunting +2cy male Amur, Siberia February 1894. © Jarmo Pirhonen, NHM.

with little contrast between breast and belly. Also Harris *et al* (1996) describes the pattern of the underparts: entire underparts of Pine Bunting are whiter apart from buff suffusion on chest, and upper-breast streaking is more blackish, fading (and with intermixed rufous-orange markings) toward breast sides and flanks. In Yellowhammer there are no fine blackish marks on upper breast (Svensson *et al* 2009).

The undertail-coverts are less streaked in Pine Bunting (Occhiato 2003). Harris et al (1996) mention that the undertail-coverts may even be unstreaked but rarely quite heavily streaked. The underwing-coverts are always white in Pine Bunting and yellow in Yellowhammer. The outer webs of the outer primaries are white in Pine Bunting, but may be white in hybrids (and possibly in some pure Yellowhammers also).

In all plumages Pine Buntings have grey lesser coverts (difficult to see in the field) and rufous scapulars contrasting with streaked grey-brown upperparts. The pale wing-bars are also more distinct (whiter) in first-winter female Pine Bunting than in Yellowhammer. (Duivendijk 2011).

Pine Bunting averages more white on the two outer rectrices than Yellowhammer (T 5-6) (Byers *et al* 1995). There are different opinions regarding the value of this character. According to Cramp & Perrins (1994) Pine Buntings (adults) have white edge over 50% of feather in T6 and little under 50% in T5. In Yellowhammer's T6 the amount of white is about 50% and 25% in T5 10. According to Byers et al (1995) the variation is independent of age, and in the figure of tail feathers the amount of white seems to be very close to Pine Bunting. According to Occhiato (2003) this character is important. Also the distal edges of central tail feathers are whiter in Pine Buntings. Males are usually easily to separate, and females are quite similar.

The bill base is often grey or sometimes flesh-coloured, latter is not seen in Yellowhammer (Duivendijk 2011).

Photo 9. Pine Bunting +2cy female Punjab January 1927. © Jarmo Pirhonen, NHM.

Case studies

Pale female-plumaged buntings are observed and photographed by birders in Finland, especially during the winter. One issue is the possibility of a pure female Pine Bunting, which is a great rarity in the country. Most of these birds do not have any clearly visible yellow on their plumage. Individuals without obvious yellow are scarce, even quite large winter flocks consist entirely of Yellowhammers with easily visible yellow tones.

One obvious problem with these Finnish pale individuals is that none of them are carefully documented, they are not trapped and therefore not examined carefully in the hand. Very slight traces of yellow may be very difficult see, and also the characters of the underwing are impossible to evaluate in the field. Most of the Finnish birds were found in flocks of Yellowhammer in winter, when light is poor.

Many of these pale females seem to have a dull plumage without obvious whitish background colour on the underparts. In the field, many of them have looked very pale without traces of yellow even on the outer edges of the primaries. Still, even in the palest Finnish birds, the supercilia and submoustachial stripes have been quite dull without obvious whitish colour, and with little contrast to the ear-coverts. There is often no obvious and contrasting rear lateral crown-stripe on the nape, while I would expect a Pine Bunting to show reddish-brown on the breast area as well as quite an obvious blackish necklace. The flanks of the pale female Yellowhammers also seem to be quite dull looking with no contrast between streaks and off-white underparts.

The first individual shown here was photographed in Suonenjoki, Central Finland in January 2012 (Photo 12). This female is described as showing no visible trace of yellow in the plumage nor on the edges of the primaries in the field. The second individual was photographed in Kuopio, Finland (Photo 13). No trace of yellow was visible in the field or in the photos.

Both are in many ways similar to a Yellowhammer. The underparts are not as pure white as in Pine

Photo 10. Pine Bunting +1cy female Tian Shan, Kyrgyzstan, October 1908 © Jarmo Pirhonen, NHM.

Bunting. The flanks are diffusely streaked and the pale parts do not contrast much with the darker parts. Also they lack a brownish breast with a contrasting black necklace. These birds are probably pale Yellowhammers.

These two cases were initially suspected to be Pine Buntings, but in the end, the consensus was that they were pale Yellowhammers (or possibly hybrids). The following three cases are generally thought to be female Pine Buntings.

A bird from Lappeenranta (Photo 14) was accepted as a Pine Bunting by the National Rarities Committee. Reddish streaks on rear flanks fit adult-winter female Pine Bunting. However, this individual lacks an obvious black necklace or spots on the throat, and a brownish, obviously contrasting breast. Also the submoustachial area is not pure white and there is no distinct contrast between supercilium and other parts of the head. Adult females should also show reddish tones on the head. The flank streaks are also quite diffuse and contrast less with the off-white background colour (source photos and field notes).

A pale female from Latvia, (Photo 16) shows off-white tones (on the outer edges of the primaries etc.). There is no reddish breast band or a contrasting black necklace. The rear of the lateral crown-stripe shows no strong contrasts with the nape. The darker breast streaks are diffuse, and so are the flank streaks. In photos, many female Pine Buntings have quite obvious and contrasting streaks in these areas.

A pale 2cy female from Paimio, SW Finland (Photo 16) was photographed in a large flock of Yellowhammers in good light conditions. Overall the bird looks very white, and the streaks of the undertail-coverts are narrow. There are diffuse reddish streaks on the breast. However, the head pattern is not very typical for a Pine Bunting. The submoustachial area and the supercilium are dull and therefore contrast only slightly with the rest of the head. The lateral throat stripe and the breast pattern are still quite diffuse and the patterns are not very contrasting. Also, as many photographs of Pine Bunting show, the flanks should be more

Photo 11 a,b. 1cy female Pine Bunting November Tian Shan, Kyrgyzstan, November 1908 a) underparts b) side view. Note obvious black necklace, pure colours, chestnut breast band and white underparts and especially white flanks and contrast between white background and streaks/breast band. The throat is also whitish and contrasts with blackish lateral streaks and a black necklace. © Jarmo Pirhonen, NHM.

Photo 12a,b,c. Female-plumaged bunting, Suonenjoki, Finland January 2012. © Olli Korhonen.

Photo 13. Female-plumaged bunting, Kuopio, Finland. March 2011. © Ilkka Markkanen.

Photo 14. Pine Bunting (accepted), Lappeenranta, Finland 7.December 1997. © Pekka Karhu.

sharply streaked. The upperparts do not seem to be very pale.

Conclusion

Generally, female-plumaged Pine Buntings look very clean, due to pure colours and contrasts. This was also observed by Svensson (1997). Lack of these characters should be enough to ensure that the individual is checked very carefully.

It is possible that some of these pale female-plumaged birds may be of hybrid origin or just very pale Yellowhammers. It may be that birdwatchers pay too much attention to the lack of yellow colour, instead of using the many other plumage characters, which are essential for identification in the field because of variation. As a matter of fact, as stated in the literature, the criteria of the head and underparts are essential for identification in the field. It would also be good to trap problematic individuals, in order to study underwing characters. Also more careful assessment of the yellow colour would then be possible. Taking DNA samples should be considered. The two species have been found to be very close regarding the normal mitochondrial markers, but quite different in some genes of nuclear DNA (Irwin et al 2009).

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Photo 15. Female-plumaged bunting, Paimio Finland 26 January 2012. © Ari Kuusela

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Photo 16a. Female-plumaged bunting, Latvia, 29 January 2012. © Sandris Rabkevics, birdinglatvia.lv

Photo 16b. Female-plumaged bunting, Latvia, 29 January 2012. © Sandris Rabkevics, birdinglatvia.lv

Photo 16c. Female-plumaged bunting, Latvia, 29 January 2012. © Sandris Rabkevics, birdinglatvia.lv

Photo 17. Pine Bunting, female 20 June 2012 Mongolia © Jarmo Pirhonen.

Photo 18. Juvenile Pine Bunting, juvenile. 12 July 2005 Karakol, Kyrgyzstan. Note pure colours even in juvenile plumage. © Tom Lindroos.

Photo 19. Details of several pale Yellowhammer individuals. February 2003 Vantaa, Finland. © Annika Forsten.