A new species of woodcock (Aves: Scolopacidae) from the Philippines and a re-evaluation of other Asian/Papuasian woodcock

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INTRODUCTION

Summary of the genus Scolopax

Currently there are six recognized species of woodcock in the world (Hayman et al. 1986, van Gils and Wiersma 1996). Two of these are well known migratory species with broad ranges. The first of these, the American Woodcock Scolopax minor breeds from south-eastern Canada to central and south-eastern United States and migrates to the south-eastern United States, with a few reaching north-eastern Mexico (American Ornithologists’ Union 1998). The other is the Eurasian Woodcock Scolopax rusticola, which breeds from the Azores in the Atlantic Ocean across Eurasia to Japan and migrates to southern Europe, north Africa to South-East Asia and southern China (Sibley and Monroe 1990). The remaining four are poorly known non-migratory species with restricted ranges. One of these, the Amami Woodcock S. mira is found in lowland subtropical evergreen broadleaf forest only on four islands in the central Ryukyu or Nansei Shoto Islands, Japan (Brazlia and Ikejaya 1987, BirdLife International 2001). The other three occupy montane moist or mossy forest usually above 1,000 m. The Sulawesi Woodcock S. celebensis is restricted to the mountains of north, north-central and central Sulawesi (White and Bruce 1986, Coates and Bishop 1997). The Rufous Woodcock S. saturata has two highly disjunct races, S. s. saturata recorded from two mountains in Sumatra and three mountains in Java (MacKinnon and Phillipps 1993), and S. s. rosenbergii confined to the highlands of New Guinea (Beehler et al. 1986). Finally, the Moluccan Woodcock S. rochussenii is known only from eight specimens from two relatively small islands in the Moluccas, seven from Obi and one from Bacan (Coates and Bishop 1997, BirdLife International 2001).

Woodcock in the Philippines

Dickinson et al. (1991) summarized the published Philippine records of the Eurasian Woodcock, which at the time they believed was the only woodcock known from the Philippines. McGregor and Manuel (1936) reported two specimens, both obtained in the lowlands of Luzon, the first on 4 December 1929 from Santo Tomas, Pampanga Province, and the other on 18 September 1931 from Fort William McKinley (now Ft Bonifacio, Makati [Kennedy et al. 2000]), Rizal Province. These presumed Eurasian Woodcock specimens were deposited in the Bureau of Science collections [later to become the National Museum of the Philippines (NMP)], but were destroyed when the National Museum was bomed during World War II. McClure and Leelavit (1972) provided banding records from Dalton Pass, Nueva Vizcaya Province, Luzon (Figure 1); of four other woodcock captured and released, two in 1966, one in 1967, and one in 1969. DuPont (1971) simply noted that the Eurasian Woodcock “winters on Luzon from Asia” yet the illustration of the species in Plate 23 of his book was based on a specimen (DMNH 3453) from Dalton Pass obtained in August 1969; this specimen was not a Eurasian Woodcock. Since the previous specimens of “Eurasian Woodcock” have been destroyed, no confirmatory evidence exists regarding which species the earlier woodcock records represent.

On 18 February 1993, Harrap and Fisher, along with other members of a Birdquest tour, flushed a woodcock from a trail in a relict patch of forest at c. 1,600 m on Mt. Kitanglad (Figure 1) in Sitio Kinubalan, Barangay
Figure 1. Map of the Philippines showing the distribution of localities mentioned in the text, and the distribution of land above 1,000 m (shaded grey) and above 2,000 m (shaded dark grey).
Dalwangan, Municipality of Malaybalay, Bukidnon Province in north-central Mindanao (Harrap and Fisher 1994). On 19 and 20 February 1993, the party both sighted and heard the woodcock during the dawn twilight hours performing roding (courtship) behaviour and concluded that it must be a resident population but was not the Eurasian Woodcock. During subsequent trips to the area in 1993 and 1994, Fisher, Harrap, Ben King, Peter Morris and others made additional sightings and recorded the unique calls of the birds.

As part of the National Museum of the Philippines/Cincinnati Museum of Natural History (NMP/CMNH) Philippine Biodiversity Inventory, Fisher and Kennedy returned to Kinubalan and observed the woodcocks at dawn and dusk during the period 18 to 22 January 1995. On the morning of 22 January at 05h30, shortly before the birds normally stop roding and calling, they captured an individual in a mist-net set over a ploughed field between patches of forest. The bird was darker and more richly coloured than the Eurasian Woodcock and very similar to the Delaware Museum specimen from Dalton Pass that they had examined prior to visiting the site.

Since the capture of the 1995 specimen, three more specimens have been obtained from Mt. Kitanglad, one in 1996 by researchers from the Nordic Agency for Development and Ecology (NORDECO)/Department of Environment and Natural Resources field team (but not yet housed in a museum), and two in 1999 by Dale H. Clayton and Sarah Al-Tamimi (specimens in Field Museum of Natural History). In addition, one specimen was obtained on Mt. Kimangkil northeast of Mt. Kitanglad on Mindanao in 2000 by Franelyn J. Saguindang (specimen in Natural Science Museum, Mindanao State University-Iligan Institute of Technology), one on Mt. Malindang, Mindanao in 2000 by the CARE (Cooperative for American Relief Everywhere) Philippine-AWESOME (Agencies Working for Ecological Sustainability of Mt. Malindang’s Environs) Project biodiversity survey team, and we located one older specimen of this woodcock (NMP 8175 identified on the label as Scolopax rusticola) collected on 3 June 1985, from Dalton Pass, Luzon. Comparison of the two specimens from Luzon and six from Mindanao with specimens of all other woodcocks confirms that the resident populations of woodcock in the Philippines represent a new species, which we name *Scolopax bukidnonensis*, sp. nov.

**Holotype**

Skin with detached spread right wing (CMNH 37639 to be deposited in NMP; Figure 2), adult male with left testis measuring 19 x 12 mm. It was mist-netted in a cleared field adjacent to montane forest (Figure 3) on 22 January 1995, at an elevation of 1,530 m, c. 8 o

\[
\text{Holotype formula: } 9 > 8 > 10 = 7. \text{ See Plate 1 and Figure 2.}
\]

**Measurements of the holotype**

Measurements (in mm) taken from dried skin: Wing chord 170, tail 65.6, tarsus length 40.3, culmen length from base of skull 81.0, width of upper mandible at widest part of tip 3.8, bill width at base at feather line 9.0, height of upper mandible at feather line 8.9, length of longest toe including nail 41.7, total length (from fresh specimen) 310, weight 216 g.
Figure 2. The holotype of *Scolopax bukidnonensis* shortly after it was captured on Mt. Kitanglad. Photo by R. S. Kennedy.

Figure 3. The type locality of *Scolopax bukidnonensis* on Mt. Kitanglad on 22 January 1995, the day the holotype was captured. Photo by R. S. Kennedy.
Paratypes
FMNH 392226 male, FMNH 392227 female, collected by Dale H. Clayton and Sarah Al-Tamimi on 27 April 1999 at elevations of 1,457 m and 1,463 m respectively, on Mt. Kitanglad, 8º11’20”N 124º55’20”E, 10.7 km south, 2.9 km west of Sumilao Municipality center, Barangay Lupiagan, Municipality of Sumilao, Bukidnon Province, Mindanao.

Paratypic variation
The other adult male specimen is virtually identical to the holotype in all plumage characteristics and in wing formula. The female specimen varies in plumage from the holotype by having less contrasting and duller Cinnamon-Rufous edges and/or notches in the feathers, by the bands on the hind-crown and nape, and in the feathers of the mantle, wing-coverts and flight feathers, giving the upperparts an overall duller appearance. The underparts of this specimen are likewise duller, with slightly narrower and duller Dusky Brown barring from throat to undertail-coverts, and generally paler Cinnamon throughout the underparts. In addition, the Dusky Brown loral stripes are narrower. Wing formula equals that of the holotype.

Other specimens
DMNH 3453 female, collected by Nicandro Icarangal, Sr in August 1969, elevation 1,070 m, at Dalton Pass, Nueva Vizcaya Province, Luzon. The Luzon female differs from the holotype by having darker supraloral areas and forehead and lighter forecrown showing less distinction between the two. Cinnamon-Rufous areas on the upperparts are generally brighter. Secondarys are paler Dusky Brown with less contrast and with Cinnamon-Rufous notches. Uppertail-coverts are brighter, tail is more distinctly barred and tipped with more reddish Brownish Olive. Lower throat and breast brighter Cinnamon. Belly is lighter Pale Pinkish Buff. Barring on underparts from lower throat to undertail-coverts paler, with bars from throat to belly narrower, both similar to the Mindanao female. Undertail-coverts are richer reddish Pale Pinkish Buff. Wing-point formula differs from the holotype as follows: 9 = 8>7>10. Combining measurement data of the Luzon specimen to that of the Mindanao female and comparing males to females, we found that differences between sexes were not significant in any measurement taken (t-test, Wilcoxon test, P< 0.05). A second Luzon specimen (NMP 8175, sex unknown), collected by Manuel Celestino on 3 June 1965, elevation 1,070 m, at Dalton Pass, Nueva Vizcaya Province, was in a foxed, mouldy and damaged condition. Other specimens examined by one of us, but not available during the description of this species include: one female collected by the Nordic Agency for Development and Ecology/Department of Environment and Natural Resources field team on 4 September 1996, elevation 2,750 m, on Mt. Dulang-dulang in the Mt. Kitanglad Range, sitio Bulogan, Barangay Sungko, Municipality of Lantapan, Bukidnon Province, Mindanao; one male collected by Blas R. Tabaranza, Jr and Renato E. Fernandez of the CARE Philippines-AWESOME biodiversity team on 2 May 2000, elevation between 1,750 and 1,850 m, 8º14’23”N 123º37’18”E, 1.8 km west, 2.8 km north of the peak of Mt. Malindang, sitio Patagan, Barangay Lalud, Municipality of Don Victoriano, Misamis Occidental Province, Mindanao; and one male (Natural Science Museum, Mindanao State University-Iligan Institute of Technology, field number 0026) collected by Franelyn J. Saguidang on 23 May 2000, elevation 1,200 m, on Mt. Kimangkil, sitio Nasandigan, Barangay Hagua, Municipality of Impasug-ong, Bukidnon Province, Mindanao. (Notes: the Mt. Dulang-dulang and Mt. Malindang specimens will eventually be deposited in the NMP; the location of Mt. Kimangkil is not marked in Fig. 1)

Diagnosis
Plumage — Scolopax bukidnonensis differs from the most similar species, S. celebensis, in having the notches in the flight feathers darker Cinnamon-Rufous (almost Pale Pinkish Buff in S. celebensis); by the less extensive Pale Pinkish Buff motting on the wing-coverts; by the throat and breast Cinnamon and belly dark Pale Pinkish Buff (throat, breast and belly are bright cinnamon Clay Color 123B in S. celebensis), with broader barring on the lower throat, breast and flanks, and having barring on the centre of belly and undertail-coverts.

From both taxa of the next most similar species, S. saturata, S. bukidnonensis differs in having the two Pale Pinkish Buff parallel lines down the back better defined, and in having prominent Cinnamon-Rufous notches in the primaries. The Dusky Brown lores, stripe below the eye and vertical bar on the side of the breast are strongly defined in S. bukidnonensis and, although present in both populations of S. saturata, are usually narrower and less defined. S. bukidnonensis lacks the white malar spots and supraloral spots that are well developed and conspicuous in S. s. rosenbergii, but less so in S. s. saturata. The underparts of S. bukidnonensis are much lighter, more uniformly coloured, and barred with Dusky Brown, while S. s. rosenbergii has a white chin, Dusky Brown throat, breast and belly with narrow Cinnamon bars on throat and breast, white barring and feathers tipped white on lower breast and belly, and some narrow Drab 27 bars on the flanks and mixed in with the white on the belly; S. s. saturata has a Pale Horn Color 92 chin, throat, breast and belly finely barred and/or mottled with Dusky Brown and Drab, and a white band between the breast and belly. The undertail-coverts of S. bukidnonensis are paler Cinnamon and more heavily barred than in both populations of S. saturata.

Scolopax bukidnonensis differs from the wide-ranging and variable S. rusticola and the restricted S. mira in having darker and narrowly patterned upperparts (S. rusticola and S. mira have Dusky Brown confined to the lores, stripe below eye, bars on crown and hindneck, and to the centres of a few feathers on the mantle and scapulars). The Pale Pinkish Buff spots associated with the Dusky Brown centres that form two parallel lines running down the scapulars in S. bukidnonensis contrast strongly with the rest of the upperparts, less so in S. rusticola and S. mira. The rest of the upperparts in S. rusticola and S. mira range more or less from pale Cinnamon-Rufous to Drab and are finely barred with Dusky Brown to Olive-Brown. The undertails of S. bukidnonensis are generally more uniform, and darker and more heavily barred than in S. rusticola and S. mira. Both the latter have a Pale Horn Color chin and upper throat and pale Buff 124 breast and belly finely barred with pale Dusky Brown to Olive-Brown, and both have
Table 1. Measurements (x ± SD, with [n, range] in parentheses) of Scolopax bukidnonensis and other woodcock species

<table>
<thead>
<tr>
<th>Measurement (mm)</th>
<th>Scolopax bukidnonensis</th>
<th>Scolopax celebensis</th>
<th>Scolopax (s.) saturata</th>
<th>Scolopax (s.) rosenbergii</th>
<th>Scolopax mira</th>
<th>Scolopax rusticola</th>
<th>Scolopax rochussenii</th>
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</thead>
<tbody>
<tr>
<td>Wing chord</td>
<td>171.3 ± 9.6 (6, 162 – 188)</td>
<td>189.2 ± 4.1 * (5, 184 – 193)</td>
<td>145.6 ± 4.1 * (14, 136 – 151)</td>
<td>151.9 ± 3.9 ** (29, 142 – 160)</td>
<td>188.4 ± 4.6 * (9, 182 – 195)</td>
<td>186.8 ± 5.1 * (29, 177 – 197)</td>
<td>195.2 ± 6.2 * (4, 190 – 204)</td>
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<tr>
<td>Tail</td>
<td>63.2 ± 3.0 (5, 59.8 – 66.8)</td>
<td>68.4 ± 2.0 (5, 65.6 – 70.3)</td>
<td>51.2 ± 3.3 * (13, 45.7 – 58.4)</td>
<td>58.4 ± 2.5 ** (27, 53.5 – 63.2)</td>
<td>69.7 ± 2.0 (9, 62.6 – 78.8)</td>
<td>76.2 ± 4.6 * (28, 69.1 – 83.3)</td>
<td>70.8 ± 5.2 (4, 63.4 – 74.8)</td>
</tr>
<tr>
<td>Tarsus</td>
<td>40.5 ± 1.4 (6, 38.1 – 41.9)</td>
<td>44.2 ± 1.1 * (4, 43.3 – 45.8)</td>
<td>35.0 ± 0.9 * (14, 34.0 – 36.8)</td>
<td>36.9 ± 1.4 ** (29, 33.8 – 39.6)</td>
<td>45.5 ± 2.14 * (9, 42.2 – 46.6)</td>
<td>37.7 ± 1.1 * (29, 35.8 – 38.7)</td>
<td>48.9 ± 0.2 * (2, 48.8 – 49.1)</td>
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<tr>
<td>Culmen chord</td>
<td>82.7 ± 6.4 (6, 72.3 – 91.4)</td>
<td>88.3 ± 6.0 (5, 81.3 – 93.1)</td>
<td>75.8 ± 4.6 (13, 69.9 – 83.1)</td>
<td>84.9 ± 5.7 ** (29, 73.4 – 93.4)</td>
<td>87.1 ± 4.6 (9, 80.3 – 95.1)</td>
<td>80.0 ± 2.8 (29, 74.7 – 84.8)</td>
<td>100.8 ± 3.9 * (2, 98.0 – 103.5)</td>
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<tr>
<td>Bill tip width</td>
<td>4.1 ± 0.2 (5, 3.8 – 4.4)</td>
<td>4.3 ± 0.2 (5, 4.1 – 4.6)</td>
<td>3.3 ± 0.1 (11, 3.1 – 3.6)</td>
<td>3.4 ± 0.1 (29, 3.2 – 3.8)</td>
<td>4.3 ± 0.1 (8, 4.2 – 4.5)</td>
<td>3.7 ± 0.2 (14, 3.1 – 4.0)</td>
<td>4.8 ± 0.0 (2, 4.7 – 4.8)</td>
</tr>
<tr>
<td>Bill width at</td>
<td>8.9 ± 0.7 (6, 8.1 – 9.8)</td>
<td>9.6 ± 0.6 (5, 8.8 – 10.4)</td>
<td>8.0 ± 0.3 (12, 7.3 – 8.5)</td>
<td>8.1 ± 0.7 (29, 6.7 – 9.3)</td>
<td>9.6 ± 0.8 (8, 7.9 – 10.5)</td>
<td>7.9 ± 0.7 (14, 7.0 – 9.4)</td>
<td>11.5 ± 2.0 (2, 10.1 – 12.9)</td>
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<tr>
<td>Bill height at</td>
<td>8.2 ± 0.6 (5, 7.6 – 8.9)</td>
<td>8.4 ± 0.5 (5, 7.9 – 9.1)</td>
<td>6.9 ± 0.4 (12, 6.0 – 7.5)</td>
<td>6.7 ± 0.5 (29, 5.5 – 7.8)</td>
<td>8.3 ± 0.5 (8, 7.6 – 9.0)</td>
<td>6.9 ± 0.5 (14, 6.1 – 7.8)</td>
<td>8.7 ± 1.1 (2, 7.9 – 9.5)</td>
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<td>feather line</td>
<td>43.0 ± 1.6 (5, 41.1 – 45.1)</td>
<td>42.2 ± 2.3 (3, 41.1 – 45.7)</td>
<td>41.0 ± 2.3 (13, 37.8 – 44.9)</td>
<td>39.1 ± 2.4 (25, 35.1 – 43.9)</td>
<td>46.3 ± 2.2 * (8, 43.5 – 50.4)</td>
<td>42.5 ± 2.4 (29, 37.5 – 48.4)</td>
<td>48.7 ± 1.8 * (2, 47.6 – 49.8)</td>
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<tr>
<td>Longest toe</td>
<td>9 &gt; 8 &gt; 10 &gt; 7 (2)</td>
<td>9 &gt; 8 &gt; 10 &gt; 7 (2)</td>
<td>9 &gt; 8 &gt; 10 &gt; 7 (2)</td>
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<td>Wing-point</td>
<td>9 &gt; 8 &gt; 10 &gt; 7 (1)</td>
<td>9 &gt; 8 &gt; 10 &gt; 7 (1)</td>
<td>9 &gt; 8 &gt; 10 &gt; 7 (1)</td>
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<td>9 &gt; 8 &gt; 10 &gt; 7 (1)</td>
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<tr>
<td>Weight (g)</td>
<td>238.3 ± 43.9 (4, 193 – 310)</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
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<td>No data</td>
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<tr>
<td>Wing-point</td>
<td>2.2 ± 0.8 (5, 1.3 – 3.5)</td>
<td>5.2 ± 1.5 (2, 4.1 – 6.2)</td>
<td>3.9 ± 1.3 (9, 1.8 – 5.1)</td>
<td>5.1 ± 0.1 (2, 5.0 – 5.2)</td>
<td>6.9 ± 0.8 * (2, 6.4 – 7.5)</td>
<td>15.5 ± 2.4 * (9, 12.2 – 19.4)</td>
<td>No data</td>
</tr>
<tr>
<td>Total length</td>
<td>314.8 ± 16.6 (5, 301 – 343)</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>335.7 (5, 290 – 354)</td>
<td>No data</td>
</tr>
</tbody>
</table>

* Differs significantly from Scolopax bukidnonensis (pairwise differences between species at 95% simultaneous confidence intervals for specified linear combinations, by the Tukey method).

** Pairwise differences between S. (s.) saturata and S. (s.) rosenbergii at 95% simultaneous confidence intervals.

darker throats and upper breasts, which may form a band; in S. bukidnonensis, the band is variable, ranging from Cinnamon to pale Dusky Brown, while in S. mira, it is typically Dusky Brown and very broad.

** Wing-point formula ** — The wing-point formulae of woodcock fall into two general categories (Table 1): those with pointed wings (S. rusticola and S. mira) having wing-point formula P10>P9>P8>P7; and those with rounded wings (the remaining species) having P8 or P9 the longest. The wing-point formula for S. bukidnonensis is most similar to that of S. celebensis in that P9 is the longest, yet the formula for S. celebensis was distinct in three of the four specimens for which it was determined. Although S. bukidnonensis shares rounded wings with both populations of S. saturata, the latter is highly variable with P9 the most frequent longest feather followed by P8. Wing-point formula for S. rochussenii P9>P8>P10>P7 follows the general pattern for the majority of S. bukidnonensis.

** Mensural differences ** — Scolopax bukidnonensis differs significantly (pairwise differences between species and subspecies at 95% simultaneous confidence intervals for specified linear combinations, by the Tukey method) in wing chord and tarsus length from all species and subspecies (Table 1), in tail length from S. s. saturata and S. rusticola, in culmen chord from S. rochussenii, in length of longest toe from S. mira and S. rochussenii, and in wing-point difference (distance between longest and shortest of primaries 7 to 10) from S. mira and S. rusticola. For each variable measured, the mean of at least one species/subspecies differs significantly (ANOVA, P < 0.01) from the mean of at least one other species or subspecies (Table 1), whether or not the sexes are pooled or compared separately.

** Etymology **
We are pleased to name this remarkable new species after the collective name for all of the local tribes of people inhabiting the Mt. Kitanglad Range, and for whom the Province of Bukidnon, Mindanao is named.
The Visayan word *bukid* means “mountain” and the word *bukidnon* means “of the mountain.” The English name Bukidnon Woodcock thus means “woodcock of the mountains” and in the broad sense is an accurate description of the habitat of this species, i.e. montane forests and clearings usually above 1,000 m, throughout its known range on the Philippine islands of Luzon and Mindanao.

**DISTRIBUTION AND HABITAT**

In addition to the specimen records of the Bukidnon Woodcock from Mt. Kitanglad, Mt. Malindang and Mt. Kimangkil on Mindanao and Dalton Pass in Nueva Vizcaya Province, Luzon, there are tape recordings, and sight and auditory records from these and other localities on these islands (Figure 1).

**Mindanao** — On Mt. Apo, Kennedy obtained tape recordings of the call of the Bukidnon Woodcock at 05h12 on 25 January 1995 and again at 18h02 and 18h09 on 26 January 1995 at the Mt. Apo Geothermal Site in Barangay Iloomavis, Municipality of Kidapawan, North Cotabato Province, Mindanao, at 2,200 m in montane mossy forest. The original tape-recordings are deposited in the Cornell Library of Natural Sounds.

**Luzon** — On Luzon there have been several sightings of what was probably this species. On Mt. Cetaceo in Cagayan Province, at about 17°42’N 122°02’E, Danielsen *et al.* (1994) reported sighting a woodcock on three occasions in montane mossy forest between 1,400 and 1,650 m in May 1992.

On Mt. Banahao, Barangay Lalo, Municipality of Tayabas, Quezon Province Diesmos sighted or heard the woodcock on two separate occasions. One bird was flushed from a row of dense undergrowth surrounding a natural clearing (landslide) in upper montane forest at 1,700 m near the summit in June 1996 at about 10h00. In addition, Diesmos heard one or more birds call in flight five times between 05h00 and 06h00 at Pinagheseralan, Mt. Banahao from 30 April to 5 May 2000 at 1,400 m in upper montane forest. He described the call as follows: “The call was in two parts: the first part sounded like a high-pitched trill *pratatatatat* . . ., which is similar to the call of the Colasisi *Loriculus philippensis* or Guaiabero *Bobopitacus lumilatus*; this was followed immediately by a snort-like *ngork-ngork-ngork*. . .”

On Mt. Natib, Sitio Banati, Municipality of Orani in Subic-Bataan Natural Park, 15.5 km west of Municipality of Balanga, Bataan Province, 14°43.’12”N 120°23.’58”E, Diesmos, as part of the NORDECO-DENR field team, sighted woodcocks three times, twice in the morning and once in the afternoon, in May 1996 at about 1,000 m in a 2 ha clearing in lower montane forest.

In April 2001 in the Cordillera Mountains in Barangay Balbalasang, Municipality of Balbalan, Kalinga Province, in an area locally called Am-licao, 17°26.’30”N 121°04.’15”E, Dan Davison, Blas Tabaranza, Renato Fernandez and Diesmos heard woodcock on several occasions at dusk (17h30 to 18h00) and pre-dawn (04h00 to 05h00) at 1,900 m. Davison and Fernandez also flushed what they believed was a woodcock from a small clearing on a ridge at about 1,900 m at 22h00.

Despite these Luzon records, Fisher, Harrap, Kennedy, Ben King and many others have birded montane mossy forests along and off the road on Mt. Polis above Banaue, Mountain Province, Luzon, from pre-dawn through dark on numerous occasions from January to April over the past 20 years without seeing or hearing the Bukidnon Woodcock.

Other islands: — Although the possibility exists that the Bukidnon Woodcock occurs on other Philippine mountainous islands with montane mossy forest above 1,000 m, none has been encountered thus far. During a biodiversity survey of Mt. Kanla-on (Canlaon) on Negros in 1998, Kennedy spent dusk to dark on 23 and 24 February and pre-dawn to dawn on 25 February at 1,900 m in montane mossy forest at an old volcanic crater, Harding sang Balo, listening for the woodcock without success.

In summary, the Bukidnon Woodcock appears to be widespread in central and northern Luzon and on Mindanao in montane and montane mossy forest, with or without clearings, from as low as 900 m (Fisher sighting, 24 June 2000 on Mt. Kitanglad at Kalengangan, San Vicente, Baungon) to near mountain summits at 2,750 m.

**HABITS**

**Daily Rhythm and Roding Behaviour**

The Bukidnon Woodcock has occasionally been flushed in or near forest patches during the day; indeed, the first sighting on Mt. Kitanglad was of a bird flushed (Harrap and Fisher 1994). Most observations are of birds in aerial display or roding flights similar to those performed by Eurasian Woodcock. At dusk, woodcock have been seen emerging from small relict forest patches, flying rapidly and giving a “rattle” call (see below), but they have also been flushed at dusk from cleared areas overgrown with a dense cover of bracken *Pteridium*.

The Bukidnon Woodcock undertakes roding flights both at dawn and at dusk. It is remarkably regular in the time of its appearance, particularly at dusk, when it starts its roding flights and begins calling when the light is such that humans can see objects, but can barely discern colours. The authors have, between them, seen, heard or heard the woodcock more than 100 times, Fisher alone having seen or heard them on 70 occasions from 1993 to 2001, mostly at the Philippine Eagle Eco-lodge at Dalwangan on Mt. Kitanglad between 1,400 and 1,650 m. In general, roding lasts about 30 minutes in the morning but may last up to 1.5 hours, particularly on clear bright nights. In the evening roding is generally shorter, usually about 10 to 20 minutes, but has lasted as long as 30 minutes. The Bukidnon Woodcock appears less active during rainy conditions. The following are a few examples of roding times. From 19 to 22 January 1995 on Mt. Kitanglad, Fisher and Kennedy noted the woodcock starting dawn calling and roding as early as 04h48 and ending by 05h46. The holotype was captured on 22 January at 05h30 as it was calling and roding. At dusk on 19, 20 and 21 January, woodcock started calling
Figure 4.


4d. **Sonagram 4** - *Scolopax rusticolus*: The snore phrase showing the banded structure. From Roché (1990).


4g. **Sonagram 7** - *Scolopax saturata rosenbergii*: Roding over forest, Gurnung Idong, 2,100 m, Mokwam, Irian Jaya, 8 October 1995. Whooshing and grunt phrases combined: *chuan*... *quorr*- *quorr*- *quorr*- *quorr*-... Recorded by D. Gibbs (British Library, National Sound Archive).
at 18h00, 18h01 and 18h01 respectively, with calling ending on the 19th at 18h15. Harrap on Mt. Kitanglad on 18 February 2001 noted roding at 05h25 and 05h36 and then at 18h10, 18h15 and 18h25. In relation to other crepuscular species, at dusk the woodcocks typically do not start roding until after Great Eared Nightjars *Eurostopodus macrotis* and Philippine Nightjars *Caprimulgus manillensis* have begun to call, but a little before Philippine Frogmouths *Batrachostomus septimus* give their dusk calls.

It may be assumed that there are seasonal variations in the intensity of the roding displays, and there certainly seem to be variations from year to year. Fisher has observed roding at the Eagle Camp on Mt. Kitanglad from 15 December to 24 June during his visits there. Diesmos and Manamtam sighted or heard them roding from 2 to 8 September 1996 at elevations from 2,000 to 2,760 m on Mt. Dulang-dulang in the Mt. Kitanglad Range. Generally the intensity of roding has been about the same during the periods observed, yet there have been times, particularly in February 1994 (Fisher and Harrap), February 1998 (P. Morris, Fisher and Kennedy) and February 1999 (Fisher and Harrap) when the activity was reduced or almost lacking.

Roding flight generally takes place at about 10 to 20 m above ground level, and the birds take a roughly oval or circular route (hence passing a stationary observer every 3-5 minutes) over both relict forest patches and open areas with cultivation or bracken *Pteridium*. This route probably encompasses an individual’s range, which may be 400 to 600 m in diameter or the length of the oval. On one occasion, Fisher placed himself between two roding circuits and, although the birds never met, their boundaries touched but did not overlap.

Typically roding birds use distinctive fluttery wing-beats, and may dangle their legs below the body. Fisher and P. Morris have seen two individuals following each other closely in roding flight, with one or both birds noted as calling. Birds are easily tracked in flight due to their loud and distinctive vocalizations.

**Vocalizations**

Bukidnon Woodcock *S. bukidnonensis* gives a loud and distinctive vocalization during roding display (Harrap and Fisher 1994, Kennedy et al. 2000). Other vocalizations may be given, but none has been recorded. The roding-call of the Bukidnon Woodcock consists of a hard, metallic, rattled or staccato phrase, comprising 4-6 motifs, each motif given at intervals of 0.05 sec (Figure 4a, also figure in Harrap and Fisher 1994). This rattle phrase may be written as *ti‘ti‘ti‘ti‘ti* or as Kennedy et al. (2000) described it *pip‘pip‘pip‘pip‘pip*. Each motif (Figure 4a) has a distinctive structure, being comprised of a distinct pulse (c. 3 kHz rising to c. 5 kHz) connecting with a concurrent higher-pitched curled syllable (c. 6 kHz rising to c. 7.2 kHz and falling to 5.7 kHz). On the sonagram these combine to form a trace (like a walking stick). The rattle phrase is given at intervals of 2.4-3.0 sec, sometimes up to 5.5 sec, and is interspersed by much lower-pitched growling or grunt phrases, which are generally given in groups of 2-3 and sometimes up to 6 phrases, with another rather shortened phrase immediately preceding the next rattle. These grunts comprise a series of simple units, c. 0.75-1.25 kHz, repeated every c. 0.01-0.13 sec in a phrase that last 0.25-0.30 sec (the shortened phrase preceding the rattle lasts c. 0.1 sec). On the sonagram the grunts appear as a distinctive series of short, closely spaced vertical bars or bands (Figure 4b). These grunts may be represented in words as *burb burp burp burp or gro-a gro-a gro-a*, and thus the roding song as *TI‘TI‘TI‘TI‘TI‘...... burp burp burp... TT‘TT‘TT‘TT‘TT‘...... burp burp burp... TT‘TT‘TT‘TT‘TT‘...* or another interpretation *PIP‘PIP‘PIP‘PIP‘PIP‘...* or *gro-a gro-a gro-a..., PIP‘PIP‘PIP‘PIP‘PIP‘... gro-a gro-a gro-a..., PIP‘PIP‘PIP‘PIP‘PIP‘...* (Figure 4c). Notably, the rattle is much louder than the grunt phrase and may be heard at a greater distance.

The known vocalizations of other Old World woodcock species compare as follows to those of the Bukidnon Woodcock.

*Scolopax rusticola* — The roding song of the male is made up of 2-5 slow but accelerating deep croaking phrases (the “snore” notes, main energy c. 1 kHz, but showing harmonics at c. 3 kHz and 5 kHz), comprised of simple units repeated at c. 0.02 sec intervals showing again as closely spaced bands (Figure 4d), uttered with the bill shut and air sacs inflated. The snore notes are closely followed by a sudden loud shrill sneeze motif (“sneeze” note, main energy c. 4-12 kHz, duration c. 0.1 sec and showing as an inverted “V” on the sonagram), given with the bill open. Each complete sequence is mechanically repeated after intervals of 2-2.5 sec, e.g. *quor quor quor PIETZ... quor quor quor PIETZ...* (Figure 4e). The snore notes are only audible at close range, and the sneeze notes often sound disyllabic at longer ranges (“chissick”). The song may be individually recognizable, and although usually of a constant composition, birds may add or subtract snore notes. Imperfect songs may be given at the beginning and end of the breeding season (Cramp and Simmons 1983).
Scolopax saturata — We have been unable to locate recordings of the vocalizations of nominate saturata from Sumatra and Java. In the taxon rosenbergii, from New Guinea, the roding song consists of a single motif with a distinctive nasal “whooshing” quality, showing as an inverted comma on the sonagram, starting at c. 3 kHz, dropping to c. 1.5 kHz and then rising to c. 7 kHz (Figure 4f). This motif lasts c. 0.8 sec and can be written chuwei. These chuwei motifs are repeated every c. 2-2.5 sec and are interspersed with a series of lower-pitched grunting phrases, given in a series of 3-8 motifs, each phrase c. 0.3 sec long and comprising simple units, main energy c. 1 kHz, given every c. 0.01 sec). On the sonagram they display a banded pattern (Figure 4g). Thus the phrase may be written chuwei...quor...quor...quor...chuuwi...quor...quor...quor...quor...quor...quor...quor...quor...quor...chuuwi...quor...quor...quor...quor...quor...

Scolopax mira — This species evidently does not perform a roding flight or give a roding call (Brazil and Ikenaga 1987, M. A. Brazil in litt. 2000). A call of this species has very recently been published (Kabaya and Matsuda 2000) but, in our view, is not a roding call and it is, therefore, not discussed further here.

Scolopax celebensis — This species makes short flights over the tree-tops at dusk, but its vocalizations are unknown (Coates and Bishop 1997, K. D. Bishop in litt. 2000).

Scolopax rochussenii — Vocalizations unknown. This species is known from just eight specimens.

The three species of Old World Scolopax known to give vocalizations in roding flight and for which data are available clearly show close similarities. Scolopax bukidnonensis, S. rusticola and S. saturata rosenbergii all have a low-pitched (main energy c. 1 kHz) grunt phrase of remarkably similar structure (simple, rapidly repeated elements showing as a banded pattern on a sonagram) interspersed with a higher-frequency, louder and more complex rattling, sneezing or whooshing motifs. The grunt vocalizations thus appear to be more primitive for woodcock, whilst the higher-pitched calls are probably of more recent origin. Despite the similarity of the grunt call, all three species are nevertheless clearly distinct vocally. However, recordings of the roding calls, if these exist, are still needed for celebensis, rochussenii and nominate saturata.

CONSERVATION STATUS

The Bukidnon Woodcock appears to be locally common above 900 m on the mountains on which it has been recorded. Apparently it had been overlooked because of its crepuscular roding behaviour and nocturnal feeding habits or because it was assumed to be the Eurasian Woodcock, if seen when flushed, it had simply not been identified. For example, this clearly seems to be the case on Mt. Kitanglad where relatively recent expeditions (Salomonsen 1953, Ripley and Rabor 1961) did not collect or observe the birds. In addition, earlier collectors, mainly using guns to obtain specimens, would have had a difficult time shooting the birds when they burst from the forest floor and flew off out of range in the dense montane forest. The earlier specimens, all from Dalton Pass, Luzon, were caught at night with large dip nets, as the birds were attracted to and dazzled by bright lights. All other specimens, except those caught by the skilled hand of R. Fernandez, were mist-netted. Now that the call, roding habits, and habitat of the species are known, we expect that the species will be found on other mountains on Luzon and Mindanao, and perhaps on other islands.

Forests throughout the Philippines have for the most part been cleared or disturbed below 1,000 m. Above 1,000 m, except in parts of the Cordillera Mountains of Luzon and selected flatter slopes or plateaus elsewhere, the montane and montane mossy forests are in reasonably good condition. For the most part these forests are in extremely rugged terrain that is not conducive to farming, and they have few commercial trees for logging. Although the Bukidnon Woodcock has a restricted range (in terms of area of occupancy), we do not therefore believe that it is immediately threatened or of conservation concern in the foreseeable future.

REMARKS

Combining plumage, mensural, vocalization and behavioural differences with its isolation in the Philippines from other species, also with very restricted ranges, we conclude that the Bukidnon Woodcock has a unique evolutionary history and should be recognized as a distinct species. We are well aware of the recent debates over the “species concept” (Snow 1997, Zink 1996, among others) and regardless of which concept one follows, i.e. biological or phylogenetic, we believe that this species would be recognized. Frozen tissues of the Bukidnon Woodcock are available at the Cincinnati Museum of Natural History for those who wish to pursue phylogenetic studies of this species.

EURASIAN WOODCOCK IN THE PHILIPPINES

As noted earlier the two previous records of the Eurasian Woodcock were of specimens obtained in 1929 and 1931 and lost when the National Museum of the Philippines was destroyed during World War II. There are no recent records of this species from Philippines. The fact that the Bukidnon Woodcock is now known to be widespread on Luzon and Mindanao, casts doubt on the identity of the two earlier records. However, the earlier specimens were obtained in the lowlands of Luzon and there is no evidence that Bukidnon Woodcock frequent the lowlands. In addition, the measurements of the 1929 specimen, taken from McGregor and Manuel (1936), were as follows: wing 195 mm, tail 83 mm, tarsus 35 mm and culmen length 75 mm; these accord much better with S. rusticola than with S. bukidnonensis. We therefore recommend that the lowland-dwelling Eurasian Woodcock remain on the list of Philippine birds as a rare migrant.
SYSTEMATIC NOTES ON OTHER WOODCOCK

As we compared all the other species and subspecies of woodcock to the Bukidnon Woodcock, we began to see unique or similar characters in each species or subspecies. In fact, in our analysis of the mensural data for each species/subspecies, we found that we could match each specimen to its correct taxonomic unit based on measurements alone.

We agree with the widely accepted recognition of *S. rusticola*, *S. mira* (Brazil and Ikenaga 1987) and *S. rochussenii* as full species. Also, we agree with Stresemann (1932, 1941) and Greenway (1978), contra White and Bruce (1986), that the two populations of *S. celebensis* be recognized subspecifically based largely on differences between them in culmen chord (*S. c. celebensis* culmen chord in mm - mean 92.7, SD ± 0.3, n = 3, range 92.4 – 93.1; *S. c. heinrichi* - mean 81.7, ±0.4, n = 2, range 81.3 – 82.2).

However, we do not agree with the treatment of *S. saturata* as one species with two subspecies. Rather we believe that each subspecies should be recognized as monotypic species *S. saturata* and *S. rosenbergii* and base our conclusions on the following differences:

**Mensural Differences** — (see Table 1) *S. saturata* is similar to *S. rosenbergii* in bill height and bill width at feather line, width of bill at tip, length of longest toe, and wing-point difference. *Scolopax rosenbergii* is significantly (P < 0.05) larger than *S. saturata* in wing chord, tail length, tarsus length and culmen chord.

**Plumage Differences** — *S. rosenbergii* differs from *S. saturata* by having the Dusky Brown upperparts mottled with Cinnamon Rufous much darker and loosely barred; by having the white malar spots and supraloral spots well developed and conspicuous; by having a white chin, darker Dusky Brown throat, breast and belly with narrow Cinnamon bars on throat and breast, white barring and feathers tipped white on lower breast and belly, and some narrow Drab bars on flanks and mixed in with the white in the belly. *S. saturata* has the chin Pale Horn Color, and the throat, breast and belly finely barred and/or mottled with Dusky Brown and Drab, and a white band between breast and belly.

**Distribution and Habitat** — All five of the Asian/Papuan woodcock share similar habitats and altitudinal ranges. They all appear to be sedentary, with little movement outside of their habitat and altitudinal range. The unique plumage, size and highly restricted range of *S. rochussenii* clearly demonstrate this. The fact that two subspecies of *S. celebensis* occupy different mountain areas but on the same island also demonstrates this. The distance between suitable habitat of *S. rosenbergii* on New Guinea and *S. saturata* on Java is no less than 2,500 km. Clearly the amount of gene flow between these sedentary populations is likely to be nil or so close to nil that it would not matter. For all intents and purposes they are isolated populations of woodcock.

Combining the differences in plumage and measurements, and taking into account the distance between the populations, we consider them unique evolutionary units. We suggest that *S. saturata* be called the Javan Woodcock, and that *S. rosenbergii* be known as the New Guinea Woodcock in keeping with the geographical names of all the other known species of woodcock.

**SPECIMENS EXAMINED**

*Scolopax bukidnemensis* (Luzon and Mindanao) — 1 male (CMNH); 1 female (DMNH); 1 male, 1 female (FMNH); 1 male (MSU-IIT); 1 unknown (NMP); 1 male, 1 female (to be deposited in NMP).

*S. c. celebensis* — 1 male, 1 unknown (AMNH); 1 male (UBMN).

*S. c. heinrichi* — 1 male (AMNH); 1 male (UBMN).

*S. mira* — 4 males, 3 females, 1 unknown (AMNH); 1 male (MCZ); 1 unknown (USNM).

*S. rochussenii* — 1 female, 1 unknown (AMNH); 2 males (USNM).

*S. rosenbergii* — 18 males, 5 females, 5 unknown (AMNH); 1 male (BM).

*S. rusticola* (Japan and China) — 6 males, 6 females, 2 unknown (AMNH); 2 males, 2 unknown (MCZ); 4 males, 4 females, 5 unknown (USNM).

*S. saturata* (Java and Sumatra) — 1 male (AMNH); 1 male (MCZ); 5 males, 5 females (NNM); 1 male, 1 female (USNM).

We are pleased to dedicate this paper to our friend and field colleague, Renato E. “Boy” Fernandez, who has seen, heard and identified the Bukidnon Woodcock on Mt. Kitanglad and Mt. Malindang on Mindanao, and at Balbalasang and almost certainly Dalton Pass on Luzon; and to the late Mrs Eugene Farny, a silent friend to Philippine conservation through her support of Kennedy’s efforts in the Philippines for more than two decades. Both of these extraordinary people have helped Philippine conservation in two dramatically different ways.

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REFERENCES

American Ornithologists’ Union. (1998) Check-list of North Ameri-
can birds. 7th edition. Washington, D. C.: American Ornitholo-
gists’ Union.


mura: its identity and identification. Forktail 3: 3-16.

Alderley: Dove Publications.

Cramp, S. and Simmons, K. E. L. (eds.) (1983) The birds of the west-

Danielsen, F., Balete, D. S., Christensen, T. D., Heggaard, M.,
Conservation of biodiversity in the Sierra Madre Mountains
of Isabela and southern Cagayan Province, The Philippines. Manila:
Department of Environment and Natural Resources-BirdLife
International; and Copenhagen: Danish Ornithological Society.

of the Philippines. Tring: British Ornithologists’ Union (Check-
list No. 12).

of Natural History.

van Gils, J. and Wiersma, P. (1996) Family Scolopacidae (sandpip-
del Hoyo, A. Elliott and J. Sargatal eds. Handbook of the birds of
the world, 3. Barcelona: Lynx Edicions.

Greenway, J. C. Jr (1978) Type specimens of birds in the American


Hayman, P., Marchant, J. and Prater, T. (1986) Shorebirds: an identifi-
cation guide to the waders of the world. Boston: Houghton Mifflin
Company.

Kabaya, T. and Matsuda, M. (2001) The songs and calls of 420 birds in

Kennedy, R. S., Gonzales, P. C., Dickinson, E. C., Miranda, H. C.,
Oxford: Oxford University Press.


the MAPS Program, by locality, from 1963 through 1971. U. S.
Army Research and Development Group, Far East, Report No.
FE-315-7.

McGregor, R. C. and Manuel, C. G. (1936) Birds new and rare in


Katanglad. Postilla 50 1-20.

Roché, J. C. (1990) All the bird songs of Europe. 4 CD set. Chateaubois,
La Mure, France: Sittelle.

Salomonsen, F. (1953) Miscellaneous notes on Philippine birds.

Sibley, C. G. and Monroe, B. L., Jr (1990) Distribution and taxonony
of birds of the world. New Haven: Yale University Press.

Museum of Natural History.

American Museum of Natural History.

Snow, D. W. (1997) Should the biological be superseded by the phy-

Stresemann, E. (1932) Vorläufiges über die ornithologischen Ergebnisse
der Expedition Heinrich 1930-1932: VII. Zur Ornithologie von

White, C. M. N. and Bruce, M. D. (1986) The birds of Wallacea.
Tring: British Ornithologists’ Union Check-list No. 7.

Zink, R. M. (1996) Species concepts, speciation, and sexual selec-