Taxonomic status of the Negros Bleeding-heart
*Gallicolumba keayi* from Panay, Philippines,
with notes on its behaviour

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Following the discovery of a new population of the Negros bleeding-heart pigeon on Panay, a first, yet very incomplete, account of the species’s behaviour is given and illustrated by photographs of a live male. A clutch in March contained two eggs. Neither the morphometrics nor the colouration of three adult birds, this male included, from the north-west Panay peninsula indicate that the Panay birds are any different from the earlier described Negros form. Errors in the earlier descriptions, based entirely on museum skins, are corrected. One female showed an anomalous central tail feather. Currently data on body mass and behaviour are known only for individuals from Panay. A new way of protectively closing the eyes, not noticed in birds before, is described; it is employed whilst picking up bulky insect prey and also when the head is tucked into the plumage while preening. The similarity of the two island forms of the species reflects the close faunal resemblance of the two Visayan islands that is further underscored by the recent publication of more than 60 new distributional records of birds from Panay previously known from Negros only.

Clarke (1900) described a new bleeding-heart *Gallicolumba keayi*, based on three specimens from Negros island, Philippines, obtained from Mr W. A. Keay, the owner of a sugar plantation. Clarke’s description was enlivened by a colour plate prepared by J. G. Keulemans that got most details correct (see below). The Negros species was the last of the five Philippine endemic bleeding-hearts to be discovered (Dickinson et al. 1991). Unlike *G. luzonica* and *G. criniger* from the Luzon and the Mindanao regions, respectively, that have often been kept in bird collections, the Negros form had not been recorded in captivity, so that its appearance and behaviour remained virtually unknown. The same holds true for both the Sulu Bleeding-heart *G. menagei* (D. Allen, pers. comm. 1999) and the Mindoro Bleeding-heart *G. platenae*, though pictures of a captive *platenae* have been published recently (Brooks et al. 1995). Attention to the plight of all three critically endangered forms has been drawn by a full-colour poster painted by W. L. R. Oliver. Extensive deforestation taking place throughout the country (DENR 1997) is threatening all forest birds, and the risk of extinction is exacerbated for single-island endemics such as the three bleeding-hearts mentioned.

Following up hints received from both conservationists (Diesmos and Pedregosa 1995) and hunters in the Valderama (near Mt Baloy) and Malumpati areas (north-west Panay), the Philippine Endemic Species Conservation Project (PESCP) diligently searched for signs of the Negros Bleeding-heart on Panay from 1995 when its explorations started. As a result, project members discovered the bird in Lahang forest (Municipality of Libertad, Antique) in 1996 and, later the same year, also in nearby Sibaliw (Municipality of Buraanga, Aklan) (Klop et al. 1998), in both primary and secondary-growth forest at 450 m. Our search in good forest at 950 m near Mt Baloy (Hamtang above Nawili) did not meet with success. On Negros, the pigeon occurs at ‘higher elevations’, i.e. around 1,000 m. But this may not reflect a true preference as all forest below 800 m has been cleared.

In the course of our banding operations, three bleeding-hearts were captured near the Research Station Sibaliw, thanks to the skills of our field assistant ‘June’ Benjamin Tacud. One of them was put into a well-planted rehabilitation cage (5 x 3 x 2.5 m) as per a Memorandum of Agreement with the Department of Environment and Natural Resources (DENR). The cage was lined with very soft fishing net, thus forestalling injury. The behavioural observations and photography were carried out on this bird, while an account of the external appearance is based on all three birds.

There is great interest in establishing the taxonomic status of the Panay bleeding-heart. If it proves not to differ from the Negros form, the risk of extinction of the species would be split. Behavioural data presented here, as well as blood samples, are available only from the Panay form, so comparison of the two populations has to rest entirely on morphological features.

**APPEARANCE AND MORPHOMETRICS**

**Colouration**

The external appearance of all three birds matches the illustration by Keulemans (Clarke 1900), apart from the following important points (Plates I and II). The upper white breast is virtually embraced by a wide band of metallic-green feathers that taper off towards the midline. This shiny green band, together with the shiny bluish-green upper mantle merging into the lesser wing-coverts, encloses a band of white feathers that merges

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ventrally with the white of the breast. This white band extends towards the upper back and gives the impression of a second white wing-bar. Three study skins (Nos. 4 to 6 in Table 1) that I inspected (only photos of Nos. 4 & 5) revealed no indication of this conspicuous white band, obviously due to feather disarrangement during skin preparation. While such disarrangement of the lateral breast feathers made both the broad green lateral band and the white bar bordering it disappear on Keulemans' plate, the colour illustration of G. keayi in Hachisuka (1931-1932) captures almost correctly the position and size of the former band. Whether the vestigial length of the white bar in the latter illustration is genuine and, hence a potentially discriminating character, needs to be determined by study of live birds from Negros.

The blood red breast patch is narrow, usually no wider than 5 mm, and ca 26 mm long, but its shape may change due to the activities of the bird (Plates I and II). This name-giving trait has been seen correctly (Hachisuka 1931-1932), or has been painted far too wide (Clarke 1900). The narrow shape of this patch renders G. keayi distinct from all other bleeding-hearts.

The white wingbar is formed by the two to three most distal rows of lesser wing-coverts, the grey base of which, however, cannot be seen in life (contra Clarke 1900). The latest descriptions (Hachisuka 1931-1932, Delacour and Mayr 1946, duPont 1971) ascribe this wing-bar only to G. keayi; yet a close inspection of a skin of G. platenae (Museum für Naturkunde, Berlin) and of photos of one live bird (Brooks et al. 1995) reveal one upper prominent, or even a smaller second, white wing-bar in this species, too (colour poster of G. keayi, G. platenae by PESCP, 1997).

Clarke (1900) described the greater and median upper wing-coverts to be ‘purplish chestnut’ throughout, while other authors do not mention them (Delacour and Mayr 1946, duPont 1971), or reiterate his account verbatim (Hachisuka 1931-1932). Our first bird (No. 1, Table 2) shows only the greater and median coverts of the secondaries to be thus coloured, whereas the primary coverts are blackish (photos of spread wing). A close inspection of colour photos of both the holotype and co-type (courtesy of R. McGowan, Edinburgh) revealed no obvious difference from this pattern in the Panay bleeding-heart. Hence, the original description needs an amendment in this regard as well.

The colour of the soft parts was assessed both verbally and with the use of colour charts (Küppers 1991) (Table 1). While we agree with the then verbal accounts of earlier authors (Clarke 1900, Hachisuka 1931-1932, Delacour and Mayr 1946, duPont 1971), all of them failed to notice the violet tinge of the red iris that we found in (at least) two of the three birds. Oliver’s poster has the iris yellowish.

**Morphometrics**

Table 2 gives the measurements of our three Panay bleeding-hearts (I) and 10+ study skins from various collections, the holotype and one co-type (Nos. 4 & 5) included (II). In one case (Hachisuka 1931-1932), the number of skins examined is not given. Measurements were taken by the curators of the collections approached to forestall the loss of the material. One exception from this was No. 6. There is wide overlap of measurements between the two samples, and the overall values of the Negros birds (II) fall squarely in the range of the limited sample of Panay birds. There is one exception (No. 6) where two bill measurements exceed those for Panay.

The tail length is problematic. Whereas one source (Hachisuka 1931-1932) gives 100 mm as the lower end of the range for Negros, this is not reached by any other measurement (an anomaly [Table 2, footnote 2] excluded). Even allowing for shrinkage of tissue in skins (Svensson 1975, Jenni and Winkler 1989), this would not bridge the gap between the longest individual tails in Table 2 and the range mentioned by Hachisuka (1931-1932). Strangely, another discrepancy between data on specimen labels (Nos. 4 and 5), i.e. when collected in the fresh state and those from the skins now, runs counter to the expectation based on shrinkage and, thus, remains unexplained. In conclusion, the scanty data at hand give no hint as to a size difference between Negros and Panay bleeding-hearts.

One individual from Panay had an anomalous tail feather tip (No. 2, Table 2).

The total length and the body mass of the three Panay birds (Nos. 1 to 3) amounted to 243, 250 and 259 mm and to 175, 176 and 206 g, respectively. No comparison with the Negros birds is possible.

**BEHAVIOUR**

One adult male (No. 1, Table 2) was observed in the spacious rehabilitation cage. In view of the possible importance for future conservation breeding of this rare species and, as it was the first account of its kind for any bleeding-heart form (D. Goodwin in litt. 2000, A. Anzenberger in litt. 2000, A. Münn in litt. 2000), notes on its behaviour are reported below.

### Table 1. Colour of soft parts and breast patch in three Negros Bleeding-hearts (Nos. 1 to 3) of Table 2 from Panay as assessed with the aid of Küppers’ colour atlas (1991) and as judged by three observers qualitatively throughout

<table>
<thead>
<tr>
<th>No</th>
<th>Iris</th>
<th>Beak</th>
<th>Legs</th>
<th>Breast patch</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S20Y30/M90 violet red</td>
<td>dark slaty grey</td>
<td>S20Y50/M90 coral red</td>
<td>S00Y70/M99 blood red</td>
</tr>
<tr>
<td>2</td>
<td>S 10Y80/M80 carmine red</td>
<td>Black</td>
<td>S20Y40/M90 coral red</td>
<td>S00Y90/M90 blood red</td>
</tr>
<tr>
<td>3</td>
<td>S00Y10/M70 violet red</td>
<td>slaty grey</td>
<td>S00Y20/M99 coral red</td>
<td>S00Y70/M99 blood red</td>
</tr>
</tbody>
</table>
Table 2. Measurements (in mm, accuracy 0.1 mm, where possible) of three live individuals of G. keayi from Sibaliw, Municipality of Buruanga, Antique Province, Panay (I); of museum skins from Negros (II)

<table>
<thead>
<tr>
<th>No</th>
<th>Date</th>
<th>Sex/age</th>
<th>Wing</th>
<th>Tail</th>
<th>Tarsus</th>
<th>Bill to feathers</th>
<th>Bill to tarsus</th>
<th>Bill width/nostrils</th>
<th>Culmen at base</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1</td>
<td>8 Feb 99</td>
<td>♂ ad</td>
<td>149</td>
<td>72</td>
<td>37.6</td>
<td>19.2</td>
<td>11.1</td>
<td>3.8</td>
<td>5.9</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>11 Nov 99</td>
<td>♀ ad</td>
<td>144</td>
<td>90²</td>
<td>34.1</td>
<td>17.9</td>
<td>9.3</td>
<td>3.9</td>
<td>5.6</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>20 Mar 00</td>
<td>♂ ad</td>
<td>156</td>
<td>93</td>
<td>37.5</td>
<td>17.6</td>
<td>9.8</td>
<td>3.5</td>
<td>6.3</td>
</tr>
<tr>
<td>II</td>
<td>4</td>
<td>1899</td>
<td>-</td>
<td>158; 157</td>
<td>73³</td>
<td>36</td>
<td>16.6</td>
<td>9.8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>1899</td>
<td>-</td>
<td>147; 147</td>
<td>63³</td>
<td>34</td>
<td>18.0</td>
<td>9.5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>30 Dec 59</td>
<td>♀ 3</td>
<td>149; 146</td>
<td>32</td>
<td>16.5</td>
<td>10.0</td>
<td>5.0</td>
<td>ca. 7.5</td>
<td>Peabody Museum, Yale, No. 54310. Photograph with author.</td>
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<tr>
<td></td>
<td>7</td>
<td>10 May 50</td>
<td>♀ 4</td>
<td>146</td>
<td>80</td>
<td>32.0</td>
<td>13.9</td>
<td>8.8</td>
<td>-</td>
<td>-</td>
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<tr>
<td></td>
<td>8</td>
<td>10 May 50</td>
<td>♀ 5</td>
<td>145</td>
<td>75</td>
<td>28.3</td>
<td>13.7</td>
<td>8.1</td>
<td>-</td>
<td>-</td>
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<tr>
<td></td>
<td>9</td>
<td>7 May 50</td>
<td>♀ 6</td>
<td>139</td>
<td>69</td>
<td>29.7</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td></td>
<td>10</td>
<td>12 Apr 50</td>
<td>♂ 7</td>
<td>151</td>
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<td>16.7</td>
<td>ca. 10.4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>3 May 50</td>
<td>♂ 8</td>
<td>138.3</td>
<td>72.1</td>
<td>31.8</td>
<td>ca. 20</td>
<td>10.9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>6 May 49</td>
<td>♂ 9</td>
<td>142.2</td>
<td>93.8</td>
<td>34.2</td>
<td>17.7</td>
<td>7.6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>159</td>
<td>100-104</td>
<td>37</td>
<td>18-22</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Arithmetic mean of individual or group measurements (skins only): 147.3⁶ 78.6 33 17.0 9.4 (5.0) (7.5) Where range is given, average taken

1 Svensson’s ‘flattened wing’ method where feathers are not straightened on ruler. Two entries denote right and left wing.
2 Vane of one of the two central rectrices ends in torsion of a 15 mm long tip (not contained in tail length above) of 2 mm width. The other central rectrix ends normally.
3 Given on labels as 101 and 96 mm, respectively, while all other measurements are ‘within 1 mm or so of those written on the specimen labels’ (McGowan in litt. 1999)
4 Colour prints, courtesy of Mr R. McGowan, NMS, with author.
5 From Hachisuka⁷; bill to feathers ‘culmen from base’ (p. 221).
6 Where both wings were measured, average taken.

Feeding

Already on its second day in an acclimatization cage (60 x 50 x 40 cm), shielded off with white cloth that covered the only look-through wall, the bird took seeds from the ground. A bit later it took them from the filled bowl, on top of which freshly killed insects were placed. Insects were also placed on the ground. The seed mixture consisted of 40% oily seeds (sunflower seeds, dehusked cardy Cynara cardunculus) and 60% mealy seeds (silver millet, durrha, wheat; no rye!) (Nicolai pers. comm.). Corvimin, a top quality multi-vitamin and mineral powder, was added to the diet twice a week. A weight control in October 1999, i.e. after eight months, revealed no weight loss. The food in the aviary, which belonged to a palm (Borassus or Borassodendron) that has not yet been recorded from the Philippines, with representatives occurring on Borneo as the nearest place (H.-J. Tillich in litt.) Furthermore, mastication in the gizzard opened up the nutritious contents without the help of grit that is commonly taken up by ground doves. The captive male took up small pieces of grit, though.

The appetite for insects in the aviary was so great that up to eight dead dragonflies Odonata (Plate I, 6) in the gizzard of a female that had accidentally died (Table 2, No. 2; skin in station Sibaliw). The seed had many times the size of the smallest rejected berries. It belonged to a palm (Borassus or Borassodendron) that is represented in the Philippines, with representatives occurring on Borneo as the nearest place (H.-J. Tillich in litt.) Furthermore, mastication in the gizzard opened up the nutritious contents without the help of grit that is commonly taken up by ground doves. The captive male took up small pieces of grit, though.

The appetite for insects in the aviary was so great that up to eight dead dragonflies Odonata (Plate I, 5 and 7) were eaten less than 20 min after they were thrown on the ground of the cage. Similar-sized grasshoppers were taken as well. The bird seized the insect with (both?) eyes closed at the moment of impact (Plate I, 5), which never happened with berries, then threw the prey on the ground, without mandibulating it. After picking it up thus several times, it swallowed it. Dismembered wings and heads were eaten after the rest. Insects were clearly preferred over the seeds available all the time. Searching for food was facilitated by tossing leaves aside with the bill.
The protective eye closure when picking up an insect is remarkable. Not only did it occur when there was no prey movement but the motor pattern and context of eye closure is apparently undescribed for birds. When sleeping, a bird typically closes its eyes by raising the lower lid. The foraging bird under scrutiny half-closed its eyes by lowering the upper lid (Plate I, 5) or completely closed them by partly raising the lower lid simultaneously (photo). At the moment of impact the eyes were thus protected. While holding the insect securely, the eyes were kept wide open.

The bird drank water by sucking as is typical for doves. Once it drank from a water-filled dry leaf in preference to the full bowl a few steps away.

**Preening**
The movements used in preening were the same as employed by many birds. Surprisingly, again the eyes were closed by lowering the upper lid before the bill was tucked into the ruffled feathers (Plate II, 8), i.e. in the same way as when picking up a larger insect (see above). But, in contrast, to the latter protective mannerism, the eye was reopened, while the head was above). But, in contrast, to the latter protective

Visual displays
Typically the lifting-wings display (Plate II, 11 and 13, Fig. 3) with maximally and rapidly raised wings is given at a rate of about one third of the song rate 1 or 2 s after a song. The body feathers are puffed out, giving the bird a much-enlarged appearance. At the end, during the slower down-stroke of the wings, portions of the wing-coverts including the white bar are selectively raised above the wing surface as to be visible from the front (Plate II, 13). The display accompanied a song only once and was given on the song post. An identical display is used by the Luzon Bleeding-heart male when courting the female, or when luring her to a place for nest-building (Münst and Wolters 1999). The lifting-wings display also occurs during courtship in the New Guinean Golden-heart Dove *Gallicolumba rufigula* (Coates 1985), though with the wings raised merely halfway up (J. Nicolai, pers. comm., photos), as is also typical of *O. rubescens* (Gifford 1925). The display has apparently arisen before the Philippine radiation of the endemic bleeding-hearts and is, hence, expected to be common to all of them.

Second, there is an extremely rapid double wing-beat, during which the wings are beaten twice at such a high speed that the double stroke can be only heard but not seen. The stroke does not lift the body at all. Like the lifting-wings display, the double wing-beat occurs also during song bouts but more rarely. Only once it occurred in a bout of preening. Being close-range signals, these displays function surely in a different way than the songs. Produced in the absence of a conspecific they must be regarded as vacuum activities.

**Vocalizations**
These were recorded with a Sony TC-D5M recorder and a dynamic microphone. The male sang most commonly from September and October 1999 through to March 2000, between near dawn (ca. 05h10) and near dusk (17h00), usually from the top of the shelter (Plate II, 10). In addition to the loud songs there were two monosyllabic *hu* calls and one unrecorded bisyllabic *hu-hu* call of a distinctly different sound quality but inserted into bouts of song. The songs consisted of trills of rapidly repeated syllables with possibly up to three harmonics, with their major energy at around 0.5 kHz (Fig. 1). In spite of varying from 28 to 78 syllables, these trills always had a duration of about 2.4 s. Between trills the bird remained still or walked back and forth, sometimes flying down and up again. Trills were even sung in the acclimatization cage when the bird was suffering from a leg injury in October. On two occasions trills were preceded by two very different soft *hu* calls (Fig. 1 c., Fig. 2). All the *hu* and *hu-hu* call versions were of low volume while the loud trills were long-distance signals, easily audible in the field. The high repetition rate of ca 3.5 trills per min, and the context, suggest trills to be territorial advertisement. A wild male gave c. 11 songs/min, both before and after being flushed by humans (17 March 01, 11h25). According to hunters’ reports, the Negros Bleeding-heart utters a soft *coo* and a high-pitched *uu-oom*. These calls allow them to distinguish the species from other doves (Emerald Dove *Chalcophaps indica*, White-eared Brown Dove *Phapitiron leucotis*) (Diesmos and Pedregosa 1995). Though these calls might fit into the above account of the Panay bird, I find it strange that the major diagnostic vocalization should not be the much louder song trill (which has, however, not been reported for the Negros population).
to all other pigeons of the area. The species’s rarity may therefore be more apparent than real.

**REPRODUCTION**

On 8 March 1999 Henry Urbina of PESCP found the only known nest of the species in primary forest near the Bulanao trail (Plate II, 12). The two eggs fell victim to a predator within a day of its discovery, thus precluding further observation. The nest was placed amidst the leaves of a birdnest fern *Asplenium* supported by fallen logs, and was clearly visible from above. The time of the year matches both joint roosting of groups (see above) and previous records both for *G. platenae* and *G. luzonica*, with nestlings found in May (Dickinson *et al.* 1991).

The work of the PESCP is formalized under the aegis of a Memorandum of Agreement with the Department of Environment and Natural Resources (Quezon City, Philippines). The help of the Protected Areas and Wildlife Bureau (Director W. S. Pollisco, then R. C. Bayabos), and RED J. Amador (DENR Region VI, Iloilo) is gratefully acknowledged. The project is sponsored by the Frankfurt Zoological Society. Further support came from the Andreas-Stihi-Foundation, the AZ (German Aviculturists’ Association), the Daimler Benz AG, Deutsche Lufthansa, German Ornithologists’ Society, Vitakraft-Werke and generous donations of Prof. Dr Mult. h.c. Ernst Mayr, Cambridge, Mass., USA, Mr B. Bacsal (Manila), and Mr H. Küppers, Hachisuka, M. (1931-1932), The birds of the Philippine Islands, I. London: Witherby. Bennet, H., and Winkler, R. (1989) The feather-length of small passerines: a measurement for wing-length in live birds and museum skins. *Bird Study* 36: 1-15.


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**REFERENCES**


