FORKTAIL 18 (2002): 121-125

The Blue-tailed Trogon *Harpactes* (*Apalharpactes*) *reinwardtii*: species limits and conservation status

N. J. COLLAR AND S. VAN BALEN

The Blue-tailed Trogon *Harpactes* (now *Apalharpactes*) *reinwardtii* is better treated as two species, Javan Trogon *A. reinwardtii* and Sumatran Trogon *A. mackloti*, on the basis of (1) statistically highly significant morphometric differences suggesting at least 33% greater weight in *reinwardtii*, (2) a maroon-chestnut rump-band in male *mackloti* plus minor differences in female wing-panel colour and pattern, and (3) the apparently exclusive possession by *mackloti* of a particular (and un-trogon-like) song. Javan Trogon is known from six forested mountains within an elevation range of 800–2,400 m and inside an area much less than 11,600 km², has been recorded on only three in the past 60 years, seems to be a relatively rare bird, and may be declining with forest loss at lower levels.

INTRODUCTION

For most of the twentieth century the Blue-tailed Trogon of Sumatra and Java was consistently known as a single species under the names *Harpactes reinwardtii reinwardtii* (Java) and *H. r. mackloti* (Sumatra). For a time, Robinson and Kloss (1918, 1919, 1920) treated *mackloti* as a separate species, but presumably when they saw material from Java they felt that the unification of the two taxa under the specific name *reinwardtii* better expressed their undeniable systematic proximity (Robinson and Kloss 1924a,b); and this arrangement was promptly and universally adopted. It was one of apparently many such amalgamations of South-East Asian birds made in the 1920s and 1930s, mostly by authorities based in Singapore (Robinson, Kloss and F. N. Chasen). The practice was part of the major movement of the time to synthesise avian taxa into the system of avian classification based on subspecies which is widely accepted today; and, with occasional exceptions (see, e.g., Collar and Long 1996), the insights of these authorities have proved robust. However, the frustration for modern workers is that these amalgamations were clearly regarded as too self-evident to require written justification or discussion, so that, in cases where they might be open to question, it is impossible to determine the basis on which they were made. This is true of *H. r. reinwardtii* and *H. r. mackloti*.

In a recent treatment of the Trogonidae, one of us (Collar 2001) reinstated the genus *Apalharpactes* for these taxa, given several characters (normally fully red bill, yellow-orange legs, green upperparts, blue and glossy tail, and apparently voice) not shared with the exclusively Asian *Harpactes*, and took the further step of recognising both taxa at the species level, giving them the names Javan Trogon *A. reinwardtii* and Sumatran Trogon *A. mackloti*. It is perhaps worth noting that Robinson and Kloss maintained the generic placement (as '*Hapalarpactes*'); absorption in *Harpactes* only took place with Chasen (1935), followed by Peters (1945). The comment accompanying Collar's measure was that 'recent research, as yet unpublished' indicated the probable appropriateness of this split, based on measurements, plumage and voice. Here we present the results of this research, which fundamentally relates to morphometric differences between the two taxa.

MATERIALS AND METHODS

Although the Blue-tailed Trogon is rather poorly represented in museum collections, Naturalis ('RMNH', Leiden, Netherlands) and the Natural History Museum ('BMNH', Tring, U.K.) each hold a modest series (although the latter has only three specimens from Java). We inspected and discussed this material, and NJC took measurements from a sample of it. Specimens were chosen on the basis of intactness of measurable parts, and on the appearance of being adult; in all, eight males and nine females of each taxon were selected (*reinwardtii* RMNH 13, 14, 16, 15057, 47605–7, 47610, 47613–4, 47616–7, 47619, 47621, BMNH 73.5.12.1214, 81.5.1.5110, 81.5.1.5131; *mackloti* RMNH 7, 8, 29, 76, 155, 406, 482, 1018–9, 1076, 4356, 5145, 25487, 25980, BMNH 88.11.12.20, 88.11.12.26, 1920.6.29.115). Measurements were taken with calipers and rulers. Wings were measured curved, with calipers, to avoid specimen damage. The base of the tail was sought with care using one point of the callipers. The width of the central rectrix was measured at mid-length (as judged by eye) of the exposed feather; only specimens with unfrayed and naturally lying vanes were used. The bill measurement is the length of the gonys, from the base (point of caliper inserted) to tip. In addition, we assessed differences in plumage and bare-part coloration based on this material and on evidence in the literature; and we listened to tape-recordings of voice by Smith (1994), E. Vercruysse and SvB.

RESULTS

There were no significant differences between the biometrics of males and females for specimens of *reinwardtii* (Mann-Whitney U-tests: n = 8 males, 9 females, *P* values ranged from 0.12 to 0.52) or *mackloti* (Mann-Whitney U-tests: n = 8 males, 9 females, *P* values ranged from 0.12 to 0.65). Highly significant differences

Table 1. Mean biometrics for specimens of *Apalharpactes reinwardtii* and *A. mackloti*; *z* and *P* values come from Mann-Whitney U-tests; sample sizes for central rectrix width were 15 *reinwardtii* and 16 *mackloti*.

		Wing length (mm)	Tail length (mm)	Central rectrix width (mm)	Gonys length (mm)
reinwardtii	Mean	**141.8**	**198.2**	**23.7**	**10.3**
(n=17)	SE	1.37	2.66	0.40	0.10
	Range	132–151	185–228	21–26	9.5–11.5
mackloti	Mean	**127.3**	**173.1**	**20.4**	**8.5**
(n=17)	SE	1.25	1.18	0.46	0.1
	Range	118–140	164–180	18–23	8–9.5
	z	-4.75	-4.98	-3.92	-4.99
	P	<0.0001	<0.0001	<0.0001	<0.0001

between the two taxa were found for all four measurements taken (Table 1).

Javan Trogons thus proved to be 11.3–21.1% larger in the features measured than Sumatran Trogons. Assuming that proportionate difference in mass of the two taxa is roughly equivalent to the difference between the cubes of a mensural ratio, and assuming that wing difference (11.3%) is the most dependable (and here the most conservative) standard measurement, the body mass of Javan Trogon emerges as one-third greater again than Sumatran based on a wing-length ratio of 1:1.1 ($1.1^3 = 1.33$). This conforms with the impression of a considerable size difference in prepared museum material (irrespective of any bias created by stuffing style and method), consistently suggesting Javan Trogon to be 25% 'longer' (see Fig. 1), a feature not fully reflected in the plate illustration accompanying Collar (2001).

The key plumage difference lies in the presence in male Sumatran Trogons of a maroon or dark chestnut rump-band (Fig. 2), which according to Robinson and Kloss (1918) develops at a very early age. A second, minor difference lies between females, in their barred 'wing-panels': in Sumatran birds the barring is narrower and the background greener than in Javan birds, such that the wing-panel might scarcely be visible in the field (Fig. 3).

Descriptions of bare parts and facial skin, as indicated for Sumatran Trogon by Robinson and Kloss (1918, 1924a) and Chasen and Hoogerwerf (1941), are consistent with those for Javan Trogon on labels in RMNH, where six specimens collected by H. W. van der Weele and one by Baron van Dedem possess bare-part colour data (supplied by R. W. R. J. Dekker *in litt.* 2002): *iris* (Java) black, brown-black, brown, blue, (Sumatra) dark grey, dark brown, amethyst or plum; *periorbital skin* (Java) azure-blue, (Sumatra) turquoise-blue (emerald-green at gape), turquoise-blue (purplish round the eye, verditer-green at gape), pale blue or blue-grey; *bill* (Java) coral-red, red-brown, yellow-brown, (Sumatra) 'lake red', cherry red, red (some basally light green); *tarsus* (Java) pale yellow, sulphur-yellow, yellow, orange-yellow, yellow-red, (Sumatra) yellowish-orange, pale orange to pale red.

Descriptions of voice in the literature are inconclusive, as are tape-recordings from the field, but the indications are fairly strong. Hoogerwerf (1950) gave the call of Javan Trogon as 'a penetrating *tierr* or *tsierrr* or a loud, hoarse *turrr* accompanied by fanning of the tail' (translation: SvB). A tape-recording by Smith (1994) agrees with the former call, sounding like a dry high rattling *sterrrr*, as does another by SvB, and J. H. Becking (verbally 2001) states that he is unaware of any other call in the species than the *tierr* call. The unpublished notebooks of Bartels (1915-1931), involving a comparison with Orange-breasted Trogon *Harpactes oreskios*, the only other trogon on Java, give further confirmation:

> [Javan Trogon] differs very markedly from [Orange-breasted Trogon] by its lack of a proper call. It has merely a rather weak call-note, which sounds like *kirrr* or *zirrr*, and also an alarm note which is given when startled and flying off. When it gives its occasional call-note, perched quietly, the tail-feathers are slightly fanned. [Translation: SvB]

Of the Sumatran Trogon, Robinson and Kloss (1924a) declared that 'its song consists, like that of other Trogons, of rolling, low pitched notes'. Similarly, A. Lewis (verbally 1989) reported that birds on Sumatra produce short series of rolling notes not unlike other sympatric trogons. However, such notes are probably not a true song, since this seems to be something quite different: based on a recording by E. Vercruysse, it is a rather un-trogon-like (but rather frogmouth-like—SvB) 'high whistled *wiwi whéeer-lu*' (Collar 2001), the *whéeer* being much the longest part and falling in pitch, giving it a slightly yodelling quality. This is evidently the main call described by Lewis *et al.* (1989) as a rather quiet *ka-ka-khew*, similar in quality to Red-headed Trogon *Harpactes erythrocephalus* (to SvB the similarity to the latter species is in its brevity). To date this highly distinctive sound has not been heard (and, from the testimony cited above, seems not to exist) in Javan Trogon, and therefore could represent a significant difference between the two taxa.

DISCUSSION

The morphological distinctiveness of the two forms of blue-tailed trogon is intriguing, because it rests on just two main characters, (1) size and (2) the maroon-chestnut rump-band (oddly positioned, and really a lower back- and upper rump-band) of the male *mackloti*. Although only two in number, both key features are unusual and striking. There is no other case in trogons

Figure 1. Male *Apalharpactes reinwardtii* (left) and male *A. mackloti* (right) at the Natural History Museum, Tring. Photo: P. G. W. Salaman.

where two acknowledged subspecies have such a marked size difference, nor is there another trogon which shows a rump-band. Whatever the significance of this latter character (and it seems likely to be considerable), a weight difference of some 33% is alone suggestive of a condition (if not a mechanism) that would be likely to isolate the populations biologically if they were ever to come into contact. It is, of course, ultimately a matter of judgement where species limits are delineated in allopatric forms, but we feel that the characters at work in this instance are sufficiently strong to warrant taking a narrower view of such limits than has prevailed for the past three-quarters of a century. This is particularly the case given the few and/or minor morphological differences that are admitted as species-level markers between allopatric Neotropical trogons such as Pavonine and Golden-headed Quetzals *Pharomachrus pavoninus* and *P. auriceps* (bill colour and shade of head), White-tailed and Baird's Trogon *Trogon viridis* and *T. bairdii* (colour of lower underparts) and Citreoline and Black-headed Trogon *T. citreolus* and *T. melanocephalus* (iris and eye-ring colour, hood shade) (see Collar 2001).

The vocal evidence remains ambiguous and in need of elucidation. It appears that Sumatran Trogon has a song that is not possessed by Javan Trogon. However, it may be that, for whatever reasons, the Javan bird delivers a similar song but much less frequently; it may even be that the song is just as frequent, but has simply never been picked up by visiting ornithologists (the Sumatran song is a relatively recent discovery). However, even if the voices of the two taxa prove eventually to be identical, we are inclined to take the view that the morphological characters they exhibit are alone of sufficient significance to set them apart at the species level (as in Citreoline and Black-headed Trogons, whose voices are similar to the point of inseparability); but that if the voices prove to be distinct, this will be full confirmation of the position we take.

The implications for conservation of this split are notable. Both are montane species. In their summary of its status, van Marle and Voous (1988) gave the range of Sumatran Trogon as 'throughout the mountain ranges', and sites in the BirdLife International Biodiversity Project database (north to south), compiled

Figure 2. Lower upperparts of male *Apalharpactes reinwardtii* (left) and male *A. mackloti* (right) at the Natural History Museum, Tring. Photo: P. G. W. Salaman.

Figure 3. Wing panel of female *Apalharpactes reinwardtii* (bottom) and female *A. mackloti* (top) at the Natural History Museum, Tring. Photo: P. G. W. Salaman.

up to 1995, confirm this: Atang Putar, Palok, Simpang Agusan, Gayo Highlands, Bandar Baru, Berastagi, Talangtalu, Gunung Talamau, Gunung Singgalang, Lubuksulasih, Alahanpanjang, Gunung Kerinci, Sungaikumbang, Siolok Daras, Sandaran Agung, Palembang district, Rimbopendagang, Gunung Kaba and Air Njuruk (Gunung Dempo), thus spanning a north-west–south-east line from 4°20′N 97°15′E to 4°00′S 103°07′E (BirdLife database information provided by M. J. Crosby). It is also, at least in places, a common species: as examples, in seven days on Kerinci in July 1994 J. A. Tobias (*in litt.* 2002) saw at least five different birds per day, and in Bukit Barisan Selatan National Park, also in July 1994, he saw 3–4 birds in half a day.

The situation of the Javan Trogon is very different. While we have not attempted a complete review of sources, the species appears to have been recorded from only a small area of West Java. We know of records (west to east, with coordinates taken from BirdLife International [2001] or, for Awibengkok and Kertamanah, NIMA [2002]) from: **Gunung Halimun** (6°42′S 106°26′E) in August 1922 (three specimens in RMNH) and in recent years specifically at Nirmala, 1986–1989 (SvB) and at Cikotok, 1994–1995 and 2001 (D. Liley *in litt.* 1999, Ria Saryanthi *in litt.* 2002, SvB); **Gunung Salak** (6°45′S 106°41′E), down to 1984 (Kuroda 1933-1936, P. Andrew in BirdLife database), and specifically at Awibengkok (6°44′S 106°40′E), September 1988 (SvB), at Pasirreungit (6°42′S 106°42′E), 1981–1986 (SvB), at Singkur (between Salak and Perbakti summits), 1882 (Vorderman 1886), and at Gunung Endut (6°47′S 106°40′E), around 1900 (Bartels 1906); **Gunung Gede-Pangrango** at Gadog (6°40′S 106°43′E), 1859 (specimen in RMNH), at Tapos (6°41′S 106°53′E), November 1993 (SvB), at Megamendung (6°38′S 106°55′E), July 1981 (SvB), at Cibodas (6°46′S 106°58′E) down to the present (e.g. Robinson and Kloss 1924b, Andrew 1985, SvB), at Pasir Datar (6°50′S 106°53′E), around 1900 (Bartels 1906), and at Telaga Warna (6°42′S 106°59′E), February 1981 (SvB); **Gunung Patuha-Tilu** at Koleberes (7°11′S 107°29′E), in the years 1927–1929 (Bartels 1931; hence presumably Hoogerwerf 1948); **Gunung Wayang** at Pengalengan (7°10′S 107°34′E), around 1890 (Hartert 1891) and on the Kertamanah kina estate (7°12′S 107°36′E), May 1910 (four specimens in RMNH); **Gunung Papandayan** (7°20′S 107°44′E), around 1900 (Bartels 1906; hence presumably Hoogerwerf 1948).

Thus all records of the Javan Trogon come from six main mountain sites—only three of which (Halimun, Salak and Gede-Pangrango) have produced evidence of survival in the past 20 (indeed in the past 60) years—within a rectangle of land defined by 6°38′–7°20′S and 106°26′–107°44′E, an area of just 80 × 145 km, or 11,600 km². This is smaller than that historically occupied by Javan Cochoa *Cochoa azurea*, which is treated as threatened (Vulnerable) in BirdLife International (2001) on the basis of both restricted area and low population. Sody (1956) mentioned 800 m as the lower limit of the Javan Trogon, while Bartels (1906) referred to it as present and not rare on Endut, Pangrango and Papandayan at 'von 3000 bis 6000 Fuss' (from 3000 to 6000 feet), which is best to regard as 1,000–2,000 m. Hoogerwerf (1950) encouragingly referred to the species ranging as high as 2,400 m, and Andrew (1985) even gave 2,600 m. Nevertheless, the loss of forest on the lower slopes of the various mountains within its range (regarded as sufficient to trigger the 'small range contraction' criterion for the Javan Cochoa in BirdLife International 2001) must be a cause of alarm. The only place the species appears to be common now is Gunung Halimun, where SvB saw six birds in six days in April–May 1995, but this was at 1,000 m, nearing the lowest elevation (800 m) of forest in the area (and away from Halimun it is difficult to find forest below 1,000 m in the known range of the species: SvB). Elsewhere, at somewhat higher elevations, recent observers have tended to find very few birds—for example, in seven days on Gunung Gede-Pangrango in June 1994 J. A. Tobias (*in litt.* 2002) saw just a single bird.

Whatever the circumstances, the Javan Trogon must still possess a relatively small global total population; we would be disinclined to believe that more than a few hundred pairs live in each of the three 'current' sites, and indeed it is possible that only a few tens of pairs are present on Gede and Salak, leaving only Halimun as a site where a long-term viable population may persist. We certainly recommend (1) that the Javan Trogon be elevated to species rank on the basis of the evidence presented here, (2) that it be formally assessed against the IUCN threat status criteria for Red List inclusion at the earliest opportunity, and (3) that it become the target of a field investigation to determine its range, population, trends and ecology over the next few years.

ACKNOWLEDGEMENTS

We are most grateful to: R. W. R. J. Dekker of Naturalis, Leiden, Netherlands, and R. P. Prys-Jones of the Natural History Museum, Tring, U.K., who allowed access to specimens in their care, and provided further information on this material; P. G. W. Salaman, who took the photographs; S. H. M. Butchart, S. T. Garnett and G. M. Crowley for the statistical analysis; K. D. Bishop, S. W. Smith, F. Verbelen and E. Vercruysse for their tape-recordings or help in obtaining them; M. J. Crosby, for information from the BirdLife Biodiversity Project database; P. Andrew, D. Liley and Ria Saryanthi for their records; Rudyanto for supplying coordinates of sites not in BirdLife International (2001); and L. D. C. Fishpool and J. A. Tobias for their referees' comments.

REFERENCES

Andrew, P. (1985) An annotated checklist of the birds of the Cibodas–Gunung Gede Nature Reserve. *Kukila* 2: 10-28.

Bartels, E. (1931) Vogels van Kole Beres. *Natuurk. Tijdschr. Nederlandsch-Indië* 91: 308-348.

Bartels, M. (1906) Systematische Übersicht meiner Java-Vögel. *J. Orn.* 54: 383-407, 497-519.

Bartels, M. (1915-1931) Diaries and notebooks on Javan birds. Unpublished typescripts and manuscripts held at RMNH.

BirdLife International (2001) *Threatened birds of Asia: the BirdLife International Red Data Book*. (Third edition, part 3). Cambridge, U.K.: BirdLife International.

Chasen, F. N. (1935) A handlist of Malaysian birds. *Bull. Raffles Mus.* 11: 1-389.

Chasen, F. N. and Hoogerwerf, A. (1941) The birds of the Netherlands Indian Mt Leuser Expedition 1937 to North Sumatra. *Treubia* 18 (suppl.).

Collar, N. J. (2001) Family Trogonidae (trogons). Pp.80-127 in J. del Hoyo, A. D. Elliott and J. Sargatal, eds. *Handbook of birds of the world*, 6. Barcelona: Lynx Edicions.

Collar, N. J. and Long, A. J. (1996) Taxonomy and names of *Carpococcyx* cuckoos from the Greater Sundas. *Forktail* 11: 135-150.

Hartert, E. (1891) Über eine kleine Vogelsammlung aus der Provinz Preanger in West-Java. *Ornis* 7: 113-123.

Hoogerwerf, A. (1948) Contribution to the knowledge of the distribution of birds on the island of Java, with remarks on some new birds. *Treubia* 19: 83-137.

Hoogerwerf, A. (1950) De avifauna van Tjibodas en omgeving, inclusief het natuurmonument Tjibodas–Gn. Gede (West-Java). *Limosa* 23: 1-158.

Kuroda, N. (1933-1936) *Birds of the island of Java*. Tokyo: Kuroda.

Lewis, A., Morris, P. and Higgins, N. (1989) West Indonesia 1989: Sumatra, Java and Bali. Unpublished birding trip report.

van Marle, J. G. and Voous, K. H. (1988) *The birds of Sumatra*. Tring, UK: British Ornithologists' Union (Check-list 10).

NIMA = National Imagery and Mapping Agency (2002) Database of foreign geographic feature names. GEOnet Names Server (online at http://164.214.2.59/gns/html/index.html, at time of use last updated 14 June 2002).

Peters, J. L. (1945) *Check-list of birds of the world*, 5. Cambridge, Mass.: Harvard University Press.

Robinson, H. C. and Kloss, C. B. (1918) Results of an expedition to Korinchi Peak, Sumatra: 2, birds. *J. Fed. Malay States Mus.* 8: 81-284.

Robinson, H. C. and Kloss, C. B. (1919) On a collection of birds from N.E. Sumatra. *J. Straits Branch R. Asiatic Soc.* 80: 73-133.

Robinson, H. C. and Kloss, C. B. (1920) On a collection of birds from N.E. Sumatra. Part II. *J. Straits Branch R. Asiatic Soc.* 81: 79-115.

Robinson, H. C. and Kloss, C. B. (1924a) On a large collection of birds chiefly from West Sumatra made by Mr E. Jacobson. *J. Fed. Malay States Mus.* 11: 189-347.

Robinson, H. C. and Kloss, C. B. (1924b) A nominal list of the birds collected in Java. *Treubia* 5: 267-298.

Smith, S. W. (1994) Bird recordings from Java, Bali and Sumatra. Unpublished tape-recordings.

Sody, H. J. V. (1956) De Javaanse bosvogels. *Madjalah Ilmu Alam untuk Indonesia* 112: 153-170.

Vorderman, A. G. (1886) Bijdrage tot de kennis de avifauna van den berg Salak. *Natuurk. Tijdschr. Nederlandsch-Indië* 45: 304-414.

N. J. Collar, BirdLife International, Wellbrook Court, Girton Road, Cambridge CB3 0NA, U.K., and Conservation Biology Unit, Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ, U.K. Email: nigel.collar@birdlife.org.uk

S. van Balen, Tropical Nature Conservation and Vertebrate Ecology Group, Wageningen University, Bornsesteeg 69, 6708 PD, Wageningen, Netherlands. Email: Bas.vanBalen@staf.ton.wau.nl