Threatened Birds of Asia:
The BirdLife International Red Data Book

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SPOTTED IMPERIAL-PIGEON
Ducula carola

Critical □ —
Endangered □ —
Vulnerable ■ A1a,c,d; A2c,d; C1

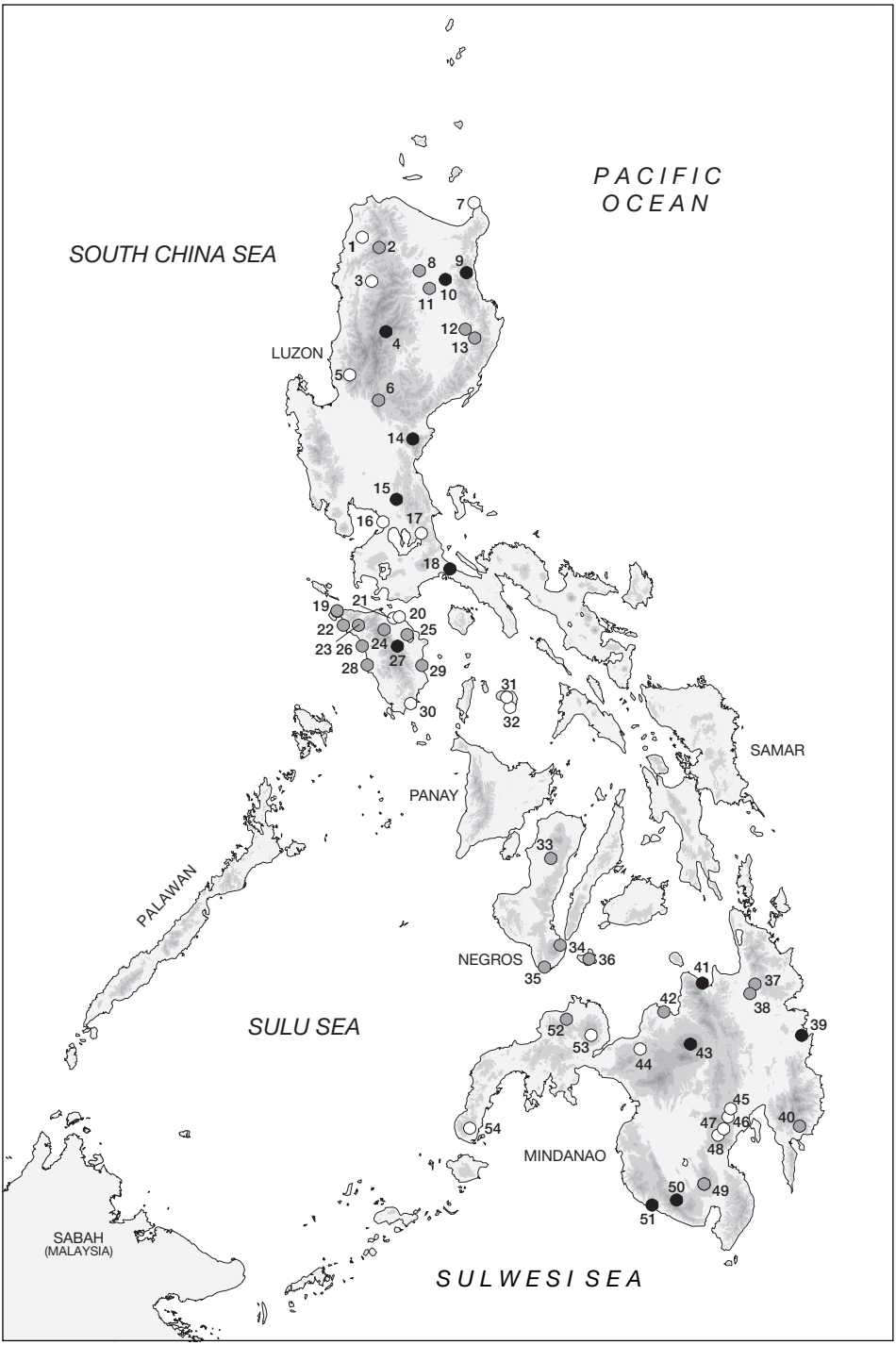
This nomadic species has a small population which is inferred to be declining rapidly owing to forest loss throughout its range, compounded by widespread hunting, qualifying it as Vulnerable.

DISTRIBUTION The Spotted Imperial-pigeon (see Remarks 1) is endemic to the Philippines where it is represented by three subspecies distributed rather patchily throughout the archipelago, nominate *carola* being found on Luzon, Mindoro and Sibuyan, *nigrorum* on Negros and (presumably this race: see Breeding, below) Siquijor, and *mindanensis* on Mindanao (Dickinson *et al.* 1991; see Remarks 2). Records from Luzon are all from north of Manila, but there is a specimen (in MCML) labelled "South Luzon", June 1839, which conceivably refers to a population now lost from the southern peninsula. Site-specific records are as follows:

■ ***PHILIPPINES*** *Luzon* (*western*) **San Esteban** (presumably the town on the coast in Ilocos Norte), May 1921 (male in MCZ); **Mt Sicapo-o** at Mt Simminublan, Ilocos Norte, 480 m, April 1959 (male in FMNH); **Massisiat**, Abra, 1,050 m, May 1946 (17 specimens in FMNH, PNM; also Rabor 1955a,b); **Mt Polis**, Lagawe, Ifugao province, at 2,100 m, February 1996 (T. H. Fisher verbally 1997); **Irisan**, Benguet, April–June 1903 (McGregor 1904a); **Dalton Pass**, Nueva Vizcaya, August, September and November 1969, June 1970 and January 1973 (15 specimens in ANSP, DMNH, PNM; also McClure and Leelavit 1972); (*eastern*) **Cape Engaño**, May 1895 (female in BMNH; hence Ogilvie Grant 1896a); **San Vicente**, Tuao, Cagayan, February 1971 (two specimens in PNM); **Mt Cetaceo**, May 1992, when a flock of 10 was seen (Danielsen *et al.* 1994, Poulsen 1995); **Peñablanca**, Cagayan, 150 m, October 1982 (male in NCSM), and at Quibal, 240 m, February 1980 and undated (two specimens in DMNH); **Liwan** at Kenama (or Kinama), Kalinga-Apayao, 450 m, December 1970 and January 1971 (two females in DMNH, PNM); "Molino", at or near present-day **San Mariano**, Isabela, May 1894 (male in BMNH; hence Ogilvie Grant 1895a), and, at 180–210 m, April–May 1961 (21 specimens in AMNH, PNM); **Disulap**, San Mariano, 180 m, April and May 1961 (two specimens in CM); **Maria Aurora Memorial National Park** in the Talisi Valley, Dinalongan, April 1996 (D. W. Billing *in litt.* 1997, T. H. Fisher verbally 1997); (*central*) Angat watershed near **Angat Dam**, where forest stretches to the southern Sierra Madre, January 1990 (Lambert 1993c), and subsequently to 1996 at least (Poulsen 1995, T. H. Fisher verbally 1997); "**Manila**", undated but in seven cases before 1889 (nine specimens in BMNH, MCML, ZSM;

The distribution of Spotted Imperial-pigeon *Ducula carola* (map opposite): (1) San Esteban; (2) Mt Sicapo-o; (3) Massisiat; (4) Mt Polis; (5) Irisan; (6) Dalton Pass; (7) Cape Engaño; (8) San Vicente; (9) Mt Cetaceo; (10) Peñablanca; (11) Liwan; (12) San Mariano; (13) Disulap; (14) Maria Aurora Memorial National Park; (15) Angat Watershed; (16) Manila; (17) Mt Salangbato; (18) Quezon National Park; (19) Mt Calavite; (20) Calapan; (21) Balete; (22) Mamara; (23) Pulo; (24) Mt Halcon; (25) Alcate; (26) Tilago; (27) MUFRC Experimental Forest; (28) Siburan; (29) Bok-bok; (30) Bulalacao; (31) Sibuyan; (32) San Fernando; (33) Mt Canlaon; (34) San Antonio; (35) Siaton; (36) Capalasanan; (37) Sumile; (38) Maguinda; (39) Bislig; (40) Mt Mayo; (41) Lunao; (42) Opol; (43) Mt Kitanglad; (44) Pantar; (45) Davao; (46) Calinan; (47) Mt McKinley; (48) Mt Apo; (49) Mt Matutum; (50) Lake Sebu; (51) Luhan; (52) Matam; (53) Mt Malindang National Park; (54) Zamboanga.

○ Historical (pre-1950) ◍ Fairly recent (1950–1979) ● Recent (1980–present)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also Wardlaw Ramsay 1886, McGregor 1920), and occasionally down to 1905 (McGregor 1905a); **Mt Salangbato**, Sta Maria, Laguna, April 1923 (two males in FMNH); **Quezon National Park**, February/March 1986 (Turton *et al.* 1986; hence Poulsen 1995);

Mindoro **Mt Calavite** on the west slope, 180 m, February 1964 (male in PNM); **Calapan**, May 1890 (two specimens in ZMB); **Balete**, on the Baco river near Mt Halcon, March–May 1905 (McGregor 1905c); **Mamara**, June 1972 (six specimens in PNM); Bojo (untraced), June 1888 (male in BMNH); **Pulo**, Abra de Ilog, Mindoro Occidental, April 1969 (male in DMNH); **Mt Halcon**, April 1937 (Peters 1939), specifically Ilong Peak at 1,200–1,670 m, May 1954, with observations made at nearby Barrio Go-ob, May–June 1938 (Ripley and Rabor 1958), on the north slope at Arangin, July and August 1964 (three specimens in AMNH, PNM), and at Bignay, March 1937 (female in MCZ); **Alcate**, Victoria, 30 m, June 1969 (two males in DMNH); Malpalon, by report only (i.e. requiring confirmation) (Dutson *et al.* 1992); **Tilago**, Santa Cruz, 150 m, June 1966 (female in AMNH); **MUFRC Experimental Forest**, 1980 (Catibog-Sinha 1982); **Siburan** (Sablayan on label), June 1950 (female in PNM); **Bok-bok**, Bongabong, 200 m, July 1963 (female in AMNH); **Bulalacao**, between May 1905 and February 1906 (McGregor 1906a); Kamali-malihan (untraced), Mindoro Occidental, May 1971 (three specimens in DMNH, PNM);

Sibuyan unspecified locality, June 1904 (two specimens in FMNH; also McGregor 1905a); **San Fernando**, August 1928 (Baud 1976);

Negros **Mt Canlaon**, April 1896 (Ogilvie Grant 1896c, Whitehead 1899d) and April–May 1953, with one specimen taken as high as 2,210 m (Ripley and Rabor 1956); **San Antonio**, Sibulan, September 1952 (male in FMNH); **Siaton** at Sumaliring, July 1959 and 8 km to the north, July 1964 (two specimens in DMNH);

Siquijor **Capalasanan**, Lazi, December 1952 (female in FMNH; also Rand and Rabor 1960);

Mindanao (*eastern*) **Sumile** at 100–500 m, November/December 1976 (Sanguila and Tabaranza 1979); **Maguinda**, Agusan, at 50–100 m, November/December 1976 (Sanguila and Tabaranza 1979); **Bislig** at the PICOP concession, February 1984 (Gibbs 1984), March 1990 (Greensmith 1990), February 1994 (Hornbuckle 1994) and February 1997 (P. A. J. Morris *in litt*. 1997); **Mt Mayo**, Limot, Mati, March and April 1949 (four specimens in PNM), June 1965 (male in USNM); (*central*) **Lunao**, Gingoog City, 150 m, June 1980 (male in DMNH); **Opol**, Misamis Oriental, September 1951 (male in ZMC); **Mt Kitanglad**, unspecified area in 1997 (F. Verbelen *in litt.* 1997), and at Malaybalay, April 1960 (two specimens, one at 1,500 m, in DMNH; also Ripley and Rabor 1961); **Pantar**, September 1903 (female in USNM); "**Davao**", September 1908 (male in AMNH); **Calinan** (as "Catalnan"), March 1930 (four specimens in YIO); **Mt McKinley** on the east slope, 1,450–2,150 m, August and September 1946 (two specimens in PNM); **Mt Apo** at Sibulan, early 1882 (Kutter 1883), at 2,400 m, March 1905 (Ogilvie Grant 1906, Dickinson *et al.* 1991), and at Apo Lake and near Kidapawan, February 1929 (nine specimens in DMNH and YIO; also Hachisuka 1930) and at Faggamb, February 1929 (two specimens in AMNH and YIO); **Mt Matutum**, Tupi, 1,500 m, March 1962 (female in AMNH), June 1966 (female in USNM), and at Balisong, Kablon, Tupi, September 1963 (male in PNM); **Lake Sebu** at Sitio Siete, February 1986 (Fisher mss), 1993 (N. Bostock verbally 1993), 1997 (F. Verbelen *in litt.* 1997); **Luhan**, New Dumangas, T'boli, South Cotabato, between mid-1984 and mid-1985 (Krupa *et al.* 1985); (*western*) **Matam**, Katipunan, May 1952 (two males in FMNH); **Mt Malindang** at McMurray Flats, Grand Malindang Peak, 1,850 m, June 1906 (male in USNM), and at Mt Bliss, 1,750 m, May 1906 (male in USNM); **Zamboanga** town, in the period March–May 1878 (Tweeddale 1878h).

POPULATION This "flocking species" (Rand and Rabor 1960) is presumably uncommon (Dickinson *et al.* 1991), and certainly the number of recent (post-1990) localities is only seven (four in the Sierra Madre on Luzon, three on Mindanao).

Luzon The species was considered "fairly common" in parts of northern Luzon at the end of the nineteenth century, its abundance or scarcity in any given locality depending on the availability of fruit (Whitehead 1899d). A flock of 23 was observed in forest near Angat Dam in 1990 (Lambert 1993c), flocks of 15–20 birds have been seen leaving roost sites on several occasions subsequently (T. H. Fisher verbally 1997) and 10 birds were seen in small flocks on Mt Cetaceo, where several other sightings of *Ducula* might have referred to this species (Danielsen *et al.* 1994). It is now apparently rare and local in the Sierra Madre, where it was seen only once during four months of fieldwork in 1991 and 1992 (Poulsen 1995).

Mindoro A recent survey on Mindoro in 1991 failed to locate the bird, although it was reported by a local at Malpalon (Dutson *et al.* 1992, Evans *et al.* 1993a, G. C. L. Dutson *in litt*. 1996).

Sibuyan There has been no record since 1928 (Baud 1976) despite recent surveys (Evans *et al.* 1993a, Goodman *et al.* 1995).

Negros In 1896 the species was "commonly met with in flocks on the volcano of Canloon [*sic*] at an elevation of 6000 feet" (Ogilvie Grant 1896c). In the 1950s the species was still recorded as common at undisclosed sites near sea-level in the period September–November (Ripley and Rabor 1956). During a recent survey of Negros in 1991 the species was not found (Brooks *et al.* 1992, Evans *et al.* 1993a).

Siquijor There has been only the one record, in 1952, and no evidence of the species was found during a recent survey on the island in 1991 (Evans *et al.* 1993b).

Mindanao Hachisuka (1932b) stated that he had often encountered this species on Mindanao, but gave no further details. The only recent (1990s) reports for the entire island are those from Mt Kitanglad (although not found during a 1992–1993 survey: Heaney *et al.* 1993), Bislig and Lake Sebu, and indeed the species is thought to have declined at the last site (N. Bostock verbally 1994).

ECOLOGY ***Habitat*** The Spotted Imperial-pigeon occurs in forest and forest edge from the lowlands to 2,000 m (Rand and Rabor 1960, Dickinson *et al.* 1991); however, although there is one record from as high as 2,400 m on Mt Apo (see Distribution), in general the species appears to be more a bird of lower levels (which may explain its current rarity). In the Sierra Madre it is confined to primary and selectively logged forest with closed canopy (>70%) (Danielsen *et al.* 1994). However, Rabor (1955b) reported that birds in the Abra highlands would circle the forest in flocks before dawn, alighting in certain fruiting trees, but that as soon as sun lit the area they would set off towards the west, where they would reportedly be caught with lime in "stunted trees and shrubs growing abundantly on the uninhabited rocky windswept coasts"; in the daytime there would thus be only a few birds left behind, but in the evening (after sunset) the flocks would again appear flying in the vicinity (on cloudy days they would stay all day in the uplands).

Food Delacour and Mayr (1946) reported birds taking large fruit and berries, often with considerable numbers gathering in fruiting trees, but the source of this information is not known. Hachisuka (1931–1935) mentioned large seeds or nuts. Birds have been witnessed eating *Eugenia* fruit, and alighting in and almost certainly eating (though not positively seen) *Ficus* (Rabor 1955b). Evidence of witnesses (Whitehead 1899d, Rabor 1955b) indicates that this is a gregarious nomadic species that travels long distances in search of food; what food they might have found in the coastal habitat in which they were reported to be trapped (see above) is not known, although one idea is they descend into such habitat to bathe or drink in salt or fresh water, as do (or are reported to do) a few other pigeon species in Japan and Sulawesi (D. Allen verbally 1997, D. Gibbs verbally 1998). On Mindoro in 1938 birds were seen to come to fruiting trees in the early morning and late afternoon, with seemingly little feeding activity in the intervening period (Ripley and Rabor 1958).

Breeding The fragments of information suggest a complex pattern perhaps varying between years, but in general the season lasts from February to July. A male from Mindanao, February, and another from Mindoro, April, had enlarged testes, although two Mindanao females from February were less advanced (DMNH label data); a male from Luzon, April, and another from Mindanao, May, had testes slightly enlarged (FMNH label data), two of four specimens taken on Mindoro in May were breeding, one being secured from a nest with one egg (Ripley and Rabor 1958); a male from Mindanao, June, was undeveloped, while a female with an active ovary was taken in July on Negros (DMNH label data), although on the latter island evidence of breeding was also obtained in April–May (Ripley and Rabor 1956). The bird in FMNH from Siquijor, December, is small and lacks a brown belly, so is presumably juvenile (hence is difficult to attribute to race, as noted by Dickinson *et al.* 1991). The nest found on Mindoro was "very peculiar because it was inside a small hollow on the side of a high perpendicular cliff, about 12 feet from the base" (Ripley and Rabor 1958); the reason why this nest was so peculiar is not clear, since it appears to be the only one on record.

Migration The daily movements described above and reported by Rabor (1955b) were detected in May and claimed by local people on the Ilocos Sur coast to take place from March to June. Similar daily movements were noted on Mt Canlaon, Negros, with birds flying in flocks at enormous speed early each morning over the mountain top and descending to lower elevations, presumably to feed (Whitehead 1899d). Records from Dalton Pass in the period from August patchily to January suggest a further pattern of within-island movement on Luzon, some parts (at least) of the population travelling south into lower areas for what is presumably the winter season. It is possible that this species is nomadic, or becomes so when food supplies run short, and that it wanders rather widely, perhaps breeding opportunistically when it encounters appropriate conditions; this might explain the records from the smaller islands of the archipelago in the early part of this century. Certainly on Negros the record of a bird at 2,210 m in April/May was construed as evidence "that this species is highly migratory locally since it is common near sea level during September, October, and November" (Ripley and Rabor 1956).

THREATS Habitat destruction and hunting, both continuing, are blamed for this pigeon's clearly serious diminution in number and contraction in range (Collar *et al.* 1994). The deliberate conflagration of forests on Mindanao—associated with insurgency—is a problem, particularly on the Zamboanga Peninsula (D. Allen verbally 1997), while at Bislig good primary forest is being clear-felled (under the PICOP logging concession) and the land planted with exotic trees for paper production (B. Gee *in litt.* 1997; also Caufield 1983). On Sibuyan within the Kuyasian Forest, March 1992, there was considerable logging activity, particularly of the remaining large hardwoods, with the Atlas Mining Corporation on the neighbouring island of Masbate being the biggest purchaser in spite of no legal logging concession existing on the island (Goodman and Ingle 1993, Goodman *et al.* 1995). The species appears to have a complex pattern of habitat and food resource use, and this greatly magnifies the risks it faces, since it depends on such habitat and resources in many different places throughout the annual cycle: the patchier these elements become, the more difficult it must be for populations to persist (which is now understood to be the cause of the extinction of the Passenger Pigeon *Ectopistes migratorius*: see Bucher 1992). The hunting of the species is greatly facilitated by its habit of congregating at predictable sites (Manuel 1953), and on the Ilocos Sur coast local people reported to Rabor (1955b) that "great numbers" would be caught with lime and sent to large markets in the province. McGregor (1905b) reported that birds from the vicinity of Manila would occasionally be brought "into the markets here alive".

MEASURES TAKEN The Spotted Imperial-pigeon has been found in four CPPAP sites (Northern Sierra Madre Natural Park on Luzon; Mt Canlaon on Negros; Mts Kitanglad

and Apo on Mindanao) and one NIPAP site (Mt Malindang on Mindanao; see Appendix). Conservation-related activities on Mt Matutum are supported by FPE funding, and the Mt Talinis/Twin Lakes area on Negros (including the Eastern Cuernos de Negros and Lake Balinsasayao "key sites") —close to the San Antonio area—is proposed for action under the same programme (see Appendix). The MUFRC Experimental Forest on Mindoro covers 7,853 ha (Catibog-Sinha 1982) and protects an area of forest suitable for the species, as do Quezon National Park and the Maria Aurora MNP on Luzon, although the long-term outlook for these sites is unknown. The largest tract of lowland forest known on Mindoro is at Siburan (see Appendix) although it is not clear how much of the area receives protection from an adjacent penal colony or from the F. B. Harrison Game Reserve (Dutson *et al.* 1992). However, if this species is dependent on several different areas throughout its annual cycle, these measures may not be sufficient; and if it utilises food resources opportunistically it may prove very difficult indeed to offer any long-term protection for it through conventional means.

MEASURES PROPOSED Apart from the areas targeted for conservation above, the species has been recorded from sites in or near seven "key sites" (Angat Watershed and Mt Polis on Luzon; Mt Halcon and possibly Lake Naujan on Mindoro; Mt Bandila-an on Siquijor; Mts Mayo and Three Kings on Mindanao; see Appendix P) and these deserve further survey and, at least in part, formal designation under the NIPAS process. In order to assess its status and to enable the formulation of a workable conservation management plan, the species needs to be surveyed in its historical range so that information can be gathered on status, distribution and ecology; radio-tagging birds would be exceptionally helpful in understanding their seemingly complex daily and seasonal movements.

REMARKS (1) The affinities of this species are not clear, but it has been judged most likely to be an aberrant offshoot of the *poliocephala* species-group of *Ducula* pigeons, which includes the threatened *mindorensis* (Goodwin 1960). (2) The validity of these subspecies is worth reviewing; McGregor (1905c) found traits in certain populations linking them to others, and the fact that the species appears to wander widely implies that some introgression occurs.