Threatened Birds of Asia: 
The BirdLife International Red Data Book

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CRESTED ARGUS  
*Rheinardia ocellata*

Critical —
Endangered —
Vulnerable ■ A1c,d; A2c,d

This pheasant qualifies as Vulnerable because it is undergoing a continuing rapid population decline as a result of levels of exploitation and a reduction in the extent and quality of its evergreen forest habitat. This trend is projected to continue.

**DISTRIBUTION** The Crested Argus (see Remarks 1) is restricted to the Annamite Mountains dividing Vietnam and Laos, along with other ranges in central and southern Vietnam, with a disjunct population in the mountains of Peninsular Malaysia. Reports from the Indonesian island of Sumatra are unsubstantiated (see Davison 1979a).

■ **LAOS** The species is locally distributed along the central stretch of the Annamites from Xiang Khouang province south to Salavan. Records are from: Phou Sam Soung, Xiang Khouang (=Tranninh), between Ban Phou Sao and Ban Muong Ngan (Muong Ngane), feathers found and the species reported by villagers, c.1940 (David-Beaulieu 1944, Delacour 1977); Sop Theung, Bolikhamsai, in the proposed northern extension to Nakai-Nam Theun NBCA, up to four heard daily on low hills near the confluence of the Nam Theung (not Nam Theun) and Nam Chat, c.530 m, April–May 1997 (Tobias 1997); Nam Dthang (tributary of the Nam Chat), Bolikhamsai, in the proposed northern extension to Nakai-Nam Theun NBCA, up to three heard daily, 600 m, April–May 1997 (Tobias 1997); east of Ban Phonkham, Bolikhamsai, on the Nam Chat, 1–2 heard on nearby ridges, April and May 1997 (Tobias 1997); Nam Pan catchment, Bolikhamsai, common along the wet forest logging road, April–May 1996 (Thewlis et al. 1998), and 33 calling along a c.10 km transect, 850–1,150 m, April 1997 (Tobias 1997); east slope of Phou Chomvoy, in the proposed northern extension to Nakai-Nam Theun NBCA, c.12 calling on ridges, 800–1,400 m, March–April 1997 (Tobias 1997); Nam Kwaï, common, at least 10 calling in a radius of c.1 km, January–February 1994 (Thewlis et al. 1998); Nakai-Nam Theun NBCA, at Ban Nape, previously often heard in mountains above this town which lies on the present Route 8 into Vietnam (Delacour 1929b), also along the Nam Phao, just south of Route 8 where it crosses the Vietnamese border, around seven birds heard, 700 m, March 1997 (Tobias 1997); Ban Navang logging road, Nakai-Nam Theun NBCA, uncommon, with only three heard along c.7 km, 1,000–1,200 m, April 1994, two in April–May 1996 (Thewlis et al. 1998), and three in February–March 1997, plus at least six calling in the Houay Morrow valley, 700–900 m, March 1997 (Tobias 1997); present in the Ban Maka area, Nakai-Nam Theun NBCA, near the headwaters of the Nam Noy, 1990s (Timmins and Evans 1996); Nam Pheo, Nakai-Nam Theun NBCA, five heard in an area of less than 4 km² on a brief visit to hills around Ban Guner, 650–750 m, April 1994; high slopes of the Phou Vang–Phou Yiayto massif, Nakai-Nam Theun NBCA, but not from Phou Ko to the west, December 1996 (Thewlis et al. 1998); Nam On valley, 650 m, heard once, December 1996 (Thewlis et al. 1998); Hin Namno NBCA, feathers found in the Houay Packha valley, December 1995, locals from various villages in the protected area describing the species in forests close to the Vietnamese border (Thewlis et al. 1998) with up to three heard in the Xe Bangfai headwaters, 1998 (Walston and Vinton 1998); Phou Ajol, Salavan, south of Xe Sap NBCA, 1–2 regularly calling, c.1,450 m, May 1996 (Thewlis et al. 1998).

Unconfirmed records are as follows: Savannakhet, eastern parts of the province (adjacent to Xe Pon), 1944 and 1945, reportedly common and trapped with ease although not
encountered by the observer (David-Beaulieu 1949–1950); Ban Nyangdah (49°56′N 107°24′E), Attapu, in the north-eastern mountains and border hills of Dong Ampham NBCA, locally reported to have been present historically but absent since the 1980s (Davidson et al. 1997); Xe Sap NBCA, Xe Kong, reportedly “present but rare” according to local villagers, although not seen for several years (Showler et al. 1998b).

**VIETNAM** The species is quite widespread in the country, occurring at much lower altitudes than in Laos and therefore not restricted to the Annamite range; it has nevertheless become localised owing to habitat loss and hunting pressure (Robson et al. 1993a). Records are as follows: **Rao Bong watershed**, Quang Binh, small numbers calling from ridge-tops and slopes throughout the area, July 1994 (Lambert et al. 1994); **Nghia Dan**, Nghe An, undated (Nguyen Hoang verbally 1993); **Pu Mat Nature Reserve**, Nghe An, 1990s (Le Trong Trai in litt. 1997), heard on several occasions, July and November 1998 (Walston and Vinton 1998), frequently heard and feathers found on two occasions, April–May 1999 (Round 1999); **Cao Veu** village, Anh Son district, Nghe An, feathers found in the village, June 1990 (Nguyen Cu 1990); north of **Vinh**, undated (Nguyen Cu and Eames 1993); **Vu Quang Nature Reserve**, Ha Tinh, listed without details (MacKinnon and Vu Van Dung 1992), a few calling from slopes and ridges above 300 m, June 1994 (Lambert et al. 1994), “common” at all altitudes, July–September 1997 (Kalyakin and Korzun 1997); **Khe Ma Reng**, undated (Nguyen Cu and Eames 1993); **Ke Go Nature Reserve**, Ha Tinh, c.1990 (Robson et al. 1991), mainly around Rao Mon and Rao Buoi stream areas, 1992 (Nguyen Cu et al. 1992), six heard daily, April 1993 (T. Carlberg in litt. 1999), 5–10 heard daily, April 1995 (P. Alström, U. Olsson and D. Zetterström in litt. 2000); **Gat Che Me valley**, Ky Anh district, Ha Tinh, undated (Nguyen Cu and Eames 1993); **Hoanh Son pass**, south of Ky Anh, Ha Tinh, one heard, June 1988 (Robson et al. 1989); **Son Tung**, Ky Anh district, Ha Tinh, three calling, June 1988 (Robson et al. 1989); **Ngang pass**, 1990s (Nguyen Cu and Eames 1993); **Tuyen Hoa district**, Quang Binh, recorded during October and November 1964 (Dang Huy Huynh et al. 1974); **Yen Hop river**, Ke Bang limestone area, Quang Binh province, one calling and feathers found with local hunters, March 1999 (Kalyakin 1999); **Phong Nha Nature Reserve**, Quang Binh, three, April 1995 (P. Alström, U. Olsson and D. Zetterström in litt. 2000); **Vinh Linh district**, Quang Tri, October 1964 (Dang Huy Huynh et al. 1974); **Can Lo**, Quang Tri, February 1924 (male in BMNH, Delacour and Jabouille 1925); **Mai Lang** (or “Hai Lang”), Quang Tri, early 1924 (Delacour and Jabouille 1925); **Ba Long valley**, Quang Tri, 30 km south-west of Quang Tri town, one heard, 300–400 m, May 1991 (Robson et al. 1993b), reported in this area by locals (Eames et al. 1992) and Ba Long and Trieu Nguyen communes, Dakrong district, Quang Tri, June–July 1998 (Le Trong Trai et al. 1999c), and Ba Lang, early 1924 (Delacour and Jabouille 1925); **Lang Khoai**, Quang Tri, November 1925, June and November 1926 (four specimens in BMNH); **Lao Bao**, Quang Tri, August 1924 (male in BMNH); **Khe Lau** and Phong My communes, Phong Dien district, Thua Thien Hue, June–July 1998 (Le Trong Trai et al. 1999c); hills south-west of **Hue**, Thua Thien Hue, 1925–1927 (seven specimens in BMNH and FMNH); **A Sau valley**, Thua Thien Hue, 16 calling birds estimated in the vicinity of Pass 41, June 1988 (Robson et al. 1989); **Thua Luu**, Thua Thien Hue, February and March 1926, February 1927 and March 1928 (Delacour and Jabouille 1927b, Delacour et al. 1928), five birds trapped between March and May 1928 (Delacour 1928), and between Thua Luu and Bach Ma National Park, Thua Thien Hue, 500–900 m, August 1938 and March 1939 (six males in NRM, Eames and Ericson 1996); **Khe La Mai**, undated (Nguyen Cu and Eames 1993); **Bach Ma National Park**, Thua Thien Hue, 100–1,000 m, January and February 1990 (Robson et al. 1991), plus five heard outside the park and at least 21–26 birds heard calling in the southern part of the reserve, including the proposed southern extension (200–700 m) between April and May 1991 (Eames et al. 1992), specifically in the Khe Ao valley (six calling), Song Ta Trach and Khe Thuong valleys, April 1991 (Eames et al. 1992), and several heard in the north-east of
the park (Robson et al. 1993b), “fairly commonly heard”, February 1998 (Mauro 1999),
one, March 1999 (B. Wright in litt. 1999); Nam Dong district, Thua Thien Hue, 200–300 m
(Nguyen Cu in litt. 1997); Ba Na Nature Reserve, Da Nang, undated (Nguyen Cu in litt. 1997),
tail feathers found at three locations, February–March 1994 (Ghazoul et al. 1994),
feathers found on five occasions, July–September 1995 (Hill et al. 1996); Quang Ngai,
undated (Delacour and Jabouille 1931); Ngoc Linh (Quang Nam) proposed nature reserve, Quang
Nam, heard calling “on numerous occasions”, 900–1,250 m, March–April 1999 (Tordoff et al. 2000);
Ngoc Linh (Kon Tum) Nature Reserve, Kon Tum, April–May 1996 and March–
May 1998 (Le Trong Trai et al. 1999b); Kon Cha Rang Nature Reserve (within the Kon Ha
Nung area), Gia Lai, listed by Sokolov et al. (1983), three, May 1982 (Stepanyan et al. 1984),
12 calling, May 1988 (Robson et al. 1989); Kon Ha Nung, Gia Lai, recorded from this site by
tail feathers identified at Buon Luoi and Kon Ha Nung villages (Truong Van La and Nguyen

![Map of distribution of Crested Argus Rheinardia ocellata](image-url)

**The distribution of Crested Argus Rheinardia ocellata:** (1) Ban Muong Ngan; (2) Sop Theung; (3) Nam
Dthang; (4) Ban Phonkham; (5) Nam Pan catchment; (6) Phou Chomvoy; (7) Nam Kwai; (8) Ban Nape;
(9) Ban Navang; (10) Ban Maka; (11) Nam Pheo; (12) Phou Vang; (13) Nam On valley; (14) Hin Namno NBCA;
(15) Phou Ajo; (16) Rao Bong watershed; (17) Nghia Dan; (18) Pu Mat Nature Reserve; (19) Cao Veu;
(20) Vinh; (21) Vu Quang Nature Reserve; (22) Khe Ma Reng; (23) Ke Go Nature Reserve; (24) Gat Che Me
valley; (25) Hoanh Son pass; (26) Son Tung; (27) Ngang pass; (28) Tuyen Hoa district; (29) Yen Hop river;
(30) Phong Nha Nature Reserve; (31) Vinh Linh district; (32) Cam Lo; (33) Mai Lanh; (34) Ba Long valley;
(35) Lang Khoai; (36) Lao Bao; (37) Khe Lau; (38) Hue; (39) A Sau valley; (40) Thua Luu; (41) Khe La Mai;
(42) Bach Ma National Park; (43) Nam Dong district; (44) Ba Na Nature Reserve; (45) Quang Ngai; (46) Ngoc
Linh (Quang Nam) proposed nature reserve; (47) Ngoc Linh (Kon Tum) Nature Reserve; (48) Kon Cha Rang
Nature Reserve; (49) Kon Ha Nung; (50) Mom Ray Nature Reserve; (51) Kon Ka Kinh Nature Reserve; (52) Ea
Trang; (53) Nam Nung Nature Reserve; (54) Nha Trang; (55) Krong Trai Nature Reserve; (56) Hill 1,978;
(57) Long Lanh; (58) Bi Doup-Nui Ba Nature Reserve; (59) Muong Man; (60) Gunung Rabong; (61) Gunung
Gagau; (62) Gunung Tulang Rabong; (63) Gunung Mandi Angin; (64) Gunung Penumpu; (65) Gunung Tahan.

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Cu 1982, Vo Quy et al. 1983, Stepanyan 1995), although apparently now no longer present near these villages (Robson et al. 1989); Mom Ray Nature Reserve, Kon Tum, recorded (Le Trong Trai in litt. 1997); Kon Ka Kinh Nature Reserve (within the Kon Ha Nung area), Gia Lai, undated (Sokolov et al. 1983); Ea Trang, M'Drak district, Bac Lac, seen and frequently heard, April 1998 (Brickle et al. 1998); Nam Nung Nature Reserve, undated (Nguyen Cu and Eames 1993); Nha Trang, Khanh Hoa, collected in hills nearby, January 1906 (male in BMNH); Krong Trai Nature Reserve, Phu Yen, undated (Le Trong Trai in litt. 1997), and apparently recorded in Phu Yen province, June 1994 (Nguyen Cu in litt. 1997), although its occurrence here is perhaps surprising (J. C. Eames in litt. 2000); Hill 1,978 (Phuc Binh), Ninh Thuan, one, November 1993 (Eames 1995a), Phan Rang, Ninh Thuan, undated (Delacour and Jabouille 1931); Long Lanh, Lam Dong, two, May 1991 (Eames et al. 1992); Bi Doup-Nui Ba Nature Reserve, Lam Dong, three heard on Mt Bi Doup at 1,700–1,900 m, May 1991 (Robson et al. 1993b), two heard on Mt Gia Rich, December 1993 (Eames 1995a); Muong Man, Binh Thuan, reported by a hunter to be fairly common in the area, 1997 (Nguyen Cu in litt. 1997); Huong Son (Annamite) Forest (not mapped), Ha Tinh province, common, April–May 1999 (Timmins and Cuong 1999); Rao Mon (untraced), undated (Nguyen Cu and Eames 1993).

There is an unconfirmed report from: Buih Dinh (possibly “Bui Dinh”), south of Hue, undated (Oustalet 1882).

**MALAYSIA** The species is restricted to a small area of mountains in and immediately adjacent to Taman Negara National Park, and there is little evidence to suggest that its range was historically more extensive; records from Gunung Benom are not accepted here (Davison and Scriven undated, Wells 1999; see Remarks 2). The Terengganu slope offers further potentially suitable habitat but it has not yet been fully explored (Wells 1999). Records are from: Gunung Rabong, Kelantan, dancing grounds found at 900–1,000 m with fresh feathers, March 1972 (Wells 1975), seven males, all close to the 900 m contour, May 1976 (Wells 1983), one female at 1,100 m, March 1977 (Wells 1984), 790–1,080 m, 1975–1982 (Davison and Scriven undated), several sightings and dancing grounds found, 650–1,150 m, September 1988, and four males responding to playback, May 1992 (Siti Hawa Yatim 1993, Mamat and Yasak 1998); south-west flank of Gunung Gagau, one tail feather collected from a dancing ground near the summit, 1984 (Wells 1990b, Siti Hawa Yatim 1993); Gunung Tulang Rabong, moulted feathers and calling birds heard between 800 and 1,100 m, undated (Wells 1990b); Gunung Mandi Angin, two dancing grounds found at 880 and 900 m, and an adult male tail feather collected, May 1991, also four dancing grounds plus feathers and one sighting between Sungai Sepia and Camp Gajah, 890–1,150 m, February 1992 (Siti Hawa Yatim 1993, Mamat and Yasak 1998); Gunung Penumpu, one female observed and two dancing grounds found, July 1997 (Mamat and Yasak 1998); Gunung Tahan, Pahang, two males and one female, 1902 (specimen in BMNH, Hartert 1902b), two males, 1905 (Robinson 1908), 820–1,080 m, 1975–1982 (Davison and Scriven undated), c.8 males heard at c.1,000 m around Wray’s camp, May 1980, on the west flank at c.1,100 m, moulted male tail and wing feathers at a dancing ground, April 1984 (Davison 1980a, Wells 1986), two dancing grounds found on the north flank between Merapoh and Gunung Tahan, 1,000 m, February 1992, and further sightings around Camp Kor, August 1996 and July 1997 (Siti Hawa Yatim 1993, Mamat and Yasak 1998).

**POPULATION** Early this century the Crested Argus was described as abundant in certain regions of Indochina but, through a process of habitat loss and trapping for food and trade, it has become scarce throughout much of its range, and a large decline has undoubtedly occurred. It has never been thought common in Malaysia and the restricted area of available habitat suggests a low but stable population.

**Laos** The species is locally common in a narrow strip of montane forest along the Vietnam border of Laos; evidence is currently insufficient to confirm any major decline (Thewlis et al.
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1998). Locals reported that the species was “not rare” on some mountains in Xiang Khouang, but it was evidently quite localised there (David-Beaulieu 1944, Delacour 1977). The largest population apparently occurs in the proposed northern extension of Nakai-Nam Theun NBCA: at Nam Kwai, 10 birds were calling within a 1 km radius in 1994 (Thewlis et al. 1998) and, around 10 km away, 33 birds were heard calling along a 10 km road transect in the Nam Pan catchment in 1997 (Tobias 1997; see Breeding). These data imply that several hundred individuals survive in the extensive suitable habitat in this area, the largest population hitherto recorded in Laos (Thewlis et al. 1998, Tizard 1996, Tobias et al. 1998). When this area is considered together with contiguous habitat in Nakai-Nam Theun NBCA and nearby Vu Quang and Pu Mat Nature Reserves, and Huong Son Forest in Vietnam, it is evident that a highly significant total population of the species is covered by these protected or proposed protected areas (Tobias et al. 1998, Timmins and Cuong 1999). Further south in Laos, the species seems nowhere to be common.

Vietnam The largest population of the species undoubtedly occurs in Vietnam. It was thought to be “very common” in the wooded hills of Quang Tri, Vietnam (Delacour and Jabouille 1927a, Delacour et al. 1928); Delacour (1977) reported that “within four months we captured over one hundred specimens in the Laobao–Quangtri region”. Recent surveys indicate that the species is still locally common. In 1990, an estimate of 600 individuals was made in Bach Ma National Park after 75 were heard calling in c.34 km² of its area (Robson et al. 1991). In the Song Ta Trach and Khe Thuong valleys it was found to be “very common”, with up to 15 birds heard in April 1991 (Eames et al. 1992). At Ke Go Nature Reserve, it occurred at lower density, with less than one bird calling per km², and an estimate of 25 calling birds was made in the Cam Ky area of the reserve (Robson et al. 1991). It has otherwise been described as “common”, heard regularly and observed on a number of occasions in the reserve (Nguyen Cu et al. 1992, U. Treesucon in litt. 1995, Le Trong Trai et al. 1996a). Brickle et al. (1998) recorded it “frequently” at Ea Trang in M‘Drak district, Dac Lac province. The species was formerly common along Route 8 into Vietnam from Laos (Delacour 1929b), remaining common in hills to the north and south very close the Vietnam border (Tobias 1997) and thus likely to extend into Vietnam in this area (although hunting pressure is more intense on the Vietnam side). Indeed the species was found to be “common” in the relevant area (Huong Son Forest), but at much reduced population density compared with the Laos side (Timmins and Cuong 1999). In general the species is fairly widespread and still locally common but the high degree of habitat fragmentation and hunting (see Threats) must have caused a massive decline from historical population levels, and have left the species vulnerable to further rapid declines.

Malaysia The subspecies *nigrescens* is locally not uncommon but restricted to very few sites (Robinson 1928, Mamat and Yasak 1998). On Gunung Tahan, for example, it was considered “by no means uncommon” (Robinson 1908), and “about equally numerous with the common Argus” [*Argusianus argus*], at least at higher altitudes, with dance grounds occurring every c.0.4 km (Robinson 1928). More recent estimates are of 1.9 males/km² on Gunung Rabong, and 2.7–3.0 males per km² on Gunung Tahan, although its occupation of a narrow altitudinal belt around contours makes population density estimation awkward (Davison and Scriven undated). There were, however, estimated to be 15 breeding males on Gunung Rabong in May 1976 (Davison 1978, Wells 1983). Wells (1999) commented that “some of the sub-populations in and around Taman Negara must be among the smallest avian breeding units in the region” (i.e. the Thai-Malay Peninsula) but they have presumably remained stable despite this for thousands of years.

**ECOLOGY Habitat** The two subspecies inhabit roughly similar habitat, although the nominate race descends to much lower altitudes in Vietnam. According to Delacour (1977) the nominate race inhabits “deep, damp forests of the foothills and mountains, usually from sea-level up to 900 m, and higher in certain regions”. Indeed in Vietnam it has been found in primary, logged
and secondary evergreen forest from the level lowlands up to 1,900 m, even occurring in drier and patchier forests (Robson et al. 1991, Robson et al. 1993b, J. W. Duckworth in litt. 1999, Robson 2000). While the species therefore appears to occupy a fairly broad ecological niche in Vietnam, records in Malaysia and Laos have been made almost exclusively in extensive moist forest tracts at mid-altitude (J. W. Duckworth in litt. 1999). This predilection for wet forests might in part stem from its apparent taste for amphibians (see Food).

Population density in Laos is higher in more mountainous forest, perhaps owing to inaccessibility, and therefore lack of disturbance, rather than any habitat preference (Tobias 1997). Evergreen forests that receive rainfall over much of the year in the proposed northern extension to Nakai-Nam Theun NBCA support much denser populations than do drier forests of Nakai-Nam Theun NBCA to the south; the species occurs up to 1,500 m in this region, with a strong preference for wet evergreen rather than dry evergreen forest (Thewlis et al. 1998).

Davison and Scriven (undated) described its habitat in Malaysia as “hill dipterocarp/ lower montane transitional forest” on sandstone mountains; it is not known whether the geological correlation is merely coincidental, but the species does not occur on the extensive granitic mountains of Gunung Benom or the Main Range, being replaced there by the Great Argus (Wells 1999; see Remarks 2). Indeed, populations of Crested Argus in Malaysia have been postulated as relics of a northward retreat as Great Argus expanded its range at the end of the Pleistocene (Davison 1980c). Crested is generally only encountered in a narrow altitudinal band between c.800 and 1,100 m in Malaysia (extreme altitudes are 650 m and 1,150 m), with the uppermost records often being of females and the lowest records tending to be on ridge-crests (Wells 1975, 1999, Davison 1978, 1979c, Davison and Scriven undated). This is a much narrower belt than that occupied in Laos and Vietnam, presumably because of ecological overlap and competition with the chiefly lowland Great Argus (Davison 1977, 1978, 1979c, Davison and Scriven undated). While almost all Malaysian records are from “tall forest”, there is one record from “stunted forest” (maximum canopy 12 m) on Gunung Rabong, where the understorey consisted of bamboo and ferns (including Dipteris conjugata and Matonia pectinata) (Mamat and Yasak 1998).

Dancing grounds are often placed on ridge-tops or rises or just below them (Robinson 1928, Davison 1979c, Tobias 1997). Vegetation around Malaysian dancing grounds is dominated by Shorea trees, with Eugenia and Melanorrhoea and a variety of unidentified palms and undergrowth plants (Davison 1978). The tree community is representative of the transition between lowland dipterocarp and lower montane forest, with an open undergrowth layer attributable to peat-like soil, high altitude and well-drained ridge-top location (Davison 1978). The composition of the plant community is probably of little significance, with topography determining dancing ground position (Davison 1978). The species is generally “excessively wary” and difficult to observe (Beebe 1918–1922) and neither Beebe nor Delacour (1977), who snared hundreds of specimens, ever “caught a glimpse of a free bird”.

**Food** Its diet consists of berries and grubs (Delacour 1977), insects, different kinds of tree leaves, fruits and sometimes amphibians (Stepanyan et al. 1983). Beebe (1936) described captive individuals foraging on the ground for grain, crickets, other insects and small frogs. In the oesophagus of one early specimen, “frogs and toads” were found (Boucard 1892); the inclusion of amphibians in the diet might underlie the apparent tendency of the species, at least in parts of its range, to frequent very moist forests. Droppings were collected from dancing arenas in Malaysia by Davison (1978), revealing vegetable fibres and rootlets in 53% of droppings, fruit fragments in 59% including Calamus palm fruit in 41%, while detached leg segments of invertebrates were found in 59% of droppings and were probably from ants (Davison 1978). Chicks apparently never pick food up during the first few days and must be fed directly by their mother (Delacour 1977).

**Breeding** The species is apparently polygamous in the wild state, the birds presumably never forming pair-bonds (Delacour 1977). In preparing dancing grounds on “saddles or
ridges” from which it calls it resembles the Great Argus (Davison 1979c). Unlike the Great Argus, however, it performs a lateral rather than a frontal display, more similar to the peacock-pheasants *Polyplectron* (Delacour 1977). Robinson (1908, 1928) occasionally found feathers of both argus species at dancing grounds, although the conclusion that dancing grounds are thus sometimes shared (Beebe 1936, Delacour 1977) is probably incorrect (Davison 1979c). They have a similar loud call that is often given in response to thunder, gunshots, explosions and other loud noises (JAT). Calls are generally given from the dancing ground between 07h00 and around noon, with fewer in the afternoon and often away from the dancing arena (Davison 1978); males also regularly call at night from their roost (Delacour 1977, Davison 1978). These far-carrying calls may be used as an indication of the number of males possessing dancing grounds. The mean distance between dancing grounds was 1,100 m (720–1,440 m) on Gunung Rabong, Malaysia (Davison 1978), while on Phou Chomvoy and in the nearby Nam Pan catchment in Laos several males were calling only c.200 m apart, either on the same or adjacent ridges (Tobias 1997). Assuming peaks in calling frequency occur in the breeding season, the season in Laos is March–May (J. W. Duckworth *in litt.* 1999), although a chick, around 10 days old, was collected near Hue, Vietnam, on 23 August 1926 (specimen in BMNH). In Malaysia breeding probably also begins in March (Johnsgard 1999). The breeding season in captivity (northern hemisphere) falls between March and June (Delacour 1977). Captive birds apparently prefer to nest above the ground (usually in baskets provided), being “reluctant to lay on the ground” (Delacour 1977). In the wild, however, females are said to nest on the ground close to the male’s dancing arena, in the shelter of a bush or clump of low vegetation (Delacour and Jabouille 1927a). The female lays two eggs which are incubated for 25 days (Delacour 1977), although a 50-day incubation period has been reported (Boucard 1892), presumably erroneously.

**THREATS** The nominate race of Crested Argus is threatened by widespread hunting, trade and habitat loss (Eames *et al.* 1989a,b, Robson *et al.* 1991, Thewlis *et al.* 1998), although the Malaysian race *nigrescens* is relatively well protected within Taman Negara National Park.

**Habitat loss** The tendency for paths and logging roads to be routed and constructed along the crests of spurs and ridges concentrates disturbance and hunting in precisely the areas favoured by Crested Argus for their calling arenas (see, e.g., Robinson 1928, Davison 1979c, Tobias 1997). **Laos** Montane forest is threatened by shifting cultivation (Thewlis *et al.* 1998, Duckworth *et al.* 1999); while the government of Laos aimed to phase out shifting cultivation in rural areas by 2000, lack of resources or alternatives rendered this objective unachievable (Thewlis *et al.* 1998). In the proposed northern extension of Nakai-Nam Theun NBCA, Laos, where one of the densest populations of Crested Argus survives (see Breeding), habitat is threatened by two major factors: (1) logging of the commercially valuable cypress-like conifer *Fokienia hodginsii*, a species that also occurs largely on well-drained ridge-tops (proposals have been tabled to expand *Fokienia* logging activities in the area: Tobias 1997); (2) a planned road between Laos and Vietnam, which will bisect the Nam Chat catchment and seriously compromise the future of the rich biodiversity of the area, including several threatened species of bird and mammal, most notably the recently discovered saola *Pseudoryx nghetinhensis* (Tobias 1997, Tobias *et al.* 1998). **Vietnam** More than 80% of the original area of closed-canopy forest in Vietnam has been lost, and the rate of deforestation was recently estimated to be 3,110 km² per year (Collins *et al.* 1991). Natural forest cover was reduced from 44% in 1943 to 33% in 1983 and then to 27.5% in 1995; at this rate the country will have lost all natural forest by 2090 (Wege *et al.* 1999). By 1998, under 10% of the total land area was thought to support primary forest (Vo Quy 1998), as a result of commercial (and illegal) logging, over-collection of fuelwood, charcoal production, forest fire and war damage, although clearance for agriculture, including the shifting cultivation practised by some ethnic
minorities, is perhaps the greatest contributory factor (Nguyen Cu and Eames 1993, Eames et al. 1994, Lambert et al. 1994, Le Trong Trai et al. 1999b). During the Vietnam War, an estimated 22,000 km² of agricultural land and forest were destroyed, mainly in the south (Collins et al. 1991). At this time, over 13 million tons of bombs and 72 million litres of herbicide are thought to have been dropped onto the forests of Vietnam (Eames et al. 1994). Furthermore, the country’s human population doubled in around 30 years, standing at c.72 million in 1994 (Eames et al. 1994) and 77 million in 1998, and, rising at an annual rate of 2.3%, was set to double again by 2030 (Le Trong Trai et al. 1999b), placing an ever-increasing pressure on natural habitats. Although forestry laws stipulate that areas must be reforested after logging, this is rarely done, while both illegal logging and timber smuggling are rife (Eames et al. 1994). These influences have all had serious deleterious effects on forest cover in the country: continued deforestation is accompanied by environmental problems such as degradation of arable land, soil erosion, loss of water catchments, diminished groundwater sources, siltation and ecological degradation of coastal and submerged areas, and a diminution of overall biodiversity (Le Trong Trai et al. 1999b).

Low-lying forest in Bach Ma National Park was all but destroyed by herbicide spraying during the Vietnam War, followed by logging and clearance for agriculture (Eames and Robson 1991). This circumstance is compounded by continued logging (at least until 1989) and encroachment by wood-cutters, with the result that an estimated 40 km² of an original forest area of 100 km² has been destroyed (Robson et al. 1991). Vu Quang Nature Reserve suffers similar difficulties: local people are unaware of reserve boundaries, law or function, selective logging continues on a daily basis, and groups of rattan collectors visit for short periods, setting snares for small mammals and terrestrial birds (Lambert et al. 1994). Lowland forest in Quang Tri and Thua Thien Hue provinces has been significantly reduced by human exploitation and the defoliation of vast tracts during the Vietnam War, such that only small fragments remain (Le Trong Trai et al. 1999b). The Da Lat plateau forests face continued clearance, and the species apparently does not occur in Chu Yang Sin Nature Reserve (Robson et al. 1991, Eames 1995a; see Threats under Grey-crowned Crocias Crocias langbianis). An account of threats at Ngoc Linh (Kon Tum) Nature Reserve appears under Black-crowned Barwing Actinodura sodangorum. Forest at the adjacent Ngoc Linh (Quang Nam) proposed nature reserve is threatened by clearance for agriculture, a process that is accelerating in response to natural population growth and settlement of migrants in the area; these two factors pose a “formidable challenge” to local conservation (Tordoff et al. 2000). An account of habitat loss in Ke Go Nature Reserve appears under Vietnamese Pheasant Lophura hatinhensis. Malaysia The total area of available habitat in Malaysia is rather limited but fortunately almost entirely falls within Taman Negara National Park, where it receives a high degree of protection; consequently the small number of sites is not cause for immediate concern, although some monitoring is advisable (McGowan and Gillman 1997). Increasing forest destruction on the Kelantan side of the park, near Gunung Rabong, poses a possible threat (Mamat and Yasak 1998).

**Hunting and disturbance** Snaring is the greatest danger to the species, mainly because this trapping technique is highly successful when dancing grounds are targeted, a common practice in many regions of Laos and Vietnam. Although hunting with firearms is also very common in these countries (Nguyen Cu in litt. 1997, Thewlis et al. 1998), this is likely to have a smaller impact because the species is so difficult to observe. Reports that hunters can run down males in open understorey because of the difficulty they experience in taking flight with their long tails (Boucard 1892) are unreliable (Beebe 1918–1922).

**Laos** Although habitat in Laos is under threat, the species is almost certainly more acutely threatened by selective snaring; display grounds in many areas were being heavily snared during survey visits in the 1990s and local houses often contained feathers as decoration (Thewlis et al. 1998). Groups of both Lao and Vietnamese hunters have been encountered
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with Crested Argus corpses on several occasions, and snaring has rapidly depleted populations of the species near human settlements and roads, such as route 8 into Vietnam along which it was once common (Timmins and Evans 1996, Thewlis et al. 1998). In 1994 one trapper had 20 captive individuals all taken from this small area, while in the region as a whole both the number of hunters and the scale of wildlife trade is staggering; furthermore, the existence of logging roads through Nakai-Nam Theun NBCA increases the incidence of hunting and improves access for potential settlers (Timmins and Evans 1996, Tobias 1997, Thewlis et al. 1998). Villagers around Xe Sap NBCA, Laos, report that in the past they shot and snared this species in hills near the Vietnam border, but it has decreased and apparently almost disappeared from the region, quite possibly as a direct result of their actions (Showler et al. 1998b). This pressure is apparently similar across much of eastern Laos, and especially extreme in Xiang Khouang province (J. W. Duckworth in litt. 1999). A related issue is the unsustainable harvesting of non-timber forest products which in many areas of Laos, including Nakai-Nam Theun and its proposed northern extension, may be a long-term problem (Thewlis et al. 1998); such products include rattan, “mai dam” (an incense produced by a fungal infection of eaglewood trees *Aquilaria*), oleoresins (from Dipterocarpaceae) and palm products (leaves, hearts and fruits) (JAT). Not only does intensive collection cause habitat deterioration, especially for understorey birds, but harvesting teams tend to subsist largely by hunting and trapping (Tobias 1997, Thewlis et al. 1998). *Vietnam* Early reports stated that ethnic minorities used the spectacular feathers of the species for head-dress material and hunted them “constantly, being very fond of their flesh” (Boucard 1892). Over 100 birds were caught in the Lao Bao–Quang Tri area between November 1923 and March 1924 (Delacour 1977), a figure that indicates how easily the bird is trapped with snares. This hunting technique perhaps poses the most serious threat to its survival in Indochina. As noted by Beebe (1918–1922), snares are “often used at the season of courtship, when the male easily falls victim during his preoccupation of displaying”. Hunting pressure apparently remains very high almost throughout the country (Nguyen Cu in litt. 1997; see Threats under Vietnamese Pheasant). Although the Crested Argus remains fairly common in Bach Ma National Park, it is threatened by palm and rattan collectors, whose disturbance of the area has been noted more frequently since 1990 and who often hunt gamebirds for food (Eames et al. 1992). *Malaysia* In Malaysia the opening up of forests around Gunung Rabong will probably increase hunting in the area, including the trapping of galliforms (Mamat and Yasak 1998). Over 1,000 trekkers climb Gunung Tahan each year, creating a level of disturbance that might reduce habitat availability for the species (Mamat and Yasak 1998).

**Trade** The Crested Argus is thought to be threatened in many areas by trade (Nguyen Cu in litt. 1997, Thewlis et al. 1998). It became very popular with aviculturists in the 1920s (Delacour 1977) but, more recently, international trade in the species appears to be minor (P. J. Garson in litt. 1999). Pheasants of all types are nevertheless frequently sold dead or alive at local markets in Laos and Vietnam; at Ke Go Nature Reserve, for example, they are trapped for sale in Ha Tinh (Lambert et al. 1994).

**MEASURES TAKEN** The species is listed on Appendix I of CITES.

**Protected areas** In Laos, the species occurs in Nakai-Nam Theun and Hin Namno NBCAs (apparently rare in the latter) and probably in Xe Sap NBCA (but see Remarks 4 under Masked Finfoot *Heliopais personata*). In Vietnam it persists in Bach Ma National Park (220 km²), and Ke Go (248 km²), Pu Mat, Vu Quang (559 km²), Kon Cha Rang (160 km²), Kon Ka Kinh (200 km²); site of recently described Chestnut-eared Laughingthrush *Garrulax konkakinensis*; Eames and Eames 2001; see Introduction), Ngoc Linh (Kon Tum), Bi Doup-Nui Ba (726 km²) and Ba Na Nature Reserves. Despite records from adjacent areas of the Da Lat plateau, it has not been recorded within Chu Yang Sin Nature Reserve, perhaps because fieldwork was conducted outside the calling season (Eames 1995a). The Malaysian
population falls almost entirely within Taman Negara National Park (4,343 km²), where it receives strong protection.

**Education** Posters highlighting the plight of the species and an appeal to stop hunting it have been distributed within its range in Laos by the WCS Lao programme (W. G. Robichaud verbally 1997).

**Captive breeding** There have been several captive breeding initiatives, but none is known to have resulted in any re-introduction into the wild (see Measures Proposed).

**MEASURES PROPOSED** In Indochina a coordinated conservation programme for the species is required, involving education campaigns, stronger legislation and more effective enforcement, an investigation of the threat posed by trade and a long-term population monitoring programme (Duckworth *et al.* 1999).

**Protected areas** In Laos effective protection of NBCAs supporting populations of Crested Argus is an urgent priority (see Remarks 4 under Masked Finfoot), especially Nakai-Nam Theun NBCA; Timmins and Evans (1996), Tobias (1997) and IUCN (1997) provide management proposals (see Remarks 3). Establishment of the northern extension (645 km²) to Nakai-Nam Theun NBCA would be a vital step towards protecting an important population of this species. This extension was proposed in mitigation for the destruction of the Nakai plateau by the Nam Theun 2 Hydropower Project (Tizard 1996, Tobias *et al.* 1998). However, the future of this development project is uncertain while establishment of Nakai-Nam Theun NBCA’s northern extension has been put on hold and indeed seems unlikely to occur (J. W. Duckworth *in litt.* 2000). Nevertheless, logging of *Fokienia hodginsii* in ridge-top habitat favoured by Crested Argus must be controlled in this area and plans to construct a road link between Laos and Vietnam through the Nam Chat watershed should be abandoned if possible (Tobias 1997).

In Vietnam, the species occurs at Phong Dien/Dakrong (600 km²), Ngoc Linh (Quang Nam) proposed nature reserves, Phong Nha-Ke Bang proposed national park, the Khe Net extension (165 km²) Ke Go Nature Reserve, the Bach Ma proposed extension (225 km²), the Kon Cha Rang/Kon Ka Kinh corridor link (165 km²): these areas should all be decreed as reserves by the government of Vietnam and effectively protected (Le Trong Trai *et al.* 1999a,b,c, Wege *et al.* 1999, Tordoff *et al.* 2000). BirdLife and/or FIP1 are preparing investment (management) plans for these protected areas; recommendations for Phong Nha-Ke Bang proposed national park and Phong Dien/Dakrong Nature Reserve are under Edwards’s Pheasant *Lophura edwardsi*, for Ke Go Nature Reserve under Vietnamese Pheasant; and for remaining areas of forest in Dac Lac province under Green Peafowl *Pavo muticus*. To address the problems of encroachment by wood-cutters around Bach Ma National Park, a buffer zone planted with fast-growing trees has been suggested; adequate funding is required so that protected-area staff can undertake basic anti-poaching patrols (Robson *et al.* 1991); further management proposals for the park are presented by Eames *et al.* (1992).

In Malaysia the continued protection of Taman Negara National Park is vital; efforts need to be made to ensure that the park is not encroached from the Kelantan side, near Gunung Rabong.

**Control of persecution** Complete protection of the species from hunting is required in Laos, as is the cessation of snaring activity in all NBCAs in which it occurs (Duckworth *et al.* 1999). Hunting and trade should be controlled in Vietnam as required by national law (Nguyen Cu *in litt.* 1997), with particular emphasis on the control of snaring. Wherever possible, direct action needs to be taken in protected areas to stop hunting; this necessitates tighter control of access, anti-poaching patrols and surveillance of local markets near key sites in order to monitor hunting and trapping pressure on the species.

**Education** In Laos the existing CPAWM/WCS poster campaign urging protection of the Crested Argus should be continued indefinitely (Duckworth *et al.* 1999). A similar campaign
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needs to be undertaken in Vietnam, while concerted environmental awareness programmes should be developed in relevant villages in and around key sites.

**Research** A fuller ecological profile of the species in both Malaysia and Indochina is required, in order to understand the factors that constrain it in certain areas to narrow elevational bands; much clearer knowledge of its foods in various areas and seasons is needed. Radio-telemetry study is highly recommended. Further distributional, status and monitoring surveys in both Laos and Vietnam are required and the effects of snaring on populations should be studied (Nguyen Cu in litt. 1997, Duckworth et al. 1999). The Malaysian population should be surveyed every few years to monitor numbers (McGowan and Gillman 1997, Mamat and Yasak 1998).

**Captive breeding** Numbers of this species have always been small in captivity and, given its small clutch size and delayed maturity, propagation of large numbers is impractical (Howman 1985; see Remarks 4). Furthermore, it has been pointed out that captive breeding diverts money and government attention away from habitat conservation, relies on detailed knowledge of breeding biology which is often lacking for rare birds, sometimes disguises avicultural trading and is very expensive in terms of equipment, expertise and time (see equivalent section under Cheer Pheasant *Catreus wallichi*); for these reasons, conservation action *in situ* is the only viable management practice for this species (Howman 1985, Eames 1996a, J. W. Duckworth in litt. 1999).

**REMARKS**

(1) Between 1835 and 1859, J. Verreaux’s attention was called to five extraordinary tail feathers of unknown origin (subsequently attributed to Annam) in the Paris museum (Delacour 1977), but only much later these were used to describe a new species, *Argus ocellata* (Elliot 1871). A similar taxon discovered in Peninsular Malaysia was first described as a separate species (Rothschild 1902), but later demoted to the rank of subspecies *R. o. nigrescens*, despite the “considerable” differences (which concern the length of the crest and the strength of the upperpart markings, both greater in *nigrescens*) (Davison 1977). Sibley and Monroe (1990) treated *nigrescens* as an incipient species, and with changing views on avian taxonomy the Crested Argus may again be separated into two species.

(2) The early history of the species in Malaysia contains several erroneous or misleading reports. In particular, despite J. Waterstradt’s claim to have discovered the species during his (probable) historic ascent of Gunung Tahan around 1902 (see Hartert 1902b, Rothschild 1902), the type locality of *nigrescens* was given as Ulu Dong, a river emerging on Gunong Benom (Robinson 1906) or “the Ulu Dong in the Lipis District of Pahang on the west side of the Pahang River” (Robinson 1909b). The source of this disparity possibly lies in H. C. Robinson’s desire to forward his own case as the first westerner to scale Gunung Tahan (see Davison 1980c, 1991b). In any case his publications led to the inclusion of Gunung Benom in the bird’s range by various subsequent authors (e.g. Robinson 1928, Robinson and Chasen 1936, Gibson-Hill 1949b, Medway and Wells 1976, Delacour 1977). However, the original type locality is difficult to restrict further than “Ulu Pahang”, a vague term meaning “Pahang headwaters”, and therefore quite possibly on the flanks of Gunung Tahan (Mamat and Yasak 1998). Indeed, visits by Davison (1979c, 1980a, 1991b) between 1977 and 1979 suggested that the species does not occur on Gunung Benom, a rounded granitic mountain unlike others in the species’s range, and he rejected Robinson’s restriction of the *nigrescens* type locality, suggesting it be identified as the middle slopes of Gunung Tahan. The species was also reportedly heard at Batang Padang in the main range, undated (Robinson 1908) and at Kuala Lipis, at 150 m (Robinson 1908, 1909b, Beebe 1918–1922). However, the Kuala Lipis record is sufficiently unlikely to be discounted, and Robinson (1928) later regarded the Batang Padang record as doubtful. Robinson (1906) remarked that the call is “readily recognised when once heard, though it is hard to put the difference [between Crested Argus and Great Argus] into words”, and Beebe (1918–1922) categorically stated that “both Robinson and
Rheinardia ocellata

myself have heard its call near Kuala Lipis, Pahang, at only about four hundred feet elevation”, but while these comments lend a note of authenticity, Davison (1977) concluded that “in view of the poor descriptions of Crested Argus vocalisations even in Robinson’s own works it is probably best to discount these records [those at Kuala Lipis and Batang Padang] unless they are substantiated in future”.

(3) In discussion of the protected area system in Laos, Berkmüller et al. (1995) stated that “evaluation of management implementation in all areas suggests that an inadequate first-hand knowledge of the field constitutes the major obstacle to problem solving. Low skill levels, limited motivation and insufficient institutional capacity pose greater constraints to management implementation than funding.” This statement remains true both in Laos and Vietnam (JAT) and should be borne in mind in the context of protected-area system planning.

(4) Early attempts to establish a captive population of the species resulted in there being “quite a few Crested Argus in Europe and in America” in the 1940s; these populations only survived in Britain until the early 1960s and in America for a few years longer (Davison 1978). More recently, Vietnamese zoos held 26 individuals in 1995 (Dang Gia Tung 1995), and continue to breed the species (G. Robbins in litt. 1999). In September 1995 a workshop was held at Bach Ma National Park, Vietnam, with the aim of developing cooperation between zoos and national parks supporting populations of Crested Argus, which resulted in the signing of a cooperative agreement for its conservation (Dang Gia Tung 1995). A captive breeding programme in Malaysia stopped taking adults for captive breeding owing to high mortality and damage incurred in the capture process; instead, any requirements will be satisfied through collection of eggs using portable incubators (G. Robbins in litt. 1999). Interbreeding between the two subspecies in captivity must be avoided.