

**BIRDS OF LAKE JEMPANG AND THE MIDDLE MAHAKAM WETLANDS,
EAST KALIMANTAN**

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Summary

Between 1988 and 1999 avifaunistic data were collected in the wetlands around Danau Jempang (Kutai, East Kalimantan) over a period of 40 months. A total of 90 bird species was found, including important breeding populations of various herons and the Lesser Adjutant *Leptoptilos javanicus*. Breeding was also noted for the Little Tern *Sterna albifrons*, which appears to be the first breeding record for Borneo.

The bird communities of 6 habitat types are discussed and compared with other wetland areas in Kalimantan.

Repeated forest fires, extensive land conversion plans, and the catching of herons and storks, indicate the need for an immediate conservation plan for one of Kalimantan's most important wetland sites and its avifauna. Some recommendations towards such a plan are given.

Introduction

Very little information exists about one of Kalimantan's largest wetland areas. The Mahakam lakes have been investigated regarding their fishery potential during the Indonesian German TAD project (Transmigration Area Development, later renamed Technical Area Development), but their non fish fauna have remained almost unstudied, apart from surveys of the crocodiles (Cox *et al.* 1993) and of the dolphins. Beside the birds discussed in this paper, endangered mammals such as Proboscis Monkeys *Nasalis larvatus*, Irrawaddy Dolphin *Orcaella brevirostris* and wild Banteng *Bos javanicus* still occur in significant numbers, and three species of crocodiles (*Crocodylus porosus*, *Crocodylus siamensis* and *Tomistoma schlegeli*) are found in the marshes. Despite the enormous damage of recent forest fires, the Middle Mahakam Area (MMA) is still one of Kalimantan's most important wetland areas. A comparison of waterbirds between the MMA and Sungai Negara in South Kalimantan (van Balen & Prentice 1997) or Tanjung Puting National Park in Central Kalimantan (Nash & Nash 1988) stresses the MMA's importance as a crucial breeding and migration site. On a physical level, the area's buffer role for the natural regulation of the Mahakam is beyond doubt, although this seems to be little appreciated by provincial decision makers.

This report compiles avifaunistic data from the MMA with a special focus on Danau Jempang. The area's conservation status and its threats are briefly discussed, and recommendations towards an effective conservation plan are given.

Geography

The area of the Middle Mahakarn Lakes (Danau Jempang: 116°12'E, 0°25'S) covers about 400,000 ha (see Figures 1 and 2). The three largest lakes are Danau Jempang (15,000 ha on average), Danau Melintang (11,000 ha) and Danau Semayang (13,000 ha). The area of the lakes's water surface ranges from zero in extremely dry years (e.g. 1982/83, 1991, 1994, 1997/98) to more than 60,000 ha. Their maximum depth is about 6 m and annual fluctuations can reach more than 6m.

Vast swamp forests to the north of Danau Melintang and Danau Semayang feed these two lakes with groundwater (in the case of Danau Melintang, this is black water, rich in humic acid), while Danau Jempang south of the Mahakarn river is more dependent on the river system. The swamp area of the lakes is surrounded by freshwater swamp forests, peat swamp forests (mainly in the northern part) and lowland dipterocarp rain forests. The swamp forests occasionally dry out and they were severely affected by fires in April 1998.

The vegetation of the lakes (more than 86 aquatic plant species and genera) is dominated by floating weeds (mainly *Salvinia sp.* and Water Lily *Eichhornia crassipes*, *Mimosa pigra* and *Polygonum barbatum*).

The Middle Mahakarn Area (MMA) receives an average annual rainfall of 2,100 2,400 mm. Maximum temperatures range between 30 34°C, minimum temperatures between 22 24°C. The yearly average relative humidity is about 85%.

Study Area

Due to my main activities (research for a doctorate in cultural anthropology), rMst surveys were restricted to the open swamp areas and open water bodies of Danau Jempang (DJs and DJw refer to the southern and western parts of the lake respectively see Fig. 3). Occasional visits to Danau Melintang, Danau Semayang, Danau Siran, Kedang Kepala river, Sungai Baroh and once to the swamp forests northwest of Danau Melintang, contributed to the species list, but the data are insufficiently complete for the comparison of habitat types.

Habitat Types

In the classification of habitat types I mainly follow van Balen & Prentice (1997) for convenience mid comparison.

1. Open water bodies

Mainly the bigger lakes (Jempang, Melintang and Semayang and Danau Siran). According to season and year, the lakes were open, partly covered by floating vegetation, or completely dry.

2. Mudflats

During the extreme dry seasons of 1993 and 1997 the lakes fell dry, and vast mudflats emerged. Danau Jempang was probably also dry in the El Nino years of 1991 and 1994, when I was not in the region. These mudflats existed between early July and October. They were soon covered by vegetation (*Polygonum barbatum*, *Mimosa pigra*, grasses), thus becoming less important for migrating and wintering waders.



Fig. 1 : Map of Borneo





3. Open swamps

I follow the same classification of three swamp habitat types used by van Balen & Prentice (1997):

3.1 Immersed sedge and grassland especially around Jantur and, at least during low water levels, between Tanjung Jone and Muara Ohong there are vast areas of this swamp type.

3.2 Immersed sedge and grassland with *Mimosa* shrubs mainly around Pulau Repeh, P. Sega and P. Berawan, as well as along the waterway from Tanjung Isuy to Jantur during low water conditions.

3.3 Aquatic vegetation in March/April 1996 and after May 1998 all lakes were covered with thick carpets of *Eichhornia crassipes* and floating grass. The blackwater lake Danau Melintang was covered with floating grass, *Polygonum barbatum* and *Salvinia* sp. and, less frequent than in Jempang and Semayang, *Eichhornia crassipes*. Boat passages through these latter lakes were almost impossible from June until August 1998. In March and April 1999 the entrance to Danau Jempang was almost closed by extensive fields of *Eichhornia crassipes*.

4. Swamp forests

Only the fresh water swamp forests adjacent to Danau Jempang were investigated in any detail. Peat swamp forests northwest of Danau Melintang were visited in June 1998 for two days after the devastating forest fires of April 1998.

Methods

Data were collected irregularly over a total elapsed time of forty months from 1988 to 1999. Waterbirds were counted systematically on 62 boat trips (usually in rather unstable, flat *ces* motorboats) along a transect from Tanjung Isuy to Muara Muntai, representing all seasons. These lake transect counts are heavily affected by the water level and hence the lake's size. In most years the lakes were deepest from December to May and shallowest from July until October. Additional data were collected wherever possible, resulting in about 4,200 data files, mainly focusing on waterbirds.

Up to May 1999, 90 bird species have been observed in the different wetland habitats (not including aerial feeding species), as outlined below:

Aquatic Areas

A total of 79 bird species was found in the swamps and waterways of the MMA, including 12 heron species, 2 storks, 2 ducks, 6 crakes/rails, 23 waders and 4 terns. Compared with 56 species reported by van Balen & Prentice (1997) for the Sungai Negara wetlands in South Kalimantan and 61 species for the open swamps of Tanjung Puting National Park in Central Kalimantan (Nash & Nash 1988), the higher number of the MMA is mainly a result of visiting waders. The appearance of waders during the autumn migration depends on the water level of the Mahakam lakes. Significant numbers (mainly of Wood Sandpipers *Tringa glareola*) were only observed in extremely dry years (1993 and 1997), when the lakes had virtually disappeared. Vast mudflats and grasslands provided excellent feeding habitats for plovers, sandpipers and stints. The shallow lakes also attracted large numbers of Whiskered Tern *Chlidonias hybridus* and Little Tern *Sterna albifrons* as well as herons (mainly Javan Pond heron *Ardeola speciosa*, Great Egret *Casmerodius albus*, Intermediate Egret *Egretta intermedia* and Purple

Heron *Ardea purpurea*), which fed on dying fish. Whiskered Terns, both of northern (*C. h. hybridus*) and austral (*C. h. javanicus*) origin visited the MMA in large numbers for feeding during migration, and (in smaller numbers) for wintering. Little Terns use the dry lake shores in August/September for breeding, which appears to be the only known breeding site in Borneo (cf. Davison & Chew 1996, page 46).

Breeding was proved or is at least most likely for several heron species, such as Javan Pond heron (September), Cinnamon Bittern *Ixobrychus cinnamomeus* (January/February), Yellow Bittern *Ixobrychus sinensis* (February/March), Purple Heron, Intermediate and Great Egret, as well as Lesser Adjutant *Leptoptilus javanicus* (probably November). Breeding is suspected for Black Bittern *Ixobrychus flavicollis* and Oriental Darter *Anhinga melanogaster*. Roosting places of Great Egrets and Purple Herons were visited mainly from July to October. Large numbers of Javan Pond herons roosted at several places all year. Hundreds of Wandering Whistling duck *Dendrocygna arcuata* roosted at several places in the MMA, mainly from July to October; breeding was reported by local fishermen, but remains to be confirmed.

At least six species of crakes and rails are resident in the MMA, including rather large populations of Purple Swampphen *Porphyrio porphyrio*, Common Moorhen *Gallinula chloropus* and White browed Crake *Porzana cinerea*. The open water body was also utilized by raptors (6 species), terns (4 species) and the 2 duck species.

Swamp Forests

31 bird species were found in the fresh water swamp forests directly adjacent to Danau Jernpang. A large breeding colony of Lesser Adjutants was reported by local fishermen to be located in swamp forests close to Kedang Kepala river. Systematic surveys of peat swamp forests, riparian and alluvial swamp have not yet been conducted.

Selected Species Accounts

Following mainly van Balen & Prentice (1997), details are given for species that fit the following criteria:

1. Globally endangered, vulnerable or near threatened status, according to Collar *et al.* 1994).
2. Biogeographic and faunistic importance (cf. Holmes & Burton 1987 and Holmes 1997).
3. Waterbirds and raptors in general.

Oriental Darter *Anhinga melanogaster*: 22 observations; all year, probably breeding. A maximum of 7 birds including juveniles was observed on 7 Sep 1996 near MB.. Another juvenile was seen on 12 Aug 1997. A colony of breeding darters was reported by local fishermen from a swamp forest lake near ME (not confirmed so far).

Purple Heron *Ardea purpurea*. 180 observations; all year, breeding. The largest numbers were observed from July to October with roosting flocks of 30-100 birds on PR and near MO (Fig. 4). Breeding plumage is shown from April to July, juveniles were found from late June/early July (earliest record 22 Jun 1998, more regularly after the second week of July). It should be observed from Fig. 4 that the highest numbers also correspond with the lowest water level.

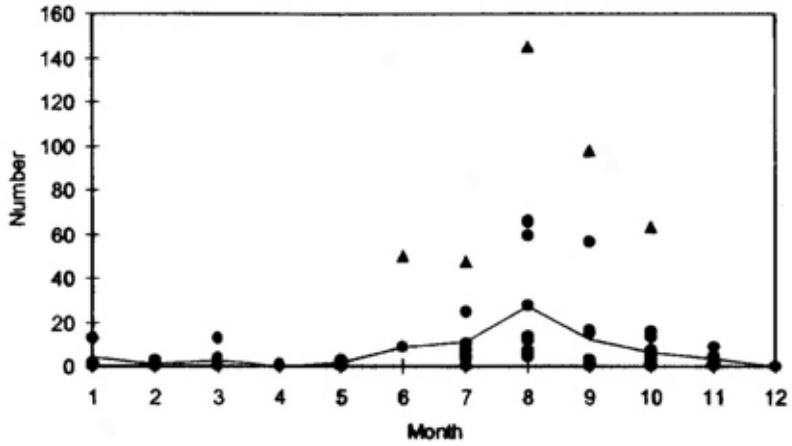


Fig. 4: Phenology of Purple Heron

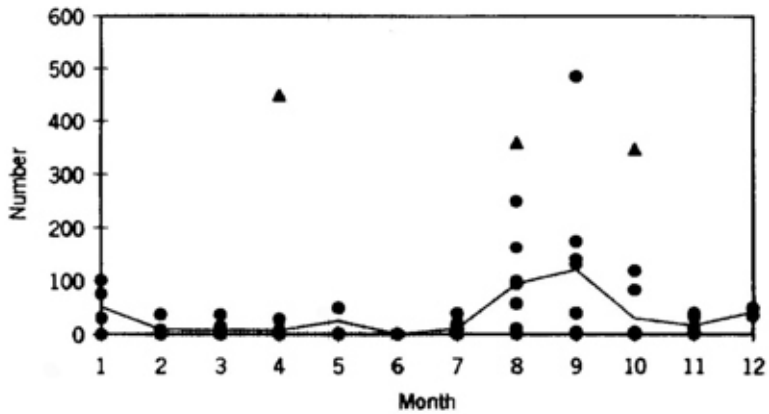


Fig. 5: Phenology of Gmat Egret

Great Egret *Casmerodius albus*. 104 observations (+ 84 observations of unidentified egrets, probably mainly this species); all year, breeding (Fig. 5). Largest roosting flocks from August until October with up to 500 birds near PS (e.g. 360 on 13 Aug 1997, 347 on 7 Sep 19%, 498 on 29 Sep 1996, 383 on 5 Oct 1996, 348 on 9 Oct 19%), occasionally also in April (450 on 7 Apr 1996). Breeding plumage was shown from April May to August September, but birds in non breeding plumage were found all year. Juveniles were caught out of their nests during the drought of 1998 and still kept as pets in early 1999.

Intermediate Egret *Egretta intermedia*. 21 observations; probably breeding visitor between July and January. Maximum numbers: at least 52 near PS between 31 Jul and 25 Aug 1993 (out of 170 egrets), 40 on 2 Sep 1997, 45 on 9 Sep 1997, 20 on 29 Nov 1997. Two birds in early July (7 Jul 1997) showed breeding plumage. Juveniles were kept as pets in February 1999 in PL.

Little Egret *Egretta garzetta*. 90 observations; all year, breeding status uncertain (Fig. 6). All birds appeared to belong to nominate *garzetta*, in contrast to Danau Sentarum where only *E. g. nigripes* is listed (Dennis et al. 19%). Maximum numbers: 160 on 16 Jan 1998, 65 on 2 Mar 1996, 50 on 31 May 19%, 100 on 9 Sep 1997. Little Egrets were mainly found along the Mahakam and small connecting rivers to DJ. Breeding plumage was shown from mid March until July (one bird in September). Single juveniles were seen in November 1993 and 1997.

Chinese Egret *Egretta eulophotes*. One observation of this threatened species, with two birds in captivity in a village on the Mahakam (29 Jun 1988). Both birds were in breeding plumage with yellow bills, black legs and elongated white head plumes. As the village was close to DJ it seems likely that the birds were caught in the MMA.

Cattle Egret *Bubulcus ibis*. 121 observations; all year, probably non breeding visitor (Fig. 7). Maximum numbers: 274 on 16 Jan 1998, 654 on 16 Feb 1998, 244 on 14 Dec 1997. Mainly in non breeding plumage. Only a few birds showed breeding plumage in March and April. Cattle Egrets were regularly found close to water buffalos near 77 and TJ.

Striated Heron *Butorides striatus*. 8 observations, scattered over the year. Striated Herons are much more common in the lower parts of the Mahakam.

Javan Pond heron *Ardeola speciosa*. 143 noted observations, not always counted; all year, breeding in August and September in large numbers. Maxima: > 4,000 on 10 Jul 1997 (DJs), ca. 10,000 on 7 Aug 19% M MM), > 2,020 on 20 Aug 1997 (DJ), 2,520 on 21 Aug 1997 (DJ). Roosting places with several hundred birds are found all year around MO, PR and PS. Counts during the rainy season are extremely difficult due to the flooded vegetation, while birds can be easily counted on the mud flats of the dry season. Nests with 2-3 light blue eggs (Hancock & Kushlan 1984 mention "dark greenish blue" eggs, while Kutter (1884) also reports light greenish blue eggs found at Lake Bangkau by Grabowsky, cf. Grabowsky 1885) were found in old *Mimosa nigra* vegetation, 1-2 m above the water in early September 1996.

Breeding plumage was worn from April May until August September. In contrast to most literature (MacKinnon & Phillipps 1993, King *et al.* 1975, Hancock & Kushlan 1984) birds in

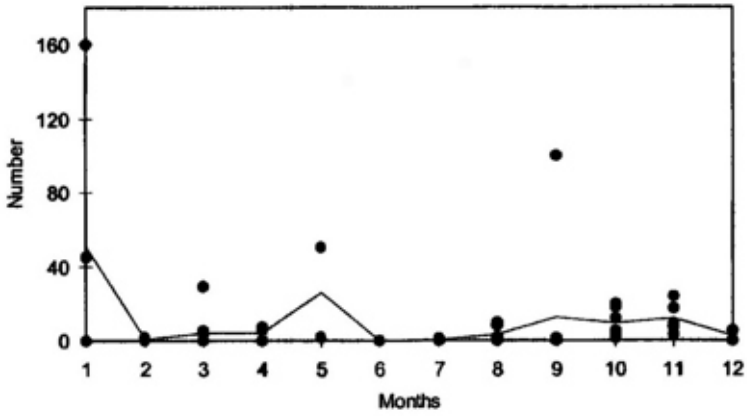


Fig. 6: Phenology of Little Egret

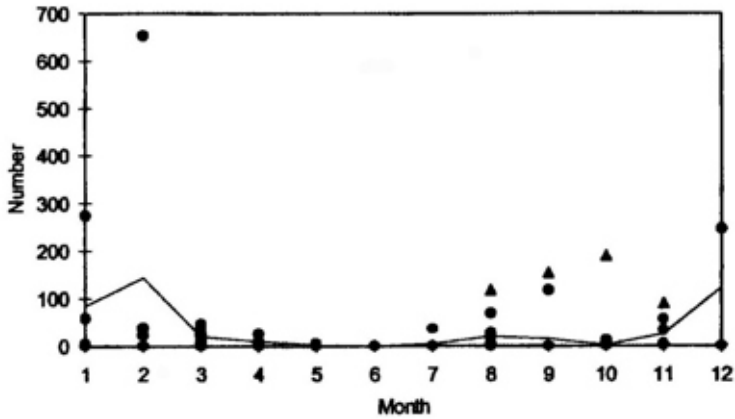


Fig. 7: Phenology of Cattle Egret

breeding plumage showed two white elongated head plumes and pinkish red legs (only in July). A photograph in Davison & Chew (1996) on page 19 shows also a Javan Pond heron in this plumage (without mentioning these details in the text), as well as the pictures in Lekagul & Round (1991, page 49).

Cinnamon Bittern *Ixobrychus cinnamomeus*. 35 observations; January until September, most probably breeding. Largest numbers: 19 on 21 Mar 1998 (TI J), 23 on 28 Mar 1998 (TI J). These birds showed worn plumage and occurred together with relatively large numbers of Yellow Bitterns and Black Bitterns. In late January/early February 1998 a single bird flew regularly to the same spot of swamp vegetation, where it might have been breeding. Birds from February April 1999 showed breeding plumage. On 14 Feb 1999 a juvenile was observed near J.

Yellow Bittern *Ixobrychus sinensis*. 40 observations; all year, probably breeding. Largest numbers: 25 on 21 Mar 1998 (TI J), 10 on 28 Mar 1998 (TI J). Like the Cinnamon Bitterns these birds showed worn plumage. Some individuals were birds in the first year. Juveniles were regularly observed from late November onwards, believed to have arrived from a northern origin. A young juvenile was seen in swamp reeds near DS on 16 Mar 1999, and another near J on 25 Apr 1999, which would appear to indicate local breeding.

Black Bittern *Dupetor flavicollis*. 92 observations; all year, breeding likely. Largest numbers: 24 on 6 Feb 1999 (PS), 34 on 21 Feb 1999 (PB), 70 on 28 Mar 1998 (M J), 14 on 21 Jun 1998 (DS, DW, II on 22 Jun 1998 (DJs), 25 on 2 Jul 1993 (TI MM). Fresh plumage (glossy black with bright yellow neck stripe) was shown by males in July and August, while birds observed in March looked greyish (on 5 Mar 1997, 28 Mar 1998 and in March 1999); some birds in February 1999 showed a black but not glossy plumage with an only dull yellow neck. Birds with rufous plumage, suspected to be juveniles, occurred from the middle of September (18 Sep 1997, 16 Sep 1998). The large number from 28 Mar 1998 were probably migrants from an austral origin. However, it cannot be excluded that Black Bitterns in February/March might also be on their way back to northern breeding grounds. The great variety in plumage conditions from greyish black to entirely black, and from worn out to clean appearance, may indicate mixed origins. Nominative *flavicollis* is known to winter in Borneo, Malaya and Indonesia (Hancock & Kushlan 1984), but confirmation is now required that austral *gouldi* visits Kalimantan in substantial numbers, and its status needs to be determined.

Black crowned Night heron *Nycticorax nycticorax*. 3 observations; evidently only a visitor: 2 birds were seen on 13 Oct 1993 (J MM), 3 on 16 Nov 1993 (J) and 1 on 9 Oct 1999 (PS).

Storm's Stork *Ciconia stormi*. 4 observations; the status of this threatened species in MMA is unclear. A juvenile bird was seen on 27 Aug 1993 on mud flats near PR. One Storm's Stork passed a ladang field near L on 31 Mar 1999, one circled above L on 15 Jul 1997, and another was seen sitting in a tree next to a logging road in secondary dipterocarp forest near MN on 21 Apr 1999. These observations would suggest that the MMA is not primary habitat for the species.

Lesser Adjutant *Leptoptilos javanicus*. 64 observations; all year, this threatened species is believed to be breeding in swamp forests. Largest numbers: 170 birds circling over MB on 21 Aug 1996, 50 at Danau Siran on 14 Sep 1996, 31 flying over KB on 15 Sep 1996. Breeding in large numbers was reported for a swamp forest near Kedang Kepala river and at Danau Siran by local fisherman. According to this information the breeding season is supposed to be November. These potential breeding grounds burnt down during the forest fires of April 1998, but dozens of juveniles were found after Nov 1998 in MM, where they were kept as pets, so either the breeding colony had moved or there is more than one colony.

Wandering Whistling duck *Dendrocygna arcuata*. 109 observations; all year, probably breeding. Largest numbers: 670 on 13 Aug 1997 (TJ MO), 960 on 17 Aug 1997 (TJ MO), 750 on 13 Sep 1996 (DS) and 700 on 16 Nov 1993 (DJe). Roosting places were reported by local fishermen for DS, DM, DJ and two smaller lakes near Kota Bangun (Danau Siamuking and Danau Kadukng). Roosting flocks of more than 500 birds were confirmed for DS and DJ, the other sites have not yet been visited. Breeding was reported by local fishermen but remains to be confirmed.

The Lesser Whistling duck *D. jmanica* has not yet been confirmed for the MMA.

Garganey *Anas querquedula*. 3 observations; migrant. 20 birds were seen on 13 Feb 1996 near MO, 2 birds (male in breeding plumage) were observed on 14 Oct 1996 at PS and a flock of 25 birds was seen on 29 Nov 1997 between TI and J.

Osprey *Pandion haliaetus*. 4 observations; migrant during northern winter. Single birds were seen on 22 Nov 1996 (DJs), 29 Jan 1997 (near J), 28 Nov 1997 (Muara Kaman), and 13 Mar 1999 (DM).

Black winged Kite *Elanus caeruleus*. 36 observations; all year, probably breeding. A couple was regularly seen near TI (from 1988-97 at the shore of DJ, afterwards in the wide open areas cleared for oil palm cultivation). The other birds were observed throughout the MMA.

Brahminy Kite *Haliastur Indus*. 161 observations; all year, breeding. Largest numbers: 20 on 8 Oct 1993 (PS), on 30 Nov 1997 (TI TJ), on 23 Jan 1998 (TI MO), 29 on 29 Nov 1997 (TI J) and 46 on 9 Sep 1997 (TJ J). The largest numbers were found during the extreme dry season 1997, when DJ had virtually disappeared, and fish were easy to catch. A roosting place near TJ was regularly visited by 10-20 birds. Juveniles were observed from early July.

White bellied Sea eagle *Haliaeetus leucogaster*. 49 observations; all year, probably breeding in small numbers. Juvenile birds were observed from early August (earliest 4 Aug 1993). Adults were regularly seen throughout the area individually or in pairs.

Grey headed Fish eagle *Ichthyophaga ichthyaetus*. 34 observations; all year, probably breeding in small numbers. An immature bird was seen on 30 Nov 1997. This species was found along SO and throughout the swamp area.

Lesser Fish eagle *Ichthyophaga humilis*. 8 observations; June to October, status uncertain. Lesser Fish eagles were only found along smallerjungle streams such as SO and SB

Changeable Hawk eagle *Spizaetus cirrhatous*. 63 observations; all year, resident. 66% dark phase, often attacked by *Haliastur indus*. Found throughout the swamps and in open areas.

Peregrine Falcon *Falco peregrinus*. 6 observations. Individual birds, presumed migrant, were seen on 7 Apr 1996 (DJs), on 31 Jan 1997 (TI MB), on 21 Feb 1999 (PB) and on 13 Mar 1999 (PL). A very dark individual hunted pond herons on 4 Aug 1997 near J, and a juvenile sat on the shore of DJ on 16 Feb 1998.

Ruddy breasted Crake *Porzana fusca*. 3 observations in swamp vegetation: 21 Jun 1988 (DJs), 28 Jul 1996 (TI MO) and 19 Aug 1997 (TI M),

White browed Crake *Porzana cinerea*. 71 noted observations; all year, common resident throughout the swamps. Calls were frequently heard.

White breasted Waterhen *Amaurornis phoenicurus*. 41 observations; all year, moderately common resident. Found throughout the swamps as well as on wet ladang fields and small ponds.

Common Moorhen *Gallinula chloropus*. 85. observations; all year, breeding. Largest numbers: 115 on 2 Oct 1993 (J), 58 on 19 Aug 1997 (TJ) and >80 on 23 Aug 1997 M TJ). Juveniles were found from July (e.g. 28 Jul 1997) until September (e.g. 16 Sep 1998), but also on 28 Mar 1998 and 25 Apr 1999. Common Moorhens often mixed with Purple Swamphens usually close to *Eichhomia* vegetation.

Despite intensive search no Dusky Moorhens *Gallinula tenebrosa* were found. The Dusky Moorhen is known from Borneo apparently from a single breeding record on Lake Bangkau (in the Negara swamps) in April 1883 (?), reported by Grabowsky, who describes both species as common (Grabowsky 1885). Eggs of *Gallinula orientalis* Horsf. and *Gallinula frontata* Wall. were collected by Grabowsky and examined by Kuner (Kutter 1884). There are no specimens. [ed. It is difficult now to confirm this identity, but the status is likely to be as a vagrant opportunistic breeder, or else this taxon has been displaced by nominate *chloropus*. The absence of recent records, despite deliberate searches (e.g. Holmes & Burton 1987, van Balen & Prentice 1997), suggests it is no longer extant on Borneo.]

Purple Swamphen *Porphyrio porphyrio*. 90 observations; all year, breeding. Largest numbers: 190 on 13 Feb 1999 (PS), 103 on 14 Feb 1999 (PB), 152 on 25 Apr 1999 (J MM), 100 on 27 Aug 1996 (J MM), 250 500 from 29 Sep 16 Oct 1996 (J MM) and 150 on 20 Nov 1996 (J MM). The largest flocks were found in floating vegetation near J between August and October. Juveniles were observed on 21 Feb 1999, on 21/22 Mar 1998 and on 12 Sep 1998. In common with the Common Waterhen, breeding seems to depend on the water level and may occur in different months.

Comb crested Jacana *Irediparra gallinacea*. 3 observations; status unclear. 2 birds were found in DS on 6 Sep 1996, 3 birds were observed in a dense *Salvinia* field on Danau Siran on 14 Sep 1996, where another bird was seen on waterlily leaves on 20 Jun 1998. It is interesting to compare this scarcity, suggesting vagrant status, with its common resident status in the Negara river basin (van Balen & Prentice 1997); it would be surprising if its ecological requirements are not met somewhere in the MMA.

Grey Plover *Pluvialis squatarola*. 3 observations: 1 on 8 Oct 1993 (PS), 1 on 9 Oct 1996 (DJs) and 4 still in 80% breeding plumage on 2 Sep 1997 (PB).

Pacific Golden Plover *Pluvialis fulva*. 9 observations between early September (2 Sep 1997 still in breeding plumage) and the middle of October (latest 19 Oct 1993) with a maximum of more than 300 birds between TJ and MO on 18 Sep 1997. One record from April: 2 moulting into breeding plumage on 9 Apr 1998 (J MM).

Little Ringed Plover *Charadrius diibius*. 23 observations between 17 Aug 1997 (32 TJ MO) and 26 Oct 1997 (25 TI) with a maximum of 100 birds at PS on 19 Oct 1993. Most Little Ringed Plovers were juvenile birds.

Mongolian Plover *Charadrius mongolus*. Only 2 observations, of which 10 birds were only identified as *Charadrius mongolus/leschenaultii* (PS 18 Sep 1993). One confirmed juvenile Mongolian Plover was observed between TI and TJ on 2 Sep 1997. The Greater Sand plover *C. leschenaultii* was not positively identified.

Whimbrel *Numenius phaeopus*. A single Whimbrel was observed near TI on 18 Sep 1997. Far eastern Curlew *Numenius madagascariensis*. One bird was seen at PS on 11 Sep 1993. Black tailed Godwit *Limosa limosa*. 4 birds near TJ on 19 Aug 1997 and 5 on 22 Aug 1997. Bar tailed Godwit *Limosa lapponica*. 1 bird at PS on 8 Oct 1993.

Common Redshank *Tringa tetanus*. 9 observations between 4 Sep 1993 (2 PS) and 17 Oct 1993 (2 PS) with a maximum of 10 at PS on 18 Sep 1993.

Common Greenshank *Tringa nebularia*. 13 observations between 13 Aug 1997 (4 at TJ) and 11 Dec 1997 (1 TI MO) with a maximum of 10 birds near TJ on 19 Aug 1997.

Wood Sandpiper *Tringa glareola*. 58 observations between 25 Jul 1993 (1 PR) and 28 Mar 1998 (6 TI J). Largest numbers: > 950 on 13 Aug 1997 (near TJ), 2,000 2,500 on 8 Sep 1997 (near TJ) and about 750 on 4 Oct 1997 (TJ MO). In August/September 1997 the daily totals at DJ may have exceeded 4,000 5,000 birds.

Green Sandpiper *Tringa ochropus*. 16 observations between 28 Jul 1997 (1 PR) and 19 Oct 1993 (PS). Two spring records: I J MM on 20 Mar 1996 and 3 on 15 Feb 1997 (DJs), cordirined by dark underwings and call. Usually seen singly.

Marsh Sandpiper *Tringa stagnatilis*. 7 observations between 13 Aug 1997 (1 PR) and 19 Oct 1993 (1 PS). Maximum: 3 new J on 12 Oct 1993.

Terek Sandpiper *Tringa cinereus*. 2 observations. 3 at PS on 8 Oct 1993 and 3 near TJ on 12 Oct 1993.

Common Sandpiper *Actitis hypoleucos*. 65 observations from late July (earliest 28 Jul 1997) until early April (latest 9 Apr 1998). Largest numbers: 17 at PLIPS on 16 Sep 1993, 11 between MM and MP along the Mahakam on 15 Mar 19917 and 9 between TI and MO on 11 Dec 1997. A single flock with 25 birds was seen further up the Mahakarn (between Long Bagun and Long Pahangai) on 20 Feb 1996.

[Swinhoe's Snipe/Pintail Snipe *Gallinago megala/stenura*. 3 birds were seen under good observation conditions in *Polygonum* vegetation near TJ on 30 Sep 1997. In flight the feet trailed beyond the tail, and the white trailing edge of the secondaries was missing. Hence, *G. gallinago* can be excluded. According to Forstmeier (1998) there is still too little information to distinguish *G. megala* and *G. stenura* clearly in the field].

Common Snipe *Gallinago gallinago*. One confirmed bird near TJ on 4 Oct 1997, 2 unconfirmed observations (12113 Oct 1993).

Great Knot *Calidris tenuirostris*. A single bird was seen at PS on 17 Oct 1993.

Red necked Stint *Calidris ruficollis*. 13 observations between 13 Aug 1997 (2 near TJ almost in breeding plumage) and 13 Oct 1993 (3 DJ). Largest number: 75 birds at PS on 8 Oct 1993.

Temminck's Stint *Calidris temminckii*. One bird was seen between TJ and MO on 30 Sep 1997. The small stint showed a uniform brownish breast, unstructured (not scaly appearing) upperparts, and yellow legs. It had no distinct supercilium. In contrast to the rather abundant Long toed Stints, which resembled miniature Wood Sandpipers, this bird rather looked like a miniature Common Sandpiper. No call was heard, and the bird's tail edges were not seen.

This appears to be only the second record for Kalimantan, the first being a specimen from Pagatan, on the SE coast, collected in February 1847 (Smythies 1957). It was distinguished from the also yellow legged Long toed Stint *C. subminuta* by its much duller and uniform breast and upperparts (lacking any rufous; tinge) and the much less distinct supercilium. The Least Sandpiper *C. minutilla*, which has not yet been observed on Borneo should have a more distinct white throat and also a more prominent supercilium.

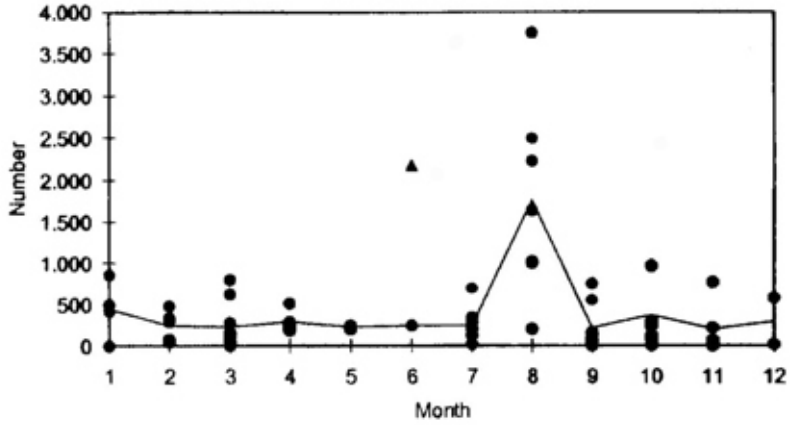


Fig. 8 Phenology of Wild Tom

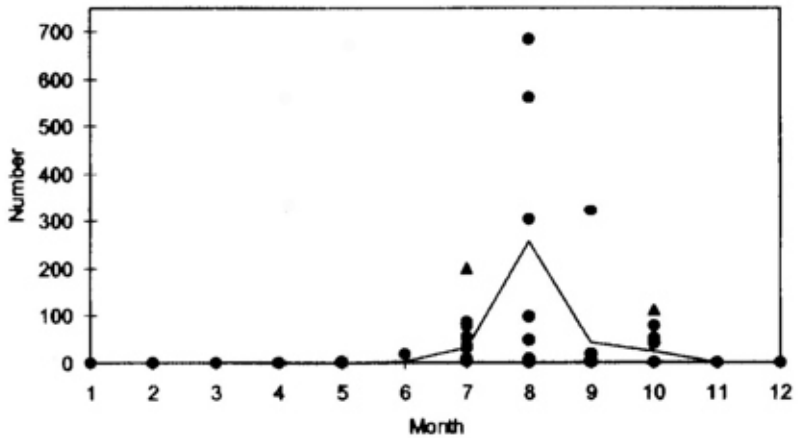


Fig. 9: Phenology of Little Tem

Long toed Stint *Calidris subminuta*. 13 observations between 17 Aug 1997 and 12 Oct 1997. Largest number: 300-400 birds between TJ and MO on 5 Sep 1997. Long toed Stints were often mixed with Wood Sandpipers in grass vegetation around the mud flats of the dry DJ. As the stints were often hidden by vegetation their total number may have exceeded 500 in early September 1997.

Curlew Sandpiper *Calidris ferruginea*. 4 observations between 13 Aug and 8 Sep 1997. All birds were moulting with a still high percentage in breeding plumage. The largest number observed was 23 birds between TJ and MO on 17 Aug 1997.

Red necked Phalarope *Phalaropus lobatus*. 5 observations in October between 9 Oct (1996) and 21 Oct (1997). All Phalaropes were found swimming in floating vegetation, where they picked insects from grass blades.

Whiskered Tern *Chlidonias hybridus*. 364 observations; all year, migrants from northern and austral origin (Fig. 8). Largest daily totals were: ca. 1,000 on 13 Feb 1999, 2,175 on 21 Jun 1998 (DS + DJ), 1,630 on 4 Aug 1997, 3,758 on 13 Aug 1997, 2,505 on 20 Aug 1997, and 2,225 on 21 Aug 1997 (all DJ).

Juveniles arrive from early September (earliest 1 Sep 1998) and are still often attended by adult birds. However, there is no evidence for breeding in the MMA. 45 juveniles of probably austral origin (not yet in the first winter plumage) were observed near PB on 13 Feb 1998.

There is a clear pattern of two overlapping migrant populations. Northern birds (*hybridus*) partly winter in the MMA and moult into breeding plumage from the middle of February until April/May, when they leave for their breeding grounds. They come back, followed by juveniles (15-20% of the total numbers) in early September. Southern birds (*javanicus*) arrive moulting or in new non breeding plumage in mid February (arrival of about 1,000 birds on 13 Feb 1999 and about 800 birds on 5 Mar 1997) and start moulting into breeding plumage in August. 95 birds in new breeding plumage migrated at high altitude south eastwards on 18 Sep 1993, 110 birds migrated in a similar way on 29 Sep 1996. During October several flocks of migrating austral birds in perfect breeding plumage stopped over in the MMA. The latest record of an austral bird in breeding plumage was 22 Nov 1996.

Southern birds in their second year make up to 25% of the population in July and August. Single non breeding birds (probably third year birds) stay all year in the MMA.

[Ed. Note that Holmes & Burton 1987 recorded abundant birds in breeding plumage as late as 20-24 Nov in the Negara swamps in 1978, presumably *javanicus*).

White winged Tern *Chlidonias leucopterus*. 46 observations between 23 Aug 1997 (second summer plumage) and 1 May 1999 (1 adult in perfect breeding plumage near KB). The largest numbers are: 10 (non breeding plumage, 1 juvenile) at MO on 27 Sep 1996, 7 J MM on 29 Sep 1996 and 6 (1 first year, 5 moulting adult birds) between TI and MO on 22 Mar 1998. Juveniles arrive in late September.

Great Crested Tern *Sterna bergii*. Two birds in perfect breeding plumage were seen on 13 Feb 1997 on DJ.

Little Tern *Sterna albifrons*. 133 observations between 9 Jun 1988 (1 DJs) and 25 Oct 1993 (1 DJw) see Fig. 9. Two individuals were seen in non breeding plumage: 1 at Muara Kaman on 3 Mar 19% and 1 at DS on 28 Apr 19%. The largest daily totals were: 200 at DS (12 Jul 1996), 303 TI J (20 Aug 1997), 572 TJ J (20 Aug 1997), 686 TJ J (21 Aug 1997) and 338 TJ J (9 Sep 1997). On 12 Jul 1996 display was shown by about 200 birds at DS.

Nests with 2-5 eggs were found near PS in early September 1993. 71m nests were made on the dry lake shore in thorny vegetation, built with a few loose sticks. Juveniles were seen in M from 2 Oct, in 1996 from 14 Sep and in 1997 from 13 Aug 1997. Breeding depends much on the water level of the Mahakam lakes. At D) breeding success was good in the dry years IM and 1997 (with more than 100 juveniles near TJ on 9 Sep 1997) but failed in 19%. when so dry lake shores were available (there was probably some breeding in other parts of the MMA since food carrying adults and a few juveniles were observed in the middle of September 1996).

It appears that these are the first breeding records for Kalimantan, though it has bred in the north of Borneo in Brunei (Smythies 2000).

Savanna Nigbijar *Caprimulgus affinis* Common throughout the swamps of the MMA. During the dry season 1997 up to 30 birds (on 29 Sep 1997) were counted along a 5 km transect the dry DJ. Probably breeding on PPL

Sacred Kingfisher *Todirhamphus sanctus*. 8 observations of single birds. Austral visitor at DJ, SO and Mahakam from July to September (earliest record 19 Jul 1991, latest record 29 Sep 1996). Most of the birds were seen flying over open water or sitting on posts near fishing villages.

The Collared Kingfisher *T chloris* was never observed in the MMA, although it is a common bird of the coastal regions of the province.

Black capped Kingfisher *Halcyon pileata*. Only one record, from SO on 23 Jan 1999.

Stork billed Kingfisher *Pelargopsis Capensis*. 184 observations; all year resident. During the dry season (with low water in DJ) up to 40 birds were counted along the lake transect. Between 20 and 30 birds are regularly found along the lower 10 km of SO and at SB, and up to 15 birds were counted along the upper reaches of SO (28 M 19").

Common Kingfisher *Alcedo attis*. 9 observations of single birds between 12 Sep 1996 (SO) and 28 Mar 1998 (M J) throughout the MMA.

Blue eared Kingfisher *Alcedo meninting*. 43 observations; all year resident. Most birds were seen along SO (e.g. 10 on 8 Aug 1993, 8 on 28 Jul 1996, 6 on 23 Jan 1998). A juvenile was observed at SO on 9 Aug 1993.

Blue banded Kingfisher *Alcedo euryzona* A female was seen at DJ on 27 Jun 1988.

Blue tailed Bee enter *Merops philippinus*. 68 observations; visitor between early October (5 Oct 1996) and late March (22 Mar 1998). Largest number: 690 near PB (13 Feb 1999). More than 200 birds roost regularly on PS, another 50 100 near MO.

Wreathed Hornbill *Aceros undulatus*. Only two records: 3 were seen near PB on 15 Feb 1997, where 4 birds mixed with Wrinkled Hornbills on 13 Mar 1997.

Wrinkled Hornbill *Aceros corrugatus*. Classified as threatened by Collar *et al.* (1994), this hornbill was regularly observed in small numbers near L. Large roosting flocks were seen in February and March 1997 near a freshwater swamp forest at PB (75 on 14 Feb, 26 on 15 Feb, 24 ind. on 5 Mar, 20 on 13 Mar, 26 on 19 Mar and 37 on 22 Mar). At the same time roosting flocks of more than 25,000 Flying Foxes *Pteropus vampyrus* were seen in the same area.

Asian Pied Hornbill *Anthracoceros albirostris*. Common in the freshwater swamp forests of the MMA and along the Mahakam. Usually singly or in pairs.

Clamorous Reed warbler *Acrocephalus stentoreus*. Only about 10 clearly identified birds (plus many unidentified *Acrocephalus* sp.) from July (earliest 10 Jul 1997) until the end of October (latest 26 Oct 1997). The identification was mainly based on morphological differences (*cf.* van Balen & Prentice 1997, MacKinnon & Phillipps 1993) such as bill shape and colour, length of supercilium, breast colour. The song of *A. stentoreus* was not as varied (less high pitched notes) as that of *A. orientalis*. A juvenile bird was seen on 26 Oct 1997 (near 71) together with an adult Clamorous Reed warbler. The juvenile showed a streaked median coronal "stripe", similar to a juvenile Sedge Warbler *A. schoenobaenus*.

Eastern Reed warbler *Acrocephalus orientalis*. Eastern Reed warblers were only clearly identified seven times between September and mid April, based on the morphological differences mentioned above. Their song, which was heard at all encounters, resembled the song of the Great Reed warbler *A. arundinacens*, with interspersed, high pitched notes and characteristic "pergi pergi pergi" phrases.

Pallas's Warbler *Locustella certhibla*. A single bird (size smaller than Clamorous Reed warbler, but larger than Cisticolas) was seen at short range in the vegetation around a remaining water hole of the dry DJ on 4 Oct 1997. The upperparts were rufous brown with black streaks, the underparts were dirty whitish with buffy flanks, a white throat and a bright supercilium. The tail was typically *Locustella* shaped. The rufous rump was not noticed due to the bird's nervous activities.

[Middendorff's Warbler *Locustella ochosensis*. A *Locustella* warbler with a clear whitish supercilium and warm brown unstreaked upperparts, a white throat, buffy flanks and pinkish legs was seen in low reed vegetation at DJ on 13 Feb 1997. A comparison with photographs of Pleske's Warbler *L. pleskei* (Leader 1998) and drawings of Gray's Warbler *L. fasciolata* (du Pont 1971) suggests this species

because of its warmer impression. However there is too little published information about the differences of the three species to enable verification.]

Yellow Wagtail *Motacilla flava*. Common migrant in the open areas of the MMA from September until May (earliest record 2 Sep 1997, latest record 1 May 1999) with a clear peak of passing birds in September.

Long tailed Shrike *Lanius schach*. Only four records of the resident race (grey crown and black mask): 14 Sep 1996 (Mahakam), 4 Oct 1996 (KB), 14 Aug 1998 (DM), and 1 May 1999 (KB).

Chestnut checked Starling *Stumus phitippensis*. Large flocks of up to 5,000 birds were seen at the shore of DJ between September (earliest 12 Sep 1998) and February (latest 21 Feb 1999). All identified birds (including many juveniles) belonged to this species. This species is classified as near threatened by Collar *et al.* (1994).

Conservation Status and Threats

According to Scott (1989), the MMA has been proposed as a conservation area in 1981. MacKinnon *et al.* (1996) list the area as a proposed nature reserve (*cagar alam*). However, until the end of 1999 no official protection status has been given to the Mahakam lakes.

North east of Danau Semayang lies the Muara Kaman reserve (62,500 ha *cagar alam*), which is supposed to protect a large swamp area. However, this reserve has been heavily degraded by forest fires (the latest in April 1998) and agricultural encroachment. Close to Muara Muntai a 450 ha fishery conservation area (Batu Bumbun) had been set up as early as 1927 (Rosenthal & Baum 1980).

There are several serious threats to this unique area:

- Species extinction and habitat loss due to land conversion by plantations and transmigration areas, river control activities.
- Unpredictable changes in the hydrology because of planned and former dredging activities, potential dam construction, river control, mining, logging and plantation activities.
- Pollution by pesticides (more than 100,000 ha of oil palm plantations are being set up; intentional fish poisoning with pesticides) and mercury (high values in the Mahakam water in autumn 1997 were probably caused by gold mining activities upriver).
- Forest fires (such as in 1982/83 and 1997/98).
- Overfishing (*cf.* Christensen 1988).
- Boat traffic (noise and fuel pollution).
- Hunting of protected and endangered species (e.g. herons, storks, hornbills, crocodiles, turtles).

Further Studies

So far, only little research has been done on the Mahakam lakes (mainly during the Indonesian German GTZ Transmigration Area Development Project from 1979-1991). In order to set up a feasible conservation plan, research on the following topics is urgently required:

- Breeding sites of Oriental Darter, herons, Lesser Adjutant, Wandering Whistlingduck and other waterbirds urgently require to be identified and assessed regarding existing or potential threats.
- "Hotspots" of biodiversity and special ecological importance should be assessed and mapped.
- The fire damage of the swamp forests north of DM and DS and in the Muara Kaman reserve should be assessed as well as the remaining biodiversity.
- Existing land use systems and future land use plans should be assessed and evaluated regarding potential conflicts between conservation and utilisation (preferably by using a GIS data base for convenient data processing and evaluation).

Conclusion

So far no conservation plan exists for the MMA. More scientific data are needed to understand this complex and dynamic ecosystem, but immediate political steps are required to protect as much as possible. The dense human population and overlapping land use interests of all stakeholders require a suitable panel (including fishermen, farmers, NGOs, provincial and district government, plantation and mining companies, universities, etc.) to decide the future of one of Kalimantan's most important wetlands. A second step should be the launching of an environmental awareness campaign involving villages, companies and schools.

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Appendix Complete list of birds observed in the MMA wetlands (September 1998)

Abbreviations of the Habitat Types and Abundance Categories (partly following van Balen & Prentice 1997):

oW: open water bodies	C: common
o1: open swamp (immersed sedge and grasslands)	U: uncommon
o2: open swamp (o1 with <i>Mimosa</i> shrubs)	R: rare
o3: open swamp (aquatic vegetation submerged/floating)	L: local
MF: mud flats	b: breeding
SF: swamp forest around the lake	b?: breeding suspected
	m: migrant
	r: roosting

		oW	o1	o2	o3	MF	SF
Oriental Darter	<i>Anhinga melanogaster</i>	-	L	-	-	-	L
Purple Heron	<i>Ardea purpurea</i>	-	C	Cb?	-	C	-
Great Egret	<i>Egretta alba</i>	-	C	Cr	-	C	-
Intermediate Egret	<i>Egretta intermedia</i>	-	U	U	-	U	-
Little Egret	<i>Egretta garzesta</i>	-	U	U	-	C	-
Chinese Egret	<i>Egretta eulophotes</i>	-	-	-	-	-	-
Cattle Egret	<i>Bubulcus ibis</i>	-	C	C	-	L	-
Striated Heron	<i>Butorides striatus</i>	-	-	R	-	-	-
Javan Pond heron	<i>Ardeold speciosa</i>	-	C	Cb	C	C	U
Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	-	-	Ub?	-	-	-
Yellow Bittern	<i>Ixobrychus sinensis</i>	-	-	Ub	-	-	-
Black Bittern	<i>Dupetorflavicollis</i>	-	-	Ub?	-	-	U
Black crowned	<i>Nycticorax nycticorax</i>	-	-	R	-	-	-
Stonds Stork	<i>Ciconia stormi</i>	-	R	-	-	R	-
Lesser Adjutaw	<i>Leptoptilosivanicus</i>	-	C	C	-	U	U
Wandering	<i>Dendrocygna arcuata</i>	C	Cb?	-	C	U	-
Garganey	<i>Anas querquedula</i>	Um	-	-	Um	-	-
Osprey	<i>Pandion halidefus</i>	R	-	-	-	-	-
Black winged Kite	<i>Elanus caeruleus</i>	-	-	L	-	-	L
Brahminy Kite	<i>Hatiastur indus</i>	C	C	C	C	C	C
White bellied Sea eagle	<i>Halideelus kucogaster</i>	U	-	-	-	U	U
Grey headed Fish eagle	<i>Ichthyophaga ichthyaetus</i>	U	-	-	-	U	U
Lesser Fish eagle	<i>Ichthyophaga humilis</i>	R	-	-	-	-	U

		oW	o1	o2	o3	MF	SF
Changeable Hawk eagle	<i>Spizaetus cirrhatus</i>			C		U	U
Peregrine Falcon	<i>Faico peregrinus</i>	Rm				Rm	
Ruddy breasted Crake	<i>Porwna fusca</i>				R		
White browed Crake	<i>Porwna cinerea</i>		C	C			
White breasted Waterhen	<i>Amaurornis phoenicurus</i>			C			
Common Moorhen	<i>Gallinula chloropus</i>		C	U	C		
Purple Swampphen	<i>Porphyrio porphyrio</i>		C	U	C		
Comb crested Jacana	<i>Irediparra gallinacea</i>				L		
Grey Plover	<i>Pluvialis squatarola</i>						Um
Pacific Golden Plover	<i>Pluvialis fulva</i>						Cm
Little Ringed Plover	<i>Charadrius dubius</i>						Cm
Mongolian Plover	<i>Charadrius mongolus</i>						Rm
Whimbrel	<i>Numenius phaeopus</i>						Rm
Far Eastern Curlew	<i>Numenius madagascariensis</i>						Rm
Black tailed Godwit	<i>Limosa limosa</i>						Rm
Bar tailed Godwit	<i>Limosa lapponica</i>						Rm
Common Redshank	<i>Tringa totanus</i>						Um
Common Greenshank	<i>Tringa nebularia</i>						Um
Wood Sandpiper	<i>Tringa glare ola</i>						Cm
Green Sandpiper	<i>Tringa ochropus</i>						Um
Marsh Sandpiper	<i>Tringa stagnatilis</i>						Um
Terek Sandpiper	<i>Tringa cinereus</i>						Rm
Common Sandpiper	<i>Tringa hypoleucos</i>						Cm
Swinhoe's Snipe	<i>Gallinago megala</i>						Rm
Common Snipe	<i>Gallinago gallinago</i>						Um
Great Knot	<i>Calidris tenuirostris</i>						Rm
Red necked Stint	<i>Calidris ruficollis</i>						Cm
Temminck's Stint	<i>Calidris temminckii</i>						Rm
Long toed Stint	<i>Calidris subminuta</i>						Cm
Curlew Sandpiper	<i>Calidris ferruginea</i>						Um
Red necked Phalarope	<i>Phalaropus lobatus</i>						Um
Whiskered Tern	<i>Chlidonias hybridus</i>	Cm	Cm		Cm	Cm	
White winged Tern	<i>Chlidonias leucopterus</i>	Um	Um		Um	Um	
Great Crested Tern	<i>Sterna bergii</i>	Rm					
Little Tern	<i>Sterna albifrons</i>	C	C	C	C	Lb	
Spotted Dove	<i>Streptopelia chinensis</i>						C
Plaintive Cuckoo	<i>Cacomantis merulinus</i>						C
Lesser Coucal	<i>Centropus bengalensis</i>						C
Savanna Nightjar	<i>Caprimulgus affinis</i>					C	
Sacred Kingfisher	<i>Todirhamphus sanctus</i>			Um	Um		Um
Black capped Kingfisher	<i>Halcyon pileata</i>						Rm

		oW	o1	o2	o3	MF	SF
Stork billed Kingfisher	<i>Pelargopsis capensis</i>			C	C		C
Common Kingfisher	<i>Alcedo atthis</i>			Urn	Urn		Urn
Blue eared Kingfisher	<i>Alcedo meninting</i>			U			C
Blue banded Kingfisher	<i>Alcedo eurywna</i>			R			
Blue tailed Bee eater	<i>Merops philippinus</i>	Cm	Cm	Cm			Cm
Wreathed Hornbill	<i>Aceros undulatus</i>						L
Wrinkled Hombill	<i>Aceros corrugatus</i>						L
Oriental Pied Hombill	<i>Anthracoceros albirostris</i>						C
Sunda Woodpecker	<i>Picoides moluccensis</i>						C
Pied Triller	<i>Lalage nigra</i>						C
Common lora	<i>Aegithina tiphia</i>						C
Yellow vented Bulbul	<i>Pycnonotus goiavier</i>				C		
Magpie Robin	<i>Copsychus saularis</i>				U		C
Clamorous Reed warbler	<i>Acrocephalus stentoreus</i>		Cb	Cb			
Eastern Reed warbler	<i>Acrocephalus orientalis</i>		Cm	Cm			
Pallas's Warbler	<i>Locustella certhiola</i>				Rm		
[Middendorffs Warbler]	<i>Locustella ochotensis</i>				Rm		
Yellow bellied Prinia	<i>Prinia flaviventris</i>				C		
Pied Fantail	<i>Rhipidura javanica</i>						C
Yellow Wagtail	<i>Motacilla flava</i>				Cm	Cm	
White breasted Wood swallow	<i>Artamus leucorhynchus</i>				L		U
Long tailed Shrike	<i>Lanius schach</i>				L		
Chestnut cheeked Starling	<i>Sturnus philippensis</i>						U
Olive backed Sunbird	<i>Nectarinia jugularis</i>						C
Dusky Munia	<i>Lonchura fuscans</i>				C		
Black headed Munia	<i>Lonchura malacca</i>				C		