Survei and Conservation of Milky Stork *Mycteria cinerea* in Sumatra, Indonesia

Final Report to Rufford Small Grant

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SUMMARY

The Milky Stork *Mycteria cinerea* is currently listed as Vulnerable because it has undergone a rapid population decline due to ongoing loss of coastal habitat, human disturbance, hunting and trade. Its status in Indonesia is less well known, but although good numbers can still be found at sites in southern Sumatra there are reports that numbers have declined considerably. Further searches at east coastal of Sumatra are therefore urgently needed to clarify the status of this species, to determine the recent population size of Milky stork within Sumatra, as global stronghold for its global population. The main goal of the 2008-2009 Milky storks survey in Sumatra was to obtain information on a basis data and asses recent population of Milky stork in the east coastal of Sumatra, as a basis data for conserving this **vulnerable** species.

Interviews with local people, and forestry officials were principle source of information on Milky stork. All information from interview with local people will confirm for further searching of population and potential breeding areas of Milky stork in the field. Terestrial surveys were conducted both on foot and by using boats. Trip routes were planned on roads and tracks that cross as many river and tributaries as possible. Densities of Milky stork were assessed by a survey trip in the east coastal of Sumatra from the coastal line of Lampung (in the South) to Aceh (in the north). A Standard site description and waterbirds count forms (Asian Waterbird Cencus form) designed and tested by Wetlands International was used for the surveys.

During 2008-2009, a comprehensive survey to asses Milky stork populations at East coastal of Sumatra, and to evaluate reasons for the population trend was undertaken. The surveys targeted to along East coastal of Sumatra, as global stronghold of its population. A total number of 497 Milky storks was counted during 2008-2009 survey in Sumatra. The highest count during survey period was 322 individuals in South Sumatra and the lowest count for Milky stork was 11 individuals in Aceh. The lowest count in Aceh could be impact of losing of breeding habitat. If compare with the previous datas from 1984-1986, 2001-2007 and this survey; it is clear indicate that Milky Stork populations have decline. Although this survey could not cover all areas in the east coastal of Sumatra, but it is suspected that maximum number of Milky stork not more than 2000 individuals. This estimation based on this survey, recent information from local people, local birders, local university student/teachers and historical records of Milky stork in Sumatra.

On 17 June 2008 after a gap of 20 years (2 September 1988), a Milky Stork breeding colony was found in Sumatra on Kumpai lake (02º26'01.7"S 105º34'52.8"E). The area is physically difficult to access, and only 25% of the total area could be surveyed. In the accessible parts, we found 31 Milky Stork nests and 65–75 adult birds. It is estimated that there are 100–115 nests within the site. The colony was located in open mangrove backswamps some 6–7 km from the coast, with nests 2–20 m up in mostly dead trees within a flooded area about 15 ha in extent. No predation of young Milky Stork was seen during the survey. However, the track of a monitor lizard *Varanus salvator* was seen near a tree where Milky Storks were nesting.

Based on our observation in Banyuasin peninsular in October 2008, we found at least 81 individuals of young bird feeding with mature in the coast. Family with 6 individuals young Milky stork were observed resting at mangrove trees in Lumpur river. Contra with Swennen and Marteijn (1987) that mudskippers is a major part of the dietary needed of

Milky stork. Most observation of Milky stork fed catfishes *Arius* spp. From 46 individuals observed, 28 individuals fed catfishes. It is mean that more than 50% fed catfishes.

The main threats to the survival of the species are human disturbance, hunting and habitat loss. The exploitation of eggs and chicks was identified as the principal threat to the continued survival of the breeding colonies.

1. INTRODUCTION

1.1. Background

The Milky Stork *Mycteria cinerea* is widely but very patchily distributed in South-East Asia and is known from Thailand, Cambodia, Vietnam, Peninsular Malaysia and Indonesia (BirdLife International 2001). The bird is currently listed as Vulnerable because it has undergone a rapid population decline due to ongoing loss of coastal habitat, human disturbance, hunting and trade. The population is small and in long-term decline due to loss of coastal habitat, hunting for food and trade. The mainland population is now very small with no more than 100–150 birds in Cambodia and Peninsular Malaysia and no breeding populations remaining in Thailand or Vietnam. In Indonesia the species is resident in Sumatra, Java and Sulawesi (Silvius & Verheugt 1989). Breeding is colonial, often occurring in multi-species aggregations. There are estimated to be only 10–20 pairs at Tonle Sap lake, Cambodia (James Eaton *in litt.* 2008), it is a vagrant to Thailand and Vietnam, whilst numbers have declined sharply in Malaysia with counts falling from over 100 individuals in 1984 to less than 10 birds in 2005. In Malaysia, only two eggs hatched from 21 nests and neither young survived at Matang mangrove forest in 1989, no successful breeding was observed in 1990 at Pulau Kelumpang, and in October 1997, 11 Milky Stork nests were found at Pulau Kelumpang by aerial survey, but again no successful breeding was recorded (Li *et al.* 2006).

Its population is estimated at 5,550 individuals with the majority in Indonesia, about 5,000 in Sumatra, its last stronghold and 400 in west Java (Silvius & Verheugt 1989; BirdLife International 2004 & 2008; Wetlands International 2006). The last stronghold of the species is Sumatra where most of the population resides. On Java numbers declined seriously in the twentieth century and the breeding population there is “tiny” (BirdLife International 2001). There may also be a small resident population on Sulawesi with the main concentration in the south-east although it has not been observed year round, most records being from August to December in recent years, and breeding has not been proved. Due to these declines that might amount to more than 50% over the last three generations, the species qualifies as Vulnerable (BirdLife International 2001, 2004).

Its status in Indonesia is less well known, but although good numbers can still be found at sites in southern Sumatra there are reports that numbers have declined considerably (BirdLife International 2008). The global stronghold of the species is Sumatra, where its primarily distributed along the coasts in east coastal swamp of Aceh, North Sumatra, Riau, Jambi, South Sumatra and Lampung (van Marle and Voous 1988). Further searches at east coastal of Sumatra are therefore urgently needed to clarify the status of this species, to determine the recent population size of Milky stork within Sumatra and protect remaining breeding areas of this species. For this reason, a project of “Survey and conservation of Milky stork *Mycteria cinerea* in the east coastal of Sumatra, Indonesia” is a mandatory to be implemented. The results of this project will monitor on a basis the status and condition of Milky stork and wetlands, in the east coastal of Sumatra; searching recent additional breeding areas of Milky stork in Sumatra, encourage greater popular interest in Milky stork, and thereby promote their conservation; and make recommendations for the conservation and management of the species and its habitat in the east coastal of Sumatra. It is hope this project can give significance information to

determine of the globally species status and contribute to local conservation activities of this Stork and habitat in Sumatra.

1.2. Objectives of the survey

The main goal of the 2008-2009 Milky storks survey in Sumatra was to obtain information on a basis data of Milky stork in the east coastal of Sumatra, as a basis data for conserving this **vulnerable** species. More specific objectives were to:

- To monitor on a basis the status and condition of Milky stork and wetlands, in the east coastal of Sumatra.
- To searching recent breeding areas of Milky stork in Sumatra.
- Define threats to the Milky stork in the project area, and possible factors responsible for any population decline.
- To encourage greater popular interest in Milky stork, and thereby promote their conservation.
- Make recommendations for the conservation and management of the species and its habitat in the east coastal of Sumatra.

2. METHODS AND AREAS SURVEYED

2.1. Areas covered

The east coastal of Sumatra is located in the eastern coast of Sumatra Island, Indonesia. Administratively, the area located at six provinces Aceh, North Sumatra, Riau, Jambi, South Sumatra and Lampung. The east coastal of Sumatra mainly comprising mangrove forest. The main covering survey areas can see in Figure 1.

Figure 1. Map of Sumatra and survey areas covered in the east coastal of Sumatra (showing by red line).

2.2. Time schedule and survey team

Fieldwork survey in six provinces in the east coastal of Sumatra were made at South Sumatra province (March-December 2008), Lampung province (late November 2008), Jambi province (early-mid December 2008), Aceh province (late December 2008), North Sumatra province (early January 2009) and Riau (March 2009).

All of the project team are local people (Sumatran people, Indonesian people). The project team was lead by Muhammad Iqbal (as Principal Investigator) and supported by various member from Sumatra. Thank to All of the project team especially Fadly Takari, Heri Mulyono, Ahmad Ridwan, Herman, Ahmad Zakaria, Khairil Anwar, Nang Hadi, Ismail, Agus Nurza, Teuku Muhammad Sanir, Giyanto Gigi, Hasri Abdillah, Edi Nurrohman and Abdullah. Thanks to Pak Ir. Sumantri (Head of Sembilang National Park) who continuously support us for working with Sembilang National Park. Field survey

participants included local people, local community leaders, university students and government staffs*; **namely*** local people in Aceh (Hendrie, Zakir, Sudirman, Mukhlis and Abdullah), Head of Resort of Karang Gading Langkat Timur Wildlife Reserve North Sumatra (Ahmadin), local people in North Sumatra (Duhuk, Jali and Sul), local people in Riau (Hendra, Ucok, Eka and Pak Burhan), head of Pulau Kijang village-Riau (Udin), local people in Jambi (Dalek, Sulek, Pak Tanjing and Pak Bisek, Department of Forestry of Sembilang National Park Office (Hasbie Effendie, Rasam, Andi and Surahman), Department of Transportation and Public works/Integrated office of Sembilang (Udin, Misran and Abdullah), Government of Ogan Komering Ilir District (Midi and Linda), South Sumatra Natural Resources Management Consortium/Consortium of NGOs in South Sumatra Province (Ali Imron and Chandra Desferli), Serikat Petani Sumatera Selatan/Local NGO in OKI (Nang Hadi), Pemuda Pantai Timur/local NGO in OKI (Abadi), Masyarakat Pantai Timur/leader of local community (Mat Rantai and Yanto), Local people in Pasir river/OKI district (Leman and Anca), Local people in Batang river/OKI district (Pak Ajit, Qodir and Pak Reli) and local people in the east coastal of Lampung (Pak Jon and Ujang).

Figure 2. The fieldwork team in the search of Milky stork Karang Gading Langkat Timur Wildlife Reserve, involving head of the resort of Karang Gading (Bapak Ahmadin).

Figure 3. The fieldwork team in the boat terminal of Kuala Raja, Aceh.

Figure 4. The fieldwork team in Sinaboi (Riau).

Figure 5. The fieldwork team in Pasir river on March 2008.

Figure 6. The fieldwork team in Sembilang National Park office on July 2008.

Figure 7. The fieldwork team in Labuhan Maringgai (Lampung province) on November 2008.

2.3. Survey Methods

2.3.1. Interviews

Interviews with local people, and forestry officials were principle source of information on Milky stork. Interviews were conducted whenever possible. A standard set of questions were asked and answers were recorded on interview form. Preliminary question were asked in every interviewee. Not all questions will asked in every interviewee, depending on how much the interviewee appeared to know.

Complete interview was only conducted with people with obvious knowledge on the species. Questions covered : distribution (current, historical), abundance (changes in number and size structure overtime), taxonomy (different colour form), nesting biology, local custom and beliefs, hunting and trading (past and present). Information on current and historical distribution were gathered from ; interviews with animal trader and hunter, forestry and nature conservation department records (Provincial and District), discussion with staff of forestry and nature conservation department who regular field patrols, and information gained from local people. The village head/leaders were meet whenever possible, and the survey aims discussed.

2.3.2. Survey

All information from interview with local people will confirm for further searching of population and potential breeding areas of Milky stork in the field. Terestrial surveys were conducted both on foot and by using boats. Trip routes were planned on roads and tracks that cross as many river and tributaries as possible. Densities of Milky stork were assessed by survey from a transect line.

Transect line were made along the east coastal of Sumatra depend on condition in the field and information from local people. The transect line and sighting localities were recorded with help using GPS. The birds were generally searched with help of binoculars and monoculars.

2.4. Analysis

Standard site description and waterbirds count forms (Asian Waterbird Cencus form) designed and tested by Wetlands International was used for the surveys. Sites description from from enabled data to be collected on types of wetlands, vegetation, uses of and threats to wetlands. Waterbird count forms provided a standard list of all waterbirds, agains which numbers could be tallied (the standard list included other waterbirds ; eg pelicans, heron, egrets and etc). In addition, wetland-dependent raptors and kingfisher also included. The sequence and nomenclature of bird species used this report follow Wetlands International (2006).

2.5. Education/public information

We have printing limited photos, calendars and posters for a public awareness campaign to inform local communities, including fishermen who live semi permanently offshore, of the conservation and protection status of this species. All materials public awareness distributed in local people in South Sumatra. The village leaders were meet whenever possible, and the survey aims discussed. This project also involve local people, local government staffs and students from South Sumatra Province. It is hope that this project would transform skill and conservation senses to local people.

3. RESULTS AND DISCUSSION

3.1. Local People's Perspective for Milky Stork

Interviews with local people and local government staffs who conducted regularly patrol in the east coast of Sumatra were conducted for exploring local knowledge about Milky Stork (see Figure 8, 9 and 10). They knew well about Milky stork and able to distinguish this species with other large waterbirds e.g. stork (e.g. Lesser Adjutant), egrets and herons. Local people can easily distinguish this species with other large waterbird from large and whitish of body and with black wing covert (compare with egret and Lesser adjutant). There was difference languages for calling Milky Stork among local people. Local people from Aceh called this bird as "Enggang kambing" (Jenieb, Kuala Raja), "Enggang Aleih" (Lhokseumawe) and "Enggang lemo" or "Enggang lembu" (Langsa); Local people from North Sumatra called "Bangau Dohok" (Karang Gading Langkat Timur) and "Baji Bolang" (Tanjung Balai); Local people from Riau called "Burung Anggung or Anggun" (Tanjung Api-api and Sinaboi) and "Bangau Kambing" (Tembilahan, include Bakung/Basu Island, Pisang Island and Nyiur Island); Local people from South Sumatra called this species as "Rerake" or "Rake putih", "Sindang Lawe" and "Bangau",

Local people reported that they saw Milky Stork every time. Most of sightings are in mangrove forest among coastline or mudflat. Sometime they saw Milky Stork in the fish pond (locally called Tambak) when water level fish pond recede. Local people only reported hundreds of Milky stork, and most of them answered that population size was stable from 2, 5, 10 and 15 years ago.

Recent survey in 2008-2009 showing that there are six colony reported by local people as potential remaining breeding colonies of Milky stork, located in 3 provinces. The provinces are North Sumatra (Sumatera Utara), Riau dan South Sumatra (Sumatera Selatan). Each province support two potential sites. All potential remaining breeding sites of Milky stork describe as follow: Selotong river and Tanjung Jumpul (North Sumatra Province), Pulau Berkey and Pulau Basu (Riau Province) and Kuala Puntian and Banyuasin Peninsular (South Sumatra Province). All of the sites mentioned above are potential key breeding areas for Milky stork in Sumatra. Although we didn't have any information on breeding sites from other three provinces (Aceh, Jambi and Lampung) located in the east coastal of Sumatra, it is not mean that there were no breeding sites available in that provinces. Limited resources make some areas cannot be visited by team. Continue to searching breeding sites is very important to learn habitat requirements and as a basic for monitoring population and breeding success in the future.

In South Sumatra, Monitor Lizard (*Varanus salvator*) was reported by local people in Batang river, which sometimes used to eating egg and young Milky Stork (Iqbal et al. 2008). Some young Milky Storks which were collected by local people in Batang river were sometimes eaten by Crocodile (*Crocodilus porosus*). Local people who collected young Milky Stork reported that they usually found some fishes in the nest of Milky Stork. The fishes sometimes they found were: Milkfish (*Chanos chanos*, locally called Bandeng), Elangote Mudskipper (*Pseudapocryptes elongatus*, locally called Janjan), Giant Mudskipper (*Periaptholomodon schlosserii*, locally called Seluncat), Mullet (*Moolgarda sp. / Chelon* sp., locally called Belanak). From the fishes mention above, Elangote Mudskipper was the common one.

Based on interviewee with local people, the main threats to the survival of the species are human disturbance and hunting. In Aceh, it is reported that Milky stork was shoot by local people in Lhokseumawe and Kuala Raja. In all potential remaining breeding sites of Milky stork were reported in Sumatra, Milky Stork was became a common caught bird by local people and they took care the bird as a cage bird. When the young bird grew up and flew, most of birds returned again to the people who took care them. Local people used to collect young bird from the nest where the bird breeds. The phenomenons were similar in all reported breeding areas of Milky stork in North Sumatra, Riau and South Sumatra. If they caught the bird, sometime they sold the young bird or took care the bird as bird cage. The Milky Stork as not sold as fresh meat or cooked meat, but people sold the bird in live condition. The price of young bird ranged between Rp 25.000-30.000 (± $2,5-3).

Figure 8. Local people is main source for exploring local knowledge of Milky stork.

Figure 9. Preparing an effective survey with the head of Karang Gading Langkat Timur Nature Reserve, North Sumatra.

Figure 10. Exploring local knowledge of Milky stork from local field staffs of Department of forestry.

3.2. Milky Stork in the east coastal of Sumatra, Indonesia

3.2.1. Historical information on Milky Stork in the east coastal of Sumatra

W. Davison (in Hume 1873b) mentioned “an enormous flock” in a large creek in Aceh, northernmost Sumatra, suggesting that the species was previously very common on Sumatra. By the end of the 1980s the island was indeed recognised as the global stronghold of the species, with a population estimated to be around 5,000 individuals (Silvius and Verheugt 1989). In 1985, 116 were counted in Lampung province (Milton and Marhadi 1985). Counts in October–November 1984 were of 3,053 birds in the provinces of Riau (703), Jambi (763) and South Sumatra (1,587); in July–August 1985 of 1,029 in Jambi (697) and South Sumatra (732); and again in March–April 1986 of 1,937 in Jambi (1,134), and South Sumatra (803); on the basis of these data these three provinces were judged to hold the majority of the world population (Danielsen and Skov 1985, Silvius 1988). In September 1988 at Tanjung Koyan 300–400 nests were estimated to be present, with a total of 500 birds including at least 50 juveniles; at Tanjung Selokan 300 nests were estimated to be present, with a total of 150 birds including several juveniles; and on the Banyuasin peninsula 280 nests were observed along with 250 adults and 100 juveniles (Danielsen *et al.* 1991a), with as many as 1,000 birds there subsequently (Verheugt *et al.* 1993). These welcome findings were in part offset by the subsequent discovery of the loss of the colony within Hutan Bakau Pantai Timor reserve, Jambi province (Danielsen *et al.* 1991b), which must be taken as reasonably likely to represent a real decline in overall numbers.

After Danielsen and Skov (1985) and Silvius (1988), the population status of the Milky Stork in South Sumatra has been closely monitored during 2001-2007 (Iqbal & Hasudungan 2008). The results of the monitoring indicate that Milky Stork populations have maximum 500 individuals in 2005.

3.2.2. Current Milky Stork population in the east coastal of Sumatra

During 2008-2009, a comprehensive survey to asses Milky stork populations at East coastal of Sumatra, and to evaluate reasons for the population trend was undertaken. The surveys targeted to along East coastal of Sumatra, as global stronghold of its population.

A total number of 497 Milky storks was counted during 2008-2009 survey in Sumatra. The highest count during survey period was 322 individuals in South Sumatra and the lowest count for Milky stork was 11 individuals in Aceh (see Table 1 for results detail on Milky stork survey in each province of Sumatra during 2008-2009). The lowest count in Aceh could be impact of losing of breeding habitat. We are unable to locate information on breeding colony of Milky stork from local people.

If compare with the previous datas from 1984-1986, 2001-2007 and this survey; it is clear indicate that Milky Stork populations have decline. Although this survey could not cover all areas in the east coastal of Sumatra, but it is suspected that maximum number of Milky stork not more than 2000 individuals. This estimation based on this survey, recent information from local people, local birders, local university student/teachers and historical records of Milky stork in Sumatra. Estimation on population of each provinces in Sumatra can see on the table 2.

Table 1. Numbers of Milky stork recorded at east Coastal of Sumatra.

Date/Period	**Locations**	**Number of Milky stork**
22 Oct-2 Nov 2008	East coastal of South Sumatra province (Pasir river in the south to Benu river in the north)	322
28 Nov-9 Dec 2008	East coastal of Lampung province (from Mesuji river in the North to Maringgai river in the South)	37
10-20 Dec 2008	Jambi province (from Benu river in the south to Tanjung Jabung in the north)	50
24-31 Dec 2008	Aceh Province (from Banda Aceh in the north to Kuala Langsa in the south)	11
1-6 Jan 2009	North Sumatra (from Karang Gading Langkat timur in the north to Tanjung Balai Asahan in the south)	60
20-29 March 2009	Riau Province (Tanjung api-api, Sinaboi, Kuala Siak & Tembilahan)	17
Total		**497**

Table 2. Numbers of estimation on Milky stork populations in the east coast of Sumatra.

Locations	**Maximum number of Milky stork[1]**	**Sources**
Aceh province	50	This survey, information from local people, historical records and Agus Nurza *pers comm*[2]
North Sumatra	500	This survey and information from local people, historical records, Robson 2008, Giesen & Sukotjo 1991 and Gigi Giyanto *pers comm*[3]
Riau	500	This survey, information from local people and historical records (especially Giesen 1991)
Jambi	300	This survey, information from local people and historical records
South Sumatra	500	This survey, information from local people and historical records
Lampung	150	This survey, information from local people and historical records
Total	**2000**	

Note:
[1] This estimation is maximum number of Milky stork in Sumatra, factual number could be lower than this estimation.
[2] Agus Nurza is young local birder in Aceh who actively conducting birdwatching in the east coast of Aceh province and he is also active in Indonesian mailing list of ornithology.
[3] Gigi Giyanto is young local birder in North Sumatra who actively conducting birdwatching in the east coast of North Sumatra and he is also active in Indonesian mailing list of ornithology. Gigi has contribution in BirdingAsia 9 (from the field) about largest number of Milky stork in Bagan Percut, North Sumatra.

3.3. Breeding record of Milky stork in Sumatra

3.3.1. Historical information on Breeding record of Milky Stork in Sumatra

In September 1988 at Tanjung Koyan 300–400 nests were estimated to be present, with a total of 500 birds including at least 50 juveniles; at Tanjung Selokan 300 nests were estimated to be present, with a total of 150 birds including several juveniles; and on the Banyuasin peninsula 280 nests were observed along with 250 adults and 100 juveniles (Danielsen *et al.* 1991a), with as many as 1,000 birds there subsequently (Verheugt *et al.* 1993). These welcome findings were in part offset by the subsequent discovery of the loss of the colony within Hutan Bakau Pantai Timor reserve, Jambi province (Danielsen *et al.* 1991b), which must be taken as reasonably likely to represent a real decline in overall numbers.

The species has been recorded nesting alongside Lesser Adjutant, Black-headed Ibis *Ibis melanocephala* and several species of heron Ardeidae (Danielsen *et al.* 1991a). The major breeding colonies found in Sumatra in September 1988 were all in

mangrove back swamps; at Tanjung Koyan the colony was some 2 km from the coast, in dense *Acrostichum* fern vegetation, with nests built in 3–4 m high bushes around a small (900 m²) pool; at Tanjung Selokan it was 1–2 km from the coast, with nests 5–15 m up in 10–12 dead trees within a flooded area 15 ha in extent; on the Banyuasin peninsula it was 3–4 km inland, 2–6 m up in 10–15 small bushes near a 2,500 m² pool in dense *Acrostichum* fern vegetation (Danielsen *et al.* 1991a); and at Kuala Betara, it was situated in the outer mangrove fringe in nine trees (probably *Avicennia*, although some were later identified as "red mangrove" *Rhizophora apiculata*) 8–12 m high (Danielsen and Skov 1985, 1987; also Silvius 1988). Two other nesting colonies were also reported one and three hours inland by canoe (Danielsen and Skov 1985).

3.3.2. Current Breeding record of Milky Stork in Sumatra

On 17 June 2008 after a gap of 20 years (2 September 1988), a Milky Stork breeding colony was found in Sumatra on Kumpai lake (02º26'01.7"S 105º34'52.8"E). The lake (or flooded area) is located about 6–7 km from the mouth of the Kumpai river, and can only be reached after three hours paddling in a small canoe. Administratively it is part of Sugihan sub-district, Ogan Komering Ilir District, South Sumatra. The three breeding sites discovered in South Sumatra in September 1988 were all in mangrove backswamp and located at Tanjung Koyan, Tanjung Selokan and Banyuasin peninsula, but accurate locations were withheld to avoid disturbance (Danielsen *et al*. 1991). The Kumpai site we located is that described as Tanjung Selokan by Danielsen. This site has been cited as an Important Bird Area (SID26) (Holmes & Rombang 2001) and has been designated Hutan Lindung (forest protected by provincial or district government), but neither the Department of Forestry of South Sumatra nor Ogan Komering Ilir District have taken practical action to protect its natural resources. The area is physically difficult to access, and only 25% of the total area could be surveyed. In the accessible parts, we found 31 Milky Stork nests and 65–75 adult birds. It is estimated that there are 100–115 nests within the site. The colony was located in open mangrove backswamps some 6–7 km from the coast, with nests 2–20 m up in mostly dead trees within a flooded area about 15 ha in extent (Figure 9). At the time of our visit, the area was flooded to a depth of 10–30 cm. A total of 300 nests were reported in September 1988 (Danielsen *et al.* 1991) but this included all waterbirds using large stick nests in the area. We found that great care was needed to confirm the ownership of nests: it was easy to mistake Great Egret nests for Milky Stork nests and we found Milky Storks perched in trees where all nests were occupied by Great Egrets. It is not certain therefore how big the decline in the number of active Milky Stork nests has been over 20 years. The timing of nesting appears to be in line with past experience in Sumatra—breeding observed July–September (Verheugt *et al.* 1993), a bird seen in breeding plumage in May (Nash & Nash 1985), and egg-laying June–August (Hancock *et al*. 1992). Dry-season breeding probably coincides with maximum fish stocks, following the rainy season (Hancock *et al*. 1992), and presumably increased ease of prey capture as water levels drop, although this may not apply to birds feeding in tidal areas (BirdLife International 2001).

The Milky Stork is essentially a coastal species favouring mangroves, mudflats and estuaries (Hancock *et al*. 1992), and also feeds on ricefields and fish ponds (Verheugt 1987). The major breeding colonies are in mangroves, with nests built 2–30 m up in trees (BirdLife International 2001). The mangrove species utilised for nesting include *Avicennia marina* and *Rhizopora apiculata.* In Pulau Rambut, Java, most nests are

built in *Sterculia foetida* (Imanudin & Mardiastuti 2003). At Kumpai lake, the nest site is mangrove backswamp with *Avicennia* vegetation. We tentatively identified the tree species as *Avicennia officinalis*. The nests were built 2–20 m up in mostly dead trees (Figures 11 & 12). Eight nests were built below 5 m, the remainder between 5–20 m up.

Nine nests were found in trees that were clearly dead, and 22 nests were in trees that were partly dead. Most trees supported two nests, one tree supported four nests and four trees supported one nest. The nests previously observed in Sumatran breeding colonies were built between 2–15 m (Danielsen & Verheugt 1991). In Java at Pulau Rambut the nests are usually 30 m up, and at Pulau Dua they were originally as low as 4 m prior to disturbance (Hancock *et al.* 1992). Most nests held a single chick; only two nests with two chicks were found (Figure 13). No nests held more than two chicks. An unhatched egg was found in a nest with single chick (Figure 14). From Java there are reports of clutches of three eggs (Hellebrekers & Hoogerwerf 1967) and clutches of five eggs have been recorded (Imanudin & Mardiastuti 2003). All the chicks seen (Figures 12 & 13) were about 20–25 days old (Imanudin & Mardiastuti 2003). The incubation period is estimated at 27–30 days (Hoogerwerf 1936, Imanudin & Mardiastuti 2003). Based on these estimates, it is suspected that at Kumpai lake laying started in late April/early May and the eggs hatched in late May/early June. Adult birds have been recorded taking large (10–23 cm) mudskippers (*Periopthalmus*), also small fish, snakes and frogs (Elliott 1992), but nothing has been reported about the diet of chicks. We found two species of prawn—Indian white prawn *Penaeus indicus* and banana prawn *P. merguensis* and one clupeid fish species, Dussumier's thryssa *Thryssa dussumieri* (Figure 15), in and around nests. The prawn and fish averaged between 7–10 cm in length, prawns predominating. The prawns are of commercial value to local fishermen. Other waterbirds recorded nesting at the site were Great Egret *Egretta alba*, Intermediate Egret *Egretta intermedia*, Little Egret *Egretta garzetta* and Little Cormorant *Phalacrocorax niger* (Figure 16).

There are no previous breeding records for Little Egret and Little Cormorant in Sumatra, and these sightings constitute first breeding records for the island. Black-headed Ibis *Threskiornis melanocephala*, Grey Heron *Ardea cinerea*, Javan Pond Heron *Ardeola speciosa*, Oriental Darter *Anhinga melanogaster*, and Striated Heron *Butorides striatus* were also observed and suspected to be breeding, but no nests were found. In the past in Sumatra, Milky Storks have been recorded nesting alongside Great Egret, Lesser Adjutant *Leptoptilos javanicus*, Javan Pond Heron, Grey Heron and Black-headed Ibis (Danielsen *et al.* 1991). At Pulau Rambut the colonies contained Purple Heron *Ardea purpurea*, Grey Heron, Great Egret, Little Egret, Cattle Egret *Bubulcus ibis*, Glossy Ibis *Plegadis falcinellus*, Black-crowned Night-heron *Nycticorax nycticorax*, Cormorants, Oriental Darter and Black-headed Ibis (Imanudin & Mardiastuti 2003).

No predation of young Milky Stork was seen during the survey. However, the track of a monitor lizard *Varanus salvator* was seen near a tree where Milky Storks were nesting (Figure 17) and local people in the Sungai Batang river reported that the monitor lizard takes Milky Stork eggs and chicks at the Kumpai site. At Pulai Rambut, both monitor lizard and White-bellied Sea-eagle *Haliaeetus leucogaster* have been observed predating Milky Stork chicks (Imanudin & Mardiastuti 2003), whilst other potential predators at Pulau Rambut are reticulated python *Python reticulatus,* cat snake *Boiga*

dendrophylla and Brahminy Kite *Haliastur indus*. At Pulau Kelumpang, Malaysia, although there were no direct observations of eggs or young, it was reported that Brahminy Kites were disturbing the nesting Milky Stork and that monitor lizard and common palm civet *Paradoxurus hermaphroditus* were other potential predators and may have contributed to the zero survival rate (Li *et al.* 2006).

Figure 11. The Kumpai colony, located in open mangrove backswamps 6–7 km from the coast with mostly dead trees within a flooded area, June 2008.

Figure 12. Two nests built 2 m up in a dead tree.

Figure 13. A nest built more than 10 m up with adult and a single chick.

Figure 14. Nest with single chick approximately 20–25 days old and an unhatched egg.

Figure 15. Nest with two chicks.

Figure 16. Dussumier's thryssa *Thryssa dussumieri* was found to be part of the diet of young Milky Stork.

Figure 17. Other nesting waterbirds are Great Egret, Intermediate Egret, Little Egret and Little Cormorant.

Figure 18. The track of a monitor lizard at the site, a potential predator of young Milky Stork.

3.3.3. Additional Possiblities of remaining breeding colony of Milky stork in Sumatra

Recent survey in 2008-2009 showing that there are six colony reported by local people as potential remaining breeding colonies of Milky stork, located in 3 provinces. The provinces are North Sumatra (Sumatera Utara), Riau dan South Sumatra (Sumatera Selatan). Each province support two potential sites. All potential remaining breeding sites of Milky stork describe as follow:

1. Selotong river (North Sumatra Province)

Selotong river located in Karang Gading district at Secanggang sub-district. This area is part of Karang Gading Langkat Timur Laut Wildlife Reserve. Local people called Milky stork as ‘bangau Dohok’. Local people reported that five years ago, Milky stork breed associated with egrets in mangrove forest *Avicenia* sp. It is reported that there are 10 nests of Milky stork with young chick in August 2008. Each nest consisting 3-4

young chick. The nest approximately ± 10 m on the ground. No Milky stork was observed when we visiting Karang Gading Langkat Timur Laut Wildlife Reserve on 2 January 2009. Giesen & Sukotjo (1991) were observed 5 Milky storks in Karang Gading Langkat Timur Wildlife Reserve.

2. Tanjung Jumpul (North Sumatra Province)

Tanjung Jumpul located in Asahan District at Tanjung Balai sub-district. Hundreds of Milky stork reported breed every year in Tanjung Jumpul (Jumpul bay). They called Milky stork as Baji Bolang (see figure 19).

3. Pulau Berkey (Riau Province)

Pulau Berkey located in Rokan Hilir District at Bangko sub-district (see figure 20). Local people called Milky stork as 'burung Anggung'. There is a lake or pool in Pulau Berkey when dry season many waterbirds especially Milky stork breed there. It is reported that hundreds of Milky stork breed associated with egrets and other waterbird. Some local people reported that they have regularly harvested egg and young Milky stork. The latest collection of egg and young Milky stork was conducted last year (2008). A photo of juvenile of Milky stork in Kubu near Bagan Siapi-api by Isabel Martinez in Elliott (1992) possible taken from Pulau Berkey.

4. Pulau Basu (Riau Province)

Pulau Basu is also known as Pulau Bakung. This island located in Indragiri Hilir District at Kuala Indragiri sub-district. Local people called Milky stork as 'burung Babi'. Same with local people from Bagan Siapi-api Riau, it is reported that Milky stork breed associated with egrets and other waterbird in a lake or pool. They also reported that local people regularly harvested egg and young Milky stork. Giesen (1991) reported that breeding colonies of egrets formerly occurred at two Danau (Danau = Lake), Danau Sungai Pangku and Danau Sungai Segar, with nesting occurring between August and September. Logging and egg collecting has meant they have now disappeared. Local people report that the birds had moved to lakes on the island of Air Tawar to the South of Bakung Island. Further survey is needed to clarify this information in discover new site for breeding colony of Milky stork in Sumatra.

5. Kuala Puntian (South Sumatra Province)

Kuala Puntian located at Banyuasin district near Sembilang National Park (see figure 21). This area is part of Banyuasin river. Kuala Puntian is site of finding 300 Milky storks in Banyuasin which cited as Iqbal & Hasudungan (2008) as Banyuasin river. Local name for this bird 'burung Sindang lawe'. Local people reported that in 2007 hundreds of Milky stork breed at mangrove forest. Some local people reported that they have regularly harvested egg and young Milky stork in this area.

6. Banyuasin Peninsular (South Sumatra Province)

Banyuasin Peninsular is also located at Banyusin district (see figure 22). Local people called this bird 'burung Bangau'. The latest report of breeding colony of Milky stork and waterbirds in Banyuasin peninsular at least until 1997. Sungai Siput and Sungai Dinding were reported by local people as potential remaining breeding sites of Milky storks in Banyuasin peninsular where approximately can be reach on canoe and by

foot for 4 hours from the coast. These might be identical with the ones reported by Danielsen *et al*. (1991). In 2001, Wetlands International Indonesia Programme searched for Milky Stork breeding sites in the Banyuasin peninsula, South Sumatra, without success (Goenner & Hasudungan 2001).

Figure 19. Tanjung Jumpul North Sumatra province on 3 January 2008.

Figure 20. Pulau Berkey Riau province on 26 March 2009.

Figure 21. Kuala Puntian South Sumatra province on 2 November 2008.

Figure 22. Banyusin peninsular South Sumatra province on 31 October 2008.

3.3.4. Current Breeding success of Milky Stork in Sumatra

On 17 June 2008, 31 Milky Stork nests and 65–75 adult birds were found at Kumpai lake. There was no follow up fieldwork to monitoring breeding success. In fourth fieldwork activities, local people informed that some fishermen still collecting young and chicks of Milky stork in the area.

However, based on our observation in Banyuasin peninsular in October 2008, we found at least 81 individuals of young bird feeding with mature in the coast (Figure 23-25). Family with 6 individuals young Milky stork were observed resting at mangrove trees in Lumpur river (Figure 26).

Figure 23. Flocks of Milky stork feed with young Milky stork but adult Milky stork was dominated.

Figure 24. Flocks of Milky stork which dominated by young Milky stork.

Figure 25. An individual Milky stork feed a catfishes

Figure 26. Young Milky storks were observed resting at mangrove trees in Lumpur river

3.4. Foraging and Food

An intensive observation of foraging and food consumed by Milky stork was observed on 1 November 2008 in Banyuasin Peninsular. Contra with Swennen and Marteijn (1987) that mudskippers is a major part of the dietary needed of Milky stork. Most observation of Milky stork fed catfishes *Arius* spp (see Figure 27). From 46 individuals observed, 28 individuals fed catfishes. It is mean that more than 50% fed catfishes. When observation made, some mudskippers also occur in the coast/mudflat. Details observation of prey item of Milky stork on 1 November 2008 can see on the table 3.

Table 3. Prey item of Milky stork on 1 November 2008 in Banyuasin Peninsular.

Milky stork prey	Individual Number
Catfishes (*Arius* sp)	**28**
Polynemid fishes	**2**
Mullet	**3**
Bawal	**1**
Shrimp	**1**
Crabs	**1**
Unidentified	**10**
Total Individual	**46**

Figure 27. A flock of Milky stork feed catfishes together.

3.5. Threats of Milky stork in Sumatra

The main threats to the survival of the species are human disturbance, hunting and habitat loss. The exploitation of eggs and chicks was identified as the principal threat to the continued survival of the breeding colonies. All informans who reported breeding colonies of Milky stork in six potential remaining breeding colony in Sumatra told that they have collected eggs and chicks of Milky stork in each sites. It is mean that the exploitation of eggs and chicks was identified as the principal threat of Milky stork in Sumatra.

In Aceh, although there was no report on breeding colony of Milky stork but local people from two localities reported that they shoot the birds when they found this birds. For them, Milky stork is a prefered bird for consumed among other waterbirds. Conducting a campaign and support local stakeholders to implemented law inforcement to the hunters are urgently needed.

Figure 28. Two young Milky storks collected from a breeding colony kept as pet in Simpang PU, South Sumatra.

4. SOME INTERESTING OTHER BIRD RECORD

When conducting this survey, there are some interesting bird record for other bird in the East coastal of Sumatra Island. Some recent interesting records are:

1. **First record for waterbird in Sumatra**

   On 31 December 2008, we observed 20 Grey-headed Lapwings at Alui Putih, Baktia sub-district, Aceh Utara district, Aceh province, Sumatra Island, Indonesia (5°08'51"N, 97°23'06"E). This record is not only the second record for Indonesia, but the first record for Western Indonesia (i.e. Sumatra, Kalimantan, Java and Bali). This observation was confirmed to be published in Wader Study Group Bulletin 116 (1) 2009 (Iqbal et al. 2009).

2. **First and additional breeding record for waterbird in Sumatra**
   There are no previous breeding records for Little Egret and Little Cormorant in Sumatra, When finding Milky stork breeding colony, we observed Little Egret and Little Cormorant with the chick on the nest. These sightings constitute first breeding records for Sumatra. This information was available published in BirdingAsia 10 (Iqbal et al. 2008).

3. **Shorebird migration**
   Mudflat along the coast of South Sumatra province is important habitat for wintering shorebird in East Asian and Australian flyway. A maximum count was made for total 27.410 shorebird in the coast of Banyuasin Peninsular (see Figure 29). This observation confirm the important of Banyuasin peninsular as habitat for shorebird. A video of shorebird migration from Sembilang National Park was posted in youtube.com

4. **Additional record of White-headed Stilt in Sumatra**
   Some White-headed Stilts were observed in the East coastal of South Sumatra province in 8-9 March 2008 and 11 July 2008 (see Figure 30). All of these records are new additional record for White-headed Stilts in South Sumatra after Iqbal 2008. The materials will planed to submitted to Stilt Journal.

5. **An aerial feeding of Brahminy kite**
   Unusual feeding technique was observed for Brahminy kite in Banyuasin Peninsular (see Figure 31). This is a first sighting of aerial feeding reported in Indonesia and unusual feeding technique with the big prey for this kite. A paper regarding this feeding was confirm to be published in Australian Field Ornithology Journal 26 (2009) (Iqbal et al. 2009 in prep).

6. **Confirm the occurrence of Himalayan Griffon in Indonesia**
   Although published by Li & Kasorndokbua (2008), but record of Himalayan Griffon in Sumatra (as first record for Indonesia) still debated. On 14 December 2008, a Himalayan Griffon finally observed in the Banyuasin Peninsular (see Figure 32). This record confirm that Himalayan Griffon as a valid species for Indonesia.

Figure 29. Shorebird migration in Sembilang National Park.

Figure 30. Mature and immature White-headed Stilt.

Figure 31. Aerial feeding Brahminy kite in Banyuasin peninsular.

Figure 32. Himalayan griffon in Banyuasin Peninsular.

5. IMPORTANT ACHIEVEMENTS

This project has achieved some important achievements. All achievement would not possible without fund from Rufford Small Grant for funded this project. The achievements were achieved as follow:

1. **Milky stork as symbol of Sembilang National Park office**
   Before this project approved, the applicant and some local NGO staffs in South Sumatra visited the Sembilang National Park office. When the head of the park ask us to give opinion about the park logo, the applicant propose the park if possible use the Milky stork as logo for the park. Now, the head of Sembilang National Park was proposed the Milky stork to Department of Forest and Nature Conservation in Jakarta, and they approved it. See Figure 33 for looking at logos of Sembilang National Park office.

2. **Give contribution to International Journal of Ornithology**
   Two international papers gain from this project were published in two International Journal of Ornithology. One paper published in Birding Asia 10 and another paper published in the first volume of Journal of Wetlands Ecology.

3. **Project leader getting first Indonesian Ornithologists Union (IdOU) award**
   Based on intensive work for Milky stork in Sumatra during 2008, Indonesian Ornithologists Union (IdOU) was appreciated this work with awarded project leader with first IdOU award.

4. **Sembilang National Park office proposing follow-up budget for monitoring Milky stork and shorebird**
   Sembilang National Park office proposing apply a specific budget for monitoring Milky stork and shorebird to Department of Forest and Nature Conservation. It is hope that this fund will give contribution to conserving Milky stork in Sembilang National Park.

5. **The applicant got invitation from international AWC in Malaysia**
   An invitation for attended International AWC training in Miri (Sarawak, Malaysia) on 26-28 Februari 2009 was made by Wetland International to the project leader. The project leader was attended this meeting as part for improve capacity building and develop networking among birdwatcher in Southeast Asia. Delegation of Indonesia in International AWC training on 26-28 Februari 2009 in Miri (Sarawak, Malaysia) can see Figure 34.

6. **Acknowledgement letter for project team from Sembilang National Park office**
   Intensive works in Sembilang National Park clearly give contributions to the park to improve capacity building of staffs in suvey technique and monitoring of avifauna in the park. For this reason, Head of Sembilang National park sent a Letter to appreciate our collaboration in the field (see Figure 35).

Figure 33. Logos of Sembilang National Park, with a Milky stork flying.

Figure 34. Delegation of Indonesia in International AWC training on 26-28 Februari 2009 in Miri (Sarawak, Malaysia)

DEPARTEMEN KEHUTANAN
DIREKTORAT JENDERAL PERLINDUNGAN HUTAN DAN KONSERVASI ALAM
BALAI TAMAN NASIONAL SEMBILANG

Nomor : S 671/IV-T.7/2008
Lampiran : -
Hal : Ucapan Terima Kasih

Nopember 2008

Kepada Yth.
Direktur Program Kelompok Pengamat Burung-
Spirit of South Sumatra
Palembang

Sehubungan dengan telah diterimanya paket berupa Buku Panduan, CD dan Form Pengamat Burung Migran dari Bapak, maka dengan hormat kami sampaikan ucapan terima kasih atas kepedulian Bapak terhadap upaya pengembangan dan penguatan kapasitas staf Taman Nasional Sembilang dalam hal survei dan pemantauan Burung Migran.

Semua yang telah Bapak kirimkan sangat berguna dan bermanfaat bagi pengelolaan Taman Nasional Sembilang. Besar harapan kami kerjasama ini dapat terus berlangsung serta dapat ditingkat dalam bentuk kegiatan yang lain.

Atas kerjasama yang baik kami ucapkan terima kasih.

Kepala Balai,

Ir. Sumantri
NIP. 710017709

Figure 35. Acknowledgement letter for project team from Sembilang National Park office.

6. CREATE MILKY STORK AWARENESS

Milky stork awareness is one of the best ways to gain one of the objectives of this project. We used some various methods to create Milky stork awareness to local people or to wide audience. The methods used as follow;

1. We have met the local community and discussed about this unique stork (see Figure 36). Most of them were enthusiastic about the study and were willing to work together to ensure the survival of Milky stork. As much as possible, we also conducting environmental education to local leader about mangrove conservation and Milky stork conservation, and make a friendship in the field.
2. We produce calendars and posters. It distributed to the local people, mostly in South Sumatra province who lived in the coast (see Appendix 1 for calendar and Apendix 2 for poster).
3. We conducting transfer our skill and sharing our knowledge with local people, local NGO staffs, member of project team from Deparment of forest and nature conservation and student from University (see Figure 37 & 38).
4. With our local counterpart of Department of forestry and Sembilang National Park office, we warning and give ultimation to people who conducting illegal logging in protected area (see Figure 39). It is hope this action will reduce degradation on Milky stork habitat in this area.
5. We documented some videos and pictures of Milky stork and this work in general. Some of videos gained from this project were shared in youtube.com. eg:

   Rediscovery a breeding colony Milky stork in Sumatra
   http://www.youtube.com/watch?v=qHU9ARi3TQ4

   Milky stork at Sinaboi, Riau Province
   http://www.youtube.com/watch?v=AhVpNj7DKm8

   Shorebird migration in Sembilang 1 Nov 2008
   http://www.youtube.com/watch?v=zIyRsCkVkpU

   Shorebirds of Pantai Labuhan Labu North Sumatra
   http://www.youtube.com/watch?v=IU-BcCWLxrs

   Brahminy kite searching prey Terusan Dalam river Sembilang NP December 2008
   http://www.youtube.com/watch?v=CpKlwwgAJXc

Figure 36. Met the local community, discussed and explored their knowledge about Milky stork.

Figure 37. Skill transfer and sharing our knowledge with local people and student from University

Figure 38. Transfer skill and sharing knowledge with Deparment of forestry and nature conservation.

Figure 39. As possible, throuhg our local counterpart, we warning and give ultimation to people who conducting illegal logging in protected area.

7. POST-PROJECT FOLLOW-UP

7.1. Dissemination of results

Results from this project were disseminated to :

- Mailing list of Indonesia birdwatchers forum, Indonesian Ornithologist Union (IdOU) and SBI (Sahabat Burung Indonesia) mailing list forum.
- Some important or significance results from the field were published in the Ornithology Journal, included Birding Asia, Journal of Wetlands Ecology and Australian Field Ornithology.
- Some videos from this project were shared world wide in youtube.com.
- Documentation (pictures and videos) from this project were shared to local government authority and some of them (eg. Sembilang National Park office) proud to use materials for conservation awareness.

7.2. Possible post-project conservation action

- Materials and photos from the field and results gained from the field will used for preparing materials for conservation awareness to public (especially for local people).
- Based on informations from this project, it is hope that local government will following up for preparing action plan for conservation activities (eg. Conducting regular Monitoring of population and breeding areas, and carrying out conservation activities).
- For following up these purposes, it is hope that a follow up proposal will developed to applied further monitoring and search additional breeding colony and combine with conservation awareness of Milky stork and habitat conservation which integrated to local stakeholder, local community and local students.

8. CONCLUSIONS

8.1. There was difference languages for calling Milky Stork among local people in Sumatra.

8.2. Information about breeding areas of Milky Stork reported by local people were very important references for searching breeding sites of Milky stork

8.3. Milky Stork was became a common caught bird by local people and they took care the bird as a cage bird. When the young bird grew up and flew, most of birds returned again to the people who took care them. Local people used to collect young bird from the nest where they breeds.

8.4. If compare with the previous datas from 1984-1986 and recent monitoring results from 2001-2007 and this survei, it is clear indicate that Milky Stork populations have decline. This trend support status for the species can be increased from “Vulnerable” to “Endangered”.

8.5. The recent breeding colony of Milky stork was located in open mangrove backswamps some 6–7 km from the coast, with nests 2–20 m up in mostly dead trees within a flooded area about 15 ha in extent.

8.6. Monitor lizard *Varanus salvator* is a potential predator of young or egg of Milky stork in the wild.

8.7. Observation of at least 81 individuals of young bird feeding with mature in the coast of Banyuasin Peninsulat and family with 6 individuals young Milky stork were observed resting at mangrove trees in Lumpur river indicate that there are breeding success for Milky stork in South Sumatra.

8.8. An intensive observation of foraging and food consumed by Milky stork in 1 November 2008 was show that most of Milky stork fed catfishes *Arius* spp. This observation is contra with previous available references that mentioned mudsipper as major prey.

8.9. There are some interesting other bird record from east coastal of Sumatra, and it is shown that avifauna in the east coastal of Sumatra Island need further survey.

8.10. The main threats to the survival of the species are human disturbance, hunting and habitat loss. The exploitation of eggs and chicks was identified as the principal threat to the continued survival of the breeding colonies.

9. RECCOMENDATIONS

9.1. This survey showed that number of Milky stork in the East coastal of South Sumatra province decrease from previous record. It is possible that this trend support status for the species can be increased from “Vulnerable” to “Endangered”.

9.2. Milky storks at east coastal of Sumatra e should be further investigated.

9.3. It remains necessary to continue to monitor the existing and future population at east coastal of Sumatra island and adjacent areas to further increase our understanding of the population, its habitat preferences, predators and threats.

9.4. Within Sumatra there is a need to enhance public awareness of the status of the threatened Milky stork to aid the conservation of the species and its habitat.

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11. APPENDICES

Appendix 1. Campaign calendar about conservation of Milky stork.

Appendix 2. Campaign posters about conservation of Milky stork.