



## Observations on the occurrence of Irrawaddy dolphin, *Orcaella brevirostris*, in the Mahakam River, East Kalimantan, Indonesia

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*Receipt of Ms. 16. 06. 1998*

*Acceptance of Ms. 30. 10. 1998*

**Key words:** *Orcaella brevirostris*, Irrawaddy dolphin, Mahakam River, encounter rates, distribution

The Irrawaddy dolphin, *Orcaella brevirostris* (Gray, 1866), is considered a 'facultative' river dolphin of which distinct riverine and coastal, marine populations exist. The species is mainly found in shallow coastal waters of the tropical Indo-Pacific, but also in major river systems, in particular: Irrawaddy, Mekong, Mahakam, and the estuaries of the Ganges and Brahmaputra (THOMAS 1892; LLOZE 1973; LEATHERWOOD et al. 1984; MARSH et al. 1989).

Relatively few published studies exist pertaining specifically to the population of Irrawaddy dolphins, in the local vernacular referred to as Pesut, in the Mahakam River, East Kalimantan, Indonesia. Studies so far have focused on the distribution and daily movement pattern of the species in Semayang-Melintang Lakes and connecting Pela and Melintang tributaries (PRIYONO 1994) and on bioacoustics (KAMMINGA et al. 1983). Although no systematic surveys on their abundance have been conducted so far, the Indonesian Directorate General of Forest Protection and Nature Conservation reported the existence of a population of 100–150 individuals for Semayang Lake, Pela River, and adjacent Mahakam River (TAS'AN and LEATHERWOOD 1984) while an unpublished estimate of 68 individuals in the Mahakam River was reported by PRIYONO (1994).

In this study, I present results of a preliminary survey, which was conducted on the Mahakam River, its tributaries, and adjacent lakes in East Kalimantan, Indonesia. Two surveys were conducted, both at medium to low waterlevels, the first from 27 February till 9 March 1997 and the second from 21 March till 6 April 1997. The river was surveyed using a small motor boat, occasionally by large public boat and by large and small motorized canoes, from Muara Kaman (ca. 200 km upstream) to Burit Haca, at the rapids past Long Bagun (ca. 600 km upstream). In addition, the Semayang, Melintang, and Jempang Lakes were surveyed as well as the Pela, Melintang, and Kedang Pahu tributaries. The total survey length was 1085 km. For analysis of sighting frequencies, the river was divided into a lower (from Samarinda, ca. 100 km upstream, until Muara Kaman), middle (from Muara Kaman until Long Iram, ca. 490 km upstream), and upper section (from Long Iram until the rapids after Long Bagun). Tributaries and lakes surveyed were also analysed separately.

Encounter rates were calculated for each section by dividing the number of observed dolphins by the number of kilometers searched. For testing whether the sighting frequencies are homogeneously distributed over all sections, and whether significant differences exist between different sections, G-tests of goodness of fit for single classification fre-

quency distributions were used. To obtain a better approximation to  $\chi^2$ , Williams' correction to G was applied ( $G_{adj}$ ; SOKAL and ROHLF 1981). G values were compared with critical values of the chi-square distribution (table C in SIEGEL and CASTELLAN 1988). Because multiple tests were performed, a corrected alpha of 0.01 was used in place of the nominal alpha of 0.05 (RICE 1989). Dolphins were spotted by eye and by means of binoculars. Group composition, location, diving times, respiration rates, and behaviors were recorded and photos taken. Additional data on the occurrence and status of Pesut were collected by interviewing local inhabitants, mainly fishermen.

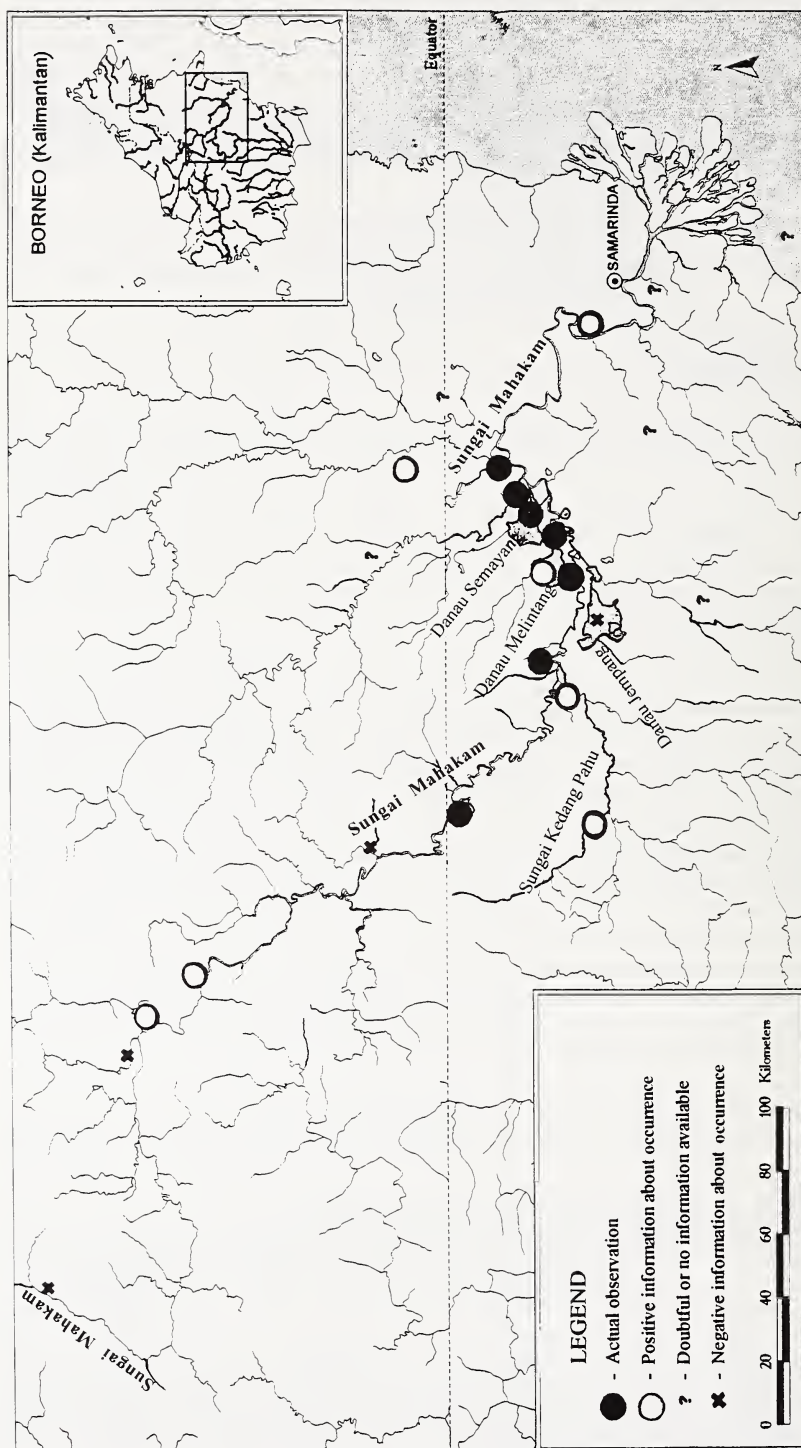
During the present study, a total of 32 dolphins were observed, of which four were juveniles. During the first survey 29 individuals were encountered while during the second only 3 were observed, presumably because more time was spent in the upper section of the Mahakam, where no dolphins were observed. Group size varied from 3 to 7 animals with a median group size of 4 individuals. No minimum estimate of abundance could be made as only three dolphins were identifiable individually on the basis of their dorsal fin (no systematic photos of their dorsal fin were made). Also, there is the possibility that the dolphins might have been encountered more than once during each survey, in case they were heading in the same direction during the night as we were heading during the day. Irrawaddy dolphins were found to be rather inconspicuous; they do not leap high out of the water and may stay submerged for up to 12 minutes, surfacing only briefly. Except for some noises produced with their blow holes, which could be heard over 100 m distance, no audible whistles or pure tones were heard. Pesuts appeared to be very social, continuously staying in close contact with one another, regardless of whether they were milling (feeding), travelling, or resting.

Table 1 shows the encounter rates, i.e. the number of dolphins per km of river searched, for different sections of the Mahakam River system. The dolphins are not homogeneously distributed over the whole length of different river sections, tributaries, and lakes ( $G_{adj} = 47.8$ ,  $df = 4$ ,  $p < 0.01$ ). The encounter rates of the middle river section are significantly higher than those of the upper section ( $G_{adj} = 39.2$ ,  $df = 1$ ,  $p < 0.01$ ). Significantly higher encounter rates were also found for the tributaries when compared to the combined main river sections ( $G_{adj} = 8.3$ ,  $df = 1$ ,  $p < 0.01$ ). However, all tributary observations of Pesut were made in the relatively short Pela tributary (only 8 km search effort), a connecting tributary to Semayang Lake and the Mahakam River. No sightings were made in the longer tributary Kedang Pahu of which 65 km in total was searched. No significant differences were found between encounter rates of middle river section and tributaries. As all tributary observations were made in the Pela tributary connecting to the middle section of the main river, and observations in the middle section of the Mahakam were significantly higher than in the upper section (with a higher search effort), this section presumably forms the primary habitat for the dolphins, when waterlevels are medium to low.

Encounter rates for the Semayang and Melintang Lakes, though lower, were not significantly so, when compared to the combined rates of the river and tributaries

**Table 1.** Encounter rates – dolphins observed per km of river searched.

Section	Search effort (km)	N of individuals	Encounter rate N of indiv./km
Lower Section	20	0	0
Middle Section	432	25	0.06
Upper Section	505	0	0
Tributaries	78	7	0.09
Lakes	50	0	0



**Fig. 1.** Distribution of *Orcaella brevirostris* in the Mahakam River, East Kalimantan, Indonesia.



( $G_{adj} = 3.9$ ,  $G_{0.01} = 6.6$ ). The significant difference in encounter rates between these sections is probably a result of treating dolphins sightings in the Pela tributary as tributary observations. However, the dolphins' presence in either the Pela tributary or in Semayang Lake might depend on time of the day, as the dolphins are reported to migrate daily between these areas (PRIYONO 1994). The absence of observations of dolphins in the lakes most certainly is due to the fact that only 50 km were surveyed of the 10,300 hectares and 8,900 hectares large Semayang and Melintang Lakes, respectively. No significant differences in encounter rates were found between lower and other river sections, possibly due to the low search effort in this section.

The encounter rates found for *Orcaella brevirostris* in the Mahakam River are in the same order of magnitude as that reported for *Lipotes vexilifer* in the Yangtze River (0.09 dolphins/km), a population considered to have a high extinction risk (HUA and CHEN 1992). However, the encounter rate of 0.06 dolphins/km in the mainstem Mahakam River, is considerably lower than those recorded, at similar medium-low water level conditions, for *Inia geoffrensis* and *Sotalia fluviatilis* in the mainstems of the Amazon-Marañon-Ucayali (0.18 and 0.27 dolphins/km, respectively; LEATHERWOOD 1996).

In the present study, Pesuts were observed up till Tering, 400 km upstream (Fig. 1), but they are said to occur up till the waterfalls after Long Bagun. Although no sightings were made in any of the lakes visited, Pesut has frequently been recorded in Semayang and Melintang Lakes (TAS'AN and LEATHERWOOD 1984), but the dolphins are said to be absent from Jempang Lake. Whether the Pesut occurs between Samarinda (near the mouth of the river) and the open sea, and in which of the river's tributaries, remains unclear. When water levels are high, dolphins are often observed by local inhabitants high up the Kedang Pahu tributary, past the village of Damai. Although the dolphins always moved away from our research vessel, they were observed twice near two villages (Muara Pahu and Tering) with high levels of boat traffic. According to local fishermen, they were said to frequent these places almost on a daily basis, presumably because of the higher availability of fish.

In conclusion, the results from this preliminary survey seem to indicate that encounter rates of the Irrawaddy dolphin in the Mahakam River are relatively low and fall in the same class of those recorded for the seriously threatened *Lipotes vexilifer*. Furthermore, middle sections of the river seems to be the primary habitat of Pesut, at least at medium to low water levels. Given the many factors contributing to possible deterioration of dolphin habitat (e.g. pollution from mining, forest fires, logging, and siltation), these observations of low encounter rates merit further study.

### Acknowledgements

I wish to thank the East Kalimantan nature conservation authorities, sub Balai Konservasi Sumber Daya Alam, WWF-Indonesia, and WWF-Netherlands for their support and cooperation. My special thanks go to Ir. A. M. RACHMAT, D. SUPRIJONO, F. BUTCHER, and boatsman PAK SEGA, who all participated in the survey. I would like to thank Dr. P. J. H. VAN BREE for all his help and support throughout the study, as well as for his comments on the manuscript. Dr. C. J. HAZEVOET, Dr. A. Ø. Mooers, V. Nijman, and an anonymous reviewer are also thanked for their comments on this manuscript. I. LYSENKO and the World Centre for Monitoring Cambridge are thanked for drawing of the map.

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Zeitschrift/Journal: [Mammalian Biology \(früher Zeitschrift für Säugetierkunde\)](#)

Jahr/Year: 1999

Band/Volume: [64](#)

Autor(en)/Author(s): Krieb Danielle

Artikel/Article: [Observations on the occurrence of Irrawaddy dolphin, \*Orcaella brevirostris\*, in the Mahakam River, East Kalimantan, Indonesia 54-58](#)