

SARAWAK DOLPHIN PROJECT

Year End Final Report

July 2009



» Sarawak Dolphin Project



**A Joint Research Project:
Shell, Sarawak Forestry, UNIMAS**

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Sarawak Dolphin Project Year End Final Report

July 2009

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Summary

The Sarawak Dolphin Project was launched on May 15th 2008. From the inception, the **Project Aims and Objectives** were as follows:

- Collect important baseline data on the seasonal distribution, habitat use and conservation needs of dolphins in Sarawak.
- Provide training and field experience for local Malaysian scientists (university students and Sarawak Forestry Corporation staff) as well as opportunities for volunteers to become involved in dolphin conservation activities.
- Raise awareness of marine mammals and their conservation needs in the local population by disseminating findings through scientific and popular press, and community workshops.
- Apply the study results to develop effective conservation and management plans.

The project partners are:

Sarawak Shell Berhad (Shell): providing funding and logistic support for the project

Sarawak Forestry Corporation (SFC): providing staffing, expertise, permits and permissions, and the link with State government to implement conservation plans.

Universiti Malaysia Sarawak (UNIMAS): Administrating project, providing academic expertise and graduate trainee researchers

Additional organizations/parties involved:

- *Piasau Boat Club (Miri)*: providing a research vessel for the Miri-based research
- *Volunteers* from Shell, the Malaysian Nature Society and other interested parties – to assist with research and learn about dolphin conservation.

Survey areas and project methods:

The project focused on three main survey areas – the nearshore waters around Miri, Bintulu/Similajau and Kuching. A series of three-day “snapshot” surveys were conducted in each area at three different times of year, allowing for comparison of dolphin distribution between areas and between seasons. Over the course of the year, 37 days were spent on small boat surveys, which covered a total of 3644 kms. Survey teams in each area were comprised of the two core researchers from UNIMAS and a minimum of two regional staff from the Sarawak Forestry Corporation. In Miri, the team was also complemented with volunteers from Shell and the Miri chapter of the Malaysian Nature Society. The team used small open-deck boats to navigate pre-determined survey tracks

(parallel lines set at 45degree angles to the coast) and record all the dolphin groups they encountered. By observing behaviour, group size and composition, the team could determine which areas of coastline are important for the dolphins' feeding and breeding. The team also used photo-identification techniques to recognize individual dolphins from distinctive scarring and patterns on their dorsal fin area.

The surveys yielded a total of 76 dolphin sightings, the details of which are stored in the purpose-designed "Sarawak Cetacean Database". This database also holds records of dolphin sightings reported by third parties, such as dolphin watch tour operators and primate and bird researchers working in coastal areas. This database can be used by future researchers and conservation managers to plot dolphin "hotspots" and plan conservation measures. The project also created photo-identification databases for three of the key species studied which will allow researchers to recognize individual dolphins over time.

The four species of dolphin studied during the course of this project were (in order of frequency):

| Common name | Scientific name | Local name | IUCN Redlist status* |
|--------------------|---------------------------------|--------------------------|---|
| Irawaddy dolphin | <i>Orcaella brevirostris</i> | Empesut | Vulnerable - with many SE Asia populations considered Critically Endangered |
| Finless porpoise | <i>Neophocaena phocaenoides</i> | Lumba lumba ambu | Vulnerable |
| Bottlenose dolphin | <i>Tursiops aduncus</i> | Lumba lumba hidung botol | Data Deficient |
| Humpback dolphin | <i>Sousa chinensis</i> | Lumba lumba putih | Near Threatened |

* from the 2008 revised IUCN Redlist of Endangered Species: <http://www.iucnredlist.org/>

The project team also responded to reports of stranded or entangled dolphins along Sarawak's coastline. A total of five dead dolphins, including one Irawaddy dolphin, two finless porpoises, one bottlenose and one humpback dolphin were examined and skin and stomach samples were collected for genetic and diet analysis.

All four of these species demonstrate a clear preference for nearshore habitats, with 89 percent of our sightings taking place in waters of less than 10m depth. Sightings of small calves and observations of feeding behaviours indicate that these areas close to shore are important for feeding and breeding. This reliance on coastal waters that are also heavily used by humans exposes them to a range of threats, including by-catch in fisheries, habitat loss and degradation, and decreased fitness from pollution/contaminants. These threats have already taken their toll on many populations of Irawaddy dolphins in Southeast Asia which are listed as Critically Endangered (only one step from extinction).

Training and capacity building:

One of the most important elements of the project is the capacity building that was possible under the unique three-way partnership. Cindy Peter, hired as the full-time research assistant on the project is now working toward an MSc in dolphin ecology in the Kuching region. She will become the first post-graduate level marine mammal expert in Sarawak.

The 20 SFC staff involved in the project also had many opportunities to gain skills and knowledge, both through hands-on training during boat surveys and more formal classroom based sessions which covered basic dolphin ecology and conservation, detailed survey methods, and methods for coping with and collecting data from both live and dead stranded dolphins.

It is hoped that Cindy and the SFC colleagues who participated in this project will be able to continue conducting conservation-based dolphin research for many years to come, and that they will be able to cascade the training they received to colleagues and students at their respective institutions. The project has produced a series of three training modules to facilitate this process.

Public awareness and education:

The project was able to promote public awareness of dolphins in Sarawak and their conservation needs through three main channels:

- Community workshops were conducted in coastal fishing villages such as the community at Pulau Salak in the Kuching region. Presentations were also given to corporate groups, schools and interest groups, including a presentation and colouring competition for over 200 children and family members at the Pustaka Miri.
- Dolphin watch operators in the Kuching region were involved in the project as contractors providing boats and drivers. Through both classroom sessions and on-the-boat training, they learned about dolphin biology and conservation and the importance of adhering to approach guidelines during dolphin encounters.
- The project website, press releases and articles in local newspapers and journals were also used to promote general awareness of dolphins and their conservation needs.

Project follow-up and recommendations:

- Dissemination of project results through popular press and the website, as well as through publications in international scientific journals.

- UNIMAS and SFC to continue research in all three target areas, as well as other areas of likely dolphin distribution along the Sarawak Coastline. Repeating the same methods will allow for detection of trends over time.
- UNIMAS and SFC to collaborate on the formation of a state-wide stranding network to allow early detection and reporting of dolphin entanglements and strandings.
- SFC and other government bodies to take project results into consideration when planning and/or approving any coastal developments that might impact the demonstrated nearshore dolphin habitats. This may require liaising with fisheries and State planning departments.

Acknowledgments

Many individuals from Shell, SFC and IBEC at UNIMAS were involved in the implementation of this project (see below). In addition to this core team The Sarawak Dolphin Project would like to thank the following organizations for their support during the project: The Piasau Boat Club in Miri, for the use of their dive boat and excellent drivers; The Malaysian Nature Society for their support in awareness-raising activities in Miri and Kuching; CPH Travel and Permai Rainforest Resort for the provision of survey vessels in the Kuching region; Pustaka Miri for hosting a community event in Miri; and the GIS teams at UNIMAS and Sarawak Shell Berhad for assistance in mapping and analysis of data.

Sarawak Dolphin Project Team

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Bottlenose dolphins with Calf – Kuala Santubong, Kuching

I. Introduction and background

On May 15th 2008, the Sarawak Dolphin Project was officially launched in Kuching. The project represented a unique partnership between industry, government and academia, with Shell providing funding and logistic support where necessary, UNIMAS providing staff and technical expertise, and SFC providing staff, logistic support and the framework in which the research methods and results could be applied to practical conservation measures. The project was based on a Memorandum of Understanding which was signed by all three parties, and set out the main objectives, which were:

- 1) Collect important baseline data on the seasonal distribution habitat use and population affiliations of dolphins in Sarawak using sound science.
- 2) Provide training and field experience for local Malaysian scientists (UNIMAS undergraduates and SFC staff) as well as opportunities for SSB staff and family members to become involved in dolphins conservation activities.
- 3) Train coastal wildlife and fisheries officers in techniques for handling dolphin strandings as a first step toward the formation of a dolphin stranding network.
- 4) Raise awareness of dolphins and their conservation needs in the local population and internationally by disseminating findings through scientific and popular press, community workshops, and the involvement of SSB staff and volunteers.
- 5) Apply the data gathered to develop effective conservation and management plans.

Work toward the first of these objectives began almost immediately with the first coastal dolphin survey being conducted in Similajau on June 11th – 13th 2008. Following that first survey, team members from SFC and UNIMAS worked hard throughout the year toward the project's first four stated objectives.

This is the final report of the Project, intended to fully inform project partners, Shell, the Sarawak Forestry Corporation and UNIMAS, about the work achieved toward these goals. As such, this report is organized into four main sections:

- Scientific surveys – with detailed information on the methods used to conduct coastal dolphin surveys, and the results obtained from these surveys.
- Training of local scientists – with detailed information on training that was conducted with UNIMAS and SFC staff.
- Awareness Raising: with detailed information on community workshops, presentations and other educational/awareness raising strategies of the project.
- Application of results: recommendations for follow-up activities and how the project results can be applied to dolphin conservation strategies in Sarawak.

Prior to 2008, formal research on the marine mammals of Sarawak was limited. Aerial and boat surveys conducted jointly by the Sarawak Forestry Corporation (SFC) the University Malaysia Sabah (UMS) and the Sabah Wildlife Department, as well as some brief surveys conducted by visiting scientists provided some initial overviews of the species present (I. Beasley and Jefferson, 1997) and their distribution (Bali *et al.*, 2008). Jaaman *et. al* (2000) provide the most comprehensive overview to date of the status of marine mammals in East Malaysia, including both inshore and offshore waters. This overview and other anecdotal data and unpublished records from Sarawak's coastline indicate that the species most commonly encountered in nearshore waters include: the Indo-Pacific humpback dolphin (*Sousa chinensis*, Osbeck, 1765), finless porpoise (*Neophocaena phocaenoides* Cuvier, 1829), bottlenose dolphin (*Tursiops aduncus*, Ehrenberg, 1833), and the Irrawaddy dolphin (*Orcaella brevirostris*, Owen in Gray, 1866).

These coastal-dwelling species are listed as "Vulnerable", "Near-Threatened" or "Data-deficient" in the IUCN Redlist of endangered species (IUCN, 2008). Many populations of Irrawaddy dolphins in Southeast Asia are listed as Critically Endangered (IUCN 2008). These species' preference for nearshore habitats exposes them to a range of threats, including by-catch in fisheries gear (Dolar *et al.*, 2002; Read *et al.*, 2006), habitat loss and degradation, decreased fitness from pollution/contaminants (e.g. Adams *et al.*, 2008; Reeves *et al.*, 2003), increased boat traffic and dolphin watch tourism (Beijder *et al.*, 2006; Constantine *et al.*, 2004; Lusseau, 2003; Lusseau *et al.*, 2007).



The Irrawaddy dolphin, the species featured in our logo, is known to rely on habitats very close to shore. This renders the species extremely vulnerable to various threats from human activity. Many closely studied populations of this species are considered "critically endangered" on the IUCN Redlist of endangered species.

All of these threats are known to be present in Borneo in general (Dolar *et al.*, 1997; Kreb and Budiono, 2005) and in Sarawak specifically (Jaaman, 2006). Fisheries expansion, logging and coastal development all present direct threats to the habitats and survival of coastal dolphins in Sarawak. As such, detailed scientific surveys are of great importance in order to more accurately assess the species composition, distribution and habitat requirements of dolphins occurring in the area. Only then can the relevant bodies design effective management and conservation strategies.

II. Data Collection: Scientific surveys

The main tool for collection of baseline data on dolphin distribution and habitat use was the use of small boat surveys conducted in different study sites at different times of year. The survey design evolved to focus on three main survey areas along the Sarawak coastline: Kuching, Bintulu/Similajau and Miri (see figure 1). Our aim was to spend a minimum of three days surveying each of the three main study areas during at least three different times of year: June-July, September-October and March-April. This survey design should allow us to compare dolphin encounter rates between survey areas and between seasons to detect possible trends in distribution.

Survey tracks and sightings

Transects extended up to 15km offshore and ran at 45 degrees parallel to the coast allowing for detection of cetacean density gradients alongshore as well as onshore/offshore (e.g. Dawson *et al.*, 2008). The boats used were open-deck, fiberglass-hulled boats averaging 28ft in length and using either single or double outboard engines ranging from 90 to 200hp. A minimum of three observers stood approximately 1.5m above sea level and searched with the naked eye, with one observer at the bow scanning a cone of about 30 degrees and two observers on either side of the boat covering angles to approximately 90 degrees to port and starboard (e.g. Parra *et al.*, 2006). A minimum of two experienced cetacean observers were always onboard, while other observers undergoing training had varying degrees of experience. Transects were navigated at a steady speed of 10 nautical miles per hour and observers rotated through different positions on the boat at roughly half-hour intervals to avoid fatigue. Whenever dolphins were detected, search effort was suspended to collect data on their group composition and behavior following standardized data collection methods (e.g. Smith and Reeves, 2000). Positional data for both survey tracks and sightings was collected using a handheld GPS unit.



Boat surveys follow pre-determined tracks in each survey area which are set 4kms apart and run at 45 degree angles to the coast. A minimum of three observers are "on effort" while the boat travels at a constant speed of 10 nautical miles per hour (approx 16kms/hr).

Effort was recorded to the nearest minute throughout each survey, in order to distinguish between time spent on optimal survey conditions, and time spent speeding to or from start and end points, on breaks, or working with dolphins. Recorded

sightings were designated an “effort code” to indicate whether they were made during optimal searching conditions, or incidentally during breaks or in transit to or from a transect. Only sightings made on transects during optimal searching conditions were used to calculate encounter rates. Encounter rates were calculated by dividing the number of “on effort” sightings by the total number of hours spent “on effort” as well as by the distance covered during “on effort” survey time. Weather conditions that could affect sighting probability were recorded on an hourly basis, or upon a rapid condition change, and search effort was suspended during heavy rain and/or Beaufort Sea-states of 4 or higher.

Given the relative inexperience of many of the team members, the low viewing platform provided by the boats used in the survey, and the short duration of the surveys, it was decided that methods for estimating relative abundance (e.g. encounter rates) as opposed to absolute abundance (numerical population estimates for each species encountered) would be more appropriate for this survey. For this reason we did not calculate angles of sightings as would be required in the use of DISTANCE line-transect methodology (Buckland *et al.*, 2001).

Survey tracks and waypoints recorded with the handheld GPS were downloaded at the end of each day and saved in different formats for later processing in Google Earth and/or ArcMap. Sighting details were entered into a custom-designed MS Access database, and both tracks and sightings were imported into Google Earth and ArcMap for viewing and mapping purposes.

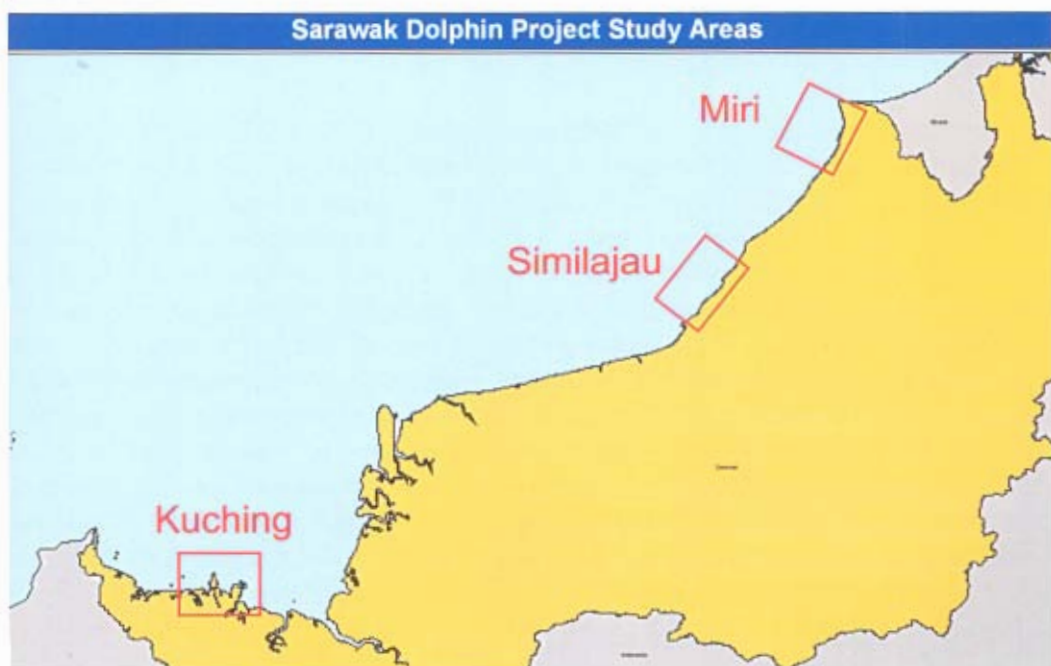


Figure 1a: Project survey areas.



1b. Survey tracks in “block 2” in Kuching, the area west of the Santubong peninsula.

Surveys completed as of June 15th 2009 are detailed in Table 1. The completed tracks and sightings made during the surveys are depicted in figures 2 a-c. During 37 days (over 214 hours) of boat surveys a total 3644 kms have been covered. Of this total 112:34 hours and 1864 km were spent “on effort”. A total of 76 dolphin sightings were made during our surveys, of which 42 were “on effort”, and can be used to calculate encounter rates and relative abundance of dolphins between survey areas and at different times of year. These sightings were all entered into the “Sarawak Cetacean Database” a custom-designed MS-Access database with 20 interlinking tables and a user-friendly form for data entry. Sightings made by third parties (e.g. dolphin watch tour operators or researchers working with other species who incidentally sight dolphins during the course of their work) have also been entered into the database, bringing the total number of records of live dolphin sightings up to over 130. These additional sightings can be used to get a broader overview of dolphin distribution outside of the survey’s own geographical and temporal scope.

Table 1: Survey dates, distance covered, hours spent surveying and number of dolphin sightings per survey period in each region.

| Dates Surveyed | Distance covered (km) | Total hrs surveying | Hours on effort | Irrawaddy dolphin sightings | Finless porpoise sightings | Other species |
|--------------------------|-----------------------|---------------------|-----------------|-----------------------------|----------------------------|----------------|
| Kuching | | | | | | |
| 15-17 July '08 | 319.57 | 19:41 | 9:00 | 5 | 2 | 1 (umid) |
| 16-18 Sept '08 | 299.33 | 18:44 | 10:56 | 6 | 1 | 1 (bottlenose) |
| 14-16 Oct '08 | 254.34 | 16:35 | 9:04 | 7 | 1 | |
| 8, 13 Nov and 11 Dec '08 | 114.82 | 13:16 | 3:52 | 4 | 0 | |
| 4-6 Mar '09 | 279.403 | 15:55 | 10:19 | 3 | 2 | |
| 20-21 May* | 199.614 | 15:40 | 5:30 | 4 | 2 | |
| Kuching total | 1467.088 | 147:51 | 48:41 | 29 | 9 | 2 |
| Similajau | | | | | | |
| 11-13 June '08 | 272 | 18:23 | 6:16 | 7 | 6 | 1 (humpback) |
| 24-26 Sept '08 | 249.37 | 16:25 | 9:26 | 1 | 3 | |
| 25-27 Mar '09 | 339.033764 | 19:00 | 9:41 | 5 | 5 | |
| Similajau total | 913.071153 | 53:48 | 25:23 | 13 | 14 | 1 |
| Miri | | | | | | |
| 24 June, 7-9 Jul '08 | 351.05 | 22:54 | 13:29 | 1 | 3 | |
| 9 Sept and 4 Nov '08 | 199.8 | 12:09 | 6:22 | 0 | 1 | 1 (bottlenose) |
| 16-18 Mar '09 | 258.195 | 14:17 | 10:15 | 0 | 0 | |
| 8-10 Jun '09** | 359.565 | 18:21 | 11:17 | 1 | 2 | 1 (bottlenose) |
| Miri total | 1263.808 | 67:40 | 41:23 | 1 | 6 | 2 |
| Grand total | 3643.967393 | 269:19 | 115:27 | 43 | 29 | 5 |

*Muara Tebas area only

** At the time of writing this report final set of surveys are still to be conducted in July in Similajau and Kuching - to complement the June 2009 survey conducted in Miri.

Table 2 depicts the on-effort encounter rates for the two most frequently sighted species, Irrawaddy dolphins and finless porpoise. Notice that the sighting numbers are much lower in this table than in Table 1. This is due to the fact that a high number of sightings were made “off effort” during our surveys, particularly in the early morning hours while speeding to the start point of a transect, or at the end of the day when speeding back to the jetty. These “off effort” sightings are unavoidable in cetacean research. Including them in distribution maps is valid (such as figures 2 a-d), but they are not included in the encounter-rate calculations, for which we want to be absolutely certain that dolphins were encountered under the same conditions in each survey area and each habitat type (e.g. boat traveling at 10kt, minimum of 3 observers on effort etc).

Table 2: Encounter rates- on effort sightings per km searched on effort for each of the different survey periods

| Dates Surveyed | Distance covered on effort (km) | Irrawaddy sightings on effort | Irrawaddy encounter rate per km | Finless porpoise sightings on effort | Finless porpoise Encounter rate per km |
|--------------------------|---------------------------------|-------------------------------|---------------------------------|--------------------------------------|--|
| Kuching | | | | | |
| 15-17 July '08 | 148.57 | 3 | 0.02 | 2 | 0.01 |
| 16-18 Sept '08 | 148.09 | 4 | 0.03 | 1 | 0.01 |
| 14-16 Oct '08 | 109.06 | 5 | 0.05 | 0 | 0 |
| 8, 13 Nov and 11 Dec '08 | 63.60 | 0 | 0 | 0 | 0 |
| 4-6 Mar '09 | 177.59 | 2 | 0.01 | 1 | 0.001 |
| 20-21 May* | 78.11 | 0 | 0 | 2 | 0.03 |
| Kuching total | 725.02 | 14 | 0.02 | 6 | 0.01 |
| Similajau | | | | | |
| 11-13 June '08 | 109.68 | 3 | 0.03 | 2 | 0.02 |
| 24-26 Sept '08 | 168.32 | 1 | 0.01 | 3 | 0.02 |
| 25-27 Mar '09 | 162.18 | 1 | 0.01 | 3 | 0.02 |
| Similajau total | 440.18 | 5 | 0.01 | 8 | 0.02 |
| Miri | | | | | |
| 24 June, 7-9 Jul '08 | 246.42 | 1 | 0.004 | 2 | 0.01 |
| 9 Sept and 4 Nov '08 | 102.60 | 0 | 0 | 1 | 0.02 |
| 16-18 Mar '09 | 164.11 | 0 | 0 | 0 | 0 |
| 8-10 Jun '09 | 185.36 | 0 | 0 | 1 | 0.01 |
| Miri total | 698.59 | 1 | 0.001 | 4 | 0.01 |
| Grand total/avg | 1863.68 | 20 | 0.011 | 18 | 0.01 |

Irrawaddy dolphin encounter rates were highest in Kuching, where they were found in high concentrations in the nearshore waters of the Salak-Santubong Estuary (see figures 2a –d). Encounter rates for this species also appeared to be relatively high in the Similajau area – but a lower number of sightings in the September 2008 surveys and a high proportion of off-effort sightings of this species there yield a lower encounter rate than Kuching. Similajau, on the other hand, has the highest encounter rate for finless porpoise. Miri had the lowest encounter rates for both Irrawaddy dolphins and finless porpoise, but the highest encounter rate for bottlenose dolphins, which were observed further offshore and in deeper waters than any of the other species encountered during our surveys. In fact, all but one of the sightings made in Miri were generally further offshore than sightings made in the other two survey areas, with 4 of the 6 finless porpoise sightings occurring in waters deeper than 10m.



Finless porpoise were the second most frequently observed species during our surveys. Difficult to spot, and even more difficult to approach and photograph, the lack of dorsal fin can make these dolphins look like a tyre or a log floating in the distance.

The reasons for this disparity in encounter rates between regions is most likely linked either to naturally occurring environmental variables (e.g. the type of substrate in nearshore areas, water salinity, etc), or human activity and human induced changes to the coastal environment. It is tempting to hypothesize that the higher levels of vessel traffic, coastal development, and documented higher levels of pollution in the Miri and Baram rivers (NREB, 2005) have made the nearshore habitats in the Miri region less suitable for Irrawaddy dolphins and finless porpoise. However, the lack of baseline data from the Miri region prior to 2008 makes it difficult to draw this conclusion. Future planned dolphin research will include sampling of water parameters (e.g. temperature, salinity, turbidity) in the study areas and should help to better define the characteristics of preferred (and less preferred) dolphin habitats.

This represents a substantial data set that should allow for solid statistical analyses to determine the characteristics of the preferred habitat for each species encountered. At the time of writing this report, data are still undergoing analyses. However, figures 2a-d already provide visual impression of some likely patterns emerging from our study. Irrawaddy dolphins and finless porpoises, which both carry an IUCN redlist status of "vulnerable" to extinction, are the most commonly encountered species in nearshore waters of Sarawak. It also appears that shallow nearshore habitats (less than 10m water depth) are the preferred habitats for both species. The sighting distributions indicate that finless porpoise may extend slightly further offshore than Irrawaddy dolphins – especially in the Miri area. The plots also indicate that humpback dolphins and bottlenose dolphins, while also occurring close to shore, may roam more widely than Irrawaddy and finless porpoises or have preferred or core habitats outside of the geographic scope of our survey areas (thus accounting for the lower encounter rates in our study areas). During the surveys all four species were observed feeding and many observations of each species also included calves. This provides an indication that the nearshore habitats in which the animals were observed are critical to feeding and breeding activity, and thus to the survival of the species. Irrawaddy dolphins, in particular, are likely to have developed hunting strategies that are specifically designed for shallow waters and the species of fish which occur in those shallows. If these shallow nearshore areas are perturbed in some way, they may not be able to adjust their foraging methods to deeper waters offshore.



This Irrawaddy mother and calf were observed in the Salak Estuary in the Kuching region. This area had the highest encounter rate for Irrawaddy dolphins of all survey areas. Observations of small calves and feeding behaviour indicate that this is an important feeding and breeding area for the species.

It is also interesting to note that while freshwater populations of Irrawaddy dolphins have been documented in many parts of the species' range, we did not observe this species "upriver" in the Similajau, Santubong, Salak, Rambungan or Sibu Laut rivers during our brief surveys there.

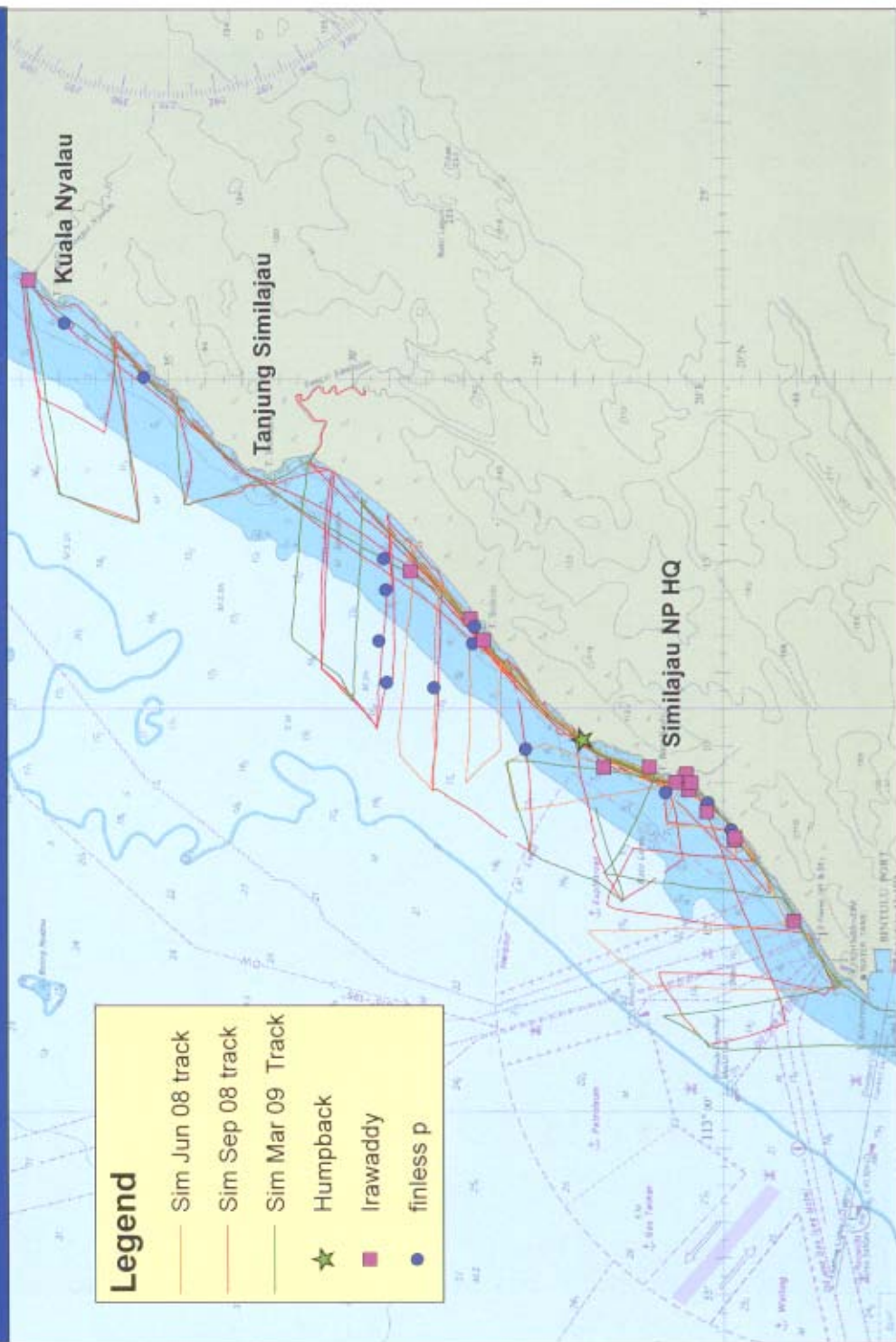
More detailed statistical analysis of our survey results over the next few months will allow us to more clearly define the preferred habitats of these dolphins. The results of this analysis will be shared with relevant government bodies in order to help managers design effective conservation strategies. They will also be published in an international journal, to help further the knowledge of these species throughout their range.

Figures 2a-d (pages 16-19): track lines covered in between June 2008 and June 2009 in the Miri, Similajau and Kuching regions, overlaid with dolphin sightings in each survey area. The darker blue shaded area next to the coast represents waters less than 10m deep.

**Sarawak Dolphin Project
Miri survey tracks and dolphin sightings**



Sarawak Dolphin Project Similajau Survey Tracks and Dolphin Sightings



Sarawak Dolphin Project Kuching Survey tracks and dolphin sightings

