# The Rufford Foundation
# Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

**Josh Cole, Grants Director**

| **Grant Recipient Details** | |
|---|---|
| **Your name** | Shambhu Paudel |
| **Project title** | Examining ecological factors influencing distribution, abundance and surfacing behaviours of endangered dolphins in major river systems of Nepal |
| **RSG reference** | 16468-2 |
| **Reporting period** | |
| **Amount of grant** | £5000 |
| **Your email address** | oasis.excurrent@gmail.com |
| **Date of this report** | 2015/12/31 |

**1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.**

| Objective | Not achieved | Partially achieved | Fully achieved | Comments |
|---|---|---|---|---|
| To assess ecological factors affecting distribution and abundance | | | ✓ | |
| To assess ecological factors affecting surfacing (diving and surfacing) behaviours | | | ✓ | |
| To assess the influence of river geometry on the distribution and abundance | | ✓ | | Due to software incompatible and lack of sufficient required input variables (GPS points), it's being hard to analyse the data on software. However, after 2 years of project period, I will update this result for foundation. |

**2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).**

Due to blockade of Government of India and agitation of some political parties in tropical area, some field work and report preparation stages were affected.

**3. Briefly describe the three most important outcomes of your project.**

- *Ecological factors affecting river dolphin distribution and abundance*

Of the nine *a priori* models that we compared to predict river dolphin occurrence, only two models received nearly all of the model support ($\Sigma\omega_i$ = 0.998 – Table 1). River effects received 100% of the model support and had the strongest influence on dolphin occurrence. The three rivers had different occurrence probabilities; both Karnali and Sapta Koshi were similar and significantly more likely to be used by river dolphins than the baseline Narayani River (Table 2). Models incorporating a seasonal influence on dolphin occurrence in the river systems ($\Sigma\omega_i$ = 0.998 – Table 1), increased occupancy probabilities during the pre-monsoon season (Table 2). All other covariates that we examined received support from the global model each with $\Sigma\omega_i$ = 0.275 (Tables 1 & 2). The deep pool habitat was the only significant predictor (CI excluded 0) of dolphin site use from the remaining covariates. Mean depth and width of the dolphin sighting locations was 4.24m ±1.98SD and 225.93m ±96.63SD respectively. The greatest proportion (41.02%) of sightings occurred in deep pool habitat, followed by confluence (28.20%) and the least was meander (12.82%).

We initially examined the Poisson and negative binomial distributions for river dolphin abundance. The negative binomial distribution received more support was used for further mixture models to predict abundance of dolphins. Similar to the occurrence models, only two of the N-mixture models received the majority of the model support ($\Sigma\omega_i$ = 0.998: Table 3). The different river systems once again had different effects on dolphin abundance (Table 1). The suitable habitat/connectivity covariate also received support, but the β-coefficient estimates were highly variable with confidence

intervals strongly overlapping 0. We used the top-ranking model to estimate dolphin abundance across all surveyed segments of the three rivers (Table 4). Since the β-coefficients were not all significant, we also included the negative binomial constant model estimates and the maximum count observed per survey as well for conservative estimates of abundance. Since the pre-monsoon and post-monsoon seasons were independent, we provide season-specific estimates for all the segments, as well as a global abundance estimate for all of Nepal. We estimate that 28 to 52 Ganges river dolphins are distributed among the three rivers in Nepal. Observed mean dolphin group size was 2.25± 1.75SD and the largest group size was recorded in Sapta Koshi with 6 dolphins in a single group.

Table 1. Model selection statistics for all occurrence models for the Ganges river dolphin (*Platanista gangetica gangetica*) derived from survey data from the Karnali, Sapta Koshi, and Narayani rivers, Nepal. ΔAIC is AIC information difference, $\omega_i$ is the Akaike weight, and *K* is the number of model parameters.

| Model | AIC | ΔAIC | $\omega_i$ | *K* | −2Log-liklihood |
|---|---|---|---|---|---|
| ψ(river + season),p(.) | 514.05 | 0 | 0.723 | 5 | 504.05 |
| ψ(global),p(.) | 515.98 | 1.93 | 0.275 | 10 | 495.98 |
| ψ(river),p(.) | 526.04 | 11.99 | 0.002 | 4 | 518.04 |
| ψ(season),p(.) | 547.01 | 32.96 | 0 | 3 | 541.01 |
| ψ(depth),p(.) | 553.47 | 39.42 | 0 | 3 | 547.47 |
| ψ(depth + width),p(.) | 555.42 | 41.37 | 0 | 4 | 547.42 |
| ψ(.),p(.) | 561.28 | 47.23 | 0 | 2 | 557.28 |
| ψ(habitat),p(.) | 562.02 | 47.97 | 0 | 5 | 552.02 |
| ψ(width),p(.) | 563.20 | 49.15 | 0 | 3 | 557.2 |

Table 2. Estimates of untransformed coefficients (± SE) of habitat and seasonal covariate effects on occurrence of Ganges river dolphins (*Platanista gangetica gangetica*) derived from survey data from the Karnali, Sapta Koshi, and Narayani rivers, Nepal. Estimates presented come from the top-ranking model in which the covariate was supported and $\Sigma\omega_i$ is the cumulative weight of support for that covariate. Confidence intervals were calculated assuming a normal distribution.

| **Covariate** Substructure | β | SE | 2.5% | 97.5% | $\Sigma\omega_i$ |
|---|---|---|---|---|---|
| **River** | | | | | |
| Karnali | **3.58** | **1.03** | **1.57** | **5.60** | **1.000** |
| SaptaKoshi | **3.38** | **1.02** | **1.38** | **5.38** | **1.000** |
| **Season** | | | | | |
| Pre-monsoon | **1.17** | **0.32** | **0.54** | **1.79** | **0.998** |
| **Habitat** | | | | | |
| Deep pool | **1.20** | **0.55** | **0.13** | **2.27** | **0.275** |

| | | | | | |
|---|---|---|---|---|---|
| Straight channel | 0.15 | 0.55 | -0.93 | 1.22 | 0.275 |
| Confluence | 0.51 | 0.57 | -0.60 | 1.63 | 0.275 |
| **River width** | -0.12 | 0.17 | -0.45 | 0.21 | 0.275 |
| **River depth** | -0.13 | 0.18 | -0.49 | 0.23 | 0.275 |

- *Surfacing types, diving behaviours and factors associated with it*

We are utilising linear models and model selection procedures to better understand the factors that most influence Ganges River dolphin diving behaviour and patterns in the amount of time spent diving. Preliminary results suggest that there is a strong difference in mean dive times between the two river systems (0 = Karnali, 1 = Sapta Koshi), between disturbed and undisturbed habitats (0 = undisturbed, 1 = disturbed), and between deep pools and the other available microhabitats (0 = other habitats, 1 = deep pools).

Mean dive time was 73.14 ± 19.45 seconds. According to model selection statistics, habitat and human disturbance were most related to mean dolphin dive times. Dolphin dive time was positively related to deep pool habitat (β = 6.61 ± 6.50SE) and negatively related to confluence habitat (β = -10.23 ± 6.53SE) compared to baseline meandering and straight channel habitats. Human disturbance was strongly associated (β = 14.155 ± 4.26SE) with increasing dive times among dolphins.

Surfacing with the head and dorsal fin exposed was the most frequently observed (64.1%) behaviour, followed by the head, rostrum, and dorsal fin exposure (22.2%). The other surfacing behaviours each contributed to less than 10% of the observations, and leaping was not observed. Surfacing types were significantly associated with human disturbance ($\chi 2 = 46.0179$, df = 12, p = 0.003).

**4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).**

Local youths were involved as project key member for the data collection process which helps to advance existing knowledge and change behaviours of local communities in terms of river dolphin conservation. Local youth were organised institutionally for the monitoring and conservation of river dolphin in the river systems of Nepal as local conservation ambassador.

**5. Are there any plans to continue this work?**

Yes. We have planned to continue this work focusing on management of river dependents. It is important to diversity the living strategies of fishing communities to minimise the pressure over river systems. At the same time, changing fishing behaviours and providing plate forms for the alternative professional jobs for river dependent communities is important. Therefore, we are planning to conduct project to strengthen co-existence between fisheries and river dolphin very shortly.

**6. How do you plan to share the results of your work with others?**

We have already published (currently in press) two peer reviewed journal papers which was supported by the Rufford Foundation as 1st grant. One journal article is attached herewith separately. For the results obtained from this second grant project, we will submit findings very soon for the peer reviewed journal paper to disseminate findings.

**7. Timescale: Over what period was The Rufford Foundation grant used? How does this compare to the anticipated or actual length of the project?**

Project data were collected for two effective seasons (10 months) in two river systems of Nepal which was anticipated time period for the project.

**8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.**

| Item | Budgeted Amount | Actual Amount | Difference | Comments |
|---|---|---|---|---|
| Research Assistants | 1250 | 1250 | | |
| Boat Hire and Boatmen Charge | 1125 | 1125 | | |
| Travel | 537 | 537 | | |
| Stationery Materials | 200 | 200 | | |
| Field logistic support | 600 | 600 | | |
| Inception workshop for field assistants | 800 | 800 | | |
| Communication | 100 | 100 | | |
| Database management and GIS | 188 | 188 | | GIS points were created/layers for river systems developed |
| Misc. | 200 | 200 | | |
| **Total** | 5000 | **5000** | | |

**9. Looking ahead, what do you feel are the important next steps?**

Strengthening co-existence between fisheries and river dolphin is identified as important next steps for the conservation of remaining river dolphin population in Nepal. This seeks diversification of living options using locally available natural and social resources, improving the behaviours and existing knowledge and assisting local concerned authorities to develop river-season specific action plan for the management of river resources. Overall, formulation of "Recovery action plan for remaining Ganges river dolphin in Nepal" is imperative in future including some genetics and habitat manipulation approaches.

**10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the RSGF receive any publicity during the course of your work?**

Yes, we have used RSGF logo while conducting field level workshops and several public awareness activities. We have also acknowledged Rufford Foundation during national and international conference presentation.

**11. Any other comments?**

We would like to thank trustee members of Rufford and the working team for internalising important of this work.