

The Rufford Small Grants Foundation

Final Report

Congratulations on the completion of your project that was supported by The Rufford Small Grants 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	Mayuresh Satish Gnagal
Project title	Assessing impact of fisheries on target fish populations and socio economic drivers of fisheries.
RSG reference	9826-1
Reporting period	September 2011-March2013
Amount of grant	£5995
Your email address	msgangal@gmail.com
Date of this report	5th August 2013

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 document the historical trends in local fisheries using pre-existing data.			Fully achieved	We used information available with central fisheries institute of India (CMFRI) and fisheries department of Maharashtra to document and analyse historical trends in fisheries.
To document perceptions of local fishermen about fisheries decline and to document attitude towards current method of fishing.			Fully achieved	We interviewed a total of 153 fishermen across 39 villages in Ratnagiri and Sindhudurg district. We chose to interview men as they were usually the ones who went out fishing. A 'snow-ball' sampling approach was used where respondents were asked to introduce other fishermen (using other types of gear or techniques)
To monitor demographic impact - to monitor juvenile mortality over different season and different gear types.		Partially achieved		We sampled catch of fishermen across different gear types. We sampled on two main fishing villages, Malvan and Harne. Total of seven sampling sessions were conducted in these two villages over 20 months'. However, even after extending the project for 8 more months we won't consider the target to be fully achieved as even after increasing our sample size with additional seasons we still have data which is discrete in time. Thus we believe it's still not sufficient to predict demographic trends of target fish species with respect to fisheries. However the project provided important start and baseline information to conduct long term monitoring work in future.
Analysis and synthesis of data gathered through secondary sources, interview surveys and fish demographic monitoring		Partially achieved		We tried to synthesis data collected by secondary sources and interview surveys to gain some understanding about the fisheries situation in Konkan (coastal Maharashtra). However we couldn't incorporate demographic information collected by our data
Dissemination of information - production of documentary and		Partially achieved		Since fishermen are directly involved in data collection and the project is directly relates to their livelihood, we constantly disseminate information and project

other material				results to the local community. In October 2012 we submitted a project report to government of India based on findings of the project. The proposed documentary is at the post production stage and will shortly made public.
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

The project faced a slight methodological problem earlier before demographic monitoring. For the demographic monitoring we had planned to extract otoliths from randomly selected individuals from selected species and to conduct age determination with the help of observing growth rings on these otoliths.

However as we planned earlier we couldn't use fish otoliths for age structure analysis mainly because reference data for many species is form the region was not consistent. As we expected to analyse maximum number of fish species which get caught in the net, we used more consistent fish morphometric data (lengths and widths) instead of otolith, for age structure analysis. This has allowed us to gather data for more species.

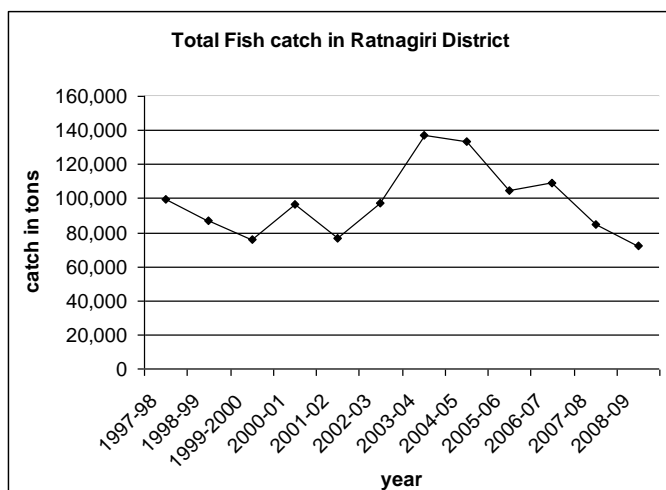
3. Briefly describe the three most important outcomes of your project.

The three main results from the projects are as follows

Catch trends

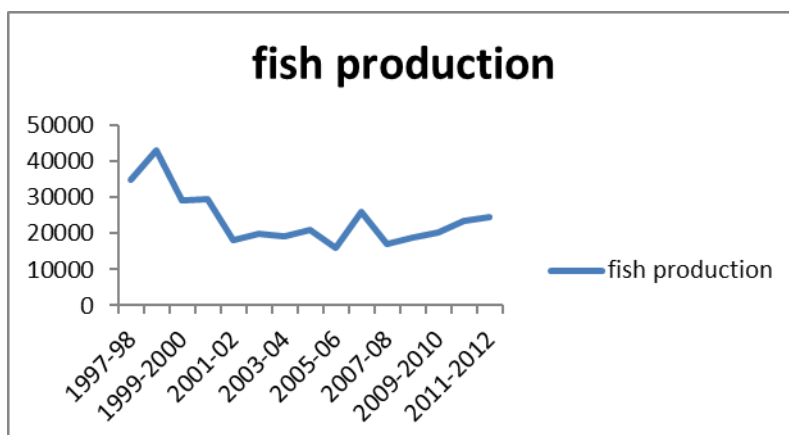
To identify the trends in the fish catch of Ratnagiri and Sindhudurg district for last 10 years (from 1999-2009) we used fish production data made available in reports of Maharashtra State Fisheries Department.

From 1997 till 2001 fish catch in Ratnagiri district was stable varying from 80-100,000 tons annually. However after 2001 it has showed a sudden increase to 140,000 tons. From 2003 there is a steady decline. The latest figure (from 2009) shows fish catch of 72,000 tons which is 60% of that of in 2003.



Sindhudurg District have suffered even graver decline in the fish catch. By 1998 total fish catch of Sindhudurg district was around 35,000 tons. By 2009 it has shown 50% decline. After 2009 fish stocks have shown little increment and it has stabilised for 24,000 tons by 2012.

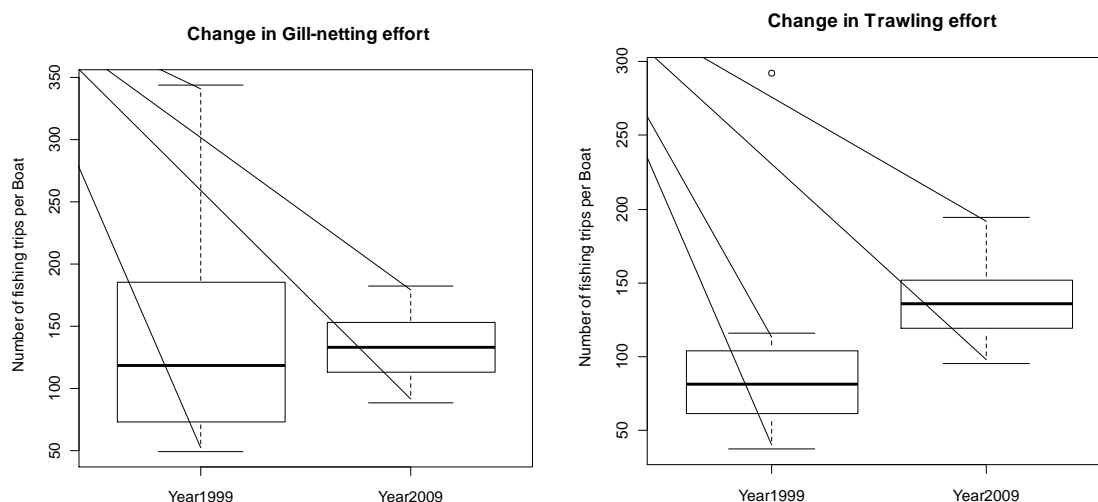
Fish production - Sindhudurg District



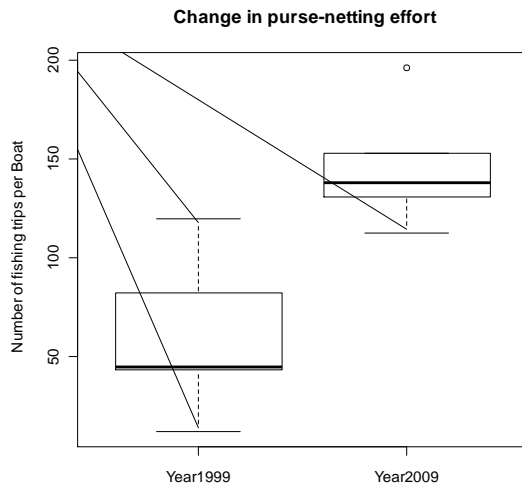
Effort analysis

As many fishermen informed us that they increased the effort as a result of decline in quantity of fish. We analysed this anecdote by estimating the number of trips required for each gear type for present (2009) and for the 10 years ago (1999). We estimated this effort in terms of trip for 2009 and for 1999 using number of days for fishing, annual catch and percent decline data from our interview survey data along with data of no. of boats for each gear type and hours spent per trip provided by Maharashtra State Fisheries Department. This data was available for boat the years 1999 and 2009. We analysed each gear type separately in calculating change in effort.

When we compared 1999 and present effort in terms of annual number of trips, we found a significant increase in efforts of trawler and purse-net fishing vessels, where as there is a little increase efforts by gill net vessels. The graphic representation for each gear type is given below.



These two results show a clear indication of overexploitation of marine resources in both Ratnagiri and Sindhudurg districts. Both districts have suffered a significant decline in marine fish production, however the most predominant methods of fishing like trawling and purse netting shows visible increase in fishing efforts. However the increase in effort is not reflecting in the total catch.



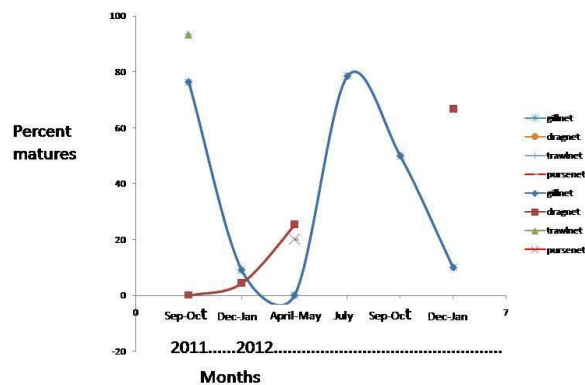
Demographic trends in fish catch

We hypothesised that fishing methods that tend to use small mesh size and which are more prevalent in shallow waters are more destructive since they catch higher proportion of immature fish. Identifying the gears that tend to catch more immature fishes was overall goal of the demographic component. To get this data, we accompanied fishermen on their fishing trips and observed fish catch in each instance of the fishing gear being laid out. 10% of the individuals of each fish species caught were then randomly selected for measurement to estimate age structure. These samples were photographed with the scale for

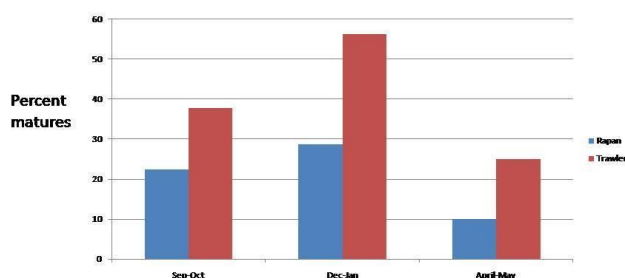
identity verification and measurement using the software ImageJ. Each specimen was then assigned as immature or mature based on established length-age relationships to estimate proportions of immature caught.

We in 20 months we sampled 20 trawling trips, 40 gillnetting trips, 25 drag net efforts and three purse net efforts. We collected age structure data for more than 30 species of fish. Despite increasing efforts of sampling, we still face a need to get more data for conclusive understanding of sustainability of different gears in different seasons. However our results pointed out two important phenomena. Firstly, fish in western coast of India is assumed to breed in monsoon season (June - July - August) and thus to avoid juvenile mortality, monsoon fishing is banned by state government of Maharashtra. However, some of the species we sampled shown the peak in proportion of immature in seasons other than monsoon. These species include some of the commercially important species of fish (E.g. *Lactarius lactarius*— big jaw jumper / false trevally) (refer graph)

Lactarius lactarius— Big Jaw jumper / False trevally



Trichiurus lepturus (Ribbonfish)



Also many times traditional methods like drag netting (locally called as Rampan) is considered as sustainable method of fishing. However our data suggests for most of the species of fish, drag nets show maximum proportions of juveniles caught, even compared to well-known unsustainable method of fishing like trawling. (Please refer to the example of ribbonfish *Trichiurus lepturus*).

However trawling happens on far bigger scale compared to drag netting and thus more work is required to understand the exact role of practices like drag netting in decline of coastal fisheries

Conclusions

1. Fisheries in Southern Maharashtra is showing indications of overexploitation
2. The current government fishing ban is not enough to control juvenile mortality of all the species of fish.
3. There is a need of long term continuous monitoring of fisheries to establish management interventions like seasonal protection to particular fishing ground, modification in gears etc.

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

The project was mainly carried out in two coastal villages of Maharashtra, on the west coast of India. For collection of demographic data we accompanied fishermen on their fishing trips and most of the catch was sampled on board. Initially fishermen were reluctant to allow us to accompany them on their fishing trips mainly due to security reasons. They were afraid that we might not be able to handle rough conditions at sea. However with experience they became not just cooperative but proactive for data collection.

As the project directly relates to sustainability of the fisheries and livelihood of local community, we regularly communicated our results to the fishermen. Because of this continuous communication and transparency in sharing information, even though we were not providing any monetary benefit to the fishermen for our fishing trips, many fishermen volunteered for data collection.

In October 2012 Government of India made a public appeal to provide information, recommendations and opinion about state of fisheries in the country. We drafted a document with consultation with local fishermen and submitted to the government. Many demands and recommendations suggested in document were written with consultation with fishermen considering difficulties fishermen face in day to day life.

In March 2013, we were invited to the village meeting in Harne. Fishermen invited us to provide information and recommendations about local fisheries. We shared a lot of our results and experience with local fishermen.

After two years the project team was successful in creating a good reputation and sensitizing local fishing community to undertake sustainable fisheries practices.

5. Are there any plans to continue this work?

Yes. We do have plans to continue our work in this landscape. The project has provided a crucial baseline in terms of ecological information. The team aims to continue collection of more ecological data, have a systematic outreach program and creating a fisheries monitoring network in the region.

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

In October 2012 Government of India made a public appeal to provide information, recommendations and opinion about state of fisheries in the country. We drafted a document based on results of the project. A project report will be also submitted to the coastal monitoring agencies like local fisheries department, police, coast guard and customs.

A detailed final report will be submitted to the Rufford Small Grants Foundation. We will share our results with the local communities through interactive meetings. In addition, we are planning to disseminate the project findings through peer-reviewed journals and popular articles. The results will also be presented in local and international seminars and conferences.

7. Timescale: Over what period was the RSG used? How does this compare to the anticipated or actual length of the project?

The RSG was used over a period of 20 months from September 2011 to June 2013. Initially the work was planned for a period of 12 months (from September 2011 to September 2012). We had to extend the work for eight more months (September 2012 to June 2013) to increase the sampling strength.

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
Travel (overnight + local travel)	261	401	-140	We mostly used economic classes for both bus and train, Still as we extended project period from 12 months to 20 months thus the overall expenditure over shot the budgeted amount
Equipment (GPS + Voice recorder + camera)	493	787	-294	We had budgeted only half the money required for video camera. However, because of money shortage from other funding sources we ended up using entire money for video camera and GPS form RSGF grant.
Laboratory supplies and consumables for estimation of age structure by using otolith	1450	0	1450	We did not used otolith analysis for identifying age structure of sampled fish. Thus we could use this amount to extend out sampling seasons
Volunteers food accommodation and honorarium	870	1780	-910	As we budgeted for only three sampling seasons but we actually sampled for seven seasons. we ended up spending more money on volunteers food,

				accommodation and honorarium
Personal cost: Researcher's living expenses	2318	2614	-296	An extension in project duration also meant that researcher had to spend more time in the field, increasing the living expenses. Money saved under other heads was used here.
Communications (phone + internet + postage + stationary)	318	128	190	As most of the communication took place through electronic media and no costly equipment were imported, no cost involved in stationary and postage.
Contingencies (miscellaneous costs)	285	285	0	We used contingency money for expenses like buying equipment for cooking, utensils, first aid and medical expenditure.
Total	5995	5995	0	

Exchange rate at the time of receiving: £ 1= Rs. 75

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

As stated earlier, with the help of this project we have worked out the fish demographic monitoring protocol and have gained the community support in fish catch monitoring. Hence forth our efforts will focus on long term monitoring of target fish populations. This will help in future stock assessments and evaluation of target fish species. We will also aim to put our efforts in determining spatial structure and migration patterns of these target fish species using genetic methods. We think these steps are important in order to assess impact of fisheries on a seascape level.

Along with conducting scientific research the team also aims to sensitise fishermen, consumers and hotel owners using outreach programs. We are planning to disseminate the results of our findings using these outreach programs.

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

RSGF logo was used in the project report submitted to the government of India in October 2012. The logo also will be used in all the reports and documents related to project. We have also used the logo in the documentary and it will be uploaded in online public forums soon.

The support provided by the RSGF was well acknowledged by the researchers in all the reports submitted to the government authorities. We encouraged several students and young researchers, both national and international, to apply for RSGF grants. We consider RSGF as a good opportunity for the young researchers to begin their career and will help other researchers in applying to RSGF.

11. Any other comments?

It was a nice experience to work with RSGF. I would like to thank RSGF for their constant support throughout the study period.