Islands &
reefs

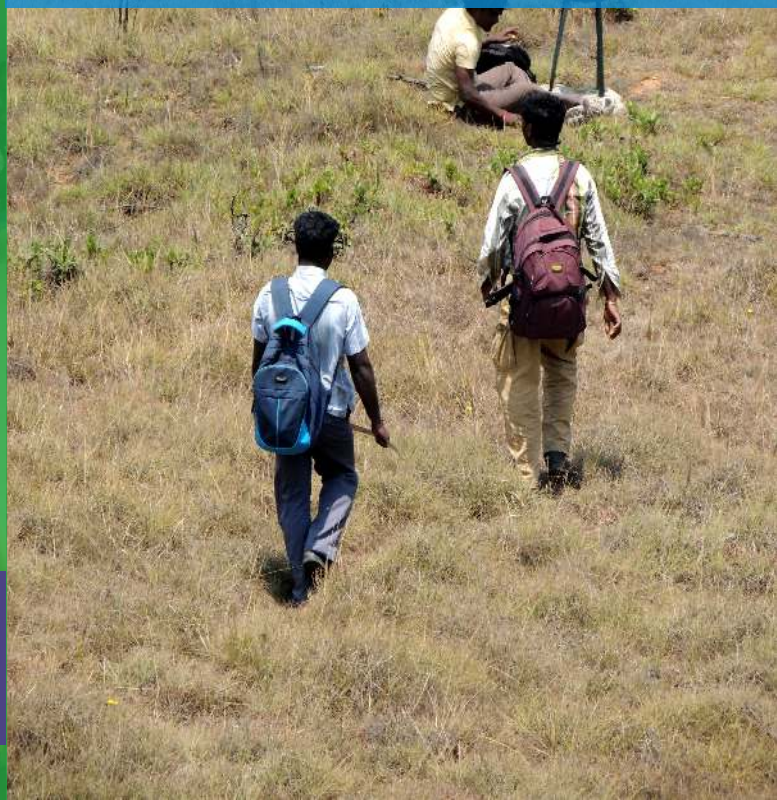
Wildlife biology
and conservation

ANNUAL REPORT 2014 - 15

FERAL

Marine
science

Natural
resource
management



Foundation for Ecological Research, Advocacy and Learning (FERAL)

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Contents

List of Acronyms:

ATREE - Ashoka Trust for Research in Ecology and the Environment.

CEPF - Critical Ecosystems Partnership Fund.

DST - Department of Science and Technology, Government of India.

KSAC - Keystone Study Away Consortium.

MOES - Ministry of Earth Sciences, Government of India.

SEED Division - Science For Equity Empowerment and Development, DST.

Photo credits to relevant project P.I. unless indicated otherwise.

Mandate

Our mandate is to address issues of resource management, conservation, environment and health at the grassroots and the policy level. To meet our mandate, we undertake both implementation and research based projects and conduct a variety of training and capacity building programmes. We collaborate with other research and development institutes in India and abroad and engage with stakeholders through action research, awareness campaigns, workshop and seminars.

We are a non-profit trust founded in 1997 to address the need for applied research and training in ecology and the environment. In the 18 years of our existence, we have contributed substantially to the key areas of our work which includes wildlife biology and conservation, natural resources management and in education and skill building in these and allied areas.

Our approach to addressing real world ecological issues is to use data driven research, combined with use of the latest technological advancements and involving all stakeholders and the society at large to come up with solutions. We believe that training and building the skills and capacities of stakeholders, researchers and students as a fundamental ingredient in achieving our goals.

The year that was

This year was packed with analysis and reporting as a large number of projects inched towards completion. Our outreach efforts continued in the form of workshops, conferences and seminars. FERAL joined five different research consortia as a partner this year and made joint bids for large grants for conservation, habitat restoration and eco-hydrology.

We also updated our web-site in an effort to better showcase our work and projects. Visitors to our new site will find it better organised, more responsive and optimised for different form-factors, including smartphones. Follow the links to the projects and events reported here to visit their respective pages which have more details and also provide access to relevant documents and photographs.

Wildlife Biology and Conservation

The focus of this programme is to undertake scientific research on wildlife and use the outputs to steer conservation interventions. In the year gone by, we completed two projects under this programme and another two are nearing completion.

In the Periyar-Agastyamalai landscape our project on the Payment for Ecosystem Services approach to procure conservation services was continued. Our pilot effort of payments to enhance biodiversity saw the completion of one year agreements with individual land owners. Results from this one year exercise are promising, indicating improvement in both biodiversity and ecosystem services on lands that were under agreements as against those that were not under an agreement. This pilot has generated a lot of interest among land owners from the community and we are looking towards endowments and other grants to expand this initiative.

Our work on addressing large connectivity in the Shencottah Gap saw another year of intense field work. Along with field surveys, we also communicated key findings to the forest departments of Kerala and Tamil Nadu. Additionally these finding have been used to develop the corridor plans for the two tiger reserves, Periyar and Kalakad-Mundathurai.

The collaborative project with Rainforest Alliance to certify rubber plantations continued, during this period key recommendation were presented to the management of the estates, some these have been adopted.

Continuing our training efforts this year year we trained over a hundred ecologists and conservation practitioners working the Western Ghats in the use of spatially explicit tools. These training programmes have built capacities of these researchers to use spatially explicit data from a variety of sources in conservation related research. We also provided support to Pakke Tiger Reserve, Arunachal Pradesh Forest Department,by developing vegetation maps, burnt area maps and maps of physical features. These maps provide the basis for developing a scientific management plan. Additionally, we provided support to many students pursuing their Masters and PhD programmes.

Thematic Training on GIS and Remote Sensing for Conservation Research and Planning

Project Period: April, 2013 to January, 2015
Budget: $ 19,925.00
Supporting Partner: CEPF – ATREE Western Ghats Small Grants Programme
Principal Investigator: R.S. Bhalla
Web page: http://www.feralindia.org/drupal/node/195
Online courses: http://www.feralindia.org/moodle/course/index.php?categoryid=3

The wide gap between the need and actual knowledge of spatial tools in the research community engaged in conservation and ecological research remains a major challenge. This is clearly a handicap for conservation action and research and will place limits on their ability to understand spatially explicit relationships which often define ecological processes.

This project tried to address this challenge in three ways:

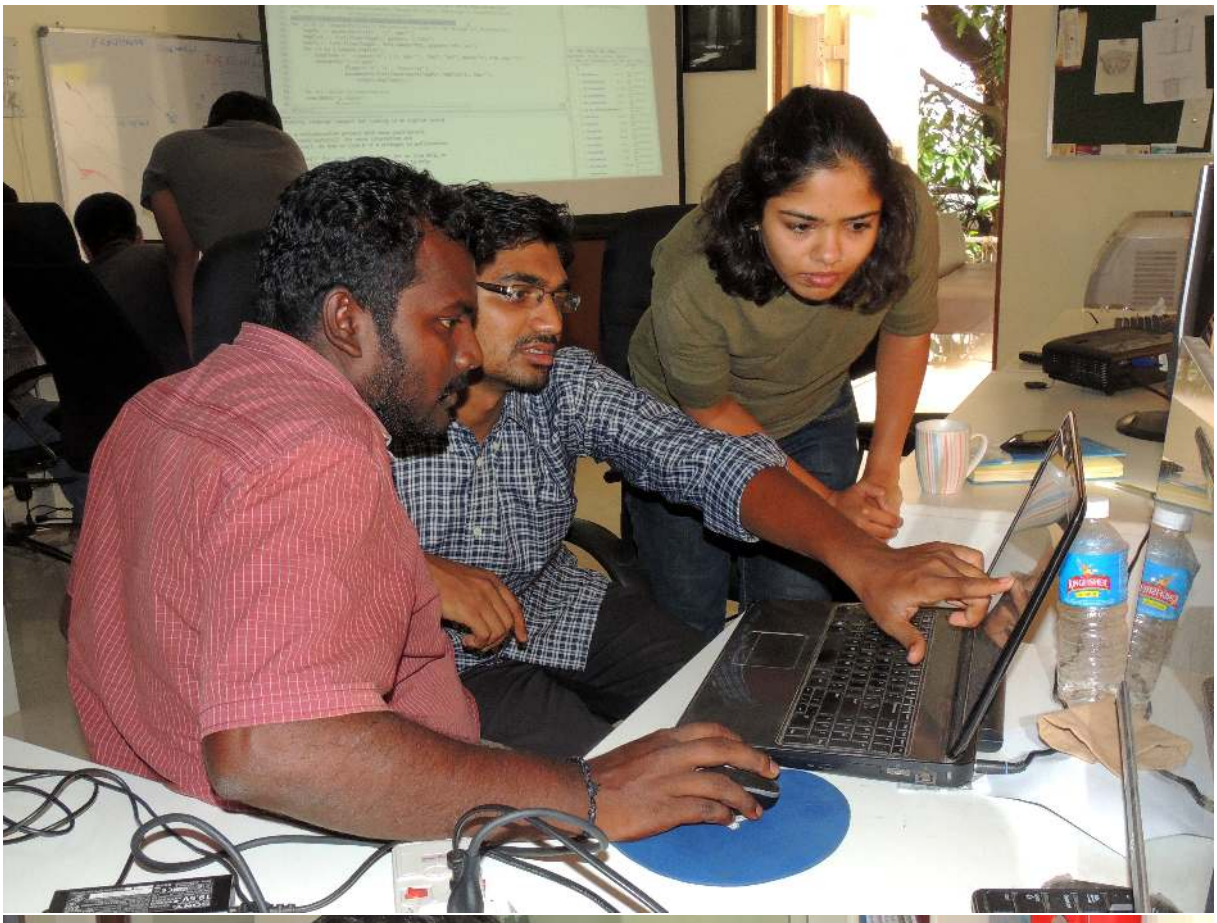
(a) Experts were identified in five thematic areas pertaining to ecology and conservation.

(b) Online courses were set up on FERAL's course management site including datasets, tutorials and quizzes. These were made available under an open source license.

(c) Training was provided to nearly a hundred professionals and researchers active in the field of conservation and ecology in the Western Ghats.

Six online courses were set up on the FERAL Moodle site covering GIS and remote sensing using both Quantum GIS and GRASS and applications of R in combination with these GIS packages in landscape ecology, spatial statistics and hydrology. This material includes tutorials, quizzes, canned datasets and exercises. All course material is released under a creative commons licence and can be downloaded from the site.

We are building upon these courses by adding components to the online materials and using them as a basis for workshops run by FERAL without any external assistance. Over time we hope to replace the presentations with screencasts. Updating the tutorials and datasets to be in sync with the software is another another ongoing task.



Crunching code! Participants in the "Applications of R" workshop at the FERAL office in Bangalore.

Bridging the Shencottah Gap: How Payments for Ecosystem Services Can Restore Biodiversity Outside Protected Areas in India

Project Period: October, 2009 to June, 2015
Budget: ₹23,973,264
Supporting Partner: Critical Ecosystems Partnership Fund
Principal Investigator: Srinivas Vaidyanathan
Web page: http://www.feralindia.org/drupal/node/144

Protected areas constitute only about 4% of the land area of India. Many ecologically rich and sensitive regions are outside this network, thus providing a potential for enlarging the protected area network through incorporation of additional land into the protected areas. While such inclusions are possible with Government owned land, incorporating privately owned land can be expensive and time consuming.

Thus immediate steps are required to maintain and enhance biodiversity in areas identified as corridors on both state owned forests and privately owned land.

This project seeks to establish protocols and build experience in using payments for ecosystem services approach to restore and conserve biodiversity in such areas and also to rationalise the existing PA network to incorporate areas within multiple use reserve forests critical to long term sustenance of wildlife and their habitat. The project targets the Shencottah gap, a mosaic of remnant moist and dry deciduous forests interspersed with rubber, tea, teak, and other farms.

Key milestones achieved so far include:

(a) Data on species richness, distribution and connectivity for large mammals from this project has contributed towards identification and delineation of the most significant areas for large mammal conservation which are outside the PA network. These results have been shared with respective state forest departments and key recommendations have been included into management plans.

(b) Our results indicate two potential areas that are important corridors for large mammal connectivity, especially tiger and elephant and priorities restoration actions that needs to be immediately undertaken. These finding have been included in the Tiger Conservation Plan for the Kalakad – Mundanthurai Tiger Reserve.

(c) Our pilot payments to enhance biodiversity on private land successfully completed one year of activities with all landowners honouring the agreement. Preliminary results indicate enhancement in biodiversity values and ecosystem – services on lands that were part of our agreement.

To develop a robust system for ecological valuation of a given patch of land was one of the tricky challenges the project had to overcome. Here you see land owners and FERAL staff running a survey to assess the improvement of habitat on a plot taken up under the PES system in the Shencottah area.

Grassland and Vegetation Mapping Study, Pakke Tiger Reserve

Project Period: June to August, 2014
Budget: ₹32,000.00
Supporting Partner: Arunachal Pradesh Forest Department, Pakke Tiger Reserve
Principal Investigator: Rajat Ramakant Nayak
Co-Investigator: Srinivas Vaidyanathan
Collaborator: Nandini Velho, Co-Investigator (James Cook University, Australia)
Web page: http://www.feralindia.org/drupal/node/290

Wildlife management often involves the management of wildlife habitats. To be effective in managing wildlife it is therefore important to understand different natural environments available for different species of flora and fauna in a protected area.

In this study we used GIS tools and remotely sensed information along with field data to map different habitats (land cover types) available in the Pakke Tiger Reserve (PTR). We also looked at changes in land-cover types over the years as a response to protection measures undertaken in the protected area.

The objectives of the project were:

- Map distribution of different habitats in Pakke Tiger Reserve.
- Determine changes in land-cover type over the last decade.
- Develop fire frequency and distribution maps.
- Develop a map showing key features, such as streams, villages, anti-poaching camps in the PTR.

We developed map showing distribution of different habitats in the PTR which can be used in management plans. We also determined changes in vegetation cover over the last 14 years, between 2002 and 2014, showing the response of vegetation to protection measures undertaken in the reserve. Fire frequency and distribution maps were also developed to help in allocating resources efficiently for fire management in the reserve.

Key results:

(a) We identified 10 different land-cover types in the Pakke Tiger Reserve. 30% of the reserve is covered with Assam valley tropical evergreen primary forest and Subtropical broad leaved primary forest cover another 34%.

(b) Comparison of vegetation cover between 2002 and 2014 suggested nearly 26% increase in primary forest cover, while secondary forest cover decreased by 11%.

(c) Buffer-zone experienced seven times more fires compared to core zones during the period 2000 to 2014. Annual fires were common the the buffer zone whereas a fire return period of 1.5 years was observed in core-zone.

A view of grassland along Dichu River, Pakke Tiger Reserve (top). Photo credits: Kalyan Varma. Khari grassland in Pakke Tiger Reserve (bottom). Photo credits: Subrata Gayen .

Exploring Sustainable Landuse Practices in Rubber Plantations in a Critical wildlife Corridor

Project Period: January, 2012 to June, 2015
Budget: $ 39,833.00
Supporting Partner: Critical Ecosystems Partnership Fund
Principal Investigator: Sunita Ram
Co-Investigator: Srinivas Vaidyanathan
Web page: http://www.feralindia.org/drupal/node/181

It is well acknowledged in India that landscape-level corridors are as important as PA's for the long-term conservation of large mammals. In the southern Western Ghats, especially in the state of Kerala, Rubber is a major crop and many plantations adjoin wildlife rich forests making them potential corridors. Rubber is also fast expanding into the biodiversity rich North-eastern states of India.

Rubber plantations are largely monocultures, devoid of ground vegetation and often the management practices are not biodiversity friendly. This adversely affects various ecological process, and there is a need to develop practices which are not only biodiversity friendly but also to ensure sustainable farm management.

This project, examines ecologically sustainable practices that can be adopted by rubber plantations. We explore a certification process, linked to Corporate Social Responsibility and a market based approach that encourages landowners to manage their land in a more wildlife-friendly manner. The proposed standards are directly linked to markets and are best management practices that are based on ecological and social indicators. The ecological indicators fall in the realm of habitat restoration which is required to re-establish connectivity. Proposed interventions provide economic benefits, while safeguarding agricultural production. Such long term mechanisms are required to ensure that initiatives to ensure wild habitat connectivity are successful and connectivity is enhanced in biodiversity hotspot areas. In this project, we focus on exploring market linkages to enhance connectivity while safeguarding rubber production by introducing the Rainforest Alliance's "Sustainable Agriculture Network" standard or the SmartWood program under the Forest Stewardship Council standards.

Key milestones achieved include:

(a) A website aimed at disseminating information on ecologically sustainable practices and certification for rubber and rubber wood has been set up <**http://www.feralindia.org/ecoag**>. The website also has training material on certification useful for interested rubber growers. Other information that has been made available includes a checklist of different taxa found in the southern Western Ghats in and around rubber plantations.

(b) We also developed protocols to establish wind barriers in areas with high wind velocities. The protocol makes use of native vegetation in the landscape to establish a multi–species wind barrier.

(c) We continued our interactions with the rubber industry, providing large plantations with technical inputs to move towards a more ecological and sustainable approach, some which have been implemented by a few plantations.

Estates and plantations occupy large tracts of the landscape in the southern western Ghats. Ecologically sustainable practices would greatly enhance connectivity between natural habitats for wildlife in these areas.

Overcoming Barriers: Restoring Ecological Connectivity Across Linear Intrusions in the Shencottah Gap

Project Period: June, 2013 to December, 2015
Budget: $145,958.00
Supporting Partner: Critical Ecosystems Partnership Fund
Principal Investigator: Srinivas Vaidyanathan
Web page: http://www.feralindia.org/drupal/node/145

In India, Protected Areas (PA) constitute only about 4% of the land area and these PAs occur as small isolated management units within a matrix of reserve forest, forest plantations and production landscapes. Management efforts so far have been PA centric and only in the few years, the focus has changed to managing our remaining wildlife and wild habitats as landscape units.

As a first step towards a landscape level management, efforts have gone into identifying coarse scale corridors, which are crucial for many ecological processes, including dispersal, gene flow and demographic rescue. As a result, initiatives by governmental and non-governmental organisations have focused on mapping corridors and conserving areas that facilitate movement to maintain population connectivity. However, no systematic effort has been invested to identify important barriers to movement identify areas where restoration could most improve connectivity.

Thus understanding the impacts of barriers, complements corridor mapping, and will help by broadening the range of conservation alternatives available to managers to restore connectivity. It can inform decisions on trade-offs between restoration and protection; for example, land purchase may be substantially more costly than restoring a road that blocks an alternate corridor.

This project seeks to establish protocols to evaluate the impacts of linear barriers in the Shencottah Gap a critical corridor for large mammals in the southern Western Ghats and use methods to optimise selection of areas that require restoration to enhance connectivity.

The key highlights so far, include:

(a) Recommendations and action points based on field visit by officials from the Forest Department, scientists, conservation biologists made to the Tamil Nadu Forest Department.

(b) Data collected so far, indicates lack of dispersal by elephants and tigers, even though they come very close the National Highway.

(c) Preliminary results shows a large number of young adult males coming very close to the National Highway, but unable to cross the highway due to steep slopes and heavy traffic. The separation distance between the two elephant populations across the highway is a mere 200m, and clearly highlights the potential to restore connectivity.

The preliminary results indicate that connectivity for tigers and elephants across the Shencottah gap can be restored and the corridors that we have identified are functional for some large mammals. However restoring connectivity needs a combination of structural modifications to linear intrusions and habitat improvement within the two corridors.

As part of this project we also developed protocols to measure the success of conservation investment in the Western Ghats using open source data and software. Preliminary results indicate the nearly 50% of the Western Ghats witnessed changes between 2001-2013 with respect to three parameter we considered to develop the protocol; biodiversity, hydrological services and carbon sequestration.

Top - Shencottah, a mosaic of natural and agricultural landscapes with homesteads and settlements. Below - mother and calf feeding on bamboo which forms a large part of their diet is also a product that is heavily extracted from the landscape.

Parapatry between the Common Langur (*Semnopithecus priam*) and the Nilgiri Langur (*Semnopithecus johnii*)

Project Period: April 2010 - Ongoing.
Budget: ₹155,976.00
Supporting Partner: Primate Conservation Inc, USA,
Principal Investigator: Sunita Ram
Co-Investigator: Srinivas Vaidyanathan
Web page: http://www.feralindia.org/drupal/node/140

The distribution of the Nilgiri langur (*Semnopithecus johnii*) a threatened colobine endemic to the southern Western Ghats, and the hanuman langur (*Semnopithecus priam*) an endemic to south India and Sri Lanka overlaps each other in some parts of their common boundary. In other words, they show a parapatric distribution in the southern Western Ghats. There have been reports of hybridisation between them in some areas. Natural hybridisation has been reported between several primate species. However, studies that have systematically documented extent of parapatry and zones of hybridisation of primates are very limited. The common occurrence and importance of natural hybridisation in primates is only now being recognised.

This project looks at the extent of parapatry between these langur species in the Annamalai hills and aims to identify regions of possible hybridisation in this landscape. Also, the project looks at the influence of specific environmental and habitat factors on the distribution pattern of these primate species. Given the ambiguity in the langur taxonomy, data on distribution, parapatry and zones of hybridisation from this study will be of considerable importance.

The project has identified that the area of parapatry between the two langurs is concentrated along the western side of the study area where the occurrence of Hanuman langur was higher. The areas of higher probability of co-occurrence of the two species was characterised by forests with fairly high tree cover (more than 40%) in not arid regions, at elevations above 685m but without steep slopes. This typically implies deciduous forests adjoining wetter forest types. In some of these areas there have also been sightings of mixed groups.

Follow up on this project is being planned. Mixed species groups will be identified, both within this landscape and across other areas such as Mundanthurai and Srivilliputtur in the southern Western Ghats, to study the ecology and behaviour of these langurs within these mixed groups. This will facilitate our understanding of the function and advantages of mixing between these closely related species.

The distribution of the Hanuman langur and Nilgiri langur overlaps in some parts of their range, and in some of these areas they form mixed groups. Hanuman langur has also been seen to interact with bonnet macaques. Mixed species groups have been recorded in primates around the world. Such formations have costs and benefits. The functional benefits include foraging advantages and better predator avoidance, but could also include social and reproductive advantages. In the case of the langurs, more studies are required to understand the costs and advantages that such mixed groups offer each of these species.

Learning and Study Abroad

A large proportion of the projects we run under this programme focus on the creation of teaching materials and enhancing the educational content of school syllabi through hands on training and exercises. We have also run projects seeking to build capacities of community based organisations, NGOs and development agencies in the use of appropriate technologies and techniques such as ornamental fish rearing, food processing and applications of GIS for vulnerability mapping and disaster preparedness.

FERAL also hosts numerous study abroad courses aimed at undergraduate students. These include semester long courses in Marine Science and shorter, summer or autumn courses in more diverse areas with topics including "Culture Class and Gender", "Sustainable Agriculture" and "Field Methods in Wildlife Sciences".

The numerous events which are associated with this programme are summarised and can be accessed on the Events menu on our web-site <**http://www.feralindia.org/drupal/content/events**>.

Capacity Building on Quantitative Tools for Natural Resource Management, Conservation and Development

Project Period: February 2014 onward
Budget: Dependent on number of participants
Course Instructors: FERAL researchers and field staff
Web page: http://www.feralindia.org/drupal/node/137
Online courses: http://www.feralindia.org/moodle/course/index.php?categoryid=2

FERAL started to develop training materials including tutorials, pratice datasets, quizzes and presentations to facilitate the teaching of quantitative tools for conservation and development initiated by the various small grants from the CEPF/ATREE Western Ghats facility (page 4).

We continued to develop these courses even after the successful completion of the project and to run unaided workshops which were partly paid for by participants and highly subsidised by FERAL itself in terms of course instructors and facilities provided.

The primary goal of this initiative was to fill in gaps in capacities of development professionals, conservationists and researchers in quantitative tools pertaining to three broad areas:

(a) GIS, remote sensing and related tech.
Spatial visualisation and analysis have always been a part of resource management, conservation and development. However, there are comparatively few avenues for students or professionals to learn how to use GIS and remote sensing in their work.

(b) Field hydrology
Water resources management is an increasingly important field. However few agencies who take up water related issues at the grassroots level have the training required to collect and analyse basic hydrologic and meteorologic data.

(c) Measuring ecosystem services
Awareness about the importance of ecosystem services is growing both at the grassroots and the policy level. The ability to measure these services and how they are impacted by changes in the environment is usually lacking in agencies devoted to conserving these ecosystem services and the communities dependent on them.

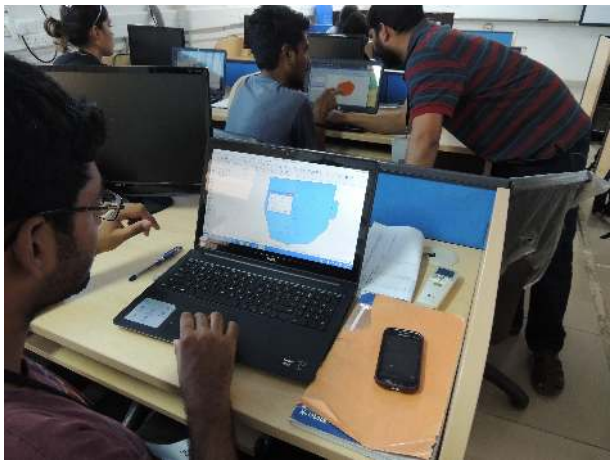
At present we offer one workshop every three months but hope to increase this to at least once a month after we raise some financial support for this effort. Students are encouraged to participate in the workshops by offering waivers or subsidies on course fee and lodging.

Mapping for disaster risk reduction using participatory tools for NGOs.

Training on participatory-GIS to NGOs using GPS units and revenue maps.

Training on nursery raising techniques to women self help groups.

Nicobari women receive training on coconut oil extraction machine.



The introductory GIS workshop which FERAL teaches every year at SCCS-Bangalore.

How to use a GPS. Training for forest department staff at the Nilgiris.

Different kinds of workshops conducted at FERAL. From income generation activities for women to the use of spatial technologies for conservation, risk reduction and natural resource management.

Natural Resource Management

The onslaught of environmental degradation and land use change combined with shifts in climatic regimes has pushed a number of ecosystems to the brink - taking its toll on the goods and services they provide. This programme tries to understand and address some of these challenges with an emphasis on the habitats and ecosystems which sustain our water resources and coastal fisheries. We seek ways to conserve, restore and manage ecosystem services with local communities who face the huge challenge of deterioration and depletion of natural resources across the country. The breakdown of traditional, though often inequitable management structures combined with the lack of baselines and monitoring systems, has led to overexploitation and depletion of a number of crucial resources.

The objectives of the NRM programme are:

- To unravel ecological processes which deliver important ecosystem services and to quantify these ecosystem services using multidisciplinary approaches.
- To demonstrate and develop research tools for decision support in the management of natural systems with specific focus on scenario building for impacts of climate change and tradeoffs between interventions.
- To use this research to identify strategies and inform and influence policy.

The goal of the NRM programme is to reduce the vulnerabilities of both stakeholders and the ecosystems on which they depend to natural disasters and climate change and to help restore, and sustainably manage ecosystem services through community action in habitat restoration, protection and management.

Hydrologic and Carbon Services in the Western Ghats: Response of Forests and Agro-ecosystems to Extreme Rainfall Events

Project Period: January, 2012 to December, 2015
Budget: ₹4,520,744.00
Supporting Partner: Ministry of Earth Sciences, GoI.
Co-Principal Investigators: R.S. Bhalla and Srinivas Vaidyanathan
Collaborators: J. Krishnaswamy (Indian P.I.) - ATREE; N. Chappell (UK P.I.) Lancaster University, UK.; S. Badiger (Co-PI) - ATREE; M. Sankaran (PI) - NCBS;
Web page: http://www.feralindia.org/drupal/node/143

Global climate change has triggered a number of local and regional alternations in rainfall patterns. One of these is the increase in the frequency of extreme rainfall events, particularly in the Western Ghats. It is still not fully understood how ecosystems will respond to such events in terms of hydrology and carbon storage and respiration. This project seeks to fill in some of these gaps in our understanding.

We collected hydro-meteorological as well as carbon respiration data from two field sites, one in the Northern Karnataka near Sirsi and another further south in the Nilgiris. Our loggers have been in place for the better part of two years at this juncture, providing us with high resolution data, both temporally and spatially. This data is now being used to parameterise hydrologic and meteorological models and is being analysed for the impact that land cover has on the hydrologic budget.

Among the initial results are evidence of increased evapotranspiration due to alteration of natural grasslands to wattle plantations. We have evidence that this significantly reduces sub-surface and surface flows in the dry season.

This has serious ramifications for stream ecosystems, irrigation and hydropower generation. In the coming months, we expect to complete two monsoons of data collection and proceed to analyse relationships between stream discharge and nutrient and sediment transport and further unravel the relationship between land cover and hydrologic response.

Under this project we also undertook analysis of secondary datasets to determine the effect of large scale land/ocean phenomena on rainfall, particularly the monsoon, over India.

Results from our analysis for the period 1951-2007 indicates a declining pattern in the proportional contribution of moderate events (25-50 mm day-1) and an increase in more intense rain events aggregated over India (>100mm day-1). Across India, La Nina's influence is restricted to low to moderate rain events and decreases systematically with increasing rain intensity although Indian Ocean Dipole's influence does not show such systematic decline with rain intensity. Spatially, nearly 48.9% of India witnessed a declining trend in La Nina's relationship with monsoonal rainfall.

There is a systematic increase in the spatial variance of La Nina's influence on rainfall totals, whereas Indian Ocean Dipole's influence on rainfall totals seems to becoming more homogeneous over time. When we look at extreme rainfall events, the spatial coherence that was evident in the trends with respect to rainfall totals is missing. The lack of spatial coherence in both indices, suggests that other local and regional drivers are more influential on frequency of intense rain events.

*The natural grasslands in the Nilgiris are being runover by evergreen invasives such as wattle (*Acacia mearnsii*), scotch broom (*Cytisus scoparius*) and Gorse (*Ulex europaeus*) fundamentally altering the hydrology (top). A stage sampler placed to capture sediment and nutrients at different stream discharge levels (bottom).*

Building Coastal Resilience in South & Southeast Asia through Mangrove Restoration for Risk Reduction

The Global Resilience Partnership Challenge

Project Period: March, 2015 to July, 2015
Budget: $ 15,204.00
Supporting Partner: Rockefeller Foundation and USAID via TNC.
Principal Investigator: R.S. Bhalla
Web page: http://www.feralindia.org/drupal/node/292

In March, this year, a consortium of which FERAL is a member, was selected as a challenge finalist in the Global Resilience Challenge Partnership Award. This was a collaborative effort led by The Nature Conservancy and Wildlife Conservation Society of the USA.

The initial grant was given to facilitate different teams to prepare a larger proposal for the award. FERAL's contribution towards this was to develop a better understanding of the successes and failures of mangrove restoration efforts across India.

We initiated a number of short field based studies across the country to help compile a report on experiences of groups involved in mangrove restoration. Among the regions covered were Maharashtra, Goa, Karnataka, Tamil Nadu and the Andaman and Nicobar islands. Experts on mangrove restoration were met and issues confronting mangrove restoration were discussed. These included officials from forest departments, GIZ, IUCN and the UNDP. The reports from the differnet field biologists can be downloaded from the project web-page.

Mangroves are among the most productive yet also the most endangered ecosystems in the world. On the left, a traditional backwater fishing boat (thoni) in the Pechavaram mangroves on the Coromandel coast. On the right, just a few kilometers from Pechavaram, mangrove habitat has been converted for aquaculture. Photo credits: Gopinath S.

Marine Science

Marine sciences research at FERAL largely focuses on traditional and artisanal fisheries along both the East and West coast of India. We work closely with the fishing community while collecting data and regularly present and receive their feedback on our findings. Scientific co-management and conservation are two linchpins of our fisheries research work which we hope will lead to breaking the vicious cycle of resource overexploitation and ecological degradation.

The lack of systematic, spatially and temporally explicit data is a major stumbling block to scientific fisheries management and marine conservation in India.

All our projects try to address these gaps and work in an action-research approach where fisherfolk are a fundamental part of research design, participating in data collection, analysis and interpretation. This approach has paid rich dividends in terms of convincing the stakeholders about the magnitude of the crisis in fisheries resources and having them participate actively in meetings with government agencies tasked with fisheries management and conservation.

Finding Spaces for Co-existence: Fishing Communities and Threatened Marine Species Conservation in India

Project Period: January 2014 to February 2015, March 2014 to April 2015
Budget: ₹483,156, ₹585,608
Supporting Partner: Rufford Small Grants | Chester Zoo Conservation grants
Principal Investigator: Divya Karnad (Rutgers University)
Web page: http://www.feralindia.org/drupal/node/210

The literature on marine systems in India talks about fishing as being part of an open-access tragedy. A lot of research has also pointed to fishing being the primary threat to species like sea turtles, sharks, cetaceans and other threatened marine species.

This project aimed to move past that rhetoric and look specifically at the ways in which fishing interacts with threatened species, as well as document community based fisheries management initiatives. By focussing on fisheries in the Ratnagiri and Sindhudurg districts of Maharashtra, this study examined a wide cross-section of fishing techniques from purse and shore seining to trawl and gill netting. This research has also helped to update the list of threatened marine species encountered in the area.

Key highlights include:

(a) Training and capacity building where eight interns were provided training in social science survey techniques and marine species identification.

(b) Three fishing boats were equipped with GPS systems and the crew trained in their use.

(c) Training in GPS use, data entry, compilation and basic visualisation was provided to a research assistant.

(d) As part of our community and public outreach we held meetings with communitymembers in both districts and participated in the Story of Light Festival at the Miramar beach.

(e) Maps of threatened species and fishing zones were produced.

Training workshop on threatened marine species at FERAL Pondicherry campus (left). Meeting with fishing community at Sindhudurg (right).

Co-management of Fisheries along the Coromandel Coast

Project Period: October, 2011 to June, 2014
Budget: ₹2,266,110
Supporting Partner: SEED Division, DST, New Delhi.
Principal Investigator: Tara Lawrence
Co-Investigator: R.S. Bhalla
Web page: http://www.feralindia.org/drupal/node/129

This project seeks to contribute to sustainable management of marine fisheries by strengthening initiatives in fisheries co-management. It seeks to answer specific questions about resource utilisation among artisanal fishers and help build upon earlier work in organising meetings between representatives of artisanal fishers and the fisheries department. This research has direct relevance to the artisanal fishing communities located along the Coromandel coast.

Among the key highlights of the project were:

(a) Organisation of a series of comanagement meetings at the village and then at the district & state level. Community leaders and major stakeholder representatives attended both meetings where the project's findings were shared. Discussion on the findings and feedback from the participants helped identify specific management interventions and reccommendations.

(b) We also designed and installed an artificial reef to demonstrate that fish refugia can be created and installed at selected locations along the coast. For the unit to remain undisturbed, it had to weigh 8 tonnes and was designed with a network of tunnels inside it to capture the complexity of a natural reef ecosystem. The choice of concrete as the material was made because concrete is less susceptible to environmental damage and degradation at the same time conducive for populations to establish themselves.

Field assistant Anbu completing a market survey with a fisher woman sorting her catch to take to the market (left). The artificial reef unit under construction (right).

Islands and Reefs

This programme is inspired by over a decade of work in the Andaman and Nicobar islands that FERAL has been involved with. The primary concern of this programme is to document the impact of invasive alien species on natural ecosystems and to find ways of controlling and restoring habitats which have been affected.

A series of short surveys and studies documenting both physical as well as ecological parameters is proposed for the coming years. Much of this work will be undertaken by students attending the semester long study abroad course in Marine Sciences. Each batch of students will learn about these techniques while putting together long term datasets on the island ecosystems. It is proposed to concentrate on mammal, bird, and marine invasive species, of which very little is known. These, including domestic species that have gone feral, are a major threat to the ecosystems in these islands.

From Tsunami to Virgin Coconut Oil

Project Period: July 2012 onward.
Budget: ₹11,60,000
Supporting Partner: Runners up for the St.Andrews Prize for the Environment.
Principal Investigator: Rauf Ali
Web page: http://www.feralindia.org/drupal/node/189

Continuing from the earlier efforts in establishing a commercially viable coconut oil industry among Nicobari tribal women, arrangements were made for a tribal businessman in Car Nicobar to purchase and supply oil. One instalment of 200 litres was received. However there were problems in arranging barrels to supply larger quantities, and barrels sourced in the islands were found to be substandard. There was no action on the part of this businessman to obtain barrels from elsewhere, and finally an entrepreneur from Port Blair stepped in. A private limited company has been set up, which will buy the nuts from Nicobaris at more than the Minimum Support price. This will be converted by the company into VCO, shipped to mainland India, and then marketed. Rs. 5 lakh in capital was contributed to this venture from private sources. With this the St. Andrews-VCO project is at an end.

While the manufacturing by women did not take off, the project has achieved one of its major goals of ensuring that at least the minimum support price for coconuts was paid, with other manufacturers having to follow suit.

Coconut oil Press with beneficiaries of the project.

Annual Boat race in Car Nicobar (top). The winning teams fans celebrate (below).


OM FIELD GUIDES
Birds of
Southern India
Richard Grimmett
Tim Inskipp

Events

We organised and participated in a variety of events this year ranging from bird watching trips to workshops and community meetings. These have been summarised below under two categories: events which were organised by FERAL and events where FERAL researchers were invited as resource persons.

For the first time, FERAL began running workshops which were not aided by external grants. As per our mandate, students continue to enjoy waivers and subsidies in these workshops where researcher volunteer their time and effort. We actively participate, both as resource persons and as attendees in events organised by other institutes. This year was no different with FERAL researchers lending their expertise to four events organised by other agencies. Our researchers also presented papers and posters in some of these.

Events Organised by FERAL

Training workshop on threatened marine species

Related project: Finding spaces for co-existence (page 28).
Venue and dates: FERAL Campus, December 2014.
No. of participants: 11.
Resource person: Divya Karnad.
Participant profile: Naturalists and ecologists from research agencies and NGOs.
Web page: **http://www.feralindia.org/drupal/node/295**

Workshop on field hydrology

Related Project: Hydrologic and Carbon Services in the Western Ghats (page 22).
Venue and dates: FERAL Campus, 10th to 14th November, 2014
No. of participants: 22.
Resource persons (FERAL): R.S. Bhalla, Srinivas Vaidyanathan.
Resource persons (ATREE): J Krishnaswamy, S Badiger, S Varghese, M Kumar.
Participant profile: Water resource managers, ecologists from NGOs/research institutes.
Web page: **http://www.feralindia.org/drupal/node/198**

Applications of R in GIS and Hydrology

Venue and dates: FERAL office - Bangalore, June 16th to 19th, 2014.
Related Project: Thematic Training on GIS and Remote Sensing (page 4).
No. of participants: 11.
Resource persons: R.S. Bhalla, Srinivas Vaidyanathan.
Target audience: Ecologists, researchers from research institutes/NGOs.
Web page: **http://www.feralindia.org/drupal/node/296**

Introductory GIS/RS using Quantum GIS

Venue and dates: FERAL Campus, 16th Feb 2015 to 20th Feb 2015
No. of participants: Seven
Resource person: R.S. Bhalla
Target audience: Researchers, development professionals from NGOs/research institutes.
Web page: **http://www.feralindia.org/drupal/node/199**

Events Organised by Others

Introduction to GIS and Remote Sensing

Event: Tools for Conservation of Freshwater Ecosystems
Organisers: Shillong College, Shillong, Meghalaya.
Venue and dates: Shillong College, Meghalaya, 18th to 21st July 2014
No. of participants: ~24
Resource persons: R.S. Bhalla (FERAL)
Target audience: Students, researchers, conservationists from NGOs/research institutes.
Web page: **http://www.feralindia.org/drupal/node/196/edit**

An introduction to Invasion Biology

Event: Student Conference on Conservation Science
Venue and dates: Bangalore, 8th September 2014
No. of participants: 25
Resource persons: Rauf Ali (FERAL), Naveen Namboothri (Dakshin Foundation)
Target audience: Naturalists and ecologists

Landscape Genetics

Event: Student Conference on Conservation Science
Venue and dates: Bangalore, 9th September 2014
No. of participants: 25
Resource persons: Uma Ramakrishnan (NCBS), Srinivas Vaidyanathan (FERAL), Prachi Thatte (NCBS)
Target audience: Naturalists and ecologists

Introducing GIS and remote sensing using QGIS

Event: Student Conference on Conservation Science
Venue and dates: Bangalore, 8th September 2014
No. of participants: 25
Resource persons: R.S. Bhalla, Rajat Nayak and Srinivas Vaidyanathan
Target audience: Naturalists and ecologists

Birdcounts at Kalivelli and Ousteri Lakes

Event: The Great Backyard Birdcount.
Organisers: Bird Count India, FERAL
Venue and dates: Kalivelli and Ousteri Lakes, February 15th and 16th, 2015.
No. of participants: 17
Participants: Students from the Dept. of Ecology and Environmental Sciences, members from the FERAL team and birding enthusiasts.

Publications

Journal Articles

- Krishnaswamy, Jagdish, **Srinivas Vaidyanathan**, Balaji Rajagopalan, Mike Bonell, Mahesh Sankaran, **R. S. Bhalla**, and Shrinivas Badiger. 2014. `Non-Stationary and Non-Linear Influence of ENSO and Indian Ocean Dipole on the Variability of Indian Monsoon Rainfall and Extreme Rain Events'. Climate Dynamics, August, 1–10. doi:10.1007/s00382-014-2288-0.
- Vanak, Abi; Aniruddha Belsare, Meghna Uniyal, **Rauf Ali** (2014) Science in the Doghouse. Current Science, 107 (3): 341-343, 10 August 2014 2.
- Vanak, Abi; **Rauf Ali** (2014) Not just subjective, but also sloppy – a response to Bhadra. Current Science, 107(11): 1779-1780, 10 December 2014

Reports

- Sivakumar, S, Rajat Nayak, and Srinivas Vaidyanathan. "Grassland and Habitat Mapping Study". Arunachal Pradesh Forest Department(2014).
- Tara N. Lawrence and R.S Bhalla, 2014. Co-management of artisanal fisheries along the Coromandel Coast. Final Project Completion Report.
- Karnad D. 2015. Final Report Submitted to Rufford Small Grants Programme.
- Karnad D. 2015. Final Report to Chester Zoo Conservation and Research Grants Scheme.

Popular Articles

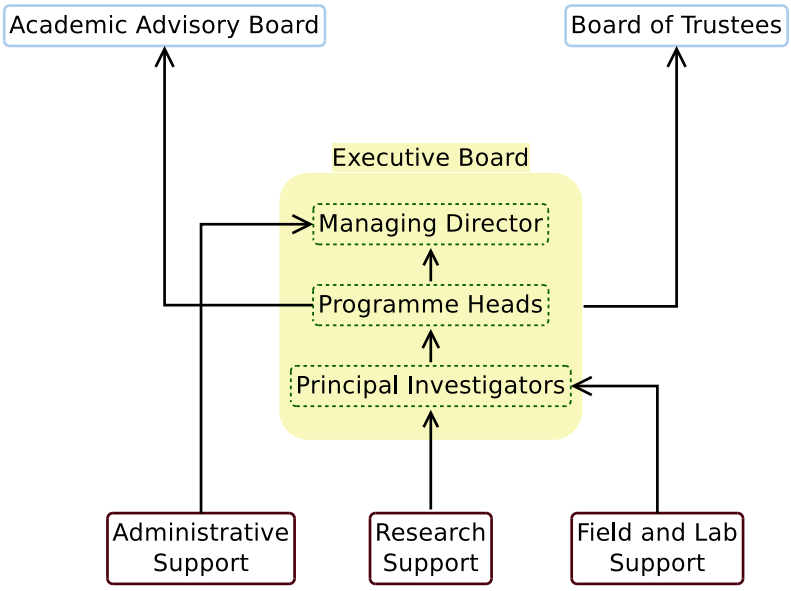
- Lawrence, Tara. 2014. "Organised Data for Effective Management | TRINet." Accessed February 17. http://trinet.in/?q=node/1332.
- Lawrence, Tara 2014 "Kaanamal Pogum Kadal valam", Kaadu, (34-37).
- Karnad, D. 2015. Deccan Herald. "How pollution affects fisheries" .
- Karnad, D. 2015. Deccan Herald. "Algal death traps".
- Karnad, D. 2015. Deccan Herald. "Silent flows the river".
- Karnad, D. 2015. Deccan Herald. "Climate costs of seafood".

- Karnad, D. 2014. Shark Focus Magazine. Between the devil and the deep blue sea.
- Karnad, D. 2014. Saevus Magazine "Still life from the sea".

Conference Papers and Presentations

- Karnad D. 2015. MARE Conference. "Fragmentation and plurality of fisheries governance in Maharashtra, India", Amsterdam, Netherlands.
- Karnad D. 2015. ATREE student talks. "Fishing for co-existence in Maharashtra".
- **Rajat R Nayak**, Mayuresh Gangal. 2014. SCCS - Beijing. "Change in Grazing Practices Induce Shift in the Ground Vegetation Community in the Western Himalayas".
- Karnad D. 2015. Poster installation . "Lighting the way", Story of Light Festival Miramar Beach, Panjim, Goa

Administrative Information



FERAL's Organogram.

Advisory Board

Ajith Kumar, Ph.D.
Arjun Sivasundar, Ph.D.
Deviprasad K. V., Ph.D.
Jagdish Krishnaswamy, Ph.D.
Karthik Shankar, Ph.D.
Mahesh Sankaran, Ph.D.
Neil Pelkey, Ph.D.
Keshavnath Perar, Ph.D.

Board of Trustees

Mahesh Sankaran, Ph.D.
Pratibha Pande
Rauf Ali, Ph.D.
R.S. Bhalla, Ph.D. (Managing Trustee)
Srinivas Vaidyanathan

Feralidae

The people behind FERAL are a diverse group with specific interests in the field of ecology. This team is responsible for formulating and coordinating the organisations activities and comprises of a number of persons introduced alphabetically (by first name) below:

Researchers

Divya Karnad

Divya is a marine ecologists working on fisheries and threatened fish species along the west coast of India. She is currently pursuing her PhD at the Rutgers University, USA and is studying sustainable livelihoods of fishermen and conservation of threatened marine fish species in the West Coast of India.

Neil W. Pelkey

Neil is a professor at the Juniata College, Pennsylvania, USA. An expert on GIS and remote sensing, he is an advisor on many of the projects and research proposals of FERAL. He is also responsible for developing the ongoing collaboration with the Juniata College and Keystone Study Abroad Consortium for the undergraduate study aboard programme in India.

R.S. Bhalla

Ravi is interested in the applications of quantitative techniques to community based natural resources management and ecosystem services and processes. He holds a Ph.D. in GIS and remote sensing based tools and models on water resources, with a focus on watershed management policy.

Rajat Ramakant Nayak

Rajat has completed his Masters in Wildlife Biology and Conservation. He has a special interest in grassland ecosystems, both low and high altitude, semiarid and wet. He is currently part of the team focusing on the biology and conservation of ecosystems and connectivity for large mammals in the Shencottah Gap.

Rauf Ali

Rauf is involved in various research efforts in the Andaman and Nicobar islands with a focus on assessments and impacts of exotic species. He is active in policy advocacy for conservation efforts and is part of the researcher network across the country and worldwide.

Senthil Babu

Babu has an M.Phil. in History of Science. He is interested in issues affecting the coastal communities in general and the fishing community in particular. He has worked along the east coast on various issues for the last several years. He has been actively involved with our work in the Shencottah Gap, working on the social aspects of payment for ecosystem services.

Siva T

Siva is a postgraduate from forestry college in Coimbatore. He works as part of the field team in the Nilgiris.

Srinivas Vaidyanathan

Srinivas is a wildlife biologist with an interest in understanding changes in landscape level processes and structure and how they affect large mammal populations. He is a guest faculty at the M.Sc course in Wildlife Biology and Conservation at NCBS, where he has been coguiding students for their Master's thesis. Srinivas uses spatial approaches for finding innovative and practical solutions to conservation problems.

Sunita Ram

Sunita has an MPhil in Bilogical Sciences from Fordham University, USA. She is currently working on factors delineating distribution of langurs in southern India. Her research interests lie in understanding the ecology and distribution of primates and finding long term conservation startegies in the southern Western Ghats.

Tara Lawrence

Tara holds a Masters degree in Marine Biology. Her broad interests lie in the area of fisheries ecology and ecophysiology. Her interest in the fisheries sector stems from the incredible dynamics the industry displays in the face of a rapidly changing resource base.

Research Support

Ignatius Peliyas
Ignatius is interested in understanding human dimensions of conservation. He works in the Agastyamalai complex assessing the role human settlements and community based organisations play in conserving wild habitats.

Kumaran K.
Kumaran has been working as part of our field teams in Pondicherry and in the Western Ghats. He is currently pursuing his Masters degree in Ecology at Pondicherry University.

Nitya Sathish
Nitya has a BE in Electronics and Communication Engineering. She is currently assisting with data management and analysis.

Saravanan S.
Saravanan holds a masters in human resources devt. He coordinates field activities and manages the teams at the Emerald field station in the Nilgiris. He is also the liaison between the project and various officials in the Nilgiris and is a resource person for GIS and GPS workshops conducted at FERAL.

Selvaganesh
Ganesh is a postgraduate, and has largely been helping the WASH team with the implementation of the projects.

Sivakumar Sankar
Sivakumar has an MTECH in GIS and RS. He is interested in applying these skills to understand coastal zone changes.

Vikrant Jathar.
Vikrant completed his masters in zoologyfrom Mumbai University. He is interested in studying butterflies and their role in biodiversity assessments. He is also interested in studying parasites infecting butterfiles in their different life stages.

Vinod M.
Vinod works as part of the field team in the Agastyamali landscape. Along with Karthik, he co ordinates field activities.

Administrative Support

FERAL has a small administrative support system who contribute to other projects by way of facilitating training programmes, workshops and reporting.

Sunita Ram
Sunita managed to juggle her research commitments with the tough job of being the Managing Director of FERAL for this financial year. She ably steered her limited administrative support team to meet the multiple requirements of donors and authorities as well as the reasonable and unreasonable demands of her colleagues.

Rajendran K.
Raji is our Office Manager and is engaged in keeping the campus operational and helps organise workshops and events for various projects. The former involves facilitating the entire range of projects operating out of the campus.

Shanthi R.
Shanthi is our Accounts Manager handling the day to day accounting responsibilities of the organisation. She is a postgraduate in commerce and is versatile in the use of a range of accounting software.

Sumathi, **Chitra** and **Renuka** help with office maintenance and manage the kitchen work on campus.

Supporting Partners

Arunachal Pradesh Forest Department, Pakke Tiger Reserve.

CEPF – ATREE Western Ghats Small Grants Programme.

Chester Zoo Conservation Grants, UK.

Critical Ecosystem partnership fund, USA.

SEED Division, Department of Science & Technology, Government of India, New Delhi.

Keystone Study Abroad Consortium (KSAC).

Ministry of Earth Sciences, Government of India, New Delhi.

Primate Conservation Inc, USA.

Ruffords Foundation, UK.

The Rockefeller Foundation.

US Agency for International Development (USAID).

University of St Andrews & ConocoPhillips, UK..

Wildlife Conservation Society India.

Collaborating Institutions

Ashoka Trust for Research in Ecology and Environment, Bangalore, India.

Centre for Wildlife Studies..

Juniata College, Huntingdon - Pennsylvania, USA.

Lancaster Environment Centre, Lancaster University, UK.

Mahatma Gandhi Medical College & Research Institute, Pondicherry, India.

National Centre for Biological Sciences, Bangalore, India.

The Nature Conservancy, USA.

Wildlife Conservation Society - India Programme.

Balance Sheet

FOUNDATION FOR ECOLOGICAL RESEARCH ADVOCACY AND LEARNING
No .170/3, Morattandi Village, Avroiville Post, Tamilnadu - 605101
BALANCE SHEET AS AT 31.03.2015

(Amount in ₹)

Particulars	Sch.Ref	31.03.2015	31.03.2014
SOURCES			
Corpus	1	(907,173)	(630,240)
Project Asset Reserve	2	4,559,239	4,559,239
Projects Account (Cr)	3	554,472	4,368,931
SBI - Bolero Vehicle Loan		-	12,225
		4,206,539	**8,310,155**
APPLICATION			
Fixed Assets less Depreciation	4	2,772,381	3,258,717
CURRENT ASSETS, LOANS AND ADVANCES			
Cash and bank balances	5	1,232,969	4,673,546
Loans and advances	6	464,983	453,328
	(i)	1,697,952	5,126,874
Less: Current liabilities	7	263,794	75,436
	(ii)	263,794	75,436
Net Current Assets (i) - (ii)		1,434,158	5,051,438
		4,206,539	**8,310,155**
Notes on Accounts	10		

As per our report of even date attached

For FOUNDATION FOR ECOLOGICAL RESEARCH ADVOCACY AND LEARNING

R S BHALLA
Managing Trustee

Dr.RAUF SAAD ALI
Trustee

FOR ASA & ASSOCIATES LLP
Chartered Accountants

K.VENKATRAMAN
Partner
M.No:200/21914
Firm Reg No: 009571N/N500006

Place : Chennai
Date : 16.09.2015

Notes:


FERAL
www.feralindia.org