

AGASTHYA

Volume 5 Issue 2

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flower

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on the wild

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in flux ?

Symphony
of flowering

“greener”
Forest Festival

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thoughts from a
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landscape

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SPECIAL FOCUS:
Long Term Monitoring



'Notes from the editor'

Learnings from long term monitoring

The summer rains in the hills had just begun and the evergreen forests of KMTR were wearing a fresh wet look; there were many species of trees in flower and as one counted them the numbers began to build up and soon it was apparent that it was a major flowering year in the forest which according to our long term monitoring data is a 'rare' event. We can say rare only because we have been monitoring such events for a long time now. Coming July 30th, the moon will start a new cycle signifying the culmination of the annual festival in the Sori Muthaian temple in KMTR. As we gear up to continue our drive for a cleaner and greener festival, I couldn't help but notice the path that we have treaded to reach this stage of our campaign. For some of us who joined ATREE in the recent past, the campaign has given us a first-hand view of the effort and dedication that is needed to carry out a long term monitoring program. The campaign essentially is divided in two parts – long term monitoring and engagement with the stakeholders. The impacts of engaging with the stakeholders are visible – entry and use of disposable plastic inside the forest has been banned; a system is in place to enforce it and; a number of volunteers from the local landscape are taking part in awareness campaigns and research activities.

ATREE has set up many such long term monitoring programs to study the dynamic systems inside the KMTR and in its foothills. Earlier, monitoring was rooted in pure natural ecological systems, parameters viz. phenology, frugivore abundances, plant-pollinator interactions and vegetation dynamics. Over time our programs have evolved to include numerous socio-economic –ecological systems. Socio-economic evaluation of the Eco-development and our awareness program exemplify this diversification. As we are getting involved in active conservation oriented programs, we realise integrating knowledge from natural systems into the human-traditional-knowledge has greater scope of success. Integration, also in a much broader sense enhances our understanding of the forests and its interactions with human beings. The wealth of information from our long term studies is the focus of this issue of Agasthya. This issue also marks the beginning of a new design and a transition to include research findings in Agasthya. However, the dissemination of the results through different media is still an important key to achieve a popular mandate on conservation and I feel this is the future challenge.

- Allwin Jesudasan

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Cover page Image: Dehisced fruit of *Cullenia exarillata*. This species fruits during seasons of fruit shortage supporting many frugivores during such periods. **Credit: R Ganesan**

Flip of cover page Image: Visitors thronging the forests of KMTR to participate in the *Aadi Amavasya* festival in *Sorimuthian* temple. **Credit: Rajkamal Goswami**

Back Cover: Biologically and culturally rich and diverse landscape of the Agasthyamalai. **Credit: R Ganesan**

Editorial Team

Editor: Allwin Jesudasan

Associate Editor: Rajkamal Goswami

Editorial Review: R Ganesan, T Ganesh, M Soubadra Devy

Design: Kiran Salagame

For feedback & suggestions please write to:
allwin.jesudasan@atree.org, rajkamal@atree.org

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When will the tree flower next?

All natural ecosystems and social systems are dynamic where change is a constant phenomenon. With global changes happening all around us, long term monitoring of such socio ecological systems as they are called these days has become a necessity. Easier said than done, long term monitoring not only requires resources, permits and field support, but also commitment from both institutions and individuals involved in the monitoring. Therefore questions like what and where to monitor becomes critical and careful selection of sites and parameters that helps us understand the dynamics of the system is essential. In early 1990 following the general trend among ecologists to understand community ecology, a series of ecological monitoring programs evolved at Kakachi in the evergreen forest of KMTR. As part of this initiative vegetation dynamics, phenology of trees, pollinator and frugivore abundances and weather parameters are being monitored for the last 20 years at the site.

Trees don't produce flowers and fruits every year; a familiar example is the availability of mango in the market that varies between

years. In Kakachi where over 70 different species of trees are being monitored nearly 60% of them flower and fruit once in several years. *Tricalysis apiocarpa*, a tree of the wet evergreen forest whose flowers are

which brought an exceptionally huge number of bats to the site. This year, while carrying out our phenology observations, we noticed a high intensity of flowering levels which could lead to a super abundance of fruits too and

perhaps a recurrence of the 1994 phenomena. Similarly *Cullenia exarillata*, another annually fruiting species produces flowers and spiny fruits (cover picture) during season of fruit shortage in the forest. It helps many fruit eating animals, like lion tailed macaque and bats, tide over periods of fruit scarcity.

The forests of Kakachi are very stable and free from anthropogenic disturbances and major climatic perturbations. But with the climate not what it is, would the forests remain the same?

Are perturbations in flowering, fruiting and recruitment observed a result of natural variations or influenced by changes in weather? Long-term monitoring of plants, phenology and animals which now also include amphibians with climate modelling may help us answer such questions and also get a deeper understanding of how species respond to climate change.

- T. Ganesh
tganesh@atree.org



View of the seasonal variation in tree phenology in Kakachi

pollinated by bees and fruits eaten by birds flowered only twice in the last 16 years and we have no clue as to when the next flowering will happen. There is a considerable variation in the intensity of flowers and fruit set between the years, among the annually flowering and fruiting tree species. Response of animals to such events could be dramatic.

In 1994 *Palaquium ellipticum*, a bat dispersed species, showed a very high intensity of fruiting than its normal years

Eavesdropping on the wild: Monitoring frogs and toads in KMTR

Linnaeus, in 1756, termed amphibians as foul and loathsome animals. It is not surprising if many others of the present generation share the same feelings towards amphibians for they are moist, cold and

slippery. They were the first four legged vertebrates to have set foot on land and have lived on ever since. Their unique life cycle of having tadpoles in water and adults living in a terrestrial environment is intriguing and are truly among the many hallmarks of evolution. Amphibians comprise frogs and toads, worm-like Caecilians and Salamanders. All the three have been successful in occupying diverse habitats. Far from being loathsome creatures, they provide vital ecosystem services like pest control as they consume large amounts of insects and are also eaten by a variety of animals ranging from mammals, birds to reptiles and are good indicators of a healthy ecosystem. But, with

increasing changes to their habitat, pesticide use, fragmentation and alteration of the environment, their survival is at stake. Amphibian populations, world over are in decline and more and more of them are facing the threat of extinction.

India is home to 314 amphibians of which 279 are either frogs or toads. Many more are still being described by scientists while many others are facing the threat of being wiped out. In spite of such great diversity and reported declines elsewhere, we neither have long term population trends nor even basic information on the species-level presence or absence. To bridge such gap, a long term study has been initiated in the evergreen forests of KMTR. The study, unique in many ways, will use the vocalizing behavior of frogs and toads to detect their presence or absence over time and across habitat. To take it a step further, the species adapted to the tall forest canopies are also being documented by accessing the



Calacad gliding frog, *Rhacophorus calcadensis*; A canopy species, it comes to the ground for breeding



Song Meter being installed

canopies.

Automated sound and data loggers programmed to record at particular intervals have been set up inside forests. They record the orchestra of calling frogs and toads from considerable distances and help detect their presence and activity patterns. This, coupled with manual searches has, so far, resulted in finding 12 species. Five of them have been matched with their calls. The remaining calls are still a mystery but we are at it and should soon know who these elusive croakers are. The calling

pattern is studied with respect to environmental variables such as temperature and humidity using automated weather trackers. Done over seasons and years, this data can help us understand the trends and relationships of calling amphibians with the environment. This will have immense potential in the future, to understand the impacts of climate change, pesticide use, disease and others on frog populations. Such signals (data) will indicate the first flash of danger to the ecosystem.

- Seshadri K. S.

seshadri.ali@gmail.com

Forests in flux?

Forest vegetation comprising trees, shrubs, herbs and other plant forms are resources for many animals and human in the forest. Various environmental factors shape the vegetation and changes in these factors will have implications on the functioning of the forest. In fact the forest one sees today is the cumulative outcome of various anthropogenic, environmental and ecological interactions over thousands of years.

Forests change very slowly and to record such changes one need to monitor the species, their abundance and spatial occurrences at regular intervals. Ascertaining the distribution of species at a point in time is good to judge the conservation status of the species. But to take informed conservation decisions based on a sound understanding of the changing patterns of forest growth, and dynamics of plant communities, long term monitoring is necessary.

The wet evergreen forest in Kalakad Mundanthurai Tiger Reserve (KMTR) is considered as one of the most pristine forests in the Western Ghats. It has several plant species that are endemic to the Agasthyamalai region. We initiated a systematic study on the trees and shrubs at Kakachi in KMTR which is a relatively under explored stretch of wet evergreen forest. The forests at Kakachi had exceptionally low levels of tree diversity compared to most other wet evergreen forests. The forest was dominated by few tree species like *Cullenia exarillata*, *Palaquium ellipticum* and *Aglaia bourdillonii*. Interestingly one of the most abundant species *A. bourdillonii* turned out to be a localized endemic tree. In the adjacent forest, where selective logging and clear felling were carried out about 40 years ago, we observed that the forest is still recuperating from the disturbance as seen by

the high abundance of short-lived, light loving tree species compared to undisturbed forests. To further understand the processes that shapes the forest community in Kakachi, we set up three 1-ha permanent long term monitoring plots.

After 18 years of monitoring these plots, our results show that changes in the composition and abundance of trees over these years is very low compared to other tropical forest sites. Only one of the plots which had a small elevation gradient and a forest opening colonized by reed bamboo, showed greater changes in the abundance of plant groups. On the other hand comparison of plant species and their abundances in undisturbed forests with regenerating forests indicate that high levels of disturbance leads to greater changes in abundance but minimal natural disturbance leads to low turnover of species. Could this lead to low number of species? We also wonder whether the high rate of girth increment in few dominant primary forest species such as *Cullenia exarillata* and *Palaquium ellipticum* could be the reason for them to monopolize the stand? The plots being located in high altitude forest and



Vegetation monitoring in action

susceptible to vagaries of both the monsoons, long term monitoring of changes in vegetation in such plots can throw more light on our understanding of impacts of climate change on forest at a regional level.

- R. Ganesan

rganesan@atree.org

Will the symphony of flowering trees and their pollinators be jeopardized?

No flowers no bees; no bees no fruits; no fruits no monkeys.

We all know that the little bee and its likes play a larger role in sustaining plant species both in the wild and managed landscapes than one can imagine. Recently there was a situation of 'yes flowers and no bees' which raged Europe and USA. What was called as Colony Collapse Disorder (CCD), whereby the bees disappeared due to a mysterious disease, leading to a loss of 212 billion USD. Part of this woe has been dependence on mobile bee keeping practice where the bee boxes are moved from one cropping land to other. As a result of loss of wilderness around farmlands, which supports substantial diversity of pollinators, the situation of dependence on single species of bees as the only pollinator has arisen. Such monoculture of pollinator species is highly vulnerable to diseases. In India fortunately, we still have the services of many bee species which straddle between the forests and other wilderness areas to crop lands. In the wet forests of Agasthyamalai, rock bees (*Apis dorsata*) move between crops and plantations in the foot hills to 1200m elevation in the hills respectively. One species, *Palaquium ellipticum*, which flowers towards the end of



A rock bee hive on a *Palaquium* branch

early warning system to changes that are likely to follow such an upset in the interactions. For example, the mismatch between hive density and flowering intensity of the *Palaquium* can indicate that something is wrong with the bees elsewhere, which is somewhat similar to what happened with *Apis cerana*, a closely related species of rock

bee that suffered from the Thai Sac brood disease. It eventually led to the collapse of their colony. Fall in honey production was perceived during this period but the pollination role of bees went unnoticed as there was no monitoring program of bees' interactions with their food-plants.

Land-use change can be another contributing factor. There is clear evidence of rock bees making a sequential staggered migration tracking resources from croplands at the base, to the wet forests in the hills following a 'nectar corridor' in different seasons. Large scale land-use and land cover changes in lowlands can also jeopardize the interactions, as the wet forest site, dominated by *Palaquium ellipticum*, the final destination of the rock bees in a year. Such long-term information can also be useful to assess the climate change, its bearing on phenology and its cascading effects on such complex ecological interactions. Monitoring a keystone interaction as one cited here could be a good indicator of a better understanding of the dynamics of the forest rather than monitoring only the pollinators.

- M Soubadra Devy
soubadra@atree.org

Monitoring for a 'greener' forest festival

Presence of religious sites in biodiversity rich forest areas is a global phenomenon. India is no exception where many forests including Protected Areas have important religious sites with many being visited by large number of people. Common examples include Sabarimala Temple (Periyar Tiger Reserve), Kedarnath Temple (Kedarnath Wild Life Sanctuary) and Biligiri Rangaswamy Temple (BRT Tiger Reserve). Kalakad Mundanthurai Tiger Reserve (KMTR) encompasses various religious sites with varying degrees of importance and following. Largest among them is *Sorimuthian kovil* (SMK), built by *Singampatti Palayam* of the erstwhile *Pandyan* Dynasty. The temple premises, including the sanctum sanctorum is located in the Mundanthurai range. Popular estimates claim that about 5 lakh people visit this temple during the new moon day (*amavasa*) in Tamil month of *Aadi* (July-August) every year. Among the numerous impacts that such a large influx of people can have on natural forests, the most conspicuous is the left over waste littered indiscriminately on the forest

floor and floating in the water bodies. The introduction of plastic as a cheap, convenient and disposable packaging material in our culture has spiraled this problem beyond control.

Till 2005 our efforts to counter the problem was very small scale and scattered. It was then that the KMTR forest managers approached us to forge an active partnership with them in-order to find effective means to ease the pressure exerted on forests due to the enormous congregation of pilgrims. Imminent problem at hand was to immediately take care of the colossal amount of waste that was being generated every year. Our action oriented campaign ranging from frisking the visitors (for polythene bags) to clearing left over garbage after the festival, proved quite successful in reducing entry and persistence of wastes inside the forests. Such an approach, which requires continuous efforts of high-scale without bringing about any perceivable change in the attitude or behavior of the pilgrims, seemed

neither sustainable nor offered any long-term solution. Thus the idea of a comprehensive campaign which would target not just the visitors but also the managers and policy makers started taking shape. It was soon formulated and came to include a strong monitoring component. Over the course of time, this late offshoot of our original campaign soon evolved into a crucial component backing our outreach and awareness with robust empirical evidences of the impacts wreaked by the festival.

Initiated in 2008, we designed a traffic census survey and arrived at a reliable measure of the number of visitors to the festival. Simultaneously we also started estimating abundances of mammals and number of road-kills across the temple forest landscape to investigate the spatial extent of the festival's impact on terrestrial animals. A single point sample gave us a good idea about the potential impact of the festival. We now knew that about 1.5 -1.7 lakh visitors came to the festival over the three days and in



Monitoring road-kills during the festival

the process was responsible for death of over 1700 animals which range from frogs, reptiles, insects and also displacing larger wild life from the area and denuding the forest understory apart from polluting the river. However new questions emerged: How are the animal communities responding to such intense disturbance over larger temporal scales? Will these changes influence the ecosystem and the habitat functions?

After three years of study, faint trends seem to be emerging. Preliminary analysis points towards overall decline in abundances of the

animals but requires rigorous statistical testing before we can say anything conclusive about population-level trends of the animal community. Road-kill estimates, which showed significant increases during the festival, also point towards an emerging pattern of local-extinctions for many invertebrate species during the festival. Traffic survey points towards an average annual increase of 11,000 visitors over the last three years. Last year we also started looking at changes that is being brought about in the vegetation structure and composition. The study points out that the canopy is gradually opening up due to repeated camping. With more temporal sampling we are trying to see if such destructive camping practices are responsible for the transformation of the dry evergreen to thickets.

We designed a visitor's survey in 2008 to gain

insights about their motivations, aspirations and incentives to visit the temple. We repeated the survey in 2010 to see if the last two years of campaign has had any impact in creating a forest friendly attitude among the visitors. The results were heartening as it did point towards a greater knowledge about impacts of plastic waste inside the forest and it also showed that people were willing to forego a few inconveniences if it meant better conservation of the forests.

On sharing the results with the district administration and the forest department, we could facilitate two conservation-friendly interventions: complete ban on the use of disposable plastic items inside the forests and provisional regulation on night traffic during the festival. Among the important future tasks and plans, first and foremost is to disseminate the results and findings in outlets that would help create links and networks with stakeholders. By setting up socio ecological monitoring, we hope to continue to remind the stakeholders that they need to do more for the festival impacts to show a declining trend. Only then can we call it a 'green forest festival'.

- Rajkamal Goswami
rajkamal@atree.org

Diverse thoughts from a diverse landscape

Our study on the socio-economic aspects of forest dependent communities at different points in time aims to capture how the people and forest interact and shape each other. Being a part of the long term study gave me an opportunity to relate with people along the eastern boundary of KMTR, tea estate laborers, *Kani* tribals and pilgrims who come to the temples located inside the forest. One common trait between villagers who resided in the immediate vicinity of the park and those inside the forests was that the older generation seemed unhappy with many restrictions that come with the declaration as a Protected Area while the younger generation did not seem to miss venturing into the forest and in many cases were keen on adapting to the new lifestyle that development had to offer. The laborers in the tea estate inside the forest appeared to have balanced the demands of the developing world and living in isolation. Some of them recalled how the estates provided them employment in early 1990s when there was a prevailing scarcity of jobs. The resultant sustained income and other social benefit schemes of the estates gave them the opportunity to educate their children. They also talk of a time when they were influenced by people outside the landscape to go on strike on various demands to the estate, ending up spoiling their good relationship with the estate and also being abandoned by

the activists. Now, additional laborers come from the North-East India which is slowly but surely changing the ethnic composition in estates inside KMTR. The characteristics of a typical pilgrim visiting the *Sorimuthian* Temple inside KMTR during the *Aadi-Amavasai* festival also seem to be changing. What used to be a local festival now attracts people from all over Tamil Nadu. The surveys that we conducted also revealed that most of the pilgrims view their time in the forest as an outlet for the extremely monotonous and stressful lifestyle that they lead back in their villages. Further, the inconveniences and the lack of sanitation facilities do not inhibit the pilgrims from coming to the festival year after year. Though most of the people were willing to take steps to reduce their impact on the forests, the increasing number of pilgrims each year is making the situation difficult to manage. We also realized that many of the pilgrims bury or burn plastic inside the forest thinking it reduces their impact. We hope to incorporate such information in future awareness programs so that pilgrims understand the



Shankerpandi

Respondents such as the pilgrim above shared their thoughts on a variety of issues

issues surrounding plastic. Such studies at different scenarios, at different points in time can help in our understanding of complex issues. For example, the data from our another study helped in evaluating the Eco-Development Program in KMTR at a finer scale. Although the program leaves much to be desired in the participation of the stakeholders in crucial decisions, it appears to have succeeded in its main goal of weaning out forest dependant forest fringe villagers from KMTR. Such insights can go a long way in aiding the conceptualization and management of intervention programs.

- Allwin Jesudasan
allwin.jesudasan@atree.org

Monitoring forest dependency

There are about 200 villages situated in the 5 km buffer area outside Kalakad Mundanthurai Tiger Reserve (KMTR). Majority of these villagers were dependent on the forest for income, livelihood and sustenance activities viz. fuelwood and cattle grazing. During the erstwhile Zamindari period these activities were legal; whereby 'pass' system was followed for regulating the use of forests resources which was nothing but a version of the modern day 'license'. After abolishment of the Zamindari system, the Government enforced strict laws under the wildlife act which restricted any kind of forest use by the people. After Kalakad and Mundanthurai Forests was elevated to Tiger Reserve in 1988, and laws began to enforced quite strictly. Activities such as fuelwood and fodder collection, cattle grazing etc were banned. Before the implementation of Eco-development Program in the absence of any viable alternative occupation or source of income and livelihood, varying degrees of fuel wood collection and grazing continued to happen inside the reserve albeit illegally.

Since 2001, ATREE's Agasthyamalai Community Conservation Centre (ACCC) monitoring the fuel wood collection and cattle grazing inside the reserve. Our initial survey recorded the entry of 40 fuelwood collectors and 60 cattle herds in the forest each day in one of the routes that led to sanctuary. Among the fuel wood collectors the gender ratio was skewed towards women, who were mostly young and middle aged women. In comparison fewer men were being recorded who also fell mostly in the young-middle aged

category. The number of fuel wood collectors was generally higher during non-agricultural season as the non-regulars too collected for domestic purposes. The sight of a single person carrying multiple bundles of fuel wood was not uncommon. However, cattle entry was lower during the non-agricultural season when fallows and agricultural fields were available for grazing. Through our initial survey (2001-2005) we realized that there were no alternative sources of biomass or fuel wood for the people dependent on fuel wood either for subsistence or income.

From 2008 onwards there seems to be a change in the general trend. Overall there seemed to be a drastic decrease in the number of both fuel wood collectors and cattle entering the forest. No newcomers and only middle and old aged people seem to be collecting forest fuel wood that too not regularly. Eco-development project, Government schemes like subsidized rates for rice and National Rural Employment Guarantee Act (NREGA) provided people with cash. This discouraged people from doing the laborious task of collecting fuel



Fuel wood collectors with their head loads

wood instead people started buying non-forest fuel wood from outside the area. Though alternate source of income inside the village could be created for people, no alternate grazing area for cattle was available. All barren lands close to the forest and inside the village are being converted as plantations or sold for making housing plots and industry. Scarcity of grazing area is one of the reasons for decreasing cattle population. Monitoring the dependency, has helped us perceive changes and also possibly predict to an extent how the future could be. Local governance is needed to save the barren lands, wetlands and other natural resources which will provide the biomass and other services to the people and animals living adjacent to the forest.

- M. Mathivanan
mathi@atree.org

Track and Text

The intention of producing the nature guide 'Treasures on Tiger Tracks' was to create awareness of biodiversity among the local people, especially children living in the KMTR



Participants at the reconnaissance workshop picking up identification skills

buffer area. In order to further this, we designed a monitoring programme involving school children, teachers and anyone who is interested in nature and natural history. The uniqueness of this monitoring programme is that the reports will be sent to a common database over SMS which eliminates paper work and the need to access internet. The idea evolved over discussions around removing barriers that are in the way of reporting observations. With mobile phones penetrating even the remotest village, the use of SMS seemed like the most practical option. On June 11th and 12th, a reconnaissance workshop was conducted to train

school teachers on making observations and reporting through SMS. The participants included 9 teachers in charge of eco-clubs in their respective schools, the Chief Environment Officer who oversees the activities of environment education in schools and about 5 other naturalists from the landscape. The enthusiasm with which the teachers participated was overwhelming. The excitement of learning to identify birds and plants quickly caught on among the teachers as they transformed into wonder-struck students during the weekend. At the end of the workshop, they provided us some valuable feedback which will be incorporated in developing the programme further. They are now geared to take this programme to their schools while we await the children's response. If you have any ideas, suggestions or experience to share, please feel free to write to us.

- Jahnvi G Pai
jahnvi@atree.org

Event Report

Announcements:

- ACCC is conducting the annual Sorimuthaian Kovil(SMK) Festival campaign from 26th July 2011 to 31st July 2011. Volunteers interested to participate in this event may contact M.Mathivanan (mail: mathi@atree.org; Ph: 9488063750)
- ACCC is conducting a 15 day workshop for Tamil Nadu Agricultural University (TNAU) students from 15th July to 29th July.
- A one day SMK-stakeholders workshop focusing on the building capacity in order to maintain proper management of waste, crown and forests is being planned to be conducted in the month of July.
- A street play on impacts of pesticide abuse on frogs in paddy fields will be carried out by Nature Talkies during the month of July. This activity is part of the CLP-SOS project implemented in KMTR.

Events:

- ACCC and TREE trust, Kallidaikurichi, jointly organised a tree planting programme at Sub Registrar office on 3rd June 2011 and in the Kallidaikurichi new Police station, Kalladaikurchi, on 13th June 2011.

Distinguished visitors:

- Dr Torbjørn Haugaasen, Associate Professor, Norwegian University of Life Sciences, Norway visited ACCC on 21st May 2011. He also planted a sapling at the ACCC.
- Dr. Malleshappa IFS, Field Director & CCF KMTR visited ACCC on 4th June 2011 along with Mr.Venkatesh, Deputy Director of KMTR

Invited:

- Mathivanan was invited for 'Eco development project activities review meeting' which was held on 24th June at Vickramasingapuram, and chaired a session titled: 'The training programmes provided by Eco development project'.

Snippets:

- Six painted snipes seen near Ambur. This is the first sighting of this species in the foot hills of the reserve.
- A tiger had killed a Gaur inside the evergreen forests of Kakachi thus providing more evidence of tiger in the evergreen forests.
- A major flowering of *Palaquium ellipticum*, the bee pollinated species in the evergreen forests, happened in May. After many years it flowered synchronously throughout KMTR.
- The 3rd re-census of permanent vegetation plots was done.
- Malabar trogon seen nesting inside dead stumps in April-May.
- Seshadri, Preeti and Tamil Azhagan saw 4 dholes on 26-5-11 in Kodayar and heard a kill being made. Next morning, saw 15 dholes with 4 pups in the same area with their tummy full
- Seshadri saw a leopard cat on 27th of May and 25th of June in fern house. These cats were seen several years back at the same place.
- Seshadri, Preeti and Tamil Azhagan spotted the recently rediscovered *Raorchestes chalazodes* frog in Kodayar. This is the second time it is being spotted since its rediscovery.
- Prashanth and Tamil Azhagan saw nestlings of the eagle owl (*Bubo bengalensis*) in June on a rocky ledge in the company of adults



Ashoka Trust for Research in Ecology and the Environment

Main Office

Royal Enclave, Srirampura, Jakkur Post, Bangalore. Pin - 560 064
Karnataka. Tel.no: +91 80 23635555 (EPABX)
email: info@atree.org

Field Academy of ATREE at Agasthyamalai region

Agasthyamalai Community - based Conservation Centre (ACCC)

3/199D, Mukkavar, Manimuthar Main Road, Manimuthar (post), Ambasamudram Taluk,
Tirunelveli District, Tamil Nadu. Pin - 627 421
Contact person: Mathivanan
Tel.no: +91 4634 291809, 293387 Mob:+91 9488063750
email: accc@atree.org