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Editorial

Dr. Satish Pande

The MOU for the establishment of the OENSL - 'Ornithology, Ethno-ornithology and Natural Sounds Laboratory' between the Maharashtra Education Society, Pune and Ela Foundation was signed on 21 May 2013. This opens several research opportunities for ecological conservation in newer disciplines. The Bat Acoustics Workshop was the first academic activity with international collaboration between OENSL and Harrison Institute.

The OENSL – of Ela Foundation and M. E. S. Pune in collaboration with Harrison Institute, UK conducted the workshop on 'Bat Acoustics' during 20th to 25th May, 2013. Jnana Prabodhini, Pune extended collaboration and facilitated the workshop by offering the venue in its premises. The workshop was free for all the participants because of generous support from Darode-Jog Properties and Dr. Shreekant Kelkar. Zoological Survey of India, W. R. C. Akurdi, Pune; Tata Power Company and Forest Department collaborated. This unique academic activity shall open a new door in bio-acoustics to promote conservation ecology in our context. Dr. Nikky Thomas, Scientific Program Officer from the Harrison Institute conducted teaching, tutorials and field studies. The first pre-symposium was held to teach the participants basics of bio-acoustics, bat acoustics, bat habitat preference and bat taxonomy. The second pre-symposium was a visit to the Zoological Survey of India, W. R. C. Akurdi, Pune where Dr. S. S. Talmale gave hands-on demonstration on various bat families of India by showing and explaining the specimen in their collection.

I was invited to participate and deliberate at the 'Conference on Green Norms for Green Energy' at India Habitat Centre, New Delhi on the invitation of CSE - Centre for Science and Environment, New Delhi on 9, May 2013. This was an exercise of brainstorming to provide inputs to formulate environmental policy on renewable energy related project deployment in India and suggest EIA guidelines. There were three sessions, first on' Need for Green Norms'; second on 'Small hydro projects – large ecological impact'; and third on 'Wind power –the need for EIA'. Sunita Narain, Editor, 'Down to Earth', Chandra Bhushan, Abhinav Goyal, Sanjay Gubbi, Shripad Dharmadhikary, Jonas Hamberg, Dr. Leena Gupta, Harsh Vardhan and Sujit Kumar were the other participants. The conference was well attended.

In the interest of the conservation of the delicately balanced and rapidly vanishing natural heritage of our country and keeping in mind that the country direly needs alternative and renewable power, a balance has to be struck between the two aspects. One should not be at the cost of the other, and we should know and fix the cost that has to be paid for power in terms of ecology. Nothing comes free. The strategy should be to generate power with ecology in focus. There are a few vital questions. Is it not necessary to keep ecological flow in rivers that are dammed for hydro power? Is it necessary to divert forest land to create wind power when newer technologies can generate power at low wind velocities? Should local people also not be the beneficiaries of such power, and what should be these benefits? How much animal and plant life and how many habitats should be sacrificed for

human needs?

In my opinion, there is a need for inter-ministerial collaboration for formulating such policies with overlay of data base of MNRE about areas of possible wind farm sites in the country and database of MOEF on areas of PA's, endemic and threatened species and high bio-diversity areas. If we superimpose these data on a GIS platform, we can have two lists: 'Areas of Exclusion' and 'Feasible Areas'. The GOI should publish such lists and update them from time to time. So also, in the wind farm scenario, it should be made mandatory upon interested parties to conduct 'Base-line Bio-diversity Surveys' – BBS - simultaneously with the initial geological and wind assessment surveys, from the time of deployment of wind masts. Areas found to have rich bio-diversity should be excluded. Criteria for exclusion of renewable energy projects should be defined and listed. The benefits that the local communities are liable to reap as well as those that they are not entitled to receive should be clearly short listed. There should be a 'Site-based Approach' and one blanket policy for all projects and compulsion to conduct EIA's at all sites should be discouraged. Criteria for conducting EIA's should be defined.

It is often noticed that because projects below 5 MW do not require environmental clearance, much larger projects to the tune of 20 MW or more are split on paper with multiple power houses shown as different projects for the single dam. The entire large project is cleared in a back-door manner. The spirit of the policy is defeated and the environment is sacrificed. The policy is twisted into a laughing stock. Hence, no project should escape environmental clearances, however the degree of rigorousness of screening should be based on 'Site-based - BBS' results. After such initial screening procedures, if a site is given a green signal, the projects should be completed in a time bound manner. The 'Conference on Green Norms for Green Energy' held by CSE is a welcome step and frequent interactions are needed to formulate an effective and practical working policy to safe guard the national interests in terms of 'power' and 'ecology' and not merely the interests of the ' power sector' and 'ecological monitors'! What the country needs is honest people who will implement the policies in word and spirit. The other more relevant and crucial problem that curbs and thwarts all conservation efforts is the ever growing human population. If we neglect this enemy, the most thoughtfully drafted policies, techno-savvy armaments and bio-technological means shall be of no use to us and to our ecology.

Butterflies of Northern Western Ghats: A Compilation of Checklists

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ABSTRACT:
Inventories were made at 30 localities in Northern Western Ghats, between 15°N to 20°N latitudes, to compile checklists of butterfly species diversity. The checklist includes 191 species of butterflies belonging to 117 genera and six families. Nymphalidae was the most speciose family with 60 species followed by Lycaenidae (59), Hesperiidae (34), Pieridae (22), Papillionidae (15) and Riodinidae (1). The purpose of this paper is to bring the recent inventory data into a primary publication that would be available in public domain.

Key words: Butterflies; Northern Western Ghats.

INTRODUCTION:
Western Ghats is one of the 34 biodiversity hotspots of the world (Mittermeier et al. 2005). While searching the literature on butterflies of Western Ghats during our recent study (Padhye et al. 2012a); we realized that there are very few recent scientific records on butterflies of Northern Western Ghats, *viz.* Bhalodia et al. (2002) - Vansda National Park; Rane & Ranade (2004) - Tamhini; Borkar & Komarpant (2004)- Bondla WLS Goa; Padhye et al. (2006)- Tamhini; Sharma & Chaturvedi (2006)- Sanjay Gandhi National Park; Gaikwad et al. (2009)- Amba Reserved Forest, Sharma & Borkar (2008)- Goa; Rangnekar & Dharwadkar (2009)- Goa; Sharma (2009)- Bhimashankar; Raut & Pendharkar (2010)- Maharashtra Nature Park, Mumbai; Nimbalkar et al. (2011)- Bhor Tahsil, Pune District, Kharat et al. (2012)- Nashik and Dhule districts, Padhye et al. (2012b)- Tata Power Hydro Lakes, Pune district and Jadhav & Sharma (2013)- Bhimashankar are some of the recent studies on the butterflies of this region.

To fill up this lacuna, we surveyed the Northern Western Ghats engaging the students of M.Sc. Biodiversity class to collect the inventory data from a few localities in the Northern Western Ghats. The efforts taken for checklist preparation are not equal, at all study sites. Studies at places such as Amboli and Phansad, appear to be more rigorous and complete, as compared to the other localities. The purpose of this paper is to bring the recent inventory data into a primary publication that is available in public domain. Further studies at all these localities may lead to preparation of enhanced version of these checklists.

To further strengthen the studies and enlarge the scope of this study we have personally contacted people who have collected inventory data for the butterfly species diversity. We could therefore collect the data from 30 localities along the Northern Western Ghats ranging from 25 m ASL to 1100 m ASL altitudes that lay between 15°N and 20°N latitudes. Locality wise contribution of authors to the inventories is given in the Appendix.

METHODOLOGY:
Thirty localities from Northern Western Ghats were visited by different field workers to collect the inventory data for the butterfly species diversity. Field data was collected through random surveys by all out search method, when butterflies were most active, i.e. in the morning 0900h to 1100h and evening 1530h to 1730h for the preparation of checklists. Butterflies were identified with the help of field guides (Gunathilagaraj *et al.* 1998; Kunte 2000 and Kehimkar 2011). Specimen collection was strictly avoided. The checklists were validated using (Kehimkar 2008). The localities where surveys were conducted are shown in Figure 1, while the list of these localities with their zone, latitude, longitude, altitude, period of survey and the

landscape elements is given as Table 1.

STUDY AREA:

1. Dandeli National Park is the southern most point monitored during this study. It is a semi evergreen and moist deciduous forest with small evergreen pockets.
2. Sarambala Irrigation Project is a medium irrigation project under construction. It is present amidst the foot hills of Western Ghats. The nearby village is Dabhil, taluka Sawantwadi, District Sindhudurg. It has paddy fields surrounded by evergreen, semi-evergreen and moist deciduous forest patches on the mountain slopes.
3. Amboli is a hill station with a mosaic landscape containing laterite plateaus, scrub, grasslands, semi-evergreen and evergreen forests.
4. Belne and Nadhavde are the villages in Sindhudurg District, Konkan, with mango and cashew orchards on small hillocks intermingled with paddy fields and human settlements.
5. Watul is a small village with dispersed human settlements. The landscape chiefly comprises of mango and cashew orchards on small hillocks intermingled with semi-evergreen and evergreen forest patches. Low lying areas show paddy fields.
6. Amba Ghat is a road way traversing through the hills along the western slopes of the Western Ghats. It starts from an up-ghat village, Amba (631 m ASL) and ends at a down-ghat village, Sakharpa (114 m ASL). Amba is a small village on the crest-line of Western Ghats with paddy fields surrounded by hills with semi-evergreen and evergreen forests. While the landscape of village, Sakharpa chiefly consists of the paddy fields and small human settlements with cattle sheds. There are semi-evergreen and evergreen forest patches with intermittent torrential streams with waterfalls all along the road.
7. Bhambarvadi and Gudhe-Pachgani are the villages near the eastern boundaries of Chandoli National Park. These are situated on plateaus with wind-farms. They show presence of scrub and grasslands with little paddy fields.
8. Chandoli is a National Park in Sangli District of Maharashtra state. It is located near the Chandoli Dam built on river Warna. It has many perennial water channels, water holes and the Vasant Sagar Reservoir. The park spreads over 317.67 km^2 along the crest of the Sahyadri Range of the northern Western Ghats, between 73°40' and 73°53' E longitudes and 17°03' and 17°20'N latitudes. Elevation of the park ranges from 589 to 1,044 m ASL. It forms the southern part of Sahyadri Tiger Reserve. It has a core zone having thick evergreen, semi evergreen and moist deciduous forests, along with intermittent scrublands and grasslands on slopes as well as lateritic plateaus in the buffer zone. There is no human intervention in core as well as buffer zones. The sampling sites for this study are in the core area of the park.
9. Zolambi is a displaced village in the buffer zone of Chandoli National Park. It is a place on plateau free from human habitation. There are no wind-farms. The place shows presence of scrub and grasslands with intermittent patches of evergreen forests.
10. Koyna-nagar is a dam colony on the banks of river Koyna, surrounded by high altitude mountains with evergreen forests and torrential streams.
11. Pophali is a small Panchayat town in Chiplun Taluka of Ratnagiri District in Maharashtra. It is known for its power plant, which is a part of the Koyna Hydro-electric Project. The town is

situated on the hill slope of the Kumbharli Ghat towards the western side amidst the foothills of Western Ghats. The landscape chiefly consists of the paddy fields and small human settlements with cattle-sheds. This small village is surrounded by moist deciduous reserve forest from one side.

12. Chalkewadi is a village on a plateau with wind-farms. It shows presence of scrub and grasslands with little paddy fields.
13. Vasota is a fort in the Koyna Wildlife Sanctuary. It is surrounded by high altitude mountains with evergreen forests and torrential streams. It is on the banks of the back-waters of Koyna dam called as Shivasagar Lake.
14. Harihareshwar is a pilgrim village on the sea coast. It is surrounded by paddy fields as well as coconut and mango orchards.
15. Ghisar is a small human settlement with cattle-sheds and paddy fields surrounded by hills with semi-evergreen and evergreen forests on the crest-line of Western Ghats. There is a sacred grove near this village.
16. Velha is a village surrounded by paddy-fields and high altitude mountains with scrub and moist deciduous forest.
17. Sinhagad is a fort near Pune city and a valley towards its north east is rich in floral diversity. The landscape chiefly consists of the paddy fields and small human settlements with cattle-sheds. The slopes of mountain show presence of moist deciduous forest patches with intermittent grasslands. It also shows many ephemeral streams with riparian vegetation.
18. Vile is a small village in Raigad District and is situated on the hill slope of the Tamhini Ghat towards the western side amidst the foothills of Western Ghats. The landscape chiefly consists of paddy fields and small human settlements with cattle-sheds. This small village is surrounded by moist deciduous reserve forest from one side. A new industrial estate is coming up in the vicinity of this village. The area is also under the threat of urbanization as many housing projects are mushrooming surrounding the industrial estate.
19. Phansad is a Wildlife Sanctuary near the sea coast in Raigad District of Maharashtra State. It is a coastal woodland ecosystem of the Western Ghats. It consists of 6979 hectares of forest, grasslands and wetlands and shows evergreen forest with perennial streams. Pockets of open grassland occur throughout the sanctuary.
20. Dongarwadi is a small village on the crest-line of Western Ghats. It shows high altitude mountains with evergreen and semi evergreen forests. In some patches the hill slopes and smaller table lands show grasslands with short shrubby vegetation. There are several torrential streams with riparian vegetation and waterfalls.
21. ARAI (Automotive Research association of India) hills are amidst Pune city with *Gliricidia* plantation. This is a huge plateau with scrub and grassland patches with intermittent ephemeral water-bodies that accumulate the rain water.
22. Nandiwali is a small village on the crest-line of Western Ghats. It is present on the bank of backwater of Mulshi Dam. It shows high altitude mountains with evergreen and semi evergreen forest patches. There is a small sacred grove near the village. The village is surrounded by paddy fields, and grasslands with scrub and short shrubby vegetation.
23. Shilimb is a small village on the crest-line of Western Ghats. It shows high altitude mountains with evergreen and semi evergreen forest patches and is surrounded by paddy fields, and grasslands with scrub and short shrubby

vegetation.

24. Lonavla is a hill station on Mumbai-Pune highway. It is situated on the crest-line of Western Ghats. It is surrounded by high altitude mountains with evergreen and semi-evergreen forests and torrential streams. The town has many small man-made lakes in surrounding areas. In the past few decades it has undergone a lot of urbanization.
25. Kambre is a small village with cattle-sheds, on the crest-line of Western Ghats, surrounded by paddy-fields and scrub.
26. The Karnala Bird Sanctuary is located in Raigad District of Maharashtra State. The sanctuary is quite small with an area of 12.11 square kilometers. The landscape consists of semi-evergreen, moist deciduous and scrub forests with intermittent patches of grasslands.
27. Matheran is a hill station. It is situated on top of a hill of an elevation of around 800 m, separated from the main crest-line of Western Ghats. The hill is surrounded by low lying areas on all sides. There are cliffs separating the hill slopes from the hill top creating an island ecosystem on the top of the hill. The hill top shows thick evergreen and semi-evergreen forest with 2 man-made lakes. The slopes are dotted with moist deciduous and scrub forest patches. The human interference is minimized by restricting the vehicular traffic only up to the entry point.
28. Bhimashankar is a pilgrim place amidst the Wildlife Sanctuary. It is a small human settlement with cattle-sheds. It is surrounded by high altitude mountains, semi-evergreen and evergreen forests with intermingling grassland and scrubs.
29. Aarey Milk Colony is situated in Goregaon East, which is a suburb of Mumbai. It is one of the most modern milk colonies in the world. This area is a grass and scrub environ with a few hillocks, possessing two perennial and one seasonal pond as well as many seasonal streams in the area. The area harbours a number of milk dairies and cattle sheds. The vast pastures of the Mauritian Para grass are maintained and harvested as fodder for cattle. Film City, better known as Mumbai's Film Hub, is dominated by dense mixed moist deciduous forest. Aarey Milk Colony and Film City are located on the southern border of the Sanjay Gandhi National Park (SGNP). The floral and faunal composition of this area is similar to that of the SGNP, but is largely degraded and highly disturbed due to human activities. The habitat is thus highly varied consisting of scrub forest, seasonal freshwater marshes, hillocks, rocky outcrops, grass and scrub interrupted by human settlements.
30. Ghatghar is a small human settlement on the crest-line of the Western Ghats. The village shows paddy fields surrounded by high altitude mountain ranges with semi-evergreen and evergreen forest patches.

RESULTS AND DISCUSSION:

Out of the 30 localities visited, 3 are situated amidst the cities (ct); 3 are situated a little away from crest-line towards eastern side (a); 2 are the plateaus with wind mills (pw); 12 are located on the crest-line of the Western Ghats (cr); 1 is a road way traversing through the western slopes of the Western Ghats (gr); 8 are located in Konkan (k) and 1 on the sea coast (co).

Minimum landscape elements (2) are present in 8 localities while Sarambala irrigation project shows maximum (9) landscape elements. Number of landscape elements in each locality is shown in

Figure 2. Scrub was the component of maximum (20) localities followed by grassland (17), moist deciduous forest (15), paddy fields surrounded by forest and mountains (13), human settlements with cattle sheds (13), semi-evergreen forest (11) and evergreen forest (10). Wind farms were the components of minimum (2) localities while only one locality had the sea coast (Table 1). Percent contribution of all 12 landscape elements toward habitats in Northern Western Ghats is shown in Figure 3.

Out of 334 species belonging to 164 genera and 6 families, found in the entire Western Ghats (Padhye et al. 2012a), we could report 191 species (57%) belonging to 117 genera (71%) and six families of butterflies. Nymphalidae was the most predominant family with 60 species followed by Lycaenidae (59), Hesperiidae (34), Pieridae (22), Papillionidae (15) and Riodinidae (1) (Table 2). However, Lycaenidae showed more generic diversity with 40 genera as compared to the 34 genera in the Nymphalidae. Comparative butterfly generic representation for entire Western Ghats and northern Western Ghats is shown in Figure 4, while comparative butterfly family predominance for entire Western Ghats and northern Western Ghats, in terms of species diversity, is shown in Figure 5.

Maximum (143) species were reported from Karnala followed by Amboli (101), Phansad (91), Aarey Milk Colony and Film City (90), ARAI hills (71) and Vasota (67), while minimum (26) species were reported from Pophali and Dongarwadi. A detailed account of butterfly species diversity in the Western Ghats is given by Kunte (2008) while distribution and composition of butterfly species along the latitudinal and habitat gradients of the Western Ghats of India are discussed by Padhye et al. (2012a).

Despite the fortnightly monitoring for 2 years, the species count could not increase beyond 33 at Bhambarwadi - Gudhe Pachgani locality. As compared to this, 30 species were reported in just one visit for two days at Chalkewadi which is a similar locality. Both of these are plateaus with wind-farms. However, on a similar plateau without wind-farm, in the nearby areas at Zolambi in Chandoli Wildlife Sanctuary, a situation is different. We could report 42 species in just 4 hrs effort. This kind of difference in the butterfly diversity of the plateaus with and without wind-farms can be a result of the large scale destruction of the vegetation during the erection of wind-farms. Similar species displacement effects on avifauna of Bhambarwadi - Gudhe Pachgani plateau are discussed in detail by Pande et al. (2013).

This study also reveals a substantial range extension of *Papilio paris* (Paris Peacock) up to Phansad Wildlife Sanctuary (18.420° N latitude & 72.933° E longitude). According to Padhye et al. (2012a), this species was known to occur up to 16°N latitude. Thus intensive surveys of protected areas from Northern Western Ghats may extend the range of a few more butterfly species. Recently, Jadhav & Sharma (2013) have reported the occurrence of *Idea malabarica* (Malabar Tree Nymph) from Bhimashankar (19°-20° N latitude zone), which was previously known upto 17°-18° N latitude zone. According to Ghosh et al. (1990), this species was reported from Poladpur, Dist. Raigad, Maharashtra (17.985278° N latitude). These records indicate the need of intensive surveys of protected areas of Northern Western Ghats to reveal the correct status of the distribution of various butterfly species.

The compilation still lacks the studies in Nasik District of Maharashtra State and the Dang District of Gujarat State. The only published reports of butterfly diversity of Nasik area is by Nayak et al. 2004 and Kharat et al. 2012. Therefore the efforts should be made to prepare the inventories for monitoring the butterflies of this part of the Northern Western Ghats also.

Though scanty, this data may prove useful for the policy makers, for conserving the diversity of Northern Western Ghats; especially on the background of large scale habitat destruction taking place in the Northern Western Ghats (Jha et al. 2000).

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Figure 1:
Butterfly diversity inventory localities in Northern Western Ghats. **Habitat Types:- gr:** a road way traversing through the western slopes of the WG; **cr:** on the crest-line of the Western Ghats; **a:** a little away from crest-line towards eastern side; **pw:** plateaus with wind mills; **k:** Konkan; **ct:** city and **co:** sea coast.

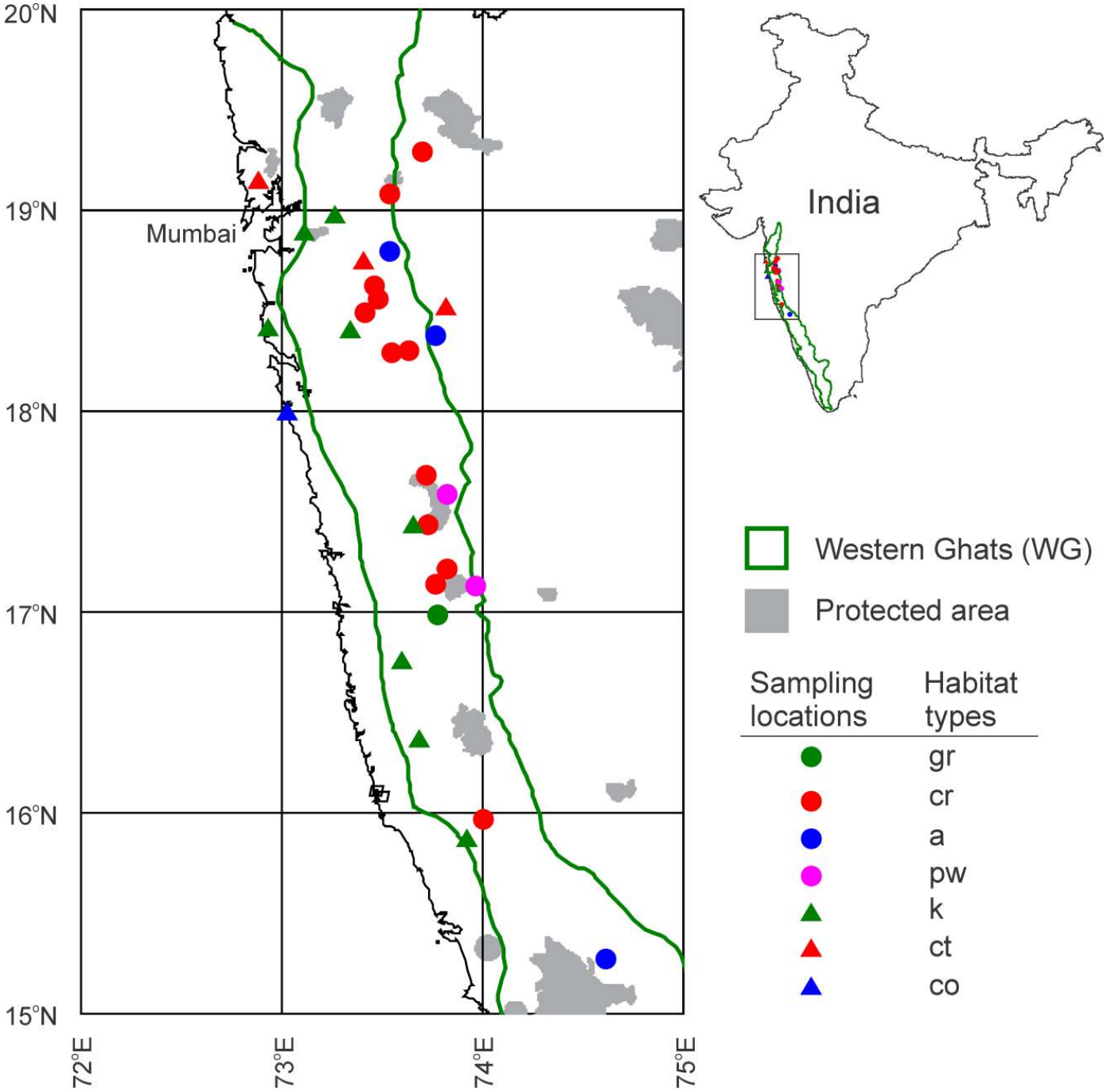


Figure 2:
Number of landscape elements (LSE's) present in each of the 30 localities of Northern Western Ghats

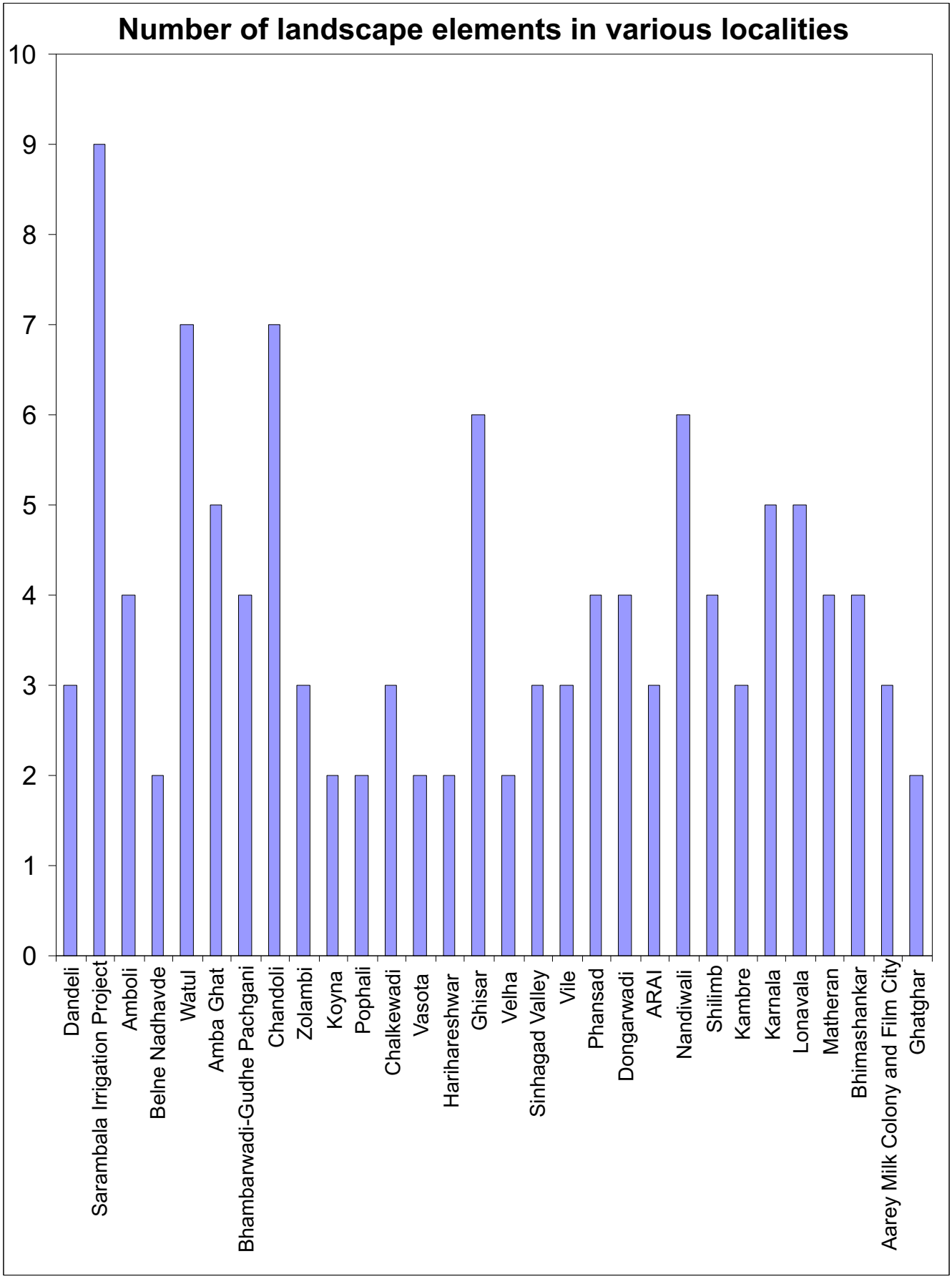


Figure 3:
Percent contribution of 12 different landscape elements to the habitats of 30 localities in Northern Western Ghats.

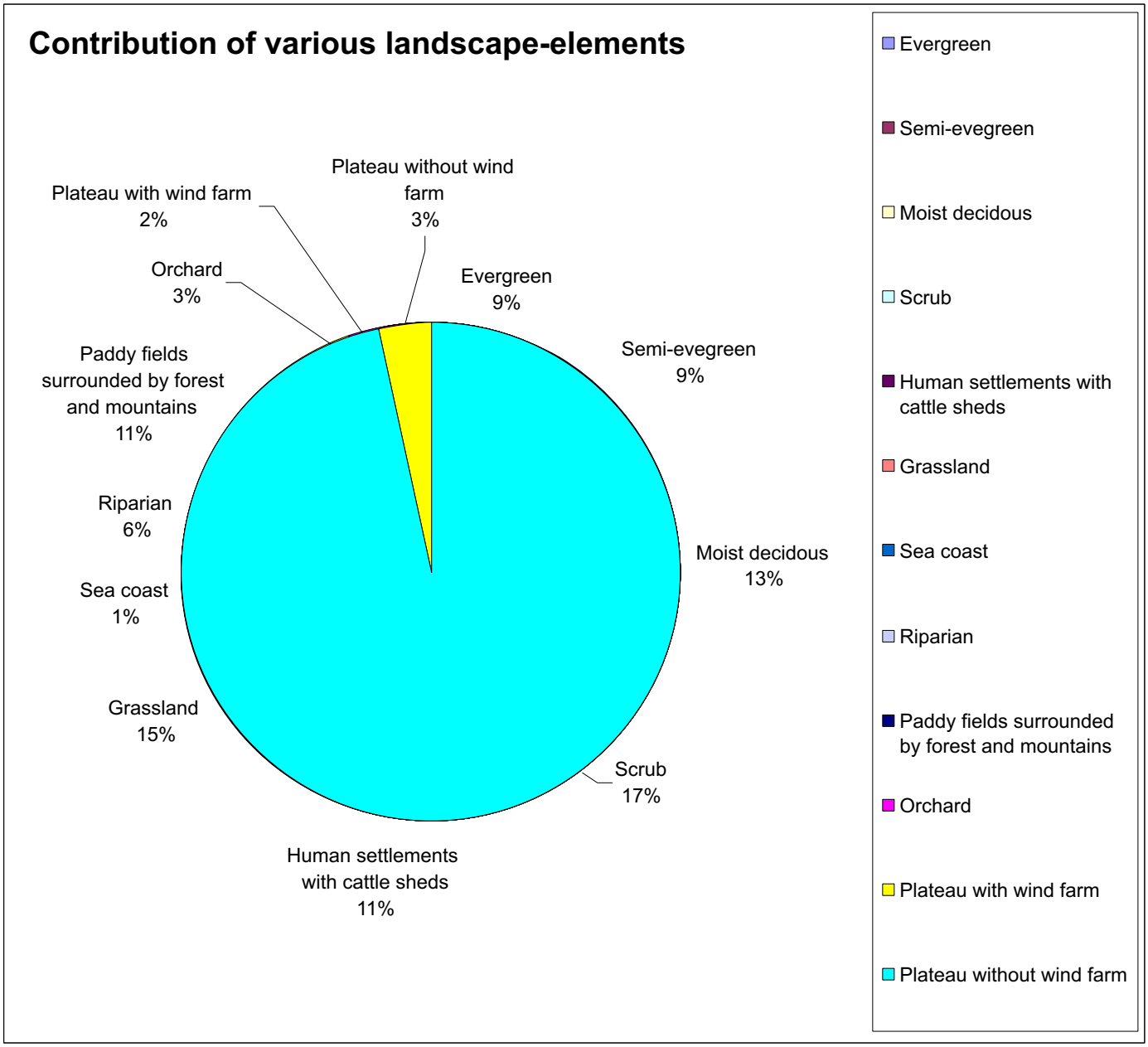


Figure 4:
Comparative account of butterfly family predominance in terms of the number of genera encountered in 30 localities from Northern Western Ghats.

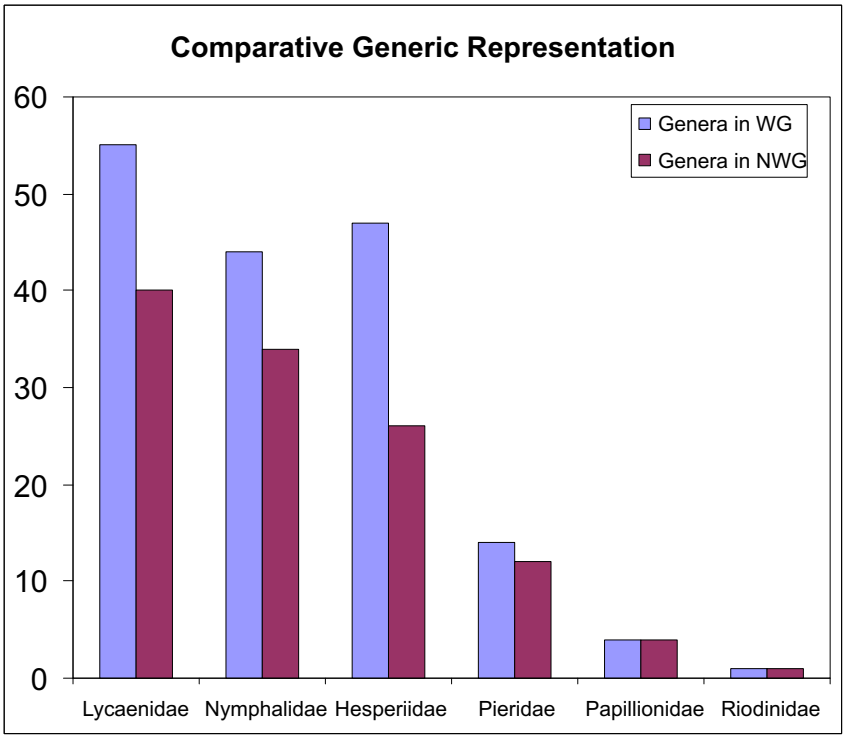
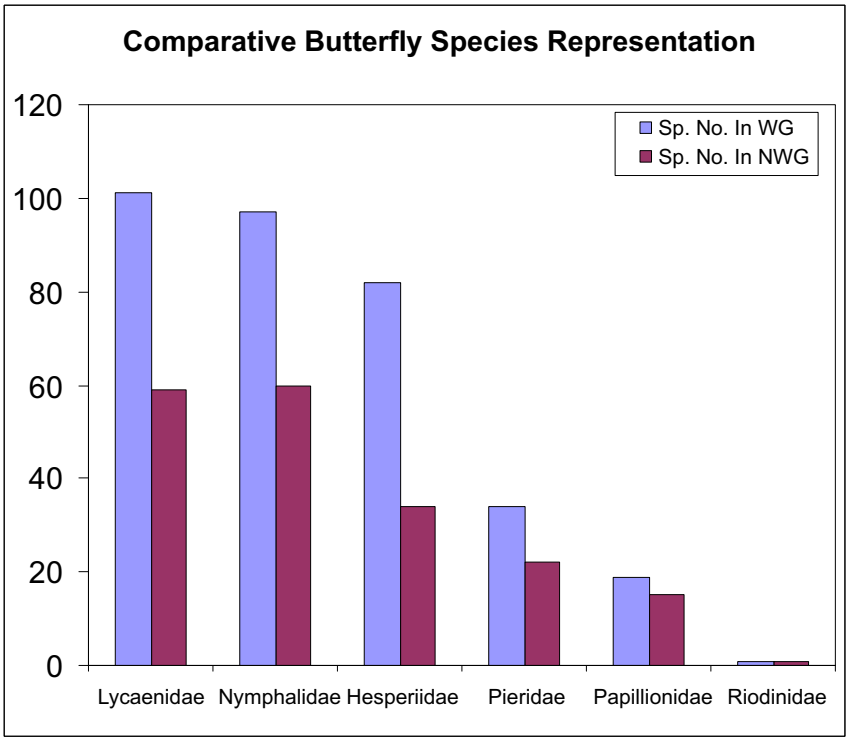


Figure 5:
Comparative account of butterfly family predominance in terms of the number of species encountered in 30 localities from Northern Western Ghats.



APPENDIX:
Locality wise contribution of authors to the inventories.

Locality Code	Locality Name and Zone	Checklist prepared by
1	Dandeli	Sheetal Shelke and Anushree Jadhav
2	Sarambala Irrigation Project	Nikhil Modak, Sandesh Jagdale
3	Amboli	Hemant Ogale, Sheetal Shelke, Ketaki Patil
4	Belne Nadhavde	Anand Padhye, Sheetal Shelke and Anushree Jadhav
5	Watul	Anand Padhye
6	Amba Ghat	Anand Padhye
7	Bhambarwadi-Gudhe Pachgani	Anand Padhye, Satish Pande and Sheetal Shelke
8	Chandoli	Ankur Patwardhan, Prachi Mhaske, Pankaj Koparde, Rakesh Deulkar, Apoorva Sahasrabuddhe, Preeti Bangal, Abhishek Narvekar
9	Zolambi	Anand Padhye, Satish Pande, Rajgopal Patil, Sanjay Khatavkar, Rohan Bhate, Hemant Kenjale
10	Koyna	Anand Padhye
11	Pophali	Sheetal Shelke
12	Chalkewadi	Neelesh Dahanukar and Mandar Paingankar
13	Vasota	Anand Padhye, Sheetal Shelke, Anushree Jadhav, Rutuja Dhamale and Sushil Chikane
14	Harihareshwar	Sheetal Shelke and Anushree Jadhav
15	Ghisar	Ankur Patwardhan, Rishikesh Patil
16	Velha	Sheetal Shelke and Anushree Jadhav
17	Sinhagad Valley	Prachi Mhaske, Neha Mujumdar, Kruti Chhaya, Ankur Patwardhan
18	Vile	Prachi Mhaske, Neha Mujumdar, Kruti Chhaya
19	Phansad	Harishchandra Naik and Sheetal Shelke
20	Dongarwadi	Anand Padhye and Anushree Jadhav
21	ARAI	Prachi Mhaske, Neha Mujumdar, Kruti Chhaya, Ankur Patwardhan,
22	Nandiwali	Anand Padhye, Anushree Jadhav, Sheetal Shelke, Swapnil Gaikwad
23	Shilimb	Prachi Mhaske, Neha Mujumdar, Kruti Chhaya, Ankur Patwardhan

Table 1:
Details of localities with landscape elements (LSE), P indicates presence of Landscape element in that locality. LSE Code:- E: Evergreen, SE: Semi-evergreen, MD: Moist deciduous, S: Scrub, HS^CS: Human settlements with cattle sheds, G: Grassland, SC: Sea coast, R: Riparian, PF^FM: Paddy fields surrounded by forest and mountains, O: Orchard, P^WF: Plateau with wind farm, P: Plateau without wind farm.

Sr. No.	Locality	Latitude °N	Longitude °E	Altitude (m) ASL	Period of Survey	E	SE	MD	S	HS CS	G	SC	R	PF FM	O	P WF	P
1	Dandeli (a)	15.261	74.616	500	2/3/2010 to 4/3/2010	P	P	P									
2	Sarambala Irrigation Project (k)	15.873	73.918	30	18/10/2010 to 21/10/2010	P	P	P	P	P	P		P	P	P		
3	Amboli (cr)	15.965	74.004	696	Jan 2009 to Oct. 2011	P		P	P		P						
4	Belne Nadhavde (k)	16.372	73.681	100	19/07/2009									P	P		
5	Watul (k)	16.764	73.597	107	6/11/2012 to 23/11/2012		P	P	P	P	P			P	P		
6	Amba Ghat (gr)	16.978	73.782	114 to 631	5/11/2012 to 25/11/12		P	P	P		P		P				
7	Bhambarwadi-Gudhe Pachgani (pw)	17.123	73.972	900	July 2008 to June 2010.				P	P	P					P	
8	Chandoli (cr)	17.132	73.765	890	May 2012	P	P	P	P		P		P				P
9	Zolambi (cr)	17.209	73.828	949	20/11/2011				P		P						P
10	Koyna (cr)	17.428	73.728	660	15/5/2011	P							P				
11	Pophali (k)	17.435	73.658	139	27/01/2010 to 31/01/2010					P				P			
12	Chalkewadi (pw)	17.581	73.824	1155	Oct-08				P		P					P	
13	Vasota (cr)	17.672	73.722	1101	21/04/2008 and 22/04/2008		P	P									
14	Harihareshwar (co)	17.998	73.021	25	2/10/2008 and 3/10/2008							P		P			
15	Ghisar (cr)	18.285	73.547	856	Jan.to Sept. 2010 & May to Sept. 2012	P		P	P	P	P			P			
16	Velha (cr)	18.296	73.637	703	16/10/2009 and 17/10/2009					P				P			
17	Sinhagad Valley (a)	18.376	73.770	720	Feb. 2010 to July 2010			P		P				P			
18	Vile (k)	18.414	73.344	128	20/12/2010 and 22/03/2011				P	P				P			
19	Phansad (k)	18.420	72.933	188	22/03/2010 and 23/03/2010	P	P				P		P				
20	Dongarwadi (cr)	18.482	73.414	585	27/10/2012	P	P		P		P						
21	ARAI (ct)	18.524	73.818	660	Feb. 2010 to January 2011				P		P						P
22	Nandiwali (cr)	18.551	73.479	673	22/09/2010		P	P	P	P	P			P			
23	Shilimb (cr)	18.619	73.464	641	Feb. 2010 to July 2010			P	P	P				P			
24	Lonavala (ct)	18.748	73.403	627	June 2011 to Jan 2012			P	P	P	P		P				
25	Kambre (a)	18.793	73.538	610	Jan. 2010 to April 2011				P	P				P			
26	Karnala (k)	18.891	73.112	50 to 375	Jan. 2010 to Nov. 2012		P	P	P		P		P				
27	Matheran (k)	18.983	73.267	745	Aug. 2012 to Nov. 2012	P	P			P							P
28	Bhimashankar (cr)	19.077	73.538	970	4/09/2009 and 5/09/2009	P		P	P		P						
29	Aarey Milk Colony and Film City (ct)	19.149	72.882	81	June 2007 to Dec. 2009			P	P		P						
30	Ghatghar (cr)	19.283	73.700	747	15/9/2008 and 28/7/2009				P					P			

Letters in parenthesis after locality name indicate habitat types as per the code given in Figure 1.

Table 2:
Distribution of butterfly species in 30 localities of Northern Western Ghats. (Taxonomic status: as per Kunte (2008); *** Western Ghats endemic species; Species names written in bold are reported from only one locality; Locality Code: as per Table 1).

	Scientific Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	PAPILIONIDAE																															
1	*Graphium agamemnon*	Tailed Jay		P	P	P	P	P	P		P		P					P			P		P	P	P	P	P	P	P	P	P	
2	*Graphium doson*	Common Jay													P								P				P				P	
3	*Graphium nomius*	Spot Swordtail																	P		P						P				P	
4	*Graphium sarpedon*	Common Bluebottle			P					P		P		P	P						P	P		P			P		P	P	P	
5	*Pachliopta aristolochiae*	Common Rose	P	P	P	P			P		P			P	P	P		P		P	P	P	P		P	P	P		P	P	P	P
6	***Pachliopta pandiyana*** ***	**Malabar Rose**		P																												
7	*Pachliopta hector*	Crimson Rose	P	P	P										P			P			P			P			P				P	
8	*Papilio clytia*	Common Mime	P		P		P	P													P						P				P	
9	*Papilio demoleus*	Lime Butterfly	P	P	P	P	P	P	P	P	P	P	P		P	P	P	P		P	P		P	P		P	P	P	P	P	P	P
10	*Papilio dravidarum* ***	Malabar Raven	P		P																											
11	*Papilio helenus*	Red Helen			P		P	P		P	P	P			P						P								P	P		
12	***Papilio paris***	**Paris Peacock**																			P											
13	*Papilio polymnestor*	Blue Mormon		P	P		P	P	P	P	P	P	P	P	P	P	P	P			P	P		P	P		P	P	P	P	P	P
14	*Papilio polytes*	Common Mormon	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P			P	P	P	P		P	P	P	P	P	P
15	*Troides minos* ***	Southern Birdwing	P		P																P											
	PIERIDAE																															
16	*Appias albina*	Common Albatross			P										P								P				P				P	
17	*Appias indra*	Plain Puffin			P																P				P							
18	*Appias libythea*	Striped Albatross						P			P											P	P				P				P	
19	*Appias lyncida*	Chocolate Albatross																			P						P					
20	*Belenois aurota*	Pioneer Or Caper White		P	P				P		P			P		P						P	P	P		P		P	P			P	P
21	*Catopsilia pomona*	Common Emigrant	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		P	P	P	P	P	P	P	P	P	P
22	*Catopsilia pyranthe*	Mottled Emigrant		P	P	P		P			P						P	P					P	P		P	P	P	P	P	P	
23	*Cepora nadina*	Lesser Gull			P																						P					
24	*Cepora nerissa*	Common Gull		P	P		P		P		P	P			P			P	P	P	P		P		P	P	P	P		P	P	
25	*Colotis danae*	Crimson Tip																			P		P									
26	*Colotis etrida*	Small Orange Tip			P										P	P					P		P									
27	*Delias eucharis*	Common Jezebel	P	P	P	P	P		P		P		P	P	P	P	P	P	P	P	P		P	P	P		P	P			P	P
28	*Eurema blanda*	Three-Spot Grass Yellow														P					P					P	P					
29	*Eurema brigitta*	Small Grass Yellow				P	P	P	P					P		P	P	P	P				P			P	P	P	P		P	
30	*Eurema hecabe*	Common Grass Yellow	P	P	P	P	P	P	P		P	P	P		P	P	P	P	P	P	P		P	P	P	P	P	P	P	P	P	P

	Scientific Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	*Eurema laeta*	Spotless Grass Yellow						P		P					P		P		P	P			P		P	P	P			P	P	
32	*Hebomoia glaucippe*	Great Orange Tip			P			P	P						P	P					P			P			P				P	
33	*Ixias marianne*	White Orange Tip		P	P									P	P						P		P				P	P			P	
34	*Ixias pyrene*	Yellow Orange Tip		P										P							P					P	P				P	
35	*Leptosia nina*	Psyche			P		P	P							P					P	P		P		P		P				P	
36	*Pareronia valeria*	Common Wanderer			P	P	P	P	P		P	P			P				P	P	P		P	P	P		P	P			P	P
37	*Pieris canidia*	Indian Cabbage White					P								P	P					P										P	
	NYMPHALIDAE																															
38	*Acraea violae*	Tawny Coster			P									P	P						P		P				P				P	
39	*Ariadne ariadne*	Angled Castor			P												P				P		P				P			P	P	
40	*Ariadne merione*	Common Castor	P	P	P	P	P	P			P	P	P		P	P	P	P	P			P	P	P	P		P	P	P	P	P	P
41	***Athyma nefte***	**Color Sergeant**			P																											
42	*Athyma perius*	Common Sergeant			P										P																	
43	***Byblia ilithyia***	**Joker**																													P	
44	*Cethosia nietneri*	Tamil Lacewing			P																P											
45	*Charaxes bernardus*	Tawny Rajah													P						P						P				P	
46	*Charaxes solon*	Black Rajah													P												P				P	
47	*Cirrochroa thais*	Tamil Yeoman	P		P					P																						
48	*Cupha erymanthis*	Rustic			P	P	P	P		P	P										P						P					
49	*Cyrestis thyodamas*	Common Map			P						P			P	P						P				P		P			P		
50	*Danaus chrysippus*	Plain Tiger	P	P	P				P	P	P		P	P	P	P	P	P		P	P	P	P	P	P	P	P	P		P	P	P
51	*Danaus genutia*	Striped Or Common Tiger	P	P	P	P	P	P	P	P	P	P	P		P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
52	***Dophla evelina***	**Redspot Duke**			P																											
53	*Elymnias hypermnestra*	Common Palmfly				P				P					P						P						P				P	
54	*Euploea core*	Common Indian Crow	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		P	P	P
55	*Euploea klugii*	Brown King Crow						P																			P					
56	*Euthalia aconthea*	Common Baron		P	P		P		P			P			P	P				P	P			P	P		P				P	P
57	*Euthalia lubentina*	Gaudy Baron			P										P						P						P				P	
58	*Euthalia nais*	Baronet Or Red Baron		P											P	P				P	P						P			P	P	
59	*Hypolimnas bolina*	Great Eggfly	P	P	P		P	P		P	P	P			P	P	P			P	P		P		P	P	P	P	P		P	
60	*Hypolimnas misippus*	Danaid Eggfly	P	P	P	P			P		P			P	P	P	P	P			P		P	P	P	P	P	P	P	P	P	P
61	*Junonia almana*	Peacock Pansy	P	P	P				P		P				P	P	P			P	P	P				P			P	P	P	
62	*Junonia atlites*	Grey Pansy		P	P		P	P	P		P	P	P		P		P	P		P	P	P		P	P		P	P	P	P	P	P

	Scientific Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
63	*Junonia hierta*	Yellow Pansy			P		P	P	P		P	P		P	P		P		P	P	P		P		P	P	P			P	P	
64	*Junonia lemonias*	Lemon Pansy	P		P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
65	*Junonia orithya*	Blue Pansy			P		P	P	P	P	P	P		P	P		P	P		P	P		P	P	P		P			P	P	
66	*Junonia(Precis) iphita*	Chocolate Pansy	P	P	P	P	P	P	P	P	P	P	P		P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
67	*Kallima horsfieldi* ***	South Indian Blue Oakleaf			P					P				P	P						P						P			P	P	
68	*Lethe europa*	Bamboo Treebrown	P		P																						P					
69	*Lethe rohria*	Common Treebrown			P					P							P				P		P			P				P		
70	***Libythea lepita***	**Common Beak**													P																	
71	*Melanitis leda*	Common Evening Brown	P	P	P	P			P	P		P	P	P	P	P	P	P		P	P		P				P		P		P	P
72	***Melanitis phedima***	**Dark Evening Brown**								P																						
73	*Moduza procris*	Commander			P										P						P						P				P	
74	***Mycalesis adolphei*** ***	**Redeye Bushbrown**																													P	
75	*Mycalesis mineus*	Dark Branded Bushbrown														P					P						P					
76	***Mycalesis oculus*** ***	**Red-Disc Bushbrown**													P																	
77	*Mycalesis perseus*	Common Bushbrown		P	P		P								P	P				P	P		P				P			P	P	
78	***Mycalesis visala***	**Long Brand Bush brown**																									P					
79	*Neptis columella*	Shortbanded Sailer													P												P					
80	*Neptis hylas*	Common Sailer	P	P	P	P	P		P	P	P	P	P	P	P	P	P	P	P	P	P		P	P	P		P	P	P	P	P	P
81	*Neptis jumbah*	Chestnut-Streaked Sailer																			P						P					
82	*Orsotriaena medus*	Nigger			P																										P	
83	*Pantoporia hordonia*	Common Lascar			P							P									P											
84	*Parantica aglea*	Glassy Tiger	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		P	P	P	P		P	P	P	P	P	P	P
85	*Phalanta phalantha*	Common Leopard			P	P	P	P	P	P	P	P	P	P	P		P	P	P	P	P	P	P	P	P	P	P	P		P	P	P
86	*Polyura agraria*	Anomalous Nawab																							P		P					
87	*Polyura athamas*	Common Nawab												P	P						P	P			P		P				P	
88	*Rohana parisatis*	Black Prince									P										P											
89	*Tanaecia lepidea*	Grey Count			P		P			P										P												
90	*Tirumala limniace*	Blue Tiger		P	P		P	P		P	P	P	P	P	P	P		P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
91	*Tirumala septentrionis*	Dark Blue Tiger		P						P							P	P			P					P	P			P		
92	*Vanessa cardui*	Painted Lady			P				P						P	P	P	P	P		P		P	P	P	P	P	P		P	P	
93	***Vanessa indica***	**Indian Red Admiral**													P																	
94	*Vindula erota*	Cruiser									P				P																	
95	*Ypthima asterope*	Common Threering				P					P	P			P				P				P		P					P	P	

	Scientific Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
96	*Ypthima baldus*	Common Fivering			P			P		P	P		P		P		P	P			P		P		P		P	P		P	P	P
97	*Ypthima huebneri*	Common Fourring			P		P			P				P	P	P	P					P		P			P	P		P	P	
	LYCAENIDAE																															
98	*Acytolepis puspa*	Common Hedge Blue	P		P										P		P		P								P				P	
99	*Amblypodia anita*	Leaf Blue			P																P						P			P		
100	***Anthene emolus***	**Ciliate Blue**																												P		
101	*Anthene lycaenina*	Pointed Ciliate Blue			P																						P		P			
102	***Arhopala amantes***	**Large Oak blue**																									P					
103	***Arhopala pseudocentaurus***	**Centaur Oak blue**																									P					
104	*Azanus jesous*	African Babul Blue																		P			P									
105	***Azanus ubaldus***	**Bright Babul Blue**																					P									
106	***Azanus uranus***	**Dull Babul Blue**																					P									
107	*Caleta caleta*	Angled Pierrot			P					P	P	P			P				P		P		P	P	P		P	P			P	P
108	*Castalius rosimon*	Common Pierrot			P		P		P	P			P	P	P			P	P	P	P	P	P	P	P	P	P	P			P	
109	*Catapaecilma elegans*	Common Tinsel								P											P						P					
110	*Catochrysops strabo*	Forget-Me-Not			P					P					P				P	P			P		P		P			P		
111	***Cheritra freja***	**Common Imperial**			P																											
112	*Chilades laius*	Lime Blue			P																P						P				P	
113	*Chilades pandava*	Plains Cupid			P					P	P												P				P		P			
114	*Chilades parrhasius*	Small Cupid		P																			P									
115	*Chilades trochylus*	Western Grass Jewel											P				P	P		P			P		P		P				P	
116	***Chliria othona***	**Orchid Tit**								P																						
117	***Curetis acuta***	**Angled Sunbeam**																									P					
118	*Curetis thetis*	Indian Sunbeam			P															P	P					P	P			P	P	
119	***Deudorix epijarbas***	**Cornelian**																									P					
120	***Deudorix isocrates***	**Guava blue**																									P					
121	***Deudorix perse***	**Large Guava Blue**																			P											
122	***Discolampa ethion***	**Banded Blue Pierrot**												P																		
123	*Euchrysops cnejus*	Gram Blue	P		P					P					P		P		P	P			P		P		P				P	
124	*Everes lacturnus*	Indian Cupid	P	P	P	P							P			P					P	P					P					P
125	*Iraota timoleon*	Silverstreak Blue																							P		P					
126	*Jamides alecto*	Metallic Cerulean																			P							P				
127	*Jamides bochus*	Dark Cerulean																P						P		P	P		P			

	Scientific Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
128	*Jamides celeno*	Common Cerulean			P	P				P	P		P				P	P	P			P	P	P	P		P	P	P		P	P
129	*Lampides boeticus*	Pea Blue			P						P								P	P	P		P		P		P			P		
130	*Leptotes plinius*	Zebra Blue			P														P				P				P				P	
131	*Loxura atymnus*	Yamfly			P																P						P				P	
132	*Megisba malaya*	Malayan			P																						P			P		
133	*Neopithecops zalmora*	Quaker			P									P																		
134	*Petrelea dana*	Dingy Lineblue																				P					P					
135	*Prosotas dubiosa*	Tailless Line Blue																	P				P				P					
136	*Prosotas nora*	Common Line Blue			P														P			P	P		P		P		P			
137	***Prosotas noreia***	**White tipped Lineblue**																									P					
138	*Pseudozizeeria maha*	Pale Grass Blue		P							P						P	P			P	P	P	P			P	P			P	
139	***Rachana jalindra***	**Banded Royal**			P																											
140	***Rapala iarbus***	**Indian Red Flash**																									P					
141	*Rapala manea*	Slate Flash			P															P			P				P					
142	*Rapala varuna*	Indigo Flash			P																						P					
143	*Rathinda amor*	Monkey Puzzle			P															P	P				P		P					
144	*Spalgis epius*	Apefly																									P			P	P	
145	*Spindasis ictis*	Shot Silverline																			P						P					
146	*Spindasis lohita*	Longbanded Silverline								P										P							P					
147	*Spindasis vulcanus*	Common Silverline								P							P		P		P		P				P				P	
148	***Surendra quercetorum***	**Common Acacia blue**																									P					
149	*Tajuria cippus*	Peacock Royal																					P				P					
150	*Talicada nyseus*	Red Pierrot			P										P		P	P												P	P	
151	*Tarucus anada*	Dark Pierrot																					P				P					
152	*Tarucus nara*	Rounded Pierrot				P															P		P				P				P	
153	***Thaduka multicaudata***	**Manytailed Oakblue**																			P											
154	*Zizeeria karsandra*	Dark Grass Blue			P								P		P								P		P		P					
155	*Zizina otis*	Lesser Grass Blue			P		P																P				P			P		
156	*Zizula hylax*	Tiny Grass Blue		P	P													P				P	P		P		P					
	HESPERIIDAE																															
157	***Ampittia dioscorides***	**Bush Hopper**																							P							
158	***Arnetta vindhiana***	**Vindhyan Bob**																									P				P	
159	***Badamia exclamationis***	**Brown Awl**																	P		P				P		P					

	Scientific Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
160	***Bibasis jaina***	**Orange Awlet**																									P					
161	*Borbo cinnara*	Rice Swift			P												P		P				P				P			P	P	P
162	*Caprona ransonnetti*	Golden Angle																		P							P				P	
163	*Celaenorrhinus ambareesa*	Malabar Spotted Flat			P																						P				P	
164	*Celaenorrhinus leucocera*	Common Spotted Flat			P																P						P				P	
165	***Coladenia indrani***	**Tricolored Pied Flat**																									P					
166	***Halpe porus***	**Moore's Ace**																									P					
167	***Hasora badra***	**Common Awl**																									P					
168	*Hasora chromus*	Common Banded Awl	P		P				P												P		P		P		P					
169	***Hasora taminatus***	**White Banded Awl**			P																											
170	***Hasora vitta***	**Plain Banded Awl**																									P					
171	*Iambrix salsala*	Chestnut Bob			P												P										P	P		P		
172	*Matapa aria*	Common Redeye																			P						P				P	
173	***Odontoptilum angulata***	**Chestnut/Banded Angle**																			P											
174	*Parnara bada*	Common Straight Swift																									P				P	
175	*Pelopidas assamensis*	Great Swift																					P				P					
176	***Pelopidas conjuncta***	**Conjoined Swift**																									P					
177	***Pelopidas mathias***	**Small Branded Swift**																									P					
178	***Pseudoborboro bevani***	**Bevan's Swift**																					P									
179	***Psolos fuligo***	**Coon**		P																												
180	*Psuedocoladenia dan*	Fulvous Pied Flat																									P				P	
181	*Sarangesa dasahara*	Common Small Flat																									P	P			P	
182	*Sarangesa purendra*	Spotted Small Flat																					P				P				P	
183	*Spialia galba*	Indian Skipper																									P			P		P
184	*Suastus gremius*	Indian Palm Bob																									P				P	
185	*Tagiades litigiosa*	Water Snow Flat			P					P											P			P								
186	***Tapena thwaitesi***	**Angled Flat**																									P					
187	*Taractrocera ceramas*	Tamil Grass Dart															P										P	P				
188	*Telicota ancilla*	Dark Palm Dart			P				P												P						P					
189	***Telicota colon***	**Pale Palm Dart**																									P					
190	*Udaspes folus*	Grass Demon			P																P						P	P			P	
	RIODINIDAE																															
191	*Abisara echerius*	Plum Judy			P	P			P	P	P	P	P	P	P		P	P		P	P			P	P	P	P	P		P	P	P

BIO-DIVERSITY OF THE PARVATI-PACHGAON HILLS:
A 'HABITAT ISLAND' IN PUNE METROPOLIS

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Introduction:
The 'Parvati-Pachgaon Van-Vihar' comprises of the Taljai-Waghjai-Parvati Hills of Pune (18^0 47' N and 73^0 84' E), Maharashtra, India. (Map). These hills are an off-shoot of the Western Ghats, a global Hot Spot of endemism and rich bio-diversity. As per the data provided by the forest department, Pune, the area of 247.68 Ha bearing survey number 1-239.68140-5.59, 95-2-41 comprising the boundaries of villages of Vadgaon budruk, Hingane khurd, Ambegaon, Dhankawadi and Parvati, at an elevation of about 610 m is declared as a Reserved Forest to conserve the existing biodiversity. The hills are located in the heart of Pune, the ninth largest Indian metropolis. The hills are calssified as Zone 3 sesmically active zone. The hills enjoy tropical wet and dry climate with three seasons of summer, monsoon and winter. The temperature ranges between minimm 5 degrees C in winter to 43 degrees C in summer with average annual temperature of 22 to 28 degrees C and annual rainfall of 722 mm. The hills form an ecotone with the confluence of three bio-geographic zones of India, the Western Ghats meeting the Deccan Plateau and the Arid Region on the east.

This fragile zone is a 'Habitat Island' surrounded by ever increasing urbanization from all sides. Part of its south-west continuity with the Western Ghats is already encroached by urbanization. In contrast, several concerned citizens with the cooperation of the forest department have planted and nurtured trees here to create conducive habitats for the existing bio-diversity. Documentation of the existing base-line bio-diversity of this region will assist conservation prioritization, both for planners and protectors. So also, such data creates public awareness and sensitizes citizens, leading to the protection of the precious local bio-diversity. Identification of endemic and threatened species and recognition of immediate and possible future risks shall effectively protect this bio-diversity. The present communication is the first report of holistic documentation of the bio-diversity of the 'Parvati-Pachgaon Hills –A Reserve Forest.

Methods:
The various checklists of fauna included in this communication are compiled by respective authors over past 25 to 30 years of field observations while two checklists (Lepidoptera and Odonata are compiled over

the past two years (2010-2012). All the observed species whose identification could be confirmed are included. Some data is based on the records of the Zoological Survey of India, W. R. C. Akurdi, Pune 411044, and this is indicated in the respective appendix. We have taken note of the previously published work on various taxa related to Pune city, particularly Gole (19--)., Padhye (19--) and Sondi et al (20--).

The checklist of flora is an updated comprehensive list primarily based on work done at Agharkar Research Institute, Pune by Kulkarni et al. (1989). Kulkarni et al (1989) report 414 species of plants belonging to 94 families. Some species are added to the list based on author's (MD) personal observations for last six years while a few species cannot be traced now. The additions are mainly due to plantation of some species. Some species not observed presently, are not recorded in the present list. In their documentation Kulkarni *et al.* have considered many species which are cultivated in and around Pachagaon Parvati, these species are retained here. Datar & Ghate (2006) is one such effort to document changes in diversity of Katraj Ghats, which has a close similarity and is in continuation with Taljai – Waghjai – Parvati Hills.

Table – 1:
Total bio-diversity of Pachgaon-Parvati Reserved Forest. The taxa are listed in Appendix 1 to 12.

TAXA	No. of Families	No. of Species
FAUNA		
Mammalia	15	24
Aves	44	135
Reptilia	07	16
Amphibia	03	07
Annelida	02	02
Crustacea	03	07
Mollusca	12	25
Arachnida		
Spiders	22	84
Scorpions	02	07
Sun-Spiders	01	02
Insecta		
Odonata	02	07
Lepidoptera	05	66
Hymenoptera	02	15
FLORA - Angiosperms		
Dicots	83	325
Monocots	12	84
Grand Total	**215**	**806**

APPENDIX 1

MAMMALS OF THE PARVATI-PACHGAON HILLS, PUNE
Dr. Anil Mahabal Ph.D.
CLASS: MAMMALIA
ORDER: PRIMATES

FAMILY: CERCOPITHECIDAE
Plains Grey Langur Langur *Semnopithecus entallus*

ORDER: RODENTIA

FAMILY: SCIURIDAE
Northern Palm Squirrel *Funambulus pennantii*
FAMILY: MURIDAE
Lesser Bandicoot Rat *Bandocota bengalensis*
Greater Bandicoot Rat *Bandicota indica*
House Rat *Rattus rattus*
House Mouse *Mus musculus*
Sinhagad Rat *Milardia kondana* **ENDEMIC** –Western Ghats
Little Indian Field Mouse *Mus* booduga

ORDER: LAGOMORPHA

FAMILY: OCHOTONIDAE
Black-naped Hare *Lepus nigricolis*

ORDER: SORICOMORPHA

FAMILY: SORICIDAE
House Shrew *Suncus murinus*

ORDER: CHIRPOTERA

FAMILY: PTEROPODIDAE
Greater Short-nosed Fruit Bat *Cyanopterus sphinx*
Flying Fox *Pteropus giganteus*
Fulvous Fruit Bat *Rousettus leschenaultii*

ORDER: CHIRPOTERA

FAMILY: MOLOSSIDAE
Evening Bat *Pipistrelle sp.*

ORDER: PHOLIDOTA

FAMILY: MANIDAE
Indian Pangolin *Manis crassicaudata* **ENDEMIC –INDIAN SUBCONTINENT**. Vagrant.

ORDER: CARNIVORA

FAMILY: FELIDAE
Jungle Cat *Felis chaus*
Panther *Panthera pardus* Vagrant
FAMILY: VIVERRIDAE
Common Palm Civet *Paradoxurus hermaphroditus*
Small Indian Civet *Viverricula indica*
FAMILY: HERPESTIDAE
Indian Gray Mongoose *Herpactes edwardsii*
FAMILY: HYAENIDAE
Striped Hyena *Hyena hyena*
FAMILY: CANIDAE
Indian Fox *Vulpes bengalensis*

ORDER: ARTIODACTYLA

FAMILY: CERVIDAE
Barking Deer *Muntiacus muntjak*
FAMILY: BOVIDAE
Indian Gaur *Bos gaurus* Vagrant

APPENDIX 2

BIRDS OF THE PARVATI-PACHGAON HILLS, PUNE

Dr. Satish Pande MB, MD, DNB, Ph.D, F.M.A.Sci. & Pramod Deshpande

FAMILY	COMMON ENGLISH NAME	SCIENTIFIC NAME	COMMENTS
Podicipedidae	Little Grebe	*Tachybaptus ruficollis*	
Phalacrocoracidae	Little Cormorant	*Phalacrocorax niger*	
Ardeidae	Grey Heron	*Ardea cinerea*	
	Indian Pond Heron	*Ardeola grayii*	
	Cattle Egret	*Bubulcus ibis*	
	Little Egret	*Egretta garzetta*	
	Medium Egret	*Mesophoyx intermedia*	
	Night Heron	*Nycticorax nycticorax*	
Anatidae	Spotbill Duck	*Anas poecilorhyncha*	
Accipitridae	Shikra	*Accipiter badius*	
	Eurasian Sparrow-Hawk	*Accipiter niseus*	
	Tawny Eagle	*Aquila rapax*	
	Changeable Hawk-Eagle	*Nisaetus cirrhatus*	
	Greater Spotted Eagle	*Aquila clanga*	
	Short-toed Eagle	*Circaetus gallicus*	
	Booted Eagle	*Hieraaetus pennatus*	
	Bonelli's Eagle	*Hieraaetus fasciatus*	
	White-eyed Buzzard	*Butastur teesa*	
	Oriental Honey-Buzzard	*Pernis ptilorhyncus*	
	Black-winged Kite	*Elanus caeruleus*	
	Black Kite	*Milvus migrans*	
Falconidae	Common Kestrel	*Falco tinnuculus*	
	Laggar Falcon	*Falco jugger*	
	Peregrine Falcon	*Falco peregrinus calidus*	
	Shaheen Falcon	*Falco peregrinus peregrinator*	Endemic
	Amur Falcon	*Falco amurensis*	
Phasianidae	Indian Peafowl	*Pavo cristatus*	
	Grey Francolin	*Francolinus francolinus*	
	Painted Francolin	*Francolinus pictus*	
	Rock Bush Quail	*Perdicula argoondah*	Endemic
Rallidae	White-breasted Waterhen	*Amaurornis phoenicurus*	
Charadriidae	Red-wattled Lapwing	*Vanellus malabaricus*	
	Yellow-wattled Lapwing	*Vanellus indicus*	
Scolopacidae	Wood or Spotted Sandpiper	*Tringa glareola*	
	Common Greenshank	*Tringa nebularia*	
	Green Sandpiper	*Tringa ochropus*	
	Common Sandpiper	*Actitis hypoleucos*	
Columbidae	Blue Rock Pigeon	*Columba livia*	
	Yellow-footed Green Pigeon	*Treron phoenicoptera*	
	Nilgiri Wood Pigeon	*Columba elphinstonii*	Endemic

	Little Brown Dove	*Streptopelia orientalis*	
	Orinetal Turtle-Dove	*Streptopelia senegalensis*	
Psittacidae	Rose-ringed Parakeet	*Psittacula krameri*	
	Alexandrine Parakeet	*Psittacula eupatria*	
Cuculidae	Plaintive Cuckoo	*Cacomantis passerinus*	
	Indian Bay-banded Cockoo	*Cacomantis sonneratii*	
	Pied Crested Cuckoo	*Clamator jacobinus*	
	Asian Koel	*Eudynamys scolopacea*	
	Brainfever Bird	*Hierococcyx varius*	
Tytonidae	Barn Owl	*Tyto alba stertens*	
Strigidae	Spotted Owlet	*Athene brama brama*	
	Indian Eagle Owl	*Bubo bengalensis*	
	Brown Wood Owl	*Strix leptogrammica*	
	Collared Scops Owl	*Otus bakkamoena*	
Caprimulgidae	Asian Nightjar	*Caprimulgus asiaticus*	
	Sykes's Nightjar	*Caprimulgus mahrattensis*	
Apodidae	House Swift	*Apus affinis*	
Alcedinidae	Small Blue Kingfisher	*Alcedo atthis*	
	White-breasted Kingfisher	*Halcyon smyrnensis*	
Meropidae	Small Green Bee-eater	*Merops orientalis*	
Upupidae	Hoopoe	*Upupa epops*	
Bucerotidae	Grey Hornbill	*Ocyceros birostris*	
Capitonidae	Crimson-breasted Barbet	*Megalaima haemacephala*	
Picidae	Yellow-fronted Pied Woodpecker	*Dryocopus mahrattensis*	
	Eurasian Wryneck	*Jynx torquilla*	
Pittidae	Indian Pitta	*Pitta brachyura*	
Alaudidae	Rufous-tailed Finch-Lark	*Amaurornis phoenicurus*	
	Ashy-crowned Finch-Lark	*Eremopterix grisea*	
	Crested Lark	*Galerida cristata*	
	Sykes's Crested Lark	*Galerida deva*	Endemic
	Malabar Lark	*Galerida malabarica*	Endemic
	Red-winged Bush Lark	*Mirafra erythroptera*	
Hirundinidae	Dusky Crag Martin	*Hirundo concolor*	
	Red-rumped Swallow	*Hirundo daurica*	
	Wire-tailed Swallow	*Hirundo smithii*	
	Barn Swallow	*Hirundo rustica*	
Motacillidae	Tree Pipit	*Anthus hodgsoni*	
	White Wagtail	*Motacilla alba*	
	Forest Wagtail	*Dendronanthus indicus*	
	Grey Wagtail	*Motacilla cinerea*	
	Yellow Wagtail	*Motacilla citreola*	
	Large Pied Wagtail	*Motacilla maderspatensis*	
Campephagidae	Small Minivet	*Pericrocotus cinnamomeus*	

	White-bellied Minivet	*Pericrocotus erythropygius*	
	Common Wood Shrike	*Tephrodornis pondicerianus*	
Pycnonotidae	Red-whiskered Bulbul	*Pycnonotus jocosus*	
	Red-vented Bulbul	*Pycnonotus cafer*	
Irenidae	Common Iora	*Aegithina tiphia*	
Laniidae	Rufous-backed Shrike	*Lanius schach*	
	Bay-backed Shrike	*Lanius vittatus*	
Timaliidae	Large Grey Babbler	*Turdoides malcolmi*	
	Jungle Babbler	*Turdoides striatus*	
Muscicapidae	Paddyfield Warbler	*Acrocephalus agricola*	
	Indian Reed Warbler	*Acrocephalus stentoreus*	
	Yellow-eyed Babbler	*Chrysomma sinense*	
	Magpie-Robin	*Copsychus saularis*	
	Indian Robin	*Saxicoloides fulicata*	
	Tickell's Blue Flycatcher	*Cyornis tickelliae*	
	Red-breasted Flycatcher	*Ficedula parva*	
	Ultramarine Flycatcher	*Ficedula superciliaris*	
	Booted Tree Warbler	*Hippolais caligata*	
	Tailor Bird	*Orthotomus sutorius*	
	Tickell's Leaf Warbler	*Phylloscopus affinis*	
	Chiffchaff	*Phylloscopus collybita*	
	Yellow Leaf Warbler	*Phylloscopus griseolus*	
	Hume's Leaf Warbler	*Phylloscopus inornatus*	
	Ashy Wren-Warbler	*Prinia socialis*	
	Plain Prinia	*Prinia subflava*	
	Jungle Prinia	*Prinia sylvatica*	
	Grey-breasted Prinia	*Prinia hodgosonii*	
	White-spotted Fantail Flycatcher	*Rhipidura albicollis*	
	Pied Bush Chat	*Saxicola caprata*	
	Collared Bush Chat	*Saxicola torquata*	
	Asian Paradise Flycatcher	*Terpsiphonbe paradisi*	
	Asian Brown Flycatcher	*Muscicapa daurica*	
	Large Grey Babbler	*Turdoides malcolmi*	
Paridae	Great Tit	*Parus major*	
Dicaeidae	Tickell's Flowerpecker	*Dicaeum erythrorhynchos*	
Nectariniidae	Purple Sunbird	*Nectarinia asiatica*	
	Purple-rumped Sunbird	*Nectarinia zeylonica*	
	Small Sunbird	*Leptocoma minima*	Endemic
Zosteropidae	White-eye	*Zosterops palpebrosus*	
Fringillidae	Common Rosefinch	*Carpodacus erythrinus*	
Estrildidae	Red Avadavat	*Amandava amandava*	
	White-throated Munia	*Lonchura malabarica*	
	Spotted Munia	*Lonchura punctulata*	
Ploceidae	House Sparrow	*Passer domesticus*	
	Baya	*Ploceus philippinus*	
Sturnidae	Jungle Myna	*Acridotheres fuscus*	
	Black-headed Starling	*Sturnus pagodarum*	
	Rosy Starling	*Sturnus roseus*	
Oriolidae	Golden Oriole	*Oriolus kundoo*	
Dicruridae	Black Drongo	*Dicrurus adsimilis*	
Corvidae	Jungle Crow	*Corvus culminatus*	
	House Crow	*Corvus splendens*	
	Rufous Tree Pie	*Dendrocitta vagabunda*	

APPENDIX 3

REPTILES OF THE PARVATI-PACHGAON HILLS, PUNE

Rohan Pandit M.Sc.

ORDER: SERPENTES

Family: Colubridae
Rat Snake *Ptyas mucosa*
Common Trinket *Coelgnathus helena*
Wolf Snake *Lycodon aulicus*
Banded Racer *Argyrogena fasciolata*
Checkered Keelback *Xenocrophis piscator*
Green Keelback *Macrophistodon plumbicolor*
Common Kukri *Oligodon arnensis*
Family: Elapidae
Spectacled Cobra *Naja naja*
Common Krait *Bungarus caerulues*
Famiy: Viperidae
Russell's Viper *Doboia russeli*
Saw-scaled Viper *Echis carinatus*

ORDER: LACERTILIA

Family: Agamidae
Garden Lizard *Calotes versicolor*
Forest Calotes *Calotes rouxii*
Family: Gekkonidae
House Gecko *Hemidactylus brookii*
Family: Scincidae
Common Skink *Mabuya carinata*
Family Varanidae:
Common Indian Monitor *Varanus bengalensis* (No recent sightings).

APPENDIX 4

AMPHIBIANS OF THE PARVATI-PACHGAON HILLS, PUNE

Dr. Anand Padhye* Ph.D.

ORDER: ANURA

Family: Bufonidae
Indian Toad *Bufo melanostictus*

Family: Dicroglossidae
Indian Bull Frog *Hoplobatrachus tigerinus*
Skittering Frog *Euphlyctis cyanophlyctis*
Sahyadri Bush Frog *Fejervarya sahyadrensis* **Endemic**
Burrowing Frog *Spherotheca breviseps*

Family: Microhylidae
Ornate Frog *Microhyla ornata*

(* Member IUCN Amphibian Specialist Group, India)

APPENDIX 5

ANNELIDS OF THE PARVATI-PACHGAON HILLS, PUNE

Dr. R.M. Sharma Ph.D. and Dr. S.K. Pati Ph.D.

PHYLUM: ANNELIDA (Leeches)
CLASS: CLITELLATA
SUBCLASS: HIRUDINEA

ORDER: RHYNCHOBDELLIDA

Family: Glossiphoniidae

1. *Paraclepsis praedatrix* Harding, 1924

ORDER: ARHYNCHOBDELLIDA

Family: Hirudinidae

2. *Asiaticobdella birmanica* (Blanchard, 1894)

APPENDIX 6

MOLLUSCS OF THE PARVATI-PACHGAON HILLS, PUNE

Dr. R.M. Sharma Ph.D. and Dr. S.K. Pati Ph.D.

PHYLUM: MOLLUSCA
CLASS: GASTROPODA
ORDER: UNASSIGNED CAENOGASTROPODA

Freshwater Molluscs

Family: Viviparidae

1. *Bellamya bengalensis* (Lamarck, 1822)

Family: Ampullariidae

2. *Pila* (*Turbinicola*) *saxea* (Reeve, 1856)

Family: Thiaridae

3. *Melanoides pyramis* (Hutton, 1850)
4. *Melanoides tuberculatus* (Müller, 1774)
5. *Thiara scabra* (Müller, 1774)

ORDER: HYGROPHILA

Family: Lymnaeidae

6. *Lymnaea acuminata* Lamarck, 1822)
7. *Lymnaea luteola* Lamarck, 1822

Family: Planorbidae

8. *Gyraulus convexiusculus* (Hutton, 1849)
9. *Indoplanorbis exustus* (Deshayes, 1834)

CLASS: BIVALVIA
ORDER: UNIONOIDA

Family: Unionidae

10. *Lamellidens marginalis* (Lamarck, 1819)
11. *Parreysia* (*Parreysia*) *corrugata* (Müller, 1774)
12. *Parreysia* (*Radiatula*) *caerulea* (Lea, 1831)

ORDER: VENEROIDA

Family: Corbiculidae

13. *Corbicula striatella* Deshayes, 1854

Land Molluscs

ORDER: LITTORINIMORPHA

Family: Pomatiidae

1. *Cyclotopsis semistriata* (Sowerby, 1843)

ORDER: STYLOMMATOPHORA

Family: Cerastidae

2. *Rhachis punctatus* (Anton, 1939)

Family: Subulinidae

3. *Subulina octona* (Bruguière, 1789)

4. *Glessula ceylanica* (Pfeiffer, 1845)

5. *Allopeas gracile* (Hutton, 1834)

6. *Zootecus insularis* (Ehrenberg, 1831)

Family: Ariophantidae

7. *Ariophanta bajadera* (Pfeiffer, 1850)

8. *Cryptozona semirugata* (Beck, 1837)

9. *Macrochlamys indica* Godwin Austen, 1908

ORDER: SYSTELLOMMATOPHORA

Family: Veronicellidae

10. *Laevicaulis alte* (Férussac, 1822)

11. *Semperula birmanica* (Theobald, 1864)

APPENDIX 7

CRUSTACEANS OF THE PARVATI-PACHGAON HILLS, PUNE
Dr. R.M. Sharma Ph.D. and Dr. S.K. Pati Ph.D.

PHYLUM: ARTHROPODA
CLASS: MALACOSTRACA
ORDER: DECAPODA
INFRAORDER: BRACHYURA
Freshwater Crabs

Family: Gecarcinucidae

1. *Barytelphusa cunicularis* (Westwood, 1836)

2. *Barytelphusa guerini* (H. Milne Edwards, 1853)

3. **INFRAORDER: CARIDEA**
Freshwater Prawns

Family: Palaemonidae

1. *Macrobrachium hendersodayanum* (Tiwari, 1952)

2. *Macrobrachium kistnense* (Tiwari, 1952)

Family: Atyidae

3. *Caridina weberi* De Man, 1892

APPENDIX 8

ARACHNID-FAUNA OF THE PARVATI-PACHGAON HILLS, PUNE
Dr. D. B. Bastawade, Ph.D.

CLASS : ARACHNIDA
ORDER : ARANEAE (Spiders)

Family : Dipluridae

1. *Ischnothele dumicola* (Pocock) Most Endangered Species

Family : Theraphosidae

2. *Phlogiodes validus* Pocock
3. *Phlogiodes robustus* Pocock
4. *Plesiophrictus millardi* Pocock
5. *Plesiophrictus sericeius* Pocock
6. *Poecilotheria regalis* Pocock
7. *Chilobrachys fimbriatus* Pocock
8. *Chilobrachys femoralis* Pocock

Family : Eresidae

9. *Stegodyphus mirandus* Pocock
10. *Stegodyphus pacificus* Pocock
11. *Stegodyphus sarasinorum* Karsch

Family : Tetragnathidae

12. *Tetragnatha geniculata* Karsch
13. *Tetragnatha mandibulata* Walckenaer
14. *Argyroepeira tessellata* Thorell

Family : Araneidae

15. *Nephila maculata* (Fabricius) *
16. *Gasteracantha geminata* (Fabricius)
17. *Leucauge decorata* (Blackwall) *
18. *Leucauge culta* (O. P. Cambridge)
19. *Leucauge dorsotuberculata* Tikader
20. *Argiope aemula* (Walckenaer) *
21. *Argiope anasuja* Thorell
22. *Argiope pulchella* Thorell
23. *Cyrtophora citricola* (Forskal) *
24. *Cirtophora cicatrosa* (Stoliczka) *
25. *Cycloza hexatuberculata* Tikader
26. *Cycloza moonduensis* Tikader
27. *Larinia chloris* (Savigny & Audouin)
28. *Parawixia dehaanii* (Doleschall)
29. *Araneus mitifica* (Simon)
30. *Araneus bituberculatus* (Walckenaer)
31. *Araneus panchganiensis* Tikader & Bal
32. *Neoscona mukerjei* Tikader *
33. *Neoscona poonaensis* Tikader & Bal
34. *Neoscona lugubris* (Walckenaer) *
35. *Neoscona laglaizei* (Simon)

Family : Lycosidae

36. *Hippasa lycosina* Pocock
37. *Hippasa mahabaldshywarensis* Tikader & Malhotra
38. *Evippa shivajii* Tikader & Malhotra
39. *Evippa banerensis* Tikader & Malhotra
40. *Pardosa birmanica* Simon *
41. *Lycosa geotubalis Tikader & Malhotra*
42. *Lycosa poonaensis Tikader & Malhotra*

Family : Gnaphosidae

43. *Gnaphosa poonaensis* Tikader

Family : Theridiidae

44. *Theridion indica* Tikader *
45. *Laterodectus hasselti* Thorell *
46. *Laterodectus geometricus* C. Koch

Family : Oxyopidaee

47. *Oxyopus shweta* Tikader

Family : Thomisidae

48. *Thomisus katrajghatus* Tikader
49. *Thomisus pooneus* Tikader
50. *Camaricus formosus* Thorell
51. *Camaricus khandalensis* Tikader
52. *Monaeses mukundi* Tikader
53. *Monaeses parvati* Tikader
54. *Tmarus kotigeharus* Tikader
55. *Misumenoides deccanes* Tikader
56. *Misumenopes khandalensis* Tikader
57. *Pasia marathas* Tikader
58. *Tibellus katrajghatus* Tikader
59. *Tibellus chaturshingi* Tikader
60. *Tibellus pashanensis* Tikader
61. *Tibellus poonaensis* Tikader

Family : Sparassidae

62. *Heteropoda vanatoria* (Linnaeus) **
63. *Heteroipa sexpunctata* Simon **
64. *Spariolenus tigris* Simon *

Family : Platoridae

65. *Plator indicus* Simon

Family : Pholcidae

66. *Artema atlanta* Walckenaer **
67. *Crossopriza lyoni* Blackwall **
68. *Pholcus phalangiodes* (Fuesslin)

Family : Hersiliidae

69. *Hersilia savignyi* Lucas *

Family : Urocteidae

70. *Uroctea indica* Pocock

Family : Scytodidae

71. *Scytodes thoracica* (Latreille) *

Family : Oonopidae

72. *Triaeris poonaensis* Tikader & Malhotra
73. *Ischnothyreus deccanensis* Tikader & Malhotra

Family : Tetrablemmidae

74. *Tetrablemma deccanensis* (Tikader)

Family : Stenochilidae

75. *Stenochilus hobsoni* O. P. Cambridge

Family : Palpimanidae

76. *Palpimanus voltuosus* Simon

Family : Filistatidae

77. *Filistat poonaensis* Tikader

Family : Salticidae

78. *Myrmarachne tristis* (Simon) *
79. *Myrmarachne satarensis* Narayan
80. *Myrmarachne maratha* Tikader

81. *Myrmarachne poonaensis* Tikader
82. *Phidippus khandalensis* Tikader
83. *Rhene khandalaensis Tikader*
84. *Zygoballus pashanensis* Tikader

ORDER : SCORPIONES (Scorpions)

Family : Buthidae

1. *Hottantota tamulus Tamulus* (Pocock) *
2. *Hottantota pachyurus* (Pocock)
3. *Orthochirus bicolor* (Pocock)
4. *Lychas rugosus (*Pocock)*)*
5. *Isometrus rigidulus* (Pocock)

Family : Scorpionidae

6. *Heterometrus phipsoni* (Pocock)
7. *Heterometrus granulomanus* Counj.

ORDER : SOLIFUGAE (Sun-Spiders)

Family : Galeodidae

8. *Galeodes orientalis* Stolicvzka *
9. *Galeodes indicus* Pocock

Note : Most of the Arachnid species listed above are endemic to the Western Indian region and mostly to the Western Ghats. However * species indicate wider distribution on Indian mainland as well as neighbouring countries e. g. Sri Lanka, Nepal, Bhutan, Bangla Desh, Myanmar and Pakistan. ** species indicate more wider distribution in South East Asia, Middle East Asia, European countries and African countries.

APPENDIX 9

ODONATES OF THE PARVATI-PACHGAON HILLS, PUNE

Aboli Kulkarni M.Sc.

CLASS: INSECTA

ORDER: ODONATA

Family	Species	Common Name
Libellulidae	*Brachythemis contaminata*	Ditch Jewel
	Diplacodes trivialis	Ground Skimmer
	Trithemis aurora	Crimson Marsh Glider
	Bradinopyga geminata	Granite Ghost
Coenagrionidae	*Ischura senegalensis*	Senegal Golden Dartlet
	Ceriagrion coromandelianum	Coromandel Marsh Dart
	Agricnemis pygmea	Pygmy Dartlet

APPENDIX 10

LEPIDOPTERA OF THE PARVATI-PACHGAON HILLS, PUNE

Neha Mujumdar, Prachi Mhaske, Kruti Chhaya, Rishikesh Patil and Ankur Patwardhan Ph.D.

CLASS: INSECTA

ORDER: LEPIDOPTERA (Butterflies)

	FAMILY / SPECIES	COMMON NAME
	PAPILIONIDAE	
1	*Graphium agamemnon*	Tailed Jay
2	*Pachliopta aristolochiae*	Common Rose
3	*Pachliopta hector*	Crimson Rose
4	*Papilio demoleus*	Lime
5	*Papilio polymnestor*	Blue Mormon
6	*Papilio polytes*	Common Mormon
	PIERIDAE	
7	*Appias albina*	Common Albatross
8	*Belenois aurota*	Pioneer Or Caper White
9	*Catopsilia pomona*	Common Emigrant
10	*Catopsilia pyranthe*	Mottled Emigrant
11	*Cepora nerissa*	Common Gull
12	*Colotis danae*	Crimson Tip
13	*Colotis etrida*	Small Orange Tip
14	*Delias eucharis*	Common Jezebel
15	*Eurema hecabe*	Common Grass Yellow
16	*Eurema laeta*	Spotless Grass Yellow
17	*Hebomoia glaucippe*	Great Orange Tip
18	*Ixias marianne*	White Orange Tip
19	*Leptosia nina*	Psyche
20	*Pareronia valeria*	Common Wanderer
21	*Pieris canidia*	Indian Cabbage White
	NYMPHALIDAE	
22	*Acraea violae*	Tawny Coster
23	*Ariadne ariadne*	Angled Castor
24	*Ariadne merione*	Common Castor
25	*Cyrestis thyodamas*	Common Map
26	*Danaus chrysippus*	Plain Tiger
27	*Danaus genutia*	Striped Or Common Tiger
28	*Euploea core*	Common Indian Crow
29	*Euthalia aconthea*	Common Baron
30	*Hypolimnas bolina*	Great Eggfly
31	*Hypolimnas misippus*	Danaid Eggfly
32	*Junonia hierta*	Yellow Pansy
33	*Junonia lemonias*	Lemon Pansy
34	*Junonia orithya*	Blue Pansy
35	*Junonia(Precis) iphita*	Chocolate Pansy
36	*Lethe rohria*	Common Treebrown
37	*Melanitis leda*	Common Evening Brown
38	*Neptis hylas*	Common Sailer
39	*Parantica aglea*	Glassy Tiger
40	*Phalanta phalantha*	Common Leopard
41	*Tirumala limniace*	Blue Tiger
42	*Tirumala septentrionis*	Dark Blue Tiger
43	*Vanessa cardui*	Painted Lady
44	*Ypthima asterope*	Common Threering
45	*Ypthima baldus*	Common Fivering
46	*Ypthima huebneri*	Common Fourring

	LYCAENIDAE	
47	*Azanus jesous*	African Babul Blue
48	*Caleta caleta*	Angled Pierrot
49	*Castalius rosimon*	Common Pierrot
50	*Chilades trochylus*	Western Grass Jewel
51	*Euchrysops cnejus*	Gram Blue
52	*Everes lacturnus*	Indian Cupid
53	*Jamides celeno*	Common Cerulean
54	*Lampides boeticus*	Pea Blue
55	*Prosotas dubiosa*	Tailless Line Blue
56	*Pseudozizeeria maha*	Pale Grass Blue
57	*Spindasis vulcanus*	Common Silverline
58	*Talicada nyseus*	Red Pierrot
59	*Tarucus nara*	Rounded/Rusty/Striped Pierrot
60	*Zizeeria karsandra*	Dark Grass Blue
61	*Zizina otis*	Lesser Grass Blue
62	*Zizula hylax*	Tiny Grass Blue
	HESPERIIDAE	
63	*Ampittia dioscorides*	Bush Hopper
64	*Borbo cinnara*	Rice Swift
65	*Hasora badra*	Common Awl
66	*Udaspes folus*	Grass Demon

APPENDIX 11

ANTS OF THE PARVATI-PACHGAON HILLS, PUNE

Rohan Joshi M.Sc.

CLASS: INSECTA

ORDER: HYMENOPTERA

Family: Formicidae

Sub-family	**Species**
Dorylinae	*Aenictus* spp.
Dolichoderinae	*Tapinoma melanocephalum*
Ponerinae	*Leptogenys processionalis*;
	Pachycondyla spp.
Formicinae	*Camponotus aungusticolis*;
	Paratrechina longicornis;
	Polyrhachis lacteipennis
Myrmecinae	*Myrmicaria brunnea*;
	Solenopsis germinate;
	Aphaenogaster beccari;
	Crematogaster spp.
Pseudomyrmecinae	*Tetraponera rufonigra*;
	Tetraponera allaborans
Family: Apidae	
	Apis dorsata
	Apis milifera

Briefly, the habits of the 13 ant species belonging to the sub-families are summarized as: Dorylinae are nomadic predators. Dolichoderinae and Formicinae are generalist predators and scavengers. Ponerinae are predators. Myrmecinae are omnivores, generalized predators and scavengers, specialist predators, seed harvesters and primitive fungus-growers. Pseudomyrmecinae are arboreal generalist feeders.

APPENDIX 12

FLORA OF THE PARVATI-PACHGAON HILLS, PUNE

DR. MANDAR DATAR Ph.D.

ANGIOSPERMS (Family names are underlined)

RANUNCULACEAE
- *Clematis heynei* M. A. Rau Endemic

ANNONACEAE
- *Anona reticulata* L.
- *Anona squamosa* L.
- *Polyalthia longifolia* (Sonnerat) Thw.

MENISPERMACEAE
- *Cocculus hirsutus* (L.) Diels
- *Tinospora cordifoia* (Willd.) Hook.*f*. & Thoms.

PAPAVERACEAE
- *Argemone mexicana* L.

CLEOMACEAE
- *Cleome viscosa* L.
- *Cleome simplicifolia* Hook.*f*. & Thoms.

CAPPARACEAE
- *Capparis zeylanica* L.
- *Maerua oblongifolia* (Forssk.) A. Rich.

COCHLOSPERMACEAE
- *Cochlospermum religiosum* (L.) Alst.

BIXACEAE
- *Bixa orellana* L.

FLACOURTIACEAE
- *Flacourtia indica* (Burm.*f*.) Merr.

POLYGALACEAE
- *Polygala arvensis* Willd.
- *Polygala erioptera* DC.
- *Polygala persicariiefolia* DC.

CARYOPHYLLACEAE
- *Polycarpaea corymbosa* (L.) Lamk.

PORTULACACEAE
- *Portulaca oleracea* L.

MALVACEAE
- *Abutilon indicum* (L.) Sweet
- *Gossypium herbaceum* L.
- *Hibiscus ovalifolius* (Forssk.) Vahl
- *Sida acuta* Burm.*f*.
- *Sida rhombifolia* L.
- *Thespesia populnea* (L.) Soland

BOMBACACEAE
- *Bombax ceiba* L.

STERCULIACEAE
- *Sterculia urens* Roxb.

TILIACEAE
- *Corchorus aestuans* L.
- *Grewia damine* Gaertn.
- *Grewia tiliaefolia* Vahl
- *Triumfetta rotundifolia* Lamk.

ELAEOCARPACEAE
- *Muntingia calabura* L.

MALPIGHIACEAE
- *Aspidopterys cordata* (Heyne *ex* Wall.) A. Juss. Endemic.

ZYGOPHYLLACEAE
- *Tribulus terrestris* L.

OXALIDACEAE
- *Biophytum sesitivum* (L.) DC.
- *Oxalis corniculata* L.

BALSAMINACEAE
- *Impatiens balsamina* L.

RUTACEAE
- *Aegle marmelos* (L.) Corr.
- *Citrus aurantium* L.
- *Citrus media* L.
- *Limonia acidissima* L.

SIMAROUBACEAE
- *Ailanthus exelsa* Roxb.

BURSERACEAE
- *Boswellia serrata* Roxb. *ex* Colebr. Endemic.
- *Burera penincillata* (Sessé & Moç. ex DC.) Engl.

MELIACEAE
- *Azadirachta indica* A. Juss.

Cipadessa baccifera (Roth.) Miq.
Melia azadarach L.
Swietenia mahagoni (L.) Jacq.

CELASTRACEAE
Cassine glauca (Rottb.) O. Ktze.
Celastrus paniculatus Willd.
Maytenus emarginatus (Willd.) Ding Hou

RHAMNACEAE
Zizyphus mauritiana Lamk.
Zizyphus oenoplia (L.) Mill.
Zizyphus xylopyrus (Retz.) Willd.

VITACEAE
Ampelocissus latifolia (Roxb.) Planch.
Cayratia trifolia (L.) Domin.
Cissus woodrowii (Stapf. *ex* Cooke) Sant. Endemic.

LEEACEAE
Leea crispa Van Royen *ex* L.

SAPINDACEAE
Cardiospermum halicacabum L.
Dodonaea viscosa (L.) Jacq.

ANACARDIACEAE
Lannea coromandellica (Houtt.) Merr.
Mangifera indica L.
Semicarpus anacardium L.*f.*

MORINGACEAE
Moringa oleifera Lamk.

FABACEAE
Abrus precatorius L.
Aeschynomene indica L.
Alysicarpus bupleurifolius (L.) DC.
Alysicarpus hamosus Edgew
Alysicarpus monilifer (L.) DC.
Alysicarpus rugosus (Willd.) DC.
Alysicarpus tetragonolobus Edgew
Alysicarpus vaginalis (L.) DC.
Butea monosperma (Lamk.) Taub.
Cajanus scarabaeoides (L.) du-Petit-Thours
Clitoria ternatea L.
Crotalaria albida Heyne *ex* Roth.
Crotalaria calycina Schrank
Crotalaria hebecarpa (DC.) Rudd
Crotalaria linifolia L.
Crotalaria orixensis Willd.
Crotalaria pallida Ait.
Dalbergia lanceolaria L.*f.*
Dalbergia melanoxylon Guill. & Perr.
Desmodium dichotomum (Willd.) DC.
Desmodium laxiflorum DC.
Erythrina suberosa Roxb.
Erythrina variegata L.
Gliricidia sepium (Jacq.) Kunth. *ex* Steud.
Indigofera cordifolia Heyne *ex* Roth.
Indigofera glandulosa Roxb. *ex* Willd
Indigofera linifolia (L.*f.*) Retz.
Indigofera trita L.*f.* var. triata
Indigofera trita L.*f.*
Melilotus indica (L.) Ali
Pisum sativum L.
Pongamia pinnata (L.) Pierre
Pterocarpus marsupium Roxb.
Rhynchosia minima (L.) DC.
Rhynchosia rothii Benth *ex* Ait.
Sesbania bispinosa (Jacq.) W.*f.* Wight
Stylosanthes fruticosa (Retz.) Alst.
Tephrosia purpurea (L.) Pers.
Tephrosia strigosa (Dalz.) Sant. et. Mahesh.
Tephrosia uniflora Pers.
Vigna radiata (L.) Wilczeck
Vigna trilobata (L.) Verdec.
Zornia gibbosa Span.

CAESALPINIACEAE
Acrocarpus fraxinifolius Wt. & Arn.
Bauhinia monandra Kurz.
Bauhinia racemosa Lamk.
Caesalpinia decapetala (Roth) Alst.
Caesalpinia pulcherima (L.) Swartz
Caesalpinia ferrea Mart. ex Tul.
Cassia absus L.
Cassia auriculata L.
Cassia fistula L.
Cassia mimosoides L.
Cassia multijuga A. Rich.
Cassia nigricans Vahl
Cassia pumila Lam.
Cassia siamea Lamk.
Cassia sophera L.
Cassia tora L.
Delonix regia (Boj *ex* Hook.) Raf.
Saraca asoka (Roxb.) de Wilde
Tamarindus indicus L.

MIMOSACEAE
Acacia auriculoformis A. Cunn.
Acacia catechu Willd.
Acacia eburnea (L.*f.*) Willd.
Acacia farnesiana (L.) Willd.
Acacia leucophloea (Roxb.) Willd.
Acacia nilotica (L.) Willd.
Albizia lebbeck (L.) Willd. var. lebbeck
Albizia odoratissima (L.*f.*) Benth.
Dichrostachys cinerea (L.) Wt. & Arn.
Leucaena leucocephala (Lamk.) de Wit.
Mimosa hamata Willd.
Pithecolobium dulce (Roxb.) Benth.
Samanea saman (Jacq.) Merr.

ROSACEAE
Rosa sp.

CRASSULACEAE
Kalanchoe diagremontiana Hamet. & Perr.

COMBRETACEAE
Anogeissus latifolia (Roxb. *ex* DC.) Wall.
Combretum ovalifolium Roxb.
Terminalia alata Heyne *ex* Roth.
Terminalia catappa L.
Quisqualis indica L.

MYRTACEAE
Callistemon citrinus (Curtis) Skeels
Eucalyptus globulus Labill.

Psidium guajava L.
Syzygium cumini (L.) Skeels

LYTHRACEAE
Ammania multiflora Roxb.
Lagerstroemia reginae Roxb.
Lawsonia inermis L.
Woodfordia fruticosa (L.) Kurz.

PUNICACEAE
Punica granatum L.

ONAGRACEAE
Ludwigia perennis L.

PASSIFLORACEAE
Passiflora foetida L.

CUCURBITACEAE
Citrulus colocynthis (L.) Schrad
Momordica dioica Roxb. *ex* Willd.
Mukia maderaspatana (L.) Roem.
Solena amlexicaulis (Lamk.) Gandhi

CACTACEAE
Cereus peruvianus (L.) Mill.
Opuntia stricta (Haw.) Haw.

MOLLUGINACEAE
Mollugo pentaphylla L.

APIACEAE
Pimpinella adscendens Dalz.

RUBIACEAE
Canthium parviflorum Lamk.
Ceriscoides turgida (Roxb.) Tirveng.
Morinda pubescens J. E. Smith
Neanotis montholoni (Hook.*f*.) W. H. Lewis
Neolamarckia cadamba (Roxb.) Boisser
Oldenlandia nagporensis Brace ex. Haines
Spermococe pusila Wall.

ASTERACEAE
Acanthospermum hispidum DC.
Ageratum conyzoides L.
Artemisia japonica Thunb.
Bidens biternata Lour.
Blanvillea acmella L.
Blumea malcolmii (C. B. Cl.) Hook.*f*. Endemic.
Caesulia axilaris Roxb.
Cosmos bipinnatus Cav.
Echinops echinatus Roxb.
Eclipta prostrata (L.) L.
Emilia sonchifolia DC.
Glossocardia bosvallea (L.*f*.) DC.
Gnaphalium purpureum L.
Goniocaulon glabrum Cass.
Lactuca remotiflora DC.
Lagascea mollis Cav.
Launaea sarmentosa (Willd.) Sch.-Bip. *ex* O. Ktze.
Oligochaeta ramose (Roxb.) Wagen.
Parthenium hysterophorus L.
Pentanema indicum (L.) Ling.
Pulicaria wightiana (DC.) Cl.
Sonchus oleraceus L.
Sphaeranthus indicus L.
Synedrella vialis (Less.) A. Gray
Tridax procumbens L.
Xanthium indicum Koen.

PLUMBAGINACEAE
Plumbago zeylanica L.

SAPOTACEAE
Madhuca longifolia (Koen.) McBride var. longifolia
Manilkara zapota (L.) Van Royen
Mimusops elengi L.

EBENACEAE
Diospyros melanoxylon Roxb.
Diospyros montana Roxb.

OLEACEAE
Jasminum auriculatum Vahl
Jasminum malabaricum Wt. Endemic.
Jasminum officinale L

APOCYNACEAE
Carissa congesta Vahl var.
Catharanthus roseus (L.) G. Don.
Holarrhena pubescens (Buch.-Ham.) Wall.
Nerium indicum Mill.
Plumeria alba L.
Plumeria rubra L.

ASCLEPIADACEAE
Asclepias curasavica L.
Calotropis gigantea (L.) R. Br.
Caralluma adscendens (Roxb.) Haw
Ceropegia bulbosa Roxb. var. bulbosa
Ceropegia bulbosa Roxb. var. lushii Hook.*f*.
Ceropegia hirsuta Wt. & Arn.
Leptadenia reticulata Wt. & Arn.
Pergularia daemia (Forssk.) Chiov.
Tylophora dalzellii Hook.*f*.
Wattakaka volubilis (L.*f*.) Stapf.

PERIPLOCACEAE
Cryptolepis buchanani Roem. & Schult.
Cryptostegia grandiflora R. Br.
Hemidesmus indicus (L.) Schult. var. indicus

GENTIANACEAE
Canscora diffusa R. Br.
Exacum pumilum Griseb.

BORAGINACEAE
Trichodesma indicum (L.) Lehm.

HELIOTROPIACEAE
Heliotropium ovalifolium Forssk.

EHRETIACEAE
Ehretia aspera Roxb.

CORDIACEAE
Cordia dichotoma Forst.
Cordia macleodii Hook.*f*. & Thoms.

CONVOLVULACEAE
Argyreia cuneata (Willd.) Ker-Gwal.
Argyreia nervosa (Burm.*f*.) Bojer
Evolvulus alsinoides L.
Ipomoea cairica (L.) Swartz.
Ipomoea carnea Jacq. spp. fistulosa (Marf. *ex* Choisy.) Austin.
Ipomoea eriocarpa R. Br.
Ipomoea hederifolia L.

Ipomoea nil (L.) Roth.
Ipomoea obscura (L.) Ker.-Gawl.
Merremia umbellata Hall.*f*.
Rivea hypocrateriformis Choisy

CUSCUTACEAE
Cuscuta campestris Yuncker

SOLANACEAE
Cestrum nocturnum L.
Solanum lycopersicum L.

SCROPHULARIACEAE
Buchnera hispida Buch.-Ham.
Limnophila indica (L.) Druce
Sopubia delphinifolia G. Don.
Striga densiflora Benth
Verbascum chinensis (L.) Sant.

BIGNONIACEAE
Dolichandrone falacata (Wall *ex* DC.) Seem
Heterophragma quadriloculare (Roxb.) K. Schum.
Jacaranda acutifolia Humb. & Bontl.
Kigellia africana (Lam.) Benth.
Millingtonia hortensis L.
Spathodea campanulata Beauv
Tabebuia argentea (Burm. & Schum.) Britt.
Tecoma stans (L.) Kunth.

PEDALIACEAE
Sesamum orientale L.

MARTYNIACEAE
Martynia annua L.

ACANTHACEAE
Andrographis paniculata Nees
Barleria cuspidata Heyne *ex* Nees
Cynarospermum asperrimum (Nees) Vollesen Endemic.
Dipteracanthus patulus (Jacq.) Nees.
Gantelbua urens (Heyne *ex* Roth.) Bremek
Justicia adhatoda L.
Lepidagathis cuspidata Nees
Peristrophe paniculata (Forssk) Brummitt.
Rostellularia diffusa (Willd.) Nees
Rostellularia japonica (Thunb.) Ellis.
Rungia elegans Dalz.

VERBENACEAE
Gmelina arborea Roxb.
Lantana camara L. var. aculeata (L.) Mold.
Tectona grandis L.
Vitex negundo L

LAMIACEAE
Hyptis suaveolens Poit.
Lavandula bipinnata (Roth.) O. Ktze. var. bipinnata
Leucas aspera Spreng.
Leucas indica (L.) R. Br. *ex* Vatke
Leucas martinicensis R. Br.
Ocimum gratisissimum L.
Orthosiphon pallidus Royle

NYCTAGINACEAE
Boerhaavia repens L. var. diffusa L.
Bougainvillaea spectabilis Willd.

AMARANTHACEAE
Achyranthes aspera L.
Alternanthera pungens Kunth.
Alternanthera sessilis (L.) R. Br.
Amaranthus spinosus L.
Celosia argentia L.*f*.
Gomphrena globosa L.
Pupalia lappacea Moq.

CHENOPODIACEAE
Chenopodium album L.

PHYTOLACCACEAE
Rivina humilis L.

POLYGONACEAE
Antigonon leptopus Hook. & Arn.
Persicaria glabra (Willd.) Gomez

PROTEACEAE
Grevillea robusta A. Cunn.

LORANTHACEAE
Dendropthoe falcata (L.*f*.) Etting.

SANTALACEAE
Osyris quadripartita Salz. *ex* Decre.
Santalum album L.

EUPHORBIACEAE
Acalypha ciliata Forssk.
Acalypha indica L.
Bridelia retusa (L.) Spreng.
Cleistanthus collinus (Roxb.) Benth. *ex* Hook.*f*.
Emblica officinalis Gaertn.
Euphorbia geniculata Orteg.
Euphorbia hirta L.
Euphorbia laciniata Paniigr.
Euphorbia microphylla Heyne
Jatropha curcas L.
Jatropha gossypifolia L.
Jatropha nana Dalz. (Endangered as per Mishra and Singh, 2001). Endemic.
Phyllanthus maderaspatensis L.
Ricinus communis L.
Secuuringea virosa (Roxb. *ex* Willd.) Baillon.

ULMACEAE
Holoptelea integrifolia Planch.
Trema orientalis Blume

MORACEAE
Artocarpus heterophyllus Lamk.
Ficus bengalensis L
Ficus racemosa L.
Ficus religiosa L.
Morus alba L.

CASUARINACEAE
Casuarina equisetifolia L. Amoen.

ORCHIDACEAE
Habenaria grandifloriformis Blatt. & McC. Endemic.
Habenaria marginata Coleb.
Zeuxine strateumatica Schltr.

CANNACEAE
Canna indica L.

AMERYLLIDACEAE
Pancratium triflorum Roxb.

HYPOXIDACEAE
Curculigo orchioides Gaertn.
AGAVACEAE
Agave americana L. var.
Agave cantula Roxb.
Agave sisalana Perrine
Furcrea foetida (L.) Haw.
DIOSCORIACEAE
Dioscoria oppositifolia L.
LILIACEAE
Aloe vera (L.) Burm.
i Willd. var. racemosus
Chlorophytum laxum R. Br.
Drimia indica Jessop.
Iphigenia indica A. Gray
Iphigenia pallida Baker Endemic.
Scilla hyacinthina Mc Bride
COMMELINACEAE
Borassus flabelifer L.
Cocos nucifera L.
Phoenix sylvestris (L.) Roxb.
ARACEAE
Arisaema murrayi (Grah.) Hook. Endemic.
Saurmatum venosum (Ait.) Schott.
NAJADACEAE
Najas indica (Willd.) Cham.
CYPERACEAE
Cyperus alulatus Kern
Cyperus articulatus L.
Cyperus corymbosus Rottb.
Cyperus exaltatus Retz.
Cyperus iria L.
Cyperus pumilus L.
Cyperus rotundus L.
Cyperus rubicundus Vahl
Fimbristylis ovata (Burm.) Kern
Fimbristylis tenera Schult. var. tenera
Fimbristylis tetragona R. Br.
Kyllinga brevifolia Rottb.
Schoenoplectus lateriflorus Lye
POACEAE

Andropogon pumilus Roxb.
Apluda mutica L.
Aristida adscensionis L.
Aristida funiculata Trin. & Rupr.
Aristida setacea Retz.
Aristida stocksii Domin. Endemic.
Arthraxon prionodes (Steud.) Dandy
Arundinella nepalensis Trin.
Bambusa arundinacea Willd.
Cenchrus biflorus Roxb.
Cenchrus ciliaris L.
Cenchrus pennisetiformis Hochst. & Steud.
Chionachne koeingii Thw.
Chloris barbata Swartz
Chrysopogon fulvus Chiov.
Cymbopogon martinii Wats.
Cynodon dactylon Pers.
Dactyloctenium aegyptium Willd.
Dicanthimum annulatum Stapf.
Digitaria ciliaris Koel.
Dimeria ornithopoda Trin.
Echinochloa colona (L.) Link
Eleusine indica (L.) Gaertn.
Eragrostiella bifaria (Vahl) Bor
Eragrostis gangetica (Roxb.) Steud.
Eragrostis tenella L.
Hackelochloa granularis (L.) O. Ktze.
Heterpogon contortus (L.) P. Beauv.
Heterpogon ritchiei (Hook.*f.*) Blatt. & McC. Endemic.
Ischaemum commutatum Hack.
Iseilema anthephoroides Hack.
Lophopogon tridentatus (Roxb.) Hack. Endemic.
Melanocenchris jacquemontii Jaub. & Spach
Ophiuros exaltatus (L.) O. Ktze.
Oropetium thomaeum (L.*f.*) Trin.
Oryza sativa L.
Panicum psilopodium Trin.
Panicum repens L.
Paspalidium flavidum (Retz.) A. Camus
Pennisetum hohenackeri Hochst. *ex* Steud.
Sehima nervosum (Rott.) Stapf.
Setaria pumila (Poir.) Roem. & Schult.
Setaria verticillata (L.) P. Beauv.
Sporobolus indicus var. (Buse) Baijens
Themeda quadrivalvis (L.) O. Ktze.
Themeda triandra Forssk.
Tragus roxburghii Panigr.

Conservation implications:
806 species belonging to 215 Families of fauna and flora of the Parvati-Pachgaon Reserve Forest are documented in this communication. The taxa included are: Mammalia, Aves, Reptilia, Amphibia, Annelida, Mollusca, Crustacea, Arachnida, Insecta Odonata, (Lepidoptera and Hymenoptera), and flora including angiosperms (monocots and dicots). Of these, 2 species of mammals, 6 species of aves, 1 species of amhibia, 7 species of scorpions and most of the spiders, and 14 species of plants are either Indian or Indian Subcontinent Endemics or endemic to the Western Ghats.

Only few representative insects are listed in this paper while several major insect Orders such as Coleoptera, Orthoptera, Mantoidea, Phasmida, Diptera, Neuroptera, Hymenoptera, Thysenura, Hemiptera and Lepidoptera (moths) are not included in this paper, and the work on these taxa is ongoing. Hence it is expected that the actual species list of the macro-fauna alone shall be over 2000 species. Micro-fauna and micro-flora are also not included in this paper.

It is therefore obvious that the Parvati-Pachgaon Reserve

Forest, a hilly region, an offshoot of the northern Western Ghats, is in itself an ecosystem in the form of a 'Habitat Island' within Pune metropolis. This habitat within Pune city, including other similar hilly habitats around the city like the Law College Hill, Chaturshringi Hill, Vetal Hill, Pashan Hill and Katraj Hill are being altered due to various reasons like rapid urbanization, developmental activities leading to changes in flora and fauna. The Ram Tekadi and the Bibwewadi Hill are almost destroyed. It is therefore essential to conserve the remaining hills mentioned above that harbor large and rich bio-diversity bearing habitats not only for the future but for their own sake.

The rich flora is also important for providing clean air to the city, and these hilly habitats are the lungs of Pune metropolis. The flora acts as a large carbon sink and keeps the temperature low. The water table of the surrounding regions is also charged due to the luxuriant vegetation. Apart from these ecological roles, the hills are also scenic and play an important role in the socio-cultural life of the citizens, since they are utilized by the citizens for morning and evening walks. Each hill also has its own deity and people visit these hills for religious purposes. Importantly, the Parvati hill also has an ancient historical heritage since the Peshwas had built the temple of lord Shiva on the Parvati Hill and had conserved a lake at its base with water birds sheltered in it, the present day 'Saras Baug'.

It is therefore essential that not only the bio-diversity, but also the geo-climatic environment of these hilly habitats should be kept *status-quo* with no interference of any kind. Any alterations such as road and other constructions, quarrying, tunneling, rope-ways, wind-mills or other similar interference should not be allowed to safeguard the life that exists in these hilly habitats, more so because these life forms do not have their say.

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We thank Shri. Nitin Kakodkar, IFS, CCF Forest Department, Pune and Dr. Hemant Ghate for reviewing the paper. Shri. Rajendra Kadam, IFS, ACF, Forest Department, Pune, kindly provided the necessary information related to the Pachgaon-Parvati Reserved Forest. We thank Raghvendra Manavi for providing the Google satellite map of the region.

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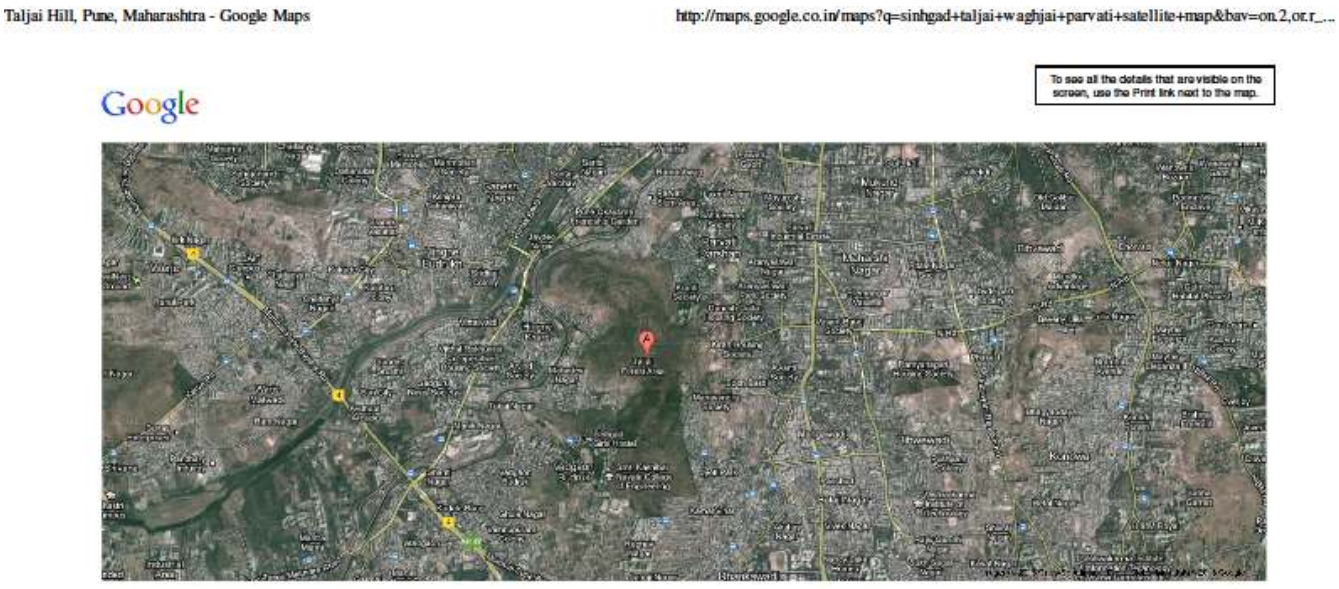

Owl Nebula

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The Owl Nebula is also called as M97 or NGC 3587. It is a planetary nebula in the constellation Ursa Major (Great Bear or Big Dipper), locally called as *Saptarshi*. It was discovered by Pierre Méchain, a colleague of Messier in 1781. It is approximately 3000 light years away from us; however there is no agreement about this among the astronomers. It is located at 11 14 47.50 right ascension and 55 01 14.0 declination and its size is 3.2 minutes of arc in diameter.

It has a visual magnitude of 9.9 in the visual range of light, with the central star of 16 magnitude. The central star has a 0.7 solar mass and the nebula has 0.15 Solar mass. It was formed about 6000 years ago.

It was first described as the “Owl Nebula” by Lord Rosse in 1848 and in 1866 Williams Higgins found its nature as a gaseous nebula by observing its spectrum.

Planetary Nebulae are the dying remnants of stars similar to our Sun. They end their lives as white dwarfs. Before they die and collapse as dense bodies, they expel their outer gaseous layer, which are spectacular. The central dying star is a small and hot object with a surface temperature of about a lakh degree Celsius. The radiation from the star excites the surrounding gas layers and they glow as a nebula. The radiation comes from ionized hydrogen and oxygen atoms, giving them a red and green tinge.

Owl Nebula is considered to be a complex planetary nebula. Its appearance has been interpreted as a cylindrical torus, so that where the matter is less, it is seen as the owl's eyes. These and other details such as colours are seen only through big telescopes with images stacked for some time. The pictures if taken with different filters, show different colours and shapes.

Owl Nebula. Photo Courtesy Fryns Andre- Belgium.
Sourced from Wikipedia.

Earth

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These days we find great importance attached to the term environment because human activities have seriously interfered with the natural world leading not only to habitat destruction and pollution but also to the extinction of a few species of flora and fauna. On a moral level, this has disturbed sensitive thinkers and scientists all over the world. If we go back to the etymology of the word 'environment', we find that it was used by the Scottish philosopher Carlyle (1795 – 1881) during 1828 AD and it was the translation of the German word '*umgebung*' used by Goethe, which meant 'area around something'.

The common Hindi or Marathi translation of the word environment is '*paryaavarana*' – the natural world. However, in the ancient Indian tradition we may not find the word '*paryaavarana*' but we find the use of the terms '*Vyashti*' and '*Samashti*'. '*Vyashti*' means single existence; and '*samashti*' means 'an aggregate which is considered to be made up of each of which is consubstantially the same as the whole'. If man correctly understands that he is only a part of the whole universe and dependent on nature, he will stop the misuse and mishandling of natural resources.

'*Vyashti*' and '*Samashti*' are deeply related to the earth. In Sanskrit we have the word '*pruthi'* for the earth. The root verb is '*prath'* meaning 'to expand'. Ancient Indian literature has given great respect to earth. Earth is revered as one of the five gross elements.

The sage Atharvana says,

"*tvajjaataastvayi charanti martyaastvam bibharshi dvipadastvam chatushpada*: | - - -
(Atharva Veda 12.1.15) (1400 BC)

"Oh earth, these human beings are born from you and they roam on you. You nourish bipeds and quadrupeds."

The sage Atharvana is full of praise for the earth and he says that the earth is full of nectar; she is infinite; for the one who looks at her without compassion, she will appear as full of stones and dust; but an enlightened person will understand her heart and she will also reveal her own real eternal nature to him. There is a continuous cycle of days and nights but her heart is always full of eternal truths.

The *Shatapatha Brahmana* (1000 BC)[1] (2.1.2) text indicates that the earth is round, revolves around herself and she holds the atmosphere.[2] In Vedic period a word for the earth was known as '*pari mandala*' (circular).

This is the philosophical background that gave rise to the custom of "*pruthvi pooja*" i.e. "the worship of earth" in Indian folk culture, because the earth was offered the status of a deity.

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(The dating in the present MS is according to Ghatge (1976-1978), but could be more ancient.)

2 '*Ancient Indian science and its relevance to the modern world'.* General editor Prof. K.E.Govindan - Edited by Prof. V. Murlidharan Sharma , Dr. Rani Sadashiva Murty , Dr. Shripad Bhat, Prof. N. Krishnaiah; Published by - Prof. K.E Govindan, Vice chancellor Rashtriya Sanskrit Vidyapeetha (Deemed Univeristy), Tirupati; 517507; Second edition Oct. 2005.

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