

# Environment Education for Ecosystem Conservation

T.V. Ramachandra





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*Editor*

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# Faunal Assemblages in *Myristica* Swamps of Central Western Ghats, Karnataka, India

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## INTRODUCTION

Tropical forests, which harbour most of the world's plant diversity, continue to be destroyed at unprecedented rates (Myers et al., 2000; Pittman & Jorgenson, 2002). The faunal species associated with these forests are also affected due to one or another reason. The wet evergreen forests of the Western Ghats of India are one of the global biodiversity hotspots, being rich in biodiversity and endemic species (Myers et al., 2000), it is also under the threat of deforestation. It harbours some of the relic elements in the remnant forests, which are in patchy distribution. *Myristica* swamps are one such threatened ecosystems occurring in these remnant forests of Western Ghats. They are undoubtedly priceless assets for the evolutionary biologist, since many features of Myristicaceae are primitive in origin and hence regarded as 'living fossils'.

## What are *Myristica* Swamps?

Swamps are wetlands dominated by woody plants. They have a fairly deep settlement of water and minimal growth of emergent plants. A marsh, though sometimes used synonymously with swamp, is more applicable to a large area of wetland where the dominant vegetation consists of low-lying grasses, rushes and sedges. Swamps have a high water table and occur near rivers, streams, and lakes. The soils are saturated (or soaked) with water. The soil is thick, black, and nutrient-rich, providing an environment for water tolerant

trees and other organisms. Freshwater swamps occur in many parts of the world, namely, Valleys of Mississippi, Odzala National Park, Congo, tributaries of Amazon, etc. In India, freshwater swamps are reported from the Siwalik and Doon Valley and the Brahmaputra Valley (Rao, 1994).

*Myristica* swamp is any freshwater swamp where any one or both of the exclusive swamp growing trees of the family Myristicaceae namely *Gymnacranthera canaria* or *Myristica fatua* var. *magnifica* are present. These swamp species may occur in association with some other, usually evergreen trees having varied degrees of flood tolerance.

## Distribution of *Myristica* Swamps

Davis et al. (1934), in their *working plan for North Mangalore Forest Division Madras* reported about "swampy evergreens" with *Myristica* spp. confined to low lying poorly drained areas, without specifying the exact locations. However, Krishnamoorthy (1960) reported *Myristica* swamps, for the first time, as a special type of habitat from Travancore. These swamps were found in the valleys of Shendurney, Kulathupuzha and Anchal forest ranges in the southern Western Ghats. Champion and Seth (1968) classified such swamps under a newly introduced category '*Myristica* Swamp Forests' under the Sub Group 4C. Talbot (1911), in *The Forest Flora of the Bombay Presidency and Sind vol II*, reported just one locality, near Malemane, in Siddapur of Uttara Kannda for *Myristica magnifica*. The northernmost swamp that is known is associated with a sacred grove in the Satari taluk of Goa (Santhakumaran et al., 1995). However, they have not reported *M. fatua* or *G. canarica* from the Goa locality. The photographs in their paper, however, are indicative of the presence of *G. canarica*, thereby meriting the classification of the habitat as a *Myristica* swamp.

Varghese and Kumar (1997) differentiate between two types of swamps having Myristicaceae, in the Travancore region: 1. *Myristica* swamp forest, restricted to below 300 m, fringing sluggish streams. 2. Tropical sub-montane hill valley swamp forest found as narrow strips of water-logged areas. Whereas, the former has *M. fatua* as well as *G. canarica*, in the latter, *G. canarica* is found along with *Mastixia arborea* and several others. Such bifurcation of these swamps does not have enough justification. The *Atlas of Endemics of the Western Ghats (India)* by Ramesh and Pascal (1997) shows that *G. canarica* and *M. fatua* occur from sea level to 700 m and 1000 m altitudes respectively.

More detailed studies on the *Myristica* swamps of Uttara Kannada in Central Western Ghats have been made recently. These swamps are isolated and situated in localities from near sea level to about 450 m altitude (Fig 1) (Chandran et al., 1999; Chandran and Mesta, 2001).



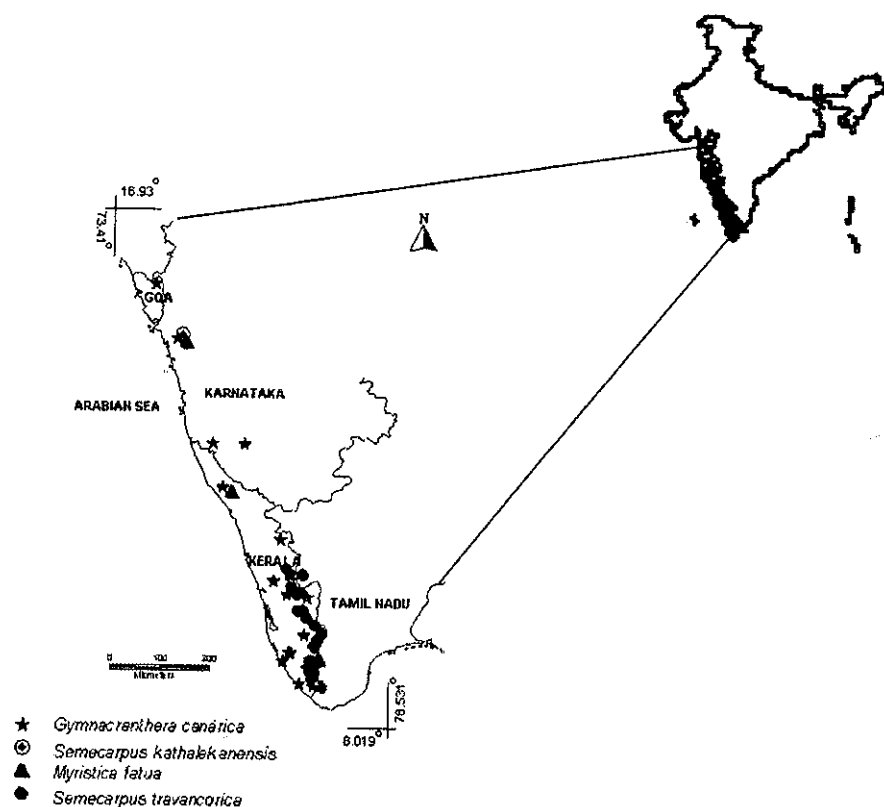


Fig. 1 *Myristica* swamps' distribution in Western Ghats

## STUDY AREA

The Uttara Kannada district, formerly North Kanara ( $13^{\circ}52''$  to  $15^{\circ}30''$ N and  $74^{\circ}05''$  to  $75^{\circ}5''$ E), is located towards the centre of the Western Ghats. The district with 10,250 km<sup>2</sup> of area is one of the most forested in South India with about 70% of the land under forest cover, including forest plantations. Here, the Western Ghats seldom exceed 700 m in altitude. The district is a maze of steep hills with narrow valleys. Tropical evergreen to semi-evergreen forests form the natural climax vegetation in most parts of the district, which receive 200 to 500 cm of rainfall. The survey has been carried out in five localities of Honnavar and Siddapur taluk (Fig. 2)

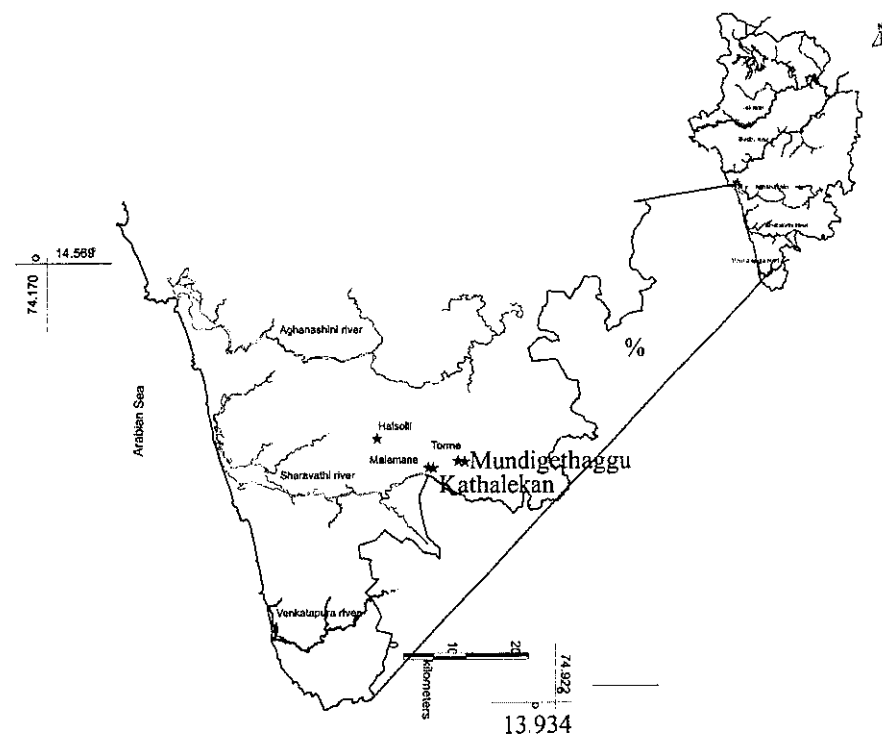


Fig. 2 Surveyed localities

## MATERIALS AND METHODS

The sampling has been carried out in five *Myristica* swamp localities namely, Kathalekan, Malemane, Torme, Halsoli and Mundigethaggu. The survey was a random opportunistic sampling visiting all the swamps and listing all the information regarding flora and fauna. For amphibians, time constrained samplings were carried out ( $2 \times 2$  man hours) from 17:30 to 19:30 hrs in five localities. During the survey, amphibians were searched using torchlight and also their vocal calls. Microhabitats like litter, wood logs, waterbodies, rocks, bushes, etc., were thoroughly searched. Keys of Daniel (1963a and b, 1975); Daniel and Sekhar (1989) and Daniels (1997a, b and c) were used for species identification.

Photographs and geographical co-ordinates of occurrence using Global positioning system (GPS) were noted. Specimens were identified with the help of regional and other floras for plants and faunal elements were identified with the help of literature and experts.



## RESULTS AND DISCUSSION

### Flora

The survey resulted in 64 trees, 24 species of shrubs and herbs (which include eight species of pteridophytes) (see Tables 1 and 2). As per the *Myristica* swamp definition it should have one or both exclusive swamp species viz., *Gymnacranthera canaria* or *Myristica fatua* var. *magnifica*. All five swamps have these trees as prominent tree species. Apart from these species *Myristica* swamps are also associated with some of the flood tolerant evergreens like, *Mastixia arborea*, *Calophyllum apetalum*, *Dipterocarpus indicus*, *Elaeocarpus tuberculatus*, and *Lophopetalum wightianum*. Recently one new species was described from the *Myristica* swamps of Uttara Kannada viz., *Semecarpus kathalekanensis* (Swaminath, 2000). Three surveyed swamps have this species in an isolated patch of few trees. The swamp has high level of Western Ghats endemism among trees; 34 species are endemics.

**Table 1** Checklist of tree species found in the five *Myristica* swamps

Sl.No.	Plant species	Distribution
1	<i>Gymnacranthera canaria</i>	Western Ghats endemic
2	<i>Mastixia arborea</i>	Western Ghats endemic
3	<i>Lophopetalum wightianum</i>	Indo-Malaysia
4	<i>Myristica fatua</i> var. <i>magnifica</i>	Western Ghats endemic
5	<i>Semecarpus kathalekanensis</i>	Western Ghats endemic (New species)
6	<i>Dipterocarpus indicus</i>	Western Ghats endemic
7	<i>Hopea wightianum</i>	Western Ghats endemic
8	<i>Hopea ponga</i>	Western Ghats endemic
9	<i>Olea dioica</i>	Western Ghats & N.E. India
10	<i>Dimocarpus longan</i>	Tropics
11	<i>Garcinia gummi-gutta</i>	Western Ghats, Sri Lanka
12	<i>Elaeocarpus tuberculatus</i>	Indo-Malaysia
13	<i>Caryota urens</i>	Tropical Asia
14	<i>Persea macaranta</i>	Western Ghats, Sri Lanka
15	<i>Hydnocarpus laurifolia</i>	Western Ghats endemic
16	<i>Holigarna grahamii</i>	Western Ghats endemic
17	<i>Syzygium laetum</i>	Western Ghats endemic
18	<i>Diospyros candolleana</i>	Western Ghats endemic
19	<i>Syzygium hemispermum</i>	South India, Sri Lanka
20	<i>Callicarpa tomentosa</i>	South India
21	<i>Holigarna arnotiana</i>	Western Ghats endemic
22	<i>Euonymus indicus</i>	Western Ghats endemic
23	<i>Syzygium macrocephala</i>	Western Ghats endemic
24	<i>Anthocephalus cadamba</i>	India, Sri Lanka, Sumatra, Borneo
25	<i>Vapris bilocularis</i>	Western Ghats endemic
26	<i>Alstonia scholaris</i>	S Asia through Malaysia to Australia & Melanesia

(contd.)

27	<i>Knema attenuata</i>	Western Ghats endemic
28	<i>Garcinia morella</i>	Indo-Malaysia
29	<i>Syzygium cumini</i>	Indo-Malaysia
30	<i>Holigarna ferruginea</i>	Western Ghats endemic
31	<i>Diospyros malabarica</i>	India, Sri Lanka
32	<i>Canarium strictum</i>	Western Ghats endemic
33	<i>Myristica malabarica</i>	Western Ghats endemic
34	<i>Mangifera indica</i>	Western Ghats endemic
35	<i>Aglaia elaeagnoidea</i>	Indo-Malaysia
36	<i>Paramignya monophylla</i>	India, Burma, Sri Lanka
37	<i>Myristica dactyloids</i>	South India, Sri Lanka
38	<i>Artocarpus hirsutus</i>	Western Ghats endemic
39	<i>Elaeocarpus serratus</i>	India including Tropical Himalayas
40	<i>Flaucortia montana</i>	Western Ghats endemic
41	<i>Aglaia anamallayana</i>	Western Ghats endemic
42	<i>Aporosa lindleyana</i>	Peninsular India, Sri Lanka
43	<i>Diospyros assimilis</i>	Western Ghats endemic
44	<i>Ficus nervosa</i>	India to Vietnam
45	<i>Syzygium gardneri</i>	Western Ghats, Sri Lanka
46	<i>Cyclostemon confertiflorus</i>	Western Ghats endemic
47	<i>Garcinia talbotii</i>	Western Ghats endemic
48	<i>Nothopegia colebrookeana</i>	Western Ghats endemic
49	<i>Cleidion</i> sp.	
50	<i>Beilschmedia fagifolia</i>	Western Ghats endemic
51	<i>Casearia elliptica</i>	India to Australia through Indo-Malaysia
52	<i>Macaranga peltata</i>	Peninsular India, Sri Lanka
53	<i>Murraya paniculata</i>	Indo-Malaysia
54	<i>Glochidion</i> sp.	
55	<i>Carallia brachita</i>	Continental Asia to N Australia
56	<i>Cinnamomum macrocarpum</i>	Western Ghats endemic
57	<i>Actinodaphne hookeri</i>	Western Ghats endemic
58	<i>Linociera malabarica</i>	Western Ghats endemic
59	<i>Ervatamia heyneana</i>	Western Ghats endemic
60	<i>Agrostistachys longifolia</i>	Central & Peninsular India
61	<i>Ixora brachiata</i>	Western Ghats endemic
62	<i>Miliusa indica</i>	Western Ghats, Sri Lanka
63	<i>Calophyllum polyanthum</i>	Western Ghats, Indo-Malaysia, China
64	<i>Symplocos racemosa</i>	Western Ghats endemic

Notable of the ground layer are rare shrubs and herbs like *Apama siliquosa*, *Ochlandra scriptoria*, *Calamus* spp., *Arenga wightii*, *Pandanus* spp., *Nothopodytes foetida*, *Alpinia malaccensis*, *Jerdonia indica*, *Neurocalyx calycinus*, *Begonia maabarica* and *Schumannnatus virgatus*. An aroid *Lagenandra ovata*, and *Elatostemma lineolatum* and *Pellionia heyneana*, both members of Urticaceae, are found abundantly in all the surveyed swamps. *Pinanga dicksonii*, a slender endemic palm of the Western Ghats, grows gregariously in all the swamps. In case of ground layer seven species are



endemic to Western Ghats. The notable of the Pteridophytes are *Angiopteris evecta*, *Bolbitis appendiculata*, *Cyathea nilgiriensis*, *Osmunda regalis*, *Pronephrium triphyllum*, *Selaginella*, *Pteris*, *Staenochlaena palustris* and *Tectaria wightii*.

**Table 2** Checklist of shrubs and herbs (including pteridophytes) species found in the five *Myristica* swamps

Sl. No.	Plant species	Remarks
1	<i>Alpinia malaccensis</i>	Indo-Malaysia
2	<i>Jerdonia indica</i>	Western Ghats endemic
3	<i>Neurocalyx calycinus</i>	Western Ghats endemic
4	<i>Schumannianthus virgatus</i>	Western Ghats, Sri Lanka
5	<i>Lagenandra ovata</i>	Western Ghats, Sri Lanka
6	<i>Elatostemma lineolatum</i>	India
7	<i>Pellionia heyneana</i>	Western Ghats, Sri Lanka
8	<i>Pinanga dicksonii</i>	Western Ghats endemic
9	<i>Apama siliquosa</i>	Western Ghats, Sri Lanka
10	<i>Ochlandra scriptoria</i>	Western Ghats endemic
11	<i>Calamus</i> sp.	
12	<i>Arenga wightii</i>	Western Ghats endemic
13	<i>Pandanus</i> sp.	
14	<i>Nothopodytes foetida</i>	China, India, Malaysia
15	<i>Begonia maabarica</i>	Western Ghats endemic
16	<i>Argostemma courtallense</i>	Western Ghats endemic

#### Pteridophytes

- 1 *Angiopteris evecta*
- 2 *Bolbitis appendiculata*
- 3 *Cyathea nilgiriensis*
- 4 *Osmunda regalis*
- 5 *Pronephrium triphyllum*
- 6 *Pteris* sp.
- 7 *Staenochlaena palustris*
- 8 *Tectaria wightii*

#### Fauna

These swamps also harbour many endemic and endangered fauna of the Western Ghats. The survey resulted in 15 species of mammals, 59 species of birds, 22 species of reptiles (including snakes), 29 species of amphibians, 16 species of fishes, 109 species of butterflies and six species of damselflies.

About six species of damselflies are found in these swamps (see Table 3) including *Phylloneura westermanni*, which is a range extension from Coorg and Wayanad. Other species are, Clear-winged Forest glory (*Vestalis gracilis*), Malabar torrent dart (*Euphea fraseri*), Stream ruby (*Rhinocypha bisignata*), Black-tipped forest glory (*Vestalis apicalis*) and Pied reed tail (*Protosticta*

*gravelyi*). Most of the species are found along the perennial stream inside the swamp. Clear-winged Forest glory (*Vestalis gracilis*) is found in the undergrowth of interior forest areas.

**Table 3** Checklist of Damselflies found in the five *Myristica* swamps

Sl. No.	Scientific name	Common name
1	<i>Phylloneura westermanni</i>	<i>Myristica</i> swamp Bamboo tail
2	<i>Vestalis gracilis</i>	Clear-winged Forest glory
3	<i>Vestalis apicalis</i>	Black-tipped Forest glory
4	<i>Rhinocypha bisignata</i>	Stream ruby
5	<i>Euphaea fraseri</i>	Malabar torrent dart
6	<i>Protosticta gravelyi</i>	Pied reed tail

About 109 species of butterflies representing five families (see Table 4) are found in the *Myristica* swamps. Family Nymphalidae is dominated by 43 species followed by Papilionidae 16, Pieridae 13, Lycaenidae 18 and Hesperidae 19 species. Many species are found basking in the open canopy areas. Malabar tree nymph (*Idea malabarica*), an endemic species found in moist, shady areas and in two swamps was observed to form congregations. Evening browns and Bush browns of family nymphalidea are found in the thick litter covered areas and in the vicinity of *Ochlandra scriptoria*, *Calamus* spp. The members of the family Hesperidae are found in the swamp edges, grasslands and open canopy areas.

**Table 4** Checklist of butterflies found in the five *Myristica* swamps

Sl. No.	Scientific name	Common name
Family Papilionidae		
1	<i>Troides minos</i> Cramer	Southern Birdwing (WG)
2	<i>Pachliopta aristolochiae</i>	Fabricius Common Rose
3	<i>Pachliopta hector</i> L.*	Crimson Rose (PI&SL)
4	<i>Graphium sarpedon</i> L.	Common Bluebottle
5	<i>Graphium doson</i> C&R Felder	Common Jay
6	<i>Graphium Agamemnon</i> L.	Tailed Jay
7	<i>Graphium nomius</i> Esper	Spot Sword Tail
8	<i>Graphium antiphates</i> Cramer	Fivebar Swordtail
9	<i>Papilio liomedon</i> Moore*	Malabar Banded Swallow Tail (WG)
10	<i>Papilio dravidarum</i> Wood-Mason	Malabar Raven (WG)
11	<i>Papilio helenus</i> L.	Red Helen
12	<i>Papilio polytes</i> L.	Common Mormon
13	<i>Papilio polymnestor</i> Cramer	Blue Mormon (PI&SL)
14	<i>Papilio paris</i> L.	Paris Peacock
15	<i>Papilio Buddha</i> Westwood	Buddha Peacock
16	<i>Papilio crino</i> Fabricius	Common Banded Peacock

(contd)



Table 4 (contd.)

Sl. No.	Scientific name	Common name
Family Pieridae		
1	<i>Catopsilia pomona</i> Fabricius	Common Emigrant
2	<i>Eurema brigitta</i> Cramer	Small Grass Yellow
3	<i>Eurema laeta</i> Boisduval	Spotless Grass Yellow
4	<i>Eurema hecabe</i> L.	Common Grass Yellow
5	<i>Delias eucharis</i> Drury	Common Jezebel (PI & SL)
6	<i>Leptosia nina</i> Fabricius	Psyche
7	<i>Appias albina</i> Boisduval	Common Albatross
8	<i>Colotis etrida</i> Boisduval	Small Orange Tip
9	<i>Colotis danae</i> Fabricius	Crimson Tip
10	<i>Ixias pyrene</i> L.	Yellow Orange Tip
11	<i>Pareronia valeria</i> Cramer	Common Wanderer
12	<i>Pareronia ceylanica</i> C&R Felder	Dark Wanderer (PI&SL)
13	<i>Hebomoia glaucippe</i> L.	Great Orange Tip
Family Nymphalidae		
1	<i>Melanitis leda</i> L.	Common Evening Brown
2	<i>Melanitis phedima</i> Stoll	Dark Evening Brown
3	<i>Elymnias hypermenstra</i> L.	Common Palmfly
4	<i>Mycalesis anaxias</i> Hewitson	White-bar Bushbrown
5	<i>Mycalesis perseus</i> Fabricius	Common Bushbrown
6	<i>Mycalesis patnia</i> Moore	Glad-eye Bushbrown (PI&SL)
7	<i>Orsotrioena medus</i> Fabricius	The Nigger
8	<i>Zipoetis saitis</i>	Tamil Catseye (WG)
9	<i>Ypthima asterope</i> Klug	Common Three-ring
10	<i>Ypthima hiebnieri</i> Kirby	Common Four-ring
11	<i>Polyura athamas</i> Drury	Common Nawab
12	<i>Acraea violae</i> Fabricius	Tawny Coster
13	<i>Cethosia nietneri</i> C&R Felder	Tamil Lacewing (PI&SL)
14	<i>Vindula erota</i> Fabricius	Cruiser
15	<i>Cupha erymanthis</i> Drury	Rustic
16	<i>Phalanta phalantha</i> Drury	Common Leopard
17	<i>Cirrochroa thais</i> Fabricius	Tamil Yeoman (PI&SL)
18	<i>Neptis jumbah</i> Moore	Chestnut-streaked Sailer
19	<i>Neptis hylas</i> Moore	Common Sailer
20	<i>Pantoporia hordonia</i> Stoll	Common Lascar
21	<i>Athyma perius</i> L.	Common Sergeant
22	<i>Limenitis procris</i> Cramer	Commander
23	<i>Parthenos sylvia</i> Cramer	Clipper
24	<i>Tanaecia lepidea</i> Butler	Grey Count
25	<i>Euthalia aconthea</i> Cramer	Common Baron
26	<i>Dolpha evelina</i> Stoll	Red-spot Duke
27	<i>Ariadne merione</i> Cramer	Common Castor
28	<i>Ariadne ariadne</i> L.	Angled Castor
29	<i>Cyrestis thyodamas</i>	Map

(contd.)

30	<i>Libythea lepita</i> Moore	Common Beak
31	<i>Junonia lemonias</i> L.	Lemon Pansy
32	<i>Junonia almana</i> L.	Peacock Pansy
33	<i>Junonia atlites</i> L.	Grey Pansy
34	<i>Junonia iphita</i> Cramer	Chocolate Pansy
35	<i>Cynthia cardui</i> L.	Painted Lady
36	<i>Hypolimnas bolina</i> L.	Great Eggfly
37	<i>Hypolimnas misippus</i> L *	Danaid Eggfly (PI&SL)
38	<i>Kallima horsfieldi</i> Kollar	South Indian Blue Oak Leaf (WG)
39	<i>Tirumala limniace</i> Cramer	Blue Tiger
40	<i>Tirumala septentrionis</i> Butler	Dark Blue Tiger
41	<i>Danaus genutia</i> Cramer	Striped Tiger
42	<i>Euploea core</i> Cramer	Common Indian Crow
43	<i>Idea malabarica</i> Moore	Malabar Tree Nymph (WG)
Family Lycaenidae		
1	<i>Abisara echerius</i> Stoll	Plum Judy
2	<i>Castalius rosimon</i> Fabricius	Common Pierrot
3	<i>Caleta caleta</i> Hewitson	Angled Pierrot
4	<i>Actolepis puspa</i> Horsfield	Common Hedge Blue
5	<i>Zizula hylax</i> Fabricius	Tiny Grass Blue
6	<i>Chilades laius</i> Stoll	Lime Blue
7	<i>Lampides boeticus</i> L.,	Pea Blue
8	<i>Jamides bochus</i> Cramer	Dark Cerulean
9	<i>Jamides celeno</i> Cramer	Common Cerulean
10	<i>Nacaduba pactolus</i>	Large four line blue
11	<i>Arhopala amantes</i> Hewitson	Large Oakblue
12	<i>Thaduka multicaudata</i> Moore	Many-tailed Oakblue
13	<i>Amblypodia anita</i> Hewitson	Leaf Blue
14	<i>Spindasis vulcanus</i> Fabricius	Common Silverline
15	<i>Loxura atymnus</i>	Yamfly
16	<i>Rathinda amor</i>	Monkey Puzzle
17	<i>Zeltus amasa</i>	Fluffy tit
18	<i>Rapala varuna</i> Moore	Indigo Flash
Family Hesperidae		
1	<i>Hasora chromus</i> Cramer	Common Banded Awl
2	<i>Hasora badra</i> Moore	Common Awl
3	<i>Badamia exclamations</i> Fabricius	Brown awl
4	<i>Celaenorrhinus leucocera</i> Kollar	Common Spotted Flat
5	<i>Celaenorrhinus ambareesa</i> Moore	Malabar Spotted Flat
6	<i>Tagiades litigiosa</i> Moschler	Water Snow Flat
7	<i>Sarangesa dasahara</i> Moore	Common Small Flat
8	<i>Sarangesa purendra</i> Moore	Spotted Small Flat (WG)
9	<i>Spialia galba</i> Fabricius	Indian Grizzled Skipper
10	<i>Ampittia dioscorides</i>	Bush Hopper
11	<i>Lambrix salsala</i> Moore	Chestnut Bob
12	<i>Notocrypta curvifascia</i> C & R Felder	Restricted Demon

(contd.)



Table 4 (contd.)

Sl. No.	Scientific name	Common name
13	<i>Udaspes folus</i> Cramer	Grass Demon
14	<i>Suastus gremius</i> Fabricius	Indian Palm Bob
15	<i>Gangara thyrasis</i> Fabricius	Giant Redeye
16	<i>Taractrocera maevius</i> Fabricius	Common Grass Dart
17	<i>Talicota colon</i> Fabricius	Pale Palm Dart
18	<i>Borbo cinnara</i> Wallace	Rice Swift
19	<i>Pelopidas mathias</i>	Small branded swift

Note \* indicates Endangered species.

Sixteen species of fishes are found in the perennial streams of these swamps (see Table 5). Most of them are generalist species found in the Western Ghats. *Garra gotyla stenorhynchus*, *Rasbora daniconius* and *Danio aequipinnatus* are prominent species.

Table 5 Checklist of fishes found in the five *Myristica* swamps

Sl. No.	Family	Scientific name	Distribution
1	Bagridae	<i>Mystus malabaricus</i>	Endemic to Western Ghats
2	Cyprinidae	<i>Garra gotyla stenorhynchus</i>	Endemic to Western Ghats
3	Cyprinidae	<i>Salmostoma boopis</i>	Endemic to Western Ghats
4	Channidae	<i>Channa orientalis</i>	India
5	Cyprinidae	<i>Puntius ticto</i>	India
6	Cyprinidae	<i>Rasbora daniconius</i>	India
7	Siluridae	<i>Ompok bimaculatus</i>	India
8	Aplocheilidae	<i>Aplocheilus lineatus</i>	Southern India
9	Balitoridae	<i>Schistura denisonii densisonii</i>	Southern India
10	Cyprinidae	<i>Danio aequipinnatus</i>	Southern India
11	Cyprinidae	<i>Puntius fasciatus</i>	Southern India
12	Cyprinidae	<i>Puntius filamentosus</i>	Southern India
13	Cyprinidae	<i>Puntius</i> sp.	
14	Balitoridae	<i>Schistura</i> sp.	
15	Balitoridae	<i>Schistura</i> sp.	
16	Synbranchidae	<i>Monopterus</i> sp.	

About 29 species of amphibians are listed from the five *Myristica* swamps (see Table 6). Order Anura comprises eight families and Gymnophiona comprises the family Ichthyophiidae. The family Dicoglossidae and Rhacophoridae comprises seven species each, whereas the family Nyctibatrachidae and Ranidae comprise three species each. Some of the notable species are *Micrixalus saxicola*, *Nyctibatrachus major*, *N. petraeus*, *Philautus ponmudi*, *P. neelanethrus*, *Polypedatus pseudocruciger* and *Rhacophorus malabaricus*.

Table 6 Checklist of amphibians found in the five *Myristica* swamps

Family	Species	Distribution	IUCN status
Bufoniidae	<i>Bufo scaber</i>		LC
	<i>Bufo melanostictus</i>		LC
Microhylidae	<i>Ramnella montana</i>	Western Ghats	NT
	<i>Microhyla ornata</i>		LC
Micrixalidae	<i>Micrixalus saxicola</i>	Western Ghats	VU
Nyctibatrachidae	<i>Nyctibatrachus cf. aliciae</i>	Western Ghats	EN
	<i>Nyctibatrachus major</i>	Western Ghats	VU
	<i>Nyctibatrachus petraeus</i>	Western Ghats	LC
Petroedetidae	<i>Indirana beddomi</i>	Western Ghats	LC
	<i>Indirana semipalmata</i>	Western Ghats	LC
Dicoglossidae	<i>Fejervarya brevipalmata</i>	Western Ghats	DD
	<i>Fejervarya limnocharis</i>		LC
	<i>Fejervarya syhadrensis</i>		LC
	<i>Fejervarya rufescence</i>	Western Ghats	LC
	<i>Sphearotheca breviceps</i>		LC
	<i>Hoplobatrachus tigrinus</i>		LC
	<i>Euphlyctes cyanophlyctis</i>		LC
	<i>Hydrophylax malabarica</i>		LC
	<i>Sylvirana temporalis</i>	Western Ghats	NT
	<i>Sylvirana</i> sp.		
Rhacophoridae	<i>Philautus tuberosus</i>	Western Ghats	DD
	<i>Philautus cf. leucorhinus</i>	Western Ghats	
	<i>Philautus</i> sp.	Western Ghats	
	<i>Philautus cf. luteolus</i>	Western Ghats	DD
	<i>Philautus ponmudi</i>	Western Ghats	CR
	<i>Polypedates pseudocruciger</i>	Western Ghats	LC
	<i>Rhacophorus malabaricus</i>	Western Ghats	NT
Ichthyophiidae	<i>Ichthyophis beddomei</i>	Western Ghats	LC
	<i>Ichthyophis</i> sp.	Western Ghats	

Note: CR: Critically endangered, EN: Endangered, VU: Vulnerable, DD: Data deficient, NT: Near threatened, LC: Least concern

Twenty-one species of reptiles include 13 species of snakes found in the surveyed swamps (see Table 7). The notable snakes are Python (*Python molurus*), King cobra (*Ophiophagus hannah*), Humpnosed pit viper (*Hypnale hypnale*), Malabar pit viper (*Trimerisurus malabaricus*), Trinket snake (*Elaphe helena helena*), etc.



Table 7 Checklist of reptiles found in the five *Myristica* swamps

Sl No.	Common name	Scientific name	IUCN status
1	Common Indian Monitor Lizard	<i>Varnus bengalensis</i>	VU
2	Flapshell turtles	<i>Lissemys punctata</i>	LRnt
3	Gunther's Supple Skink	<i>Lygosoma guentheri</i> *	LRnt
4	King Cobra	<i>Ophiophagus hannah</i>	LRnt
5	The Cobra	<i>Naja naja</i>	LRnt
6	Hump-nosed Pit Viper	<i>Hypnale hypnale</i>	LRnt
7	Malabar Pit Viper	<i>Trimersurus malabaricus</i> *	LRnt
8	Bronzebacked Tree Snake	<i>Dendrelaphis tristis</i>	LRlc
9	The Vine Snake	<i>Ahaetulla nasuta</i>	LRnt
10	Indian Ornate Flying Snake	<i>Chrysopelea ornata</i>	LRnt
11	Common Indian Trinket Snake	<i>Elaphe helena helena</i>	LRnt
12	Checkered Keelback	<i>Xenochrophis piscator piscator</i>	LRlc
13	Common Sand Boa	<i>Eryx conicus conicus</i>	LRnt
14	Shieldtail	<i>Uropeltis</i> sp.*	
15	The Rat Snake	<i>Ptyas mucosus</i>	LRnt
16	Python	<i>Python molurus</i>	LRnt
17	Lizard	<i>Calotes</i> sp.	
18	Roux's Forest Lizard	<i>Calotes rouxi</i>	LRnt
19	Deccan Ground Gecko	<i>Geckoella dekkannensis</i>	VU
20	Gecko	<i>Cnemaspis</i> sp	
21	Western Ghats Flying Lizard	<i>Draco dussumieri</i>	LRnt

Note: \*indicates Western Ghats endemic.

VU: Vulnerable, LRnt: Lower risk near threatened, LRlc: Lower risk least concern

About 59 species of birds are found in these swamps (see Table 8). Some of the endemic species like, Wynaad laughing thrush (*Garrulax delesserti*), Great pied hornbill (*Buceros bicornis*), and Bluewinged parakeet (*Psittacula columboides*) are found in all the five surveyed swamps. Indian great horned owl (*Bubo bubo* L.) is a common species found in the riparian vegetation of Kathalekan, Halsolli and Torme swamps. Other species like, Fairy bluebird (*Irena puella*), Malabar whistling Thrush (*Myiophonus horsfieldii*) and Wagtails are found along the perennial streams.

Table 8 Checklist of birds found in the five *Myristica* swamps

Sl. No.	Family	Sub-family	Common name	Scientific name
1	Accipitridae	Crested serpent eagle		<i>Spilornis cheela</i> (Latham)
2	Phasianidae	Grey jungle fowl		<i>Gallus sonneratii</i> Temminck

(contd.)

3		Common pea fowl	<i>Pavo cristatus</i> L.
4	Columbidae	Orangebreasted green pigeon	<i>Treron pompadora</i> (Jerdon)
5		Greyfronted green pigeon	<i>Treron pompadora</i> (Gmelin)
6		Green imperial pigeon	<i>Ducula aenea</i> L.
7		Emerald dove	<i>Chalcophaps indica</i> L.
8	Psittacidae	Blossomheaded parakeet	<i>Psittacula cyanocephala</i> (L.)
9		Lorikeet	<i>Loriculus vernalis</i> (Sparrman)
10		Bluewinged parakeet	<i>Psittacula columboides</i> (Vigors)*
11	Cuculidae	Cuckoo	<i>Cuculus canorus</i> L.
12		Koel	<i>Eudynamis scolopacea</i> L.
13		Sirkeer cuckoo	<i>Taccocua leschenaultii</i> Lesson
14		Crow-pheasant	<i>Centropus sinensis</i> Stephens
15	Strigidae	Striginae	Forest eagle-owl
			<i>Bubo nipalensis</i> Hodgson
16		Indian great horned owl	<i>Bubo bubo</i> L.
17	Alcedinidae	Small blue kingfisher	<i>Alcedo atthis</i> L.
18	Meropidae	Small green bee-eater	<i>Merops orientalis</i> (Latham)
19	Upupidae	Hoopoe	<i>Upupa epops</i> L.
20	Bucerotidae	Malabar grey hornbill	<i>Tockus griseus</i> Latham
21		Great pied hornbill	<i>Buceros bicornis</i> L. *
22		Malabar pied hornbill	<i>Anthraceroceros malabaricus</i> Boddaert*
23	Capitonidae	Crimson throated barbet	<i>Megalaima rubricapilla</i> Gmelin
24		Small green barbet	<i>Megalaima viridis</i> Boddaert
25		Large green barbet	<i>Megalaima zeylanica</i> Gmelin
26	Picidae	Indian goldenbacked threetoed woodpecker	<i>Dinopium javanense</i> (Ljungh)
27		Great black woodpecker	<i>Dryocopus javensis</i> (Horsfield)

(contd.)



Table 8 (contd.)

Sl. No.	Family	Sub-family	Common name	Scientific name
28			Heartspotted woodpecker	<i>Hemicircus canente</i> L.
29	Hirundinidae		Swallow	<i>Hirundo rustica</i> L.
30	Oriolidae		Golden oriole	<i>Oriolus oriolus</i> L.
31	Dicruridae		Racket-tailed drongo	<i>Dicrurus paradiseus</i> L.
32	Sturnidae		Hill myna	<i>Gracula religiosa</i> L.
33	Corvidae		House crow	<i>Corvus splendens</i> Vieillot
34			Tree pie	<i>Dendrocitta vagabunda</i> (Latham)
35	Campephagidae		Scarlet minivet	<i>Pericrocotus roseus</i> (Forster)
36	Irenidae		Iora	<i>Aegithina tiphia</i> L.
37			Goldmantled chloropsis	<i>Chloropsis cochinchinensis</i> (Gmelin)
38			Fairy bluebird	<i>Irena puella</i> (Latham)
39	Pycnonotidae		Redvented bulbul	<i>Pycnonotus cafer</i> L.
40			Rubythroated bulbul	<i>Pycnonotus melanicterus gularis</i> Gould
41			Greyheaded bulbul	<i>Pycnonotus priocephalus</i> Jerdon
42			Yellowbrowed bulbul	<i>Hypsipetes indicus</i> (Jerdon)
43	Muscicapidae	Timaliinae	Rufous babbler	<i>Turdoides subrufus</i> (Jerdon)
44			Blackheaded babbler	<i>Rhopocichla atriceps</i>
45			Jungle babbler	<i>Turdoides striatus</i> (Dumont)
46		Muscicapinae	Paradise flycatcher	<i>Terpsiphone paradise</i> L.
47			Redbreasted flycatcher	<i>Muscicapa ruficauda</i> Swainson
48			Verditer flycatcher	<i>Muscicapa thalassina</i> Swainson
49		Turdinae	Blue rock thrush	<i>Monticola solitarius</i> L.
50			Malabar whistling thrush	<i>Myiophonus horsfieldii</i> (Vigors)
51			Wynaad laughing thrush	<i>Garrulax delesserti</i> (Jerdon)

Note \* indicates Western Ghats endemic.

About 15 species of mammals are found in these swamps (see Table 9), which include an endemic and endangered primate Lion tailed macaque (*Macaca silenus*). This species is associated with the relics of the primary forests in Siddapur, having the Myristica swamps and *Dipterocapus*

Table 9 Checklist of mammals found in the five Myristica swamps

Sl No	Common name	Scientific name	IUCN status
1	Common Langur	<i>Semnopithecus entellus</i>	Lr-lc
2	Lion tailed Macaque	<i>Macaca silenus</i> *	EN
3	Small Indian Civet	<i>Viverricula indica</i>	Lr-nt
4	Grey Mongoose	<i>Herpestes endwardsii</i>	Lr-lc
5	Small Indian Mongoose	<i>Herpestes javanicus</i>	Lr-lc
6	Three-striped Palm Squirrel	<i>Funambulus palmarum</i>	Lr-lc
7	Indian Giant Squirrel	<i>Ratufa indica indica</i> *	VU
8	Common Giant Flying Squirrel	<i>Petaurista petaurista</i>	Lr-nt
9	Indian Porcupine	<i>Hystrix indica</i>	Lr-lc
10	Indian Pangolin	<i>Manis crassicaudata</i>	Lr-nt
11	Black-naped Hare	<i>Lepus nigricollis</i>	Lr-lc
12	Wild Boar	<i>Sus scrofa cristatus</i>	Lr-lc
13	Indian Spotted Chevrotain or Mouse Deer	<i>Tragulus meminna</i>	Lr-nt
14	Sambar	<i>Cervus unicolor</i>	Lr-lc
15	The Gaur or Indian Bison	<i>Bos gaurus</i>	VU

Note: \* indicates Western Ghats endemic.

EN: Endangered, VU: Vulnerable, LRnt: Lower risk near threatened, LRlc: Lower risk least concern

## CONCLUSION

In Myristica swamp the perennial streams and its associated flora harbour many of the endemic and endangered fauna of the Western Ghats. The swamp and its immediate surrounding forests have a number of wild fruit bearing trees which include *Garcinia*, *Myristica*, *Syzygium*, *Holigarna*, members of Lauraceae, Meliaceae, Myrtaceae, etc. which provide food for many wild mammals and birds. Due to high watershed value and ecological value, it is necessary to conserve and document the biodiversity of these swamps in a proper way.

In the study area most swamps are presumably extinct due to human impacts of various kinds. The swamps are encroached for agricultural lands and areca plantations. The two of the studied swamps are at risk of disappearance due to areca plantations. The pressure is mounting on the last traces of the remaining swamps due to mainly ignorance about the value and evolutionary significance of these ancient patches of forests. Rich biodiversity of swamps along with the evolutionary significance demand the immediate



policy measures to conserve these *Myristica* swamps— fragile ecosystems in remnant forest patches of Uttara Kannada. Special efforts should be made to locate more of these swamps lying hidden in the recesses of the Western Ghats.

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