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A Preliminary Checklist of Amphibians in and around the *Myristica* swamp forests of Kulathupuzha, South Western Ghats

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ABSTRACT

The *Myristica* swamps are famed for its charismatic and archaic vegetation but studies documenting the animal wealth of these swamps were almost negligible. In this study we list the amphibians recorded between Nov 2004 to March 2008 from the Myristica swamp forests of Southern Kerala and adjoining forests. We documented the presence of 56 species of amphibians belonging to 15 genera and five families. Maximum number of species was recorded from Kulathupuzha Forest Range (50) followed by Shendurney Wildlife Sanctuary (43). Anchal Range had the least number of species (15). Similarity indices indicate high species turnover between the swamps and the adjacent areas. Twenty species were endemic to the Western Ghats and one each were endemic to Kerala and India. The loss of these forests will be detrimental to the amphibian population and ecological balance of the region.

Keywords: *Myristica* swamp forests, amphibians, biodiversity, conservation.

1. Introduction

The Western Ghats, is perhaps the most diagnostic component in the landscape of peninsular India [1] providing a mosaic of ecosystems. These ecosystems comprise moist deciduous forests, montane rainforests, lowland evergreen forests, montane grasslands and highly threatened, fragmented and restricted ecosystems like the shola complexes and *Myristica* swamp forests. Many reports have provided details about diversity, distribution patterns and ecology of amphibians in the Western Ghats but there is very less data on the herpetofauna of *Myristica* swamp forests, a very specialized, fragmented and limited ecosystem. The effect of swamp size and anthropogenic disturbance on frog assemblage in the *Myristica* swamps of Uttara Kannada was studied and 26 species of amphibians belonging to four families were recorded [2]. A later study [3] reported 29 species of amphibians after sampling in five swamp localities of Uttara Kannada. In Kerala, studies are by our group [4, 5, 6, 7, 8, 9, 10]. We present the checklist of amphibians in the Myristica Swamp forests of Southern Kerala and adjacent forests in this report.

2. Methodology

2.1 Study Area

Myristica swamps were first described from Kulathupuzha, Kerala State [11] and classified in the sub-group, tropical fresh water forests (4c/FS1)[12]. Much of the *Myristica* swamps have been converted to paddy fields [13] and the ecosystem has been highlighted as most critically needing conservation [14]. Other descriptions of Myristica swamps in India include [15, 16, 17, 18]. As special abiotic conditions [15, 19] are prerequisites for the development of *Myristica* swamp forests, these swamp forests have become highly restricted and fragmented.

In Kerala, these swamps make up just about 0.01% of the total land area of the state [20] .The *Myristica* swamps in the Kulathupuzha region have been reported from the flat-bottomed ill-drained valleys of first order streams in Anchal and Kulathupuzha Forest Ranges and Shendurney Wildlife Sanctuary (Fig 1 a). These swamps lie between (77º0" and 77º55" E and 8 º0"and 8 º55"N, below 200 MSL). The dominant vegetation is trees belonging to *Myristicaceae* family which show adaptations to overcome the marshy conditions (Fig1 b). *Pandanus*, canes and reeds dominate the undergrowth. A variety of lianas are also present [20]. The current paper is based on data obtained from field work for two years (2005 March to 2008 Feb).

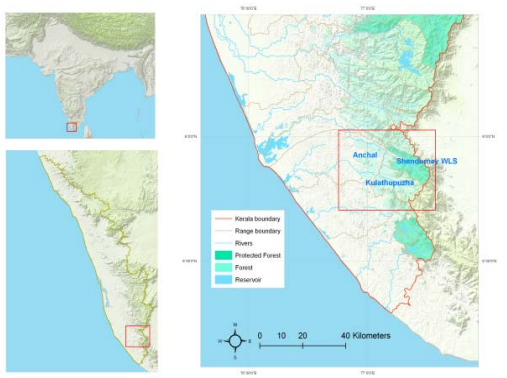

Fig 1 a: Location of study area

Fig 1 b: View of a *Myristica* swamp

Fig 1 a. and 1 b.: The *Myristica* swamp forests of Southern Kerala are situated in the Anchal and Kulathupuzha Forest Ranges and Shendurney Wildlife Sanctuary. The dominant vegetation is trees belonging to *Myristicaceae* family which show adaptations to overcome the marshy conditions

2.2 Sampling Methodology

We studied the amphibian diversity of the *Myristica* swamps in Kulathupuzha region using Visual Encounter Survey [21] to prepare the inventory and linear quadrates [22, 23] to quantify diversity. Inventory was compiled from the data obtained from Anchal and Kulathupuzha Forest Ranges and Shendurney Wildlife Sanctuary. Tree trunks were scanned to a height of 2 m [21]. Opportunistic sightings were also recorded. Amphibians were collected in transparent plastic jars by hand, photographed, measured and released. Minimum number of Voucher specimens were retained per species. Photographic vouchers were also maintained. Identification was made using available literature [24, 25, 26, 27, 28, 29] and by seeking expert opinion. Permission for entering protected areas and reserve forests and collection of specimens was obtained from the Ministry of Environment and Forest and the Forest Department. Our vouchers are deposited with the Wild Life Museum of Kerala Forest Research Institute, Peechi, Thrissur. Appropriate statistical tests (Wilcoxon signed-rank test and Jaccard's and Sorenson's similarity coefficients) were used where needed.

3. Results and Discussion

We documented the presence of 56 species of amphibians belonging to 15 genera and five families. Maximum number of species was recorded from Kulathupuzha Forest Range (50) followed by Shendurney (43). Anchal had the least number of species (15) (Table 1, Plates 1, 2, 3 and 4). There is a significant difference in the amphibian species richness of Anchal with that Kulathupuzha and Shendurney {(Wilcoxon signed-rank test; Anchal and Kulathupuzha ($T = 0$; in all cases Kulathupuzha has higher or equal values); Anchal and Shendurney ($T = 15.5$; $p \leq 0.05$)}. In the case of Shendurney and Kulathupuzha, no significant difference was found in the species richness of amphibians.

Jaccard's coefficient of similarity based on qualitative data (15 transects x 24 months) showed up to 58% similarity (Jaccard measure 0.577778) in the amphibian species composition outside and inside the swamps whereas Sorenson's measure computed was 0.73294 indicating up to 73% similarity which indicate high species turnover between the swamps and the adjacent areas.

Twenty species were endemic to the Western Ghats and one each were endemic to Kerala and India.

Several controversies in amphibian taxonomy, especially for the genus *Philautus* are yet to be cleared. It has been stated [30, 31] that *P. variabilis, P. leucorhinus* are actually extinct in India and that reports of these species from India are of *P. wynaadensis* an endangered species. Yet publications concerning *P. variabilis* and P. *leucorhinus* have since appeared in rated journals [32, 33] and in a book [27]. While several new amphibian species have been reported from the Western Ghats in the recent past [34, 35, 36, 37, 38] there have also been several debates on the authenticity of some of the reports, especially concerning the genus *Philautus* [39, 40]. As it is not in the scope of the present study to solve these problems or to enter the debate, amphibian classification proposed by Dutta [28] has been followed.

4. Conclusion

The checklist we present in Table 1 is the first qualitative baseline data for amphibians found throughout the endangered Myristica swamp forests of Southern Kerala. It provides a database for policy and planning concerning these swamp forests. The loss and desiccation of rich ecosystems like *Myristica* swamps and the accompanied alteration in vegetation will eventually affect the composition and structure of animal populations in irreversible ways [7]. We hope that our report stimulates conservation and management initiatives for the *Myristica* swamp forests and the amphibian biodiversity it supports.

Table 1: Checklist of Amphibians of *Myristica* Swamps and presence- absence data in the three forest ranges

S. No.		Binomial	Anchal	Kulathupuzha	Shendurney	Endemicity	IUCN Status	**Occurrence
1.	Ichthyophiidae	Ichthyophis cf tricolor (Annandale) $	-	+	-	EN WG		*R*
2.		Ichthyophis sp.	-	+	-			*R*
3.	Bufonidae	*Bufo melanostictus* Schneider	+	+	+			*C*
4.		*Bufo parietalis* Boulenger	-	+	+	EN WG	LRnt	R
5.		*Bufo* cf *microtympanum* Boulenger	-	+	+		Vu	R
6.	Microhylidae	*Kaloula taprobanica* (Parker)	-	+	+			R
7.		*Ramanella triangularis* (Günther)	-	+	-	EN WG	Vu	R
8.	Rhacophoridae	Philautus cf variabilis (Günther)	+	+	+	EN I	Ex+*	C
9.		*Philautus* cf *flaviventris* (Boulenger)	+	+	+	EN WG	DD	O
10.		*Philautus* cf *temporalis* (Günther)	+	+	+	EN WG	Ex+*	O
11.		*Philautus* cf *leucorhinus* (Lichtenstein and Martens)	-	+	+	EN WG	Ex+*	R
12.		*Philautus* cf *charius* Rao	-	+	+	EN WG	En	O
13.		*Philautus* cf *pulcherrimus* (Ahl) $	-	+	+	EN WG		R
14.		*Philautus* cf *tinniens* (Jerdon) $	-	+	+		En	R
15.		452 A1 *Philautus*	-	+	+			R
16.		452A2 *Philautus*	-	+	+			R
17.		452A6 *Philautus*	-	+	-			R
18.		Philautus sp.1	-	+	+			R
19.		Philautus sp.3	-	+	+			R
20		Philautus sp.4	-	+	-			R
21.		Philautus sp.5	-	+	-			R
22.		Philautus sp.6 / 452B36	-	+	+			R
23.		Philautus sp.8	-	-	+			R
24.		*Philautus* sp.11	-	+	+			R
25.		Philautus sp.13	-	-	+			R
26.		*Polypedates maculatus* (Gray)	+	+	-			O
27.		*Polypedates pseudo cruciger* (Das and Ravichandran) $	+	+	+	EN WG		F
28.		*Polypedates leucomystax* (Gravenhorst) $	-	-	+			R
29		*Rhacophorus* cf *lateralis* (Boulenger) $	-	+	+	EN WG	En	R
30.		*Rhacophorus malabaricus* Jerdon	+	+	+	EN WG		O
31.		*Rhacophorus* sp. 1	-	+	-			R
32.		Rhacophorus sp. 2 (juvenile)	-	+	+			R
33.	Ranidae	*Euphlyctis cyanophlyctis* (Schneider)	+	+	+			F
34.		*Euphlyctis hexadactylus* (Lesson)	-	+	+			R
35.		*Hoplobatrachus tigerinus* (Daudin)	+	+	+			F
36.		*Indirana beddomii* (Günther)	+	+	+	EN WG		C
37.		*Indirana brachytarsus* (Günther)	-	+	+	EN WG	En	O
38.		*Indirana semipalmatus* (Boulenger)	-	+	-	EN WG		R
39.		*Indirana leptodactylus* (Boulenger)	-	+	+	EN WG	En	R
40.		*Indirana leithii* (Boulenger)	-	+	+	EN WG	Vu	R
41.		*Fejervarya keralensis* (Dubois)	+	+	+	EN WG		F
42.		*Fejervarya limnocharis* (Gravenhorst)	+	+	+			F
43.		*Fejervarya* sp. 1	-	+	-			R
44.		*Micrixalus fuscus* Boulenger	+	+	+	EN WG	LRnt	C
45.		*Nyctibatrachus aliciae* Inger, Shaffer, Koshy and Bakde	-	+	+		En	C
46.		*Nyctibatrachus major* Boulenger	+	+	+	EN WG	Vu	F
47.		*Nyctibatrachus minor* Inger, Shaffer, Koshy and Bakde	-	+	+	EN K	En	C
48.		Nyctibatrachus sp. 1	-	+	-			R
49.		*Hylarana aurantiaca* Boulenger	-	+	+	EN WG	Vu	C
50.		*Hylarana malabarica* Tschudi	-	+	-	EN WG		O
51.		*Hylarana temporalis* (Günther)	+	+	+		LRnt	F
52.		*Tomopterna rufescens* (Jerdon)	-	+	+	EN WG		R
53.	Unidentified Juveniles	452A3	-	+	-			R
54.		Philautus? Species 7	-	-	+			R
55.		Philautus? Species 9	-	-	+			R
56.		Philautus ?Species 12/ B31	-	-	+			R
57.		Total	15	50	43			

Source of Endemicity: Ramesh *et al.,* 2003

Sources of IUCN Status: IUCN red data book list 2007 from URL http://www.iucnredlist.org/.

$ Not listed in IUCN red data book list 2007and IUCN status was referred from CAMP workshop report summary (Molur and Walker,1998a)

* Taxonomic uncertainty

** Occurrence: F= frequent, C= common, O= Occasional, R= Rare

Plate 1: Amphibians of Myristica Swamps in Southern Kerala -1

Plate 2: Amphibians of Myristica Swamps in Southern Kerala -2

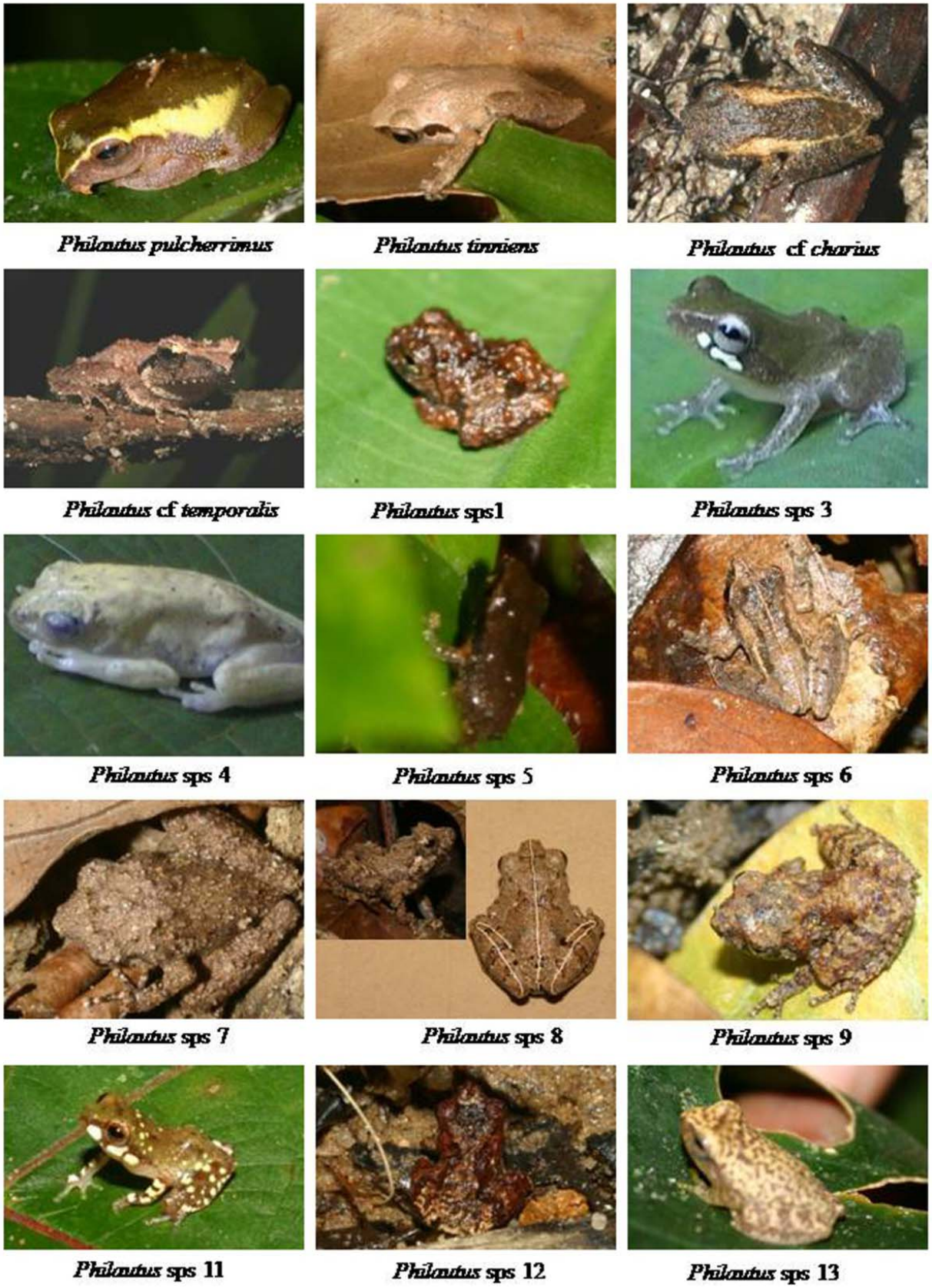

Plate 3: Amphibians of Myristica Swamps in Southern Kerala -3

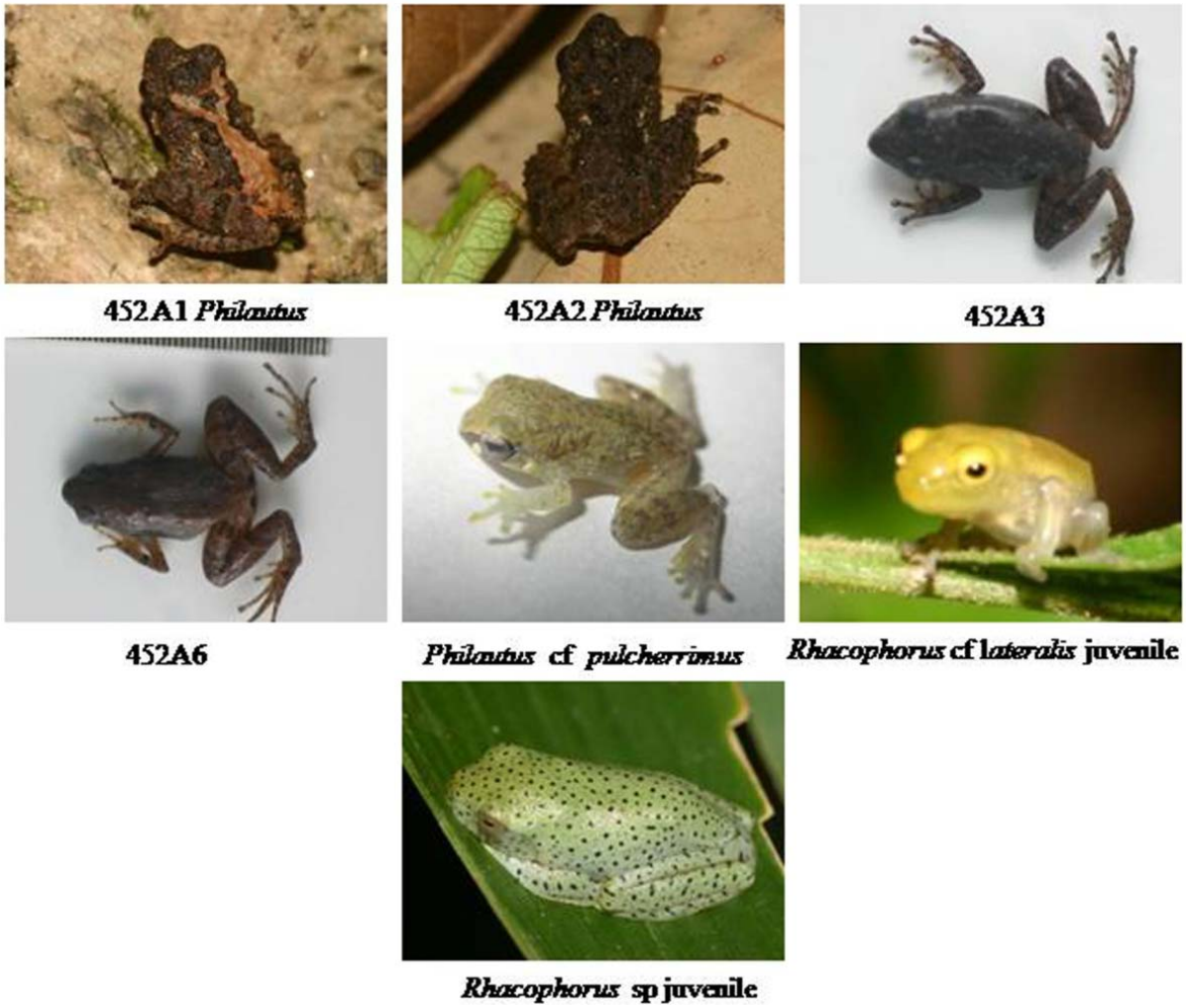

Plate 4: Amphibians of Myristica Swamps in Southern Kerala -4

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