



TAILLESS AMPHIBIANS

A Checklist of Anurans (Class: Amphibia) in Nilgiris, Western Ghats, Southern India

Globally, there are about 7,356 known amphibian species belonging to three living orders (Frost 2015). In India there are 405 species of amphibians out of this 239 species known from the Western Ghats (Dinesh et al. 2017). India has a unique assemblage of flora and fauna due to the subcontinent's successive and prolonged periods of isolation (Roelants et al. 2004). Western Ghats, one of the 34 biodiversity hotspots of the World (Myers et al. 2000; Conservation International 2005) is exceptionally rich in amphibian diversity. The amphibians of the Western Ghats are enigmatic and new species are being described with astonishing frequency.

Amphibians are vital components of a healthy environment. Presence of a good population of amphibians in a region is an indication of a healthy environment (Gururaja et al., 2008). The amphibians particularly are more sensitive to chemical pollutants due to their bimodal habitat (land and water) and the absorbing nature of their skin (Roy, 2002). Amphibian populations are declining (Alford & Richards 1999) due to various reason such as diseases (Haulahan et al. 2000), increased exposure to UVB radiation (Kiesecker et al. 2001), impact of urbanization (Ghate & Padhye 1996), habitat destruction (Daniels 1991 & 1995), pollution and specimen hunting (Daniels 1991). India has more threatened amphibian species than any other country in the Indo Malayan realm (Bain et al. 2005). Moreover, biodiversity of the Western Ghats is under threat due to deforestation (Myers 1990). The decline in amphibian population is a major concern throughout the world (Dalto & Diego, 2000; Simon et al. 2004). In Tamil Nadu a total of 77 species of amphibians are known to occur, that belonging to 11 families and 25 genera as per the checklist of Dinesh & Rhadhakrishnan (2009). There are 11 species of amphibians were described from Nilgiris, that belonging to 4 families, 5 genera. Out of this except *Indosylvirana flavescens* (Biju et.al., 2014), all 10 species were described from Nilgiris, some of them are recently described, *Micrixalus phyllophilus* and *Micrixalus spelunca* (Biju et.al., 2014), *Nyctibatrachus indraneili* (Biju et al., 2011), *Ghatixalus variabilis* (Biju et. al., 2008), *Raorchestes coonoorensis*, *R. signatus*, *R. tinniens* (Biju & Bossuyt, 2009), *R. ravii* and *R. thodai* (Zachariah et al., 2011), *Raorchestes primarrumpfi* (Vijayakumar et al., 2014). However, after recent addition to the amphibian fauna of the Western Ghats, an updated comprehensive checklist of the amphibians of Nilgiris is needed. The list of species is based on species records taken during two years of field survey in Nilgiris and

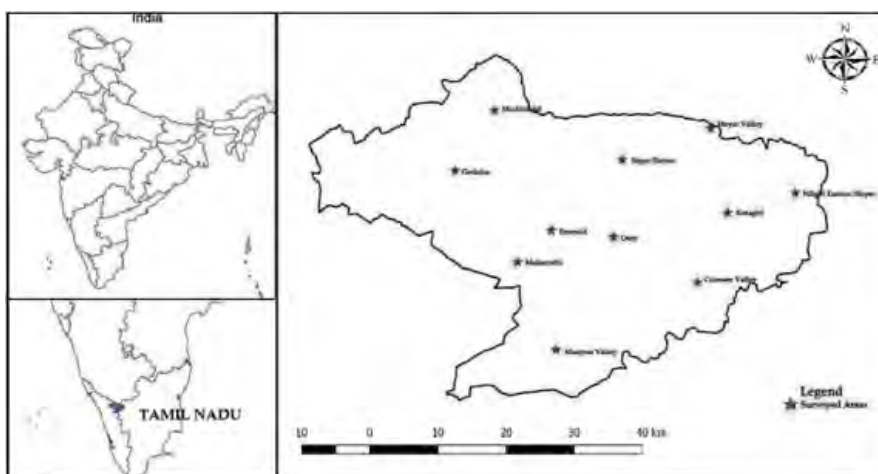


an exhaustive review of literature published. We hope that the checklist here will assist those working with amphibians in the Nilgiris and hope that this specific checklist will be replicated as presence and absence data for amphibians of many other areas of the Nilgiris is currently lacking.

Study Area

The present study conducted in parts of Nilgiris district, Tamil Nadu. It is elongated in the East - west direction and bounded by 11°30'&11°15'N latitude & 76°45'&77°00'E longitude. The total areal extent of the district is around 2551 km² and is one of the smallest districts in the state. The district is bounded by the states on the west by Kerala, on the north by Karnataka and on the southeast and south by Coimbatore district of Tamil Nadu. Major part of the district is under forest cover (56%), about 20% of the district is under plantation crops. Average annual rainfall of the district is more than 3500mm. During summer the temperature

reaches a maximum of 25°C and a minimum of 10°C. During winter the temperature maximum is 20°C and the minimum 0°C and mean relative humidity is between 75.8 and 76.9%. Natural vegetation in this district is varied and diverse, harbouring many rare, endemic, endangered



Map showing location of study sites

and threatened species of flora and fauna and occupies an enviable position in Wildlife conservation, in as much as it bears two significant protected areas viz., the Mudumalai

Table 1: Comparative account of numbers of genus and species of amphibians recorded from Nilgiris

S. No.	Family	Genus	Species
1	Bufonidae	1	2
2	Dicroglossidae	4	5
3	Micrixalidae	1	2
4	Microhylidae	2	5
5	Nyctibatrachidae	1	2
6	Ranidae	3	3
7	Rhacophoridae	5	12

Tiger Reserve (MTR) and the Mukurthi National Park (MNP). The study sites includes Ooty, Coonoor, Kotagiri, Gudalur, Emerald, Mudumalai Tiger Reserve, Mukurthi National Park, Sigur Plateau.

Methodology

Field work carried out in different sites of the Nilgiris (such as, Ooty, Coonoor, Kotagiri, Gudalur, Emerald, Mudumalai Tiger Reserve, Mukurthi



Table 2: Checklist of Amphibians in Nilgiris, Western Ghats, Tamil Nadu

S. No	Scientific Names	Common Name	Locality	Altitude	Habitat	IUCN Status
Bufonidae Gray, 1825						
1	<i>Duttaphrynus melanostictus</i> (Schneider 1799)	Common Indian Toad	Ooty, Coonoor, Kotagiri, Emerald, Gudalur, Mudumalai Tiger Reserve, Mukurthi National Park, Avalanche	942 -2465 m	Human habitat, Grass land, Shola, Agriculture	LC
2	<i>Duttaphrynus microtympenum</i> (Boulenger 1882)	Small-eared Toad	Emerald, Avalanche	1983 m	Grassland	VU
Dicroglossidae Anderson, 1871						
3	<i>Euphylyctis cyanophlyctis</i> (Schneider, 1799)	Indian skipper frog	Gudalur	942 m	Ponds, Pools & stagnant water	LC (WPA Sch IV)
4	<i>Hoplobatrachus tigerinus</i> (Daudin, 1802)	Indian Bull Frog	Gudalur	942 m	Paddy fields	LC (WPA Sch. IV & CITES App.II)
5	<i>Sphaerotheca rolandae</i> (Dubois, 1983)	Roland's Burrowing Frog	Mudumalai Tiger Reserve	925 m	Small burrows	LC
6	<i>Fejervarya nilagirica</i> (Jerdon, 1854)	Nilgiri Cricket Frog	Ooty, Emerald, Avalanche	1983 - 2244 m	Human habitat, Agriculture, Shola	EN (WPA Sch. IV)
7	<i>Fejervarya syhadrensis</i> (Annandale, 1919)	Hill Cricket Frog Hill	Masinagudi	937 m	Riverine patches	LC
Micrixalidae Dubois, Ohler and Biju, 2001						
8	<i>Micrixalus phyllophilus</i> (Jerdon, 1853)	Pink-thighed Torrent Frog	Mukurthi National Park, Kotagiri, Emerald, Avalanche	1983 -2284 m	Grassland, Shola	VU
9	<i>Micrixalus spelunca</i> (Biju, Garg, Gururaja, Souche and Walujkar, 2014)	Cave dancing frog	Coonoor	1850 m	Cave	NE
Microhylidae Gunther, 1858 (1843)						
10	<i>Uperodon taprobanicus</i> (Parker, 1934)	Srilankan Painted frog	Masinagudi	937m	Riverine patches	LC



S. No	Scientific Names	Common Name	Locality	Altitude	Habitat	IUCN Status
11	<i>Microhyla ornata</i> (Dumeril and Bibron, 1841)	Ornate Narrow Mouthed frog	Sigur Plateau	900 m	Riverine patches	LC
12	<i>Microhyla rubra</i> (Jerdon, 1854)	Red Narrow mouthed frog	Mudumalai Tiger Reserve	925 m	Riverine patches	LC
13	<i>Uperodon triangularis</i> (Günther, 1875)	Malabar Dot Frog	Ooty, Mukurthi National Park, Emerald, Avalanche	1983 -2244 m	Shola	VU
14	<i>Uperodon systoma</i> (Schneider, 1799)	Marbled Balloon Frog	Mudumalai Tiger Reserve	925 m	River side areas	LC (WPA Sch. IV)
Nyctibatrachidae Blommers-Schlösser, 1993						
15	<i>Nyctibatrachus indraneili</i> (Biju, Bocxlaer, Mahony, Dinesh, Radhakrishnan, Zachariah, Giri and Bossuyt 2011)	Indraneil Night frog	Kotagiri	1863 m	Shola	NE
16	<i>Nyctibatrachus vrijeuni</i> (Biju, Bocxlaer, Mahony, Dinesh, Radhakrishnan, Zachariah, Giri and Bossuyt 2011)	VUB Night Frog	Kotagiri, Coonoor	1800 m	Shola	NE
Ranidae Rafinesque, 1814						
17	<i>Clinotarsus curtipes</i> (Jerdon, 1853)	Bi-Coloured frog	Mudumalai Tiger Reserve	925 m	River side areas	NT
18	<i>Indosylvirana flavescens</i> (Jerdon, 1853)	Yellowish Golden-backed frog	Masinagudi	937 m	Riverine patches	NT
19	<i>Hydrophylax malabaricus</i> (Tschudi 1838)	Malabar Fungoid Frog	Mudumalai Tiger Reserve	925 m	Riverine patches	LC
Rhacophoridae Hoffman, 1932						
20	<i>Ghatixalus variabilis</i> (Jerdon, 1853)	Green Tree Frog	Ooty, Mukurthi National Park, Emerald	925-2284 m	Grasslands, Shola	EN
21	<i>Polypedates maculatus</i> (Gray, 1834)	Common Indian tree frog	Mudumalai Tiger Reserve	925 m	On bushes & trees	LC
22	<i>Pseudophilautus wynaadensis</i> (Jerdon, 1853)	Wynaad bush frog	Mudumalai Tiger Reserve	925 m	Bushes	EN



S. No	Scientific Names	Common Name	Locality	Altitude	Habitat	IUCN Status
23	<i>Raorchestes charius</i> (Rao, 1937)	Seshachar's Bush Frog	Emerald Avalanche	1983 m	Shola	EN
24	<i>Raorchestes coonoorensis</i> (Biju and Bossuyt, 2009)	Coonoor Bush Frog	Coonoor, Emerald	1850 -2083 m	Riverside areas	LC
25	<i>Raorchestes ponnudi</i> (Biju and Bossuyt, 2005)	Large ponnudi bush Frog	Gudalur	950 m	Tea bushes	CR
26	<i>Raorchestes primarumpfi</i> (Vijayakumar, Dinesh, Prabhu and Shanker, 2014)	-	Avalanche	2013 m	Grassland	NE
27	<i>Raorchestes ravii</i> (Zachariah, Dinesh, Kunhikrishnan, Das, Raju, Radhakrishnan, Palot & Kalesh, 2011)	Ravi's Bush Frog	Ooty, Emerald, Mukurthi National Park, Avalanche	1983- 2284 m	Grassland, Shola	NE
28	<i>Raorchestes signatus</i> (Boulenger, 1882)	Star-eyed Bush Frog	Ooty, Emerald , Kotagiri, Mukurthi National Park, Avalanche	1863 -2465 m	Human habitat, Agriculture, Grassland, Shola	EN
29	<i>Raorchestes thodai</i> (Zachariah, Dinesh, Kunhikrishnan, Das, Raju, Radhakrishnan, Palot & Kalesh, 2011)	Thoda Bush Frog	Ooty, Emerald , Mukurthi National Park, Avalanche	1863-2465 m	Human habitat, Grassland, Shola	NE
30	<i>Raorchestes tinniensi</i> (Jerdon, 1853)	Nilgiri Bush Frog	Ooty, Emerald, Kotagiri, Mukurthi National Park, Avalanche	1863-2465 m	Human habitat, Agriculture, Grassland, Shola	EN
31	<i>Rhacophorus lateralis</i> (Boulenger, 1883)	Boulenger's Tree Frog	Ovalley, Gudalur	965 m	Near Stream	EN

IUCN Redlist status: CR - Critically Engangered, EN - Endangered, LC - Least Concern, NT - Near Threatened, NE - Not Evaluated, VU - Vulnerable

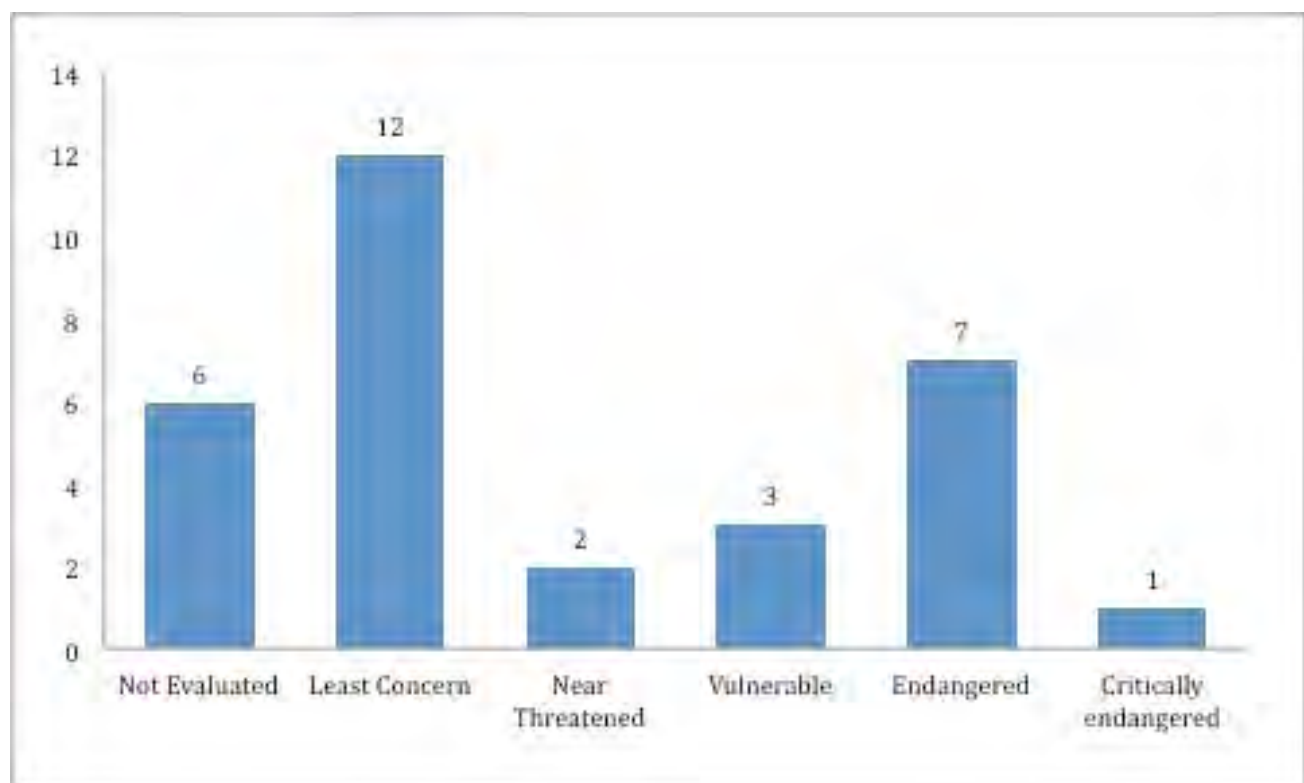


National Park etc.) from January 2014 to December 2015. It involves rapid surveys and careful visual estimation of amphibians in all the possible habitats, such as agricultural fields, sholas, rocky areas, human habitation and open lands. The observations were mostly carried out during day between 6:00 hrs to 9:00 hrs and 21:00 hrs to 24:00 hrs and different seasons such as pre-monsoon, Monsoon and post- monsoon seasons also noted. The calls heard at night were helpful in locating some species. search was made in near water bodies and microhabitats as explained in Daniels (1995) like on the forest floor, on the rocks, among leaf litter, on moss or algae, under logs, under the soil, edge of the water bodies, among weeds and near termite mounds by using powerful torchlight. During the survey amphibians were categorized as very common, common, uncommon and rare depending on the frequency of sighting of each species. Sighting amphibian species was identified by using keys of Dinesh et al. (2009), Biju & Bossuyt (2009), Biju et al. (2011), Zachariah et al. (2011), Vijayakumar et al. (2014). Doubtful species are photographed and identified later based on the keys. Systematic position followed by Frost (2016).

Result

During the study period a total of 31 species of anurans under 17 genus and 7 families were recorded from The Nilgiris (Table 2). Among these more number of species was belongs to the family Rhacophoridae (N=12 species), followed by Dicroglossidae (N=5 Species), Microhylidae (N=5 Species), Ranidae (N=3 Species), Bufonidae, Micrixalidae

Graphical representation of IUCN redlist status for amphibians of Nilgiris



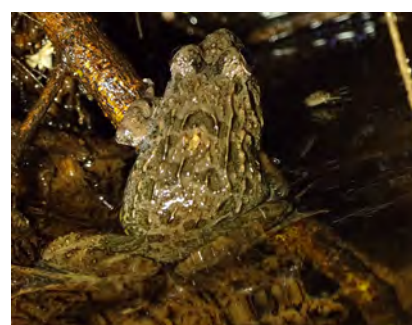
Amphibian Species



Duttaphrynus melanostictus



Fejervarya nilagirica



Euphlyctis cyanophlyctis



Fejervarya syhadrensis



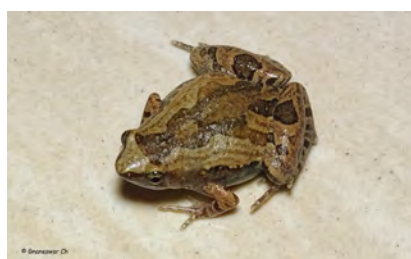
Micrixalus phyllophilus



Uperodon taprobanicus



Uperodon triangularis



Microhyla ornata



Microhyla rubra



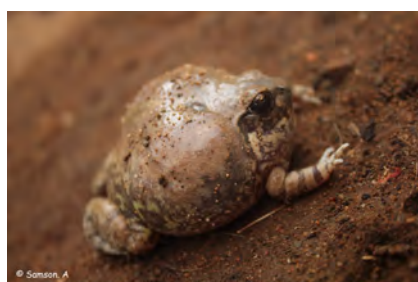
Nyctibatrachus vrijeuni



Uperodon systoma



Nyctibatrachus indraneili



Sphaerotheca rolandae



Clinotarsus curtipes



Indosylvirana flavescens



Hoplobatrachus tigerinus



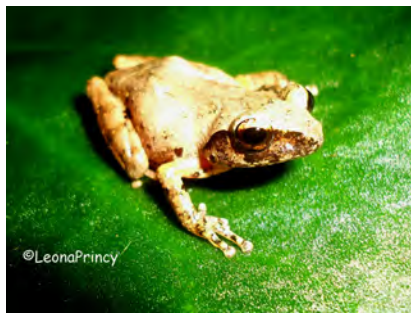
Ghatixalus variabilis



Raorchestes coonoorensis



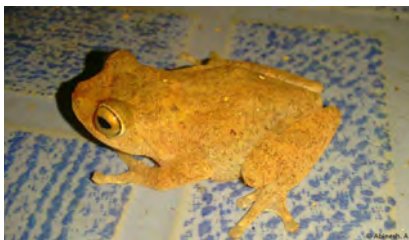
Pseudophilautus wynaadensis



Raorchestes charius



Hydrophylax malabaricus



R. Ponmudi



Raorchestes tinniensi



Raorchestes ravii



Raorchestes signatus



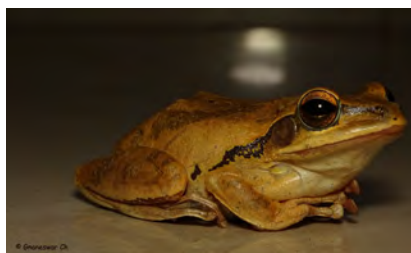
Raorchestes thodai



Raorchestes cf. primarrumpffi



Rhacophorus lateralis



Polypedates maculatus



and Nyctibatrachidae (N=2 Species) (Table 1 & 2). Among the recorded amphibians the 48% (15) of Uncommon followed by common 39% (12), rare 10% (3) and very common 3% (1). *Duttaphrynus melanostictus* is the only species widely distributed throughout the study area. Based on the IUCN Red List status, six species were found to be listed in Endangered (EN) category, three species in Vulnerable (VU) and one species each in Near Threatened (NT) and Critically Endangered (CR) categories (Table 2). Moreover three species fall under the schedules IV of Indian Wildlife Protection Act 1972 (IWPA) (*Euphlyctis cyanophlyctis*, *Hoplobatrachus tigerinus*, *Fejervarya nilagirica*) and one species comes under appendix II of CITES (*Hoplobatrachus tigerinus*).

Discussion

Anurans are sensitive to changes in the environment due to their biphasic lifestyle and changes in either of the two stages can have negative effects (Crump 2010). Investigations of amphibian species are receiving considerable attention because of the proposed role of amphibians as indicators of ecosystem deterioration (Wake 1991). Amphibian populations have been declining worldwide due to a number of environmental and human factors with habitat destruction, alteration and fragmentation considered to be the primary causes (Krishnamurthy, 1996; Kumar et al. 2002). Several research works had been carried out to explore new discoveries of amphibians in Nilgiri district, Western Ghats, such as Biju & Bossuyt (2009), Biju et al. (2011), Zachariah et al. (2011), Vijayakumar et al. (2014), Biju et al. (2014) which is the unique ecological zone of shola grasslands still several species of amphibians were recorded from the Nilgiris. But, published comprehensive lists of amphibians of in this area are unknown. Dinesh & Radhakrishnan (2009) reported the list of amphibians of Tamil Nadu, it included some species from Nilgiris. *Nyctibatrachus vrijeuni* known type locality is Suganthagiri, Mananthavady (Wayanad, Kerala) and Mettupalayam we recorded this species from Kotagiri and Coonoor. *Raorchestes charius* known only from its type locality, Chikmalagur (Karnataka), Muthodi and Mercara, at an altitude of approximately 850 m asl – 1100 m asl (Biju & Bossuyt, 2009). During field survey we recorded *Raorchestes charius* in Emerald at an altitude of 1983 masl. Likewise the distribution of *R. ponmudi* have been recorded from Kalpetta, Mananthavady, Sulthan's Battery, Gavi, Vagamon and Ponmudi in Kerala, and Honey valley, Coorg, Kudremukh, Agumbe, Vallur, Kathalekan in Karnataka. In Tamil Nadu have been recorded from only two places Anamalai hills and Valparai (Biju & Bossuyt, 2009; Gururaja 2012). *Rhacophorus lateralis* was described by Boulenger in the year 1883, it was known poorly until its report by Bennet et al., (2000) & Das (2000) from Coorg district & Biju (2000) from Wyanad. Subsequently, its distribution records were compiled and reported by Goel & Goel (2010), Molur & Molur (2010) from Coorg district and Dinesh et al. (2010) from Chikkamagaluru District, Karnataka and Idduki District, Kerala & Sachi & Dinesh (2015) from Mudigere, Karnataka. The present sighting thus is the first report of those



species from Gudalur (*R. ponmudi*), Ovalley (*Rhacophorus lateralis*) Nilgiri District Tamil Nadu. So far, 31 species of amphibians under 17 genus, 7 families are recorded from the district which is about 8 % of the total amphibians recorded from India, 14.2% of the total amphibians recorded from Western Ghats and 40% of the total amphibians recorded from Tamil Nadu. Out of 31 species 64% are endemic and 36% are Non endemic to Western Ghats. Further survey works coupled with molecular systematic study will report more amphibian fauna from the region. Due to habitat loss, fragmentation and urbanization, a vast land area that provide roost resources for amphibians starts depleting at a greater level. Hence study on the diversity and habitat is a need of the hour in order to make conservation priorities. This study generated a base line data on the amphibian fauna of this region, which may help in further studies.

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