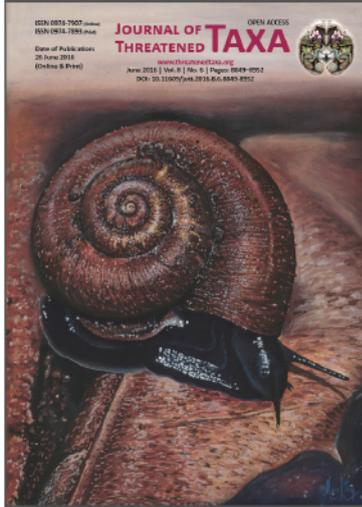


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SHORT COMMUNICATION

PERCH HEIGHT AND THE HUNTING SUCCESS OF THE INDIAN EAGLE OWL *BUBO BENGALENSIS* (FRANKLIN) (AVES: STRIGIFORMES: STRIGIDAE) TARGETING ANURAN PREY

Eric Ramanujam

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PERCH HEIGHT AND THE HUNTING SUCCESS OF THE INDIAN EAGLE OWL *BUBO BENGALENSIS* (FRANKLIN) (AVES: STRIGIFORMES: STRIGIDAE) TARGETING ANURAN PREY

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Abstract: Investigation into the predation of a pair of Indian Eagle Owls on anurans disclosed the fact that the greatest success (52.17%) was when the owls pounced from a height of less than 2m and the lowest (12.5%) was from a height of 5–6 m. No success was recorded when the owls pounced from over a height of 6m or when they tried wading in water to catch their prey. Overall, 146 pounces were observed and the strike success was 28.7%.

Key words: Anurans, prey spectrum, perch height, pounce, Puducherry, strike success.

Anurans or batrachians form an important part of the prey spectrum of many owl species, for example, *Tyto alba* or the Barn Owl (Ruprecht 1979; Obuch & Benda 2009; Woolley 2010), *T. longimembris* or the Eastern Grass Owl (Kunsorn et al. 2015), *Bubo bubo* or the Eurasian Eagle Owl (Alivizatos 2005; Mikkola & Tornberg 2014), *B. virginianus* or the Great Horned Owl (Kittredge et al. 2007), *Strix aluco* or the Tawny Owl (Betts 1928; Zawadzaka & Zawadzaka 2007; Wiacek et al. 2009), *Athene noctua* or the Little Owl (Marples 1942), *A. brama* or the Spotted Owlet (Kumar 1985), *A. cunicularia* or the Burrowing Owl (Errington & Bennett 1935), *Asio madagascariensis* or the Madagascar Long-eared Owl (Goodman et al. 1993) and *Asio flammeus* or the Short-eared Owl (Clark 1975).

Anurans form an important seasonal diet of the Indian Eagle Owl *Bubo bengalensis* around Puducherry (formerly

Pondicherry) in southern India (Ramanujam 2006). Ramanujam (2006) showed that numerically, anurans were the second highest vertebrate prey after rodents which constituted the primary food of *Bubo bengalensis*—127 anurans were consumed by four pairs of breeding owls studied from February 2001 to December 2003 (for the record 1,860 rodents were consumed). While rodents were consumed at all times of the year, anurans were predated upon only during the months of October to January when the reservoirs contained water. In stark contrast, anurans made up a very small proportion of prey in Pune and Raigad districts of Maharashtra—just six individuals among 2,016 vertebrates (Pande et al. 2011). Interestingly, anurans were completely absent in the diet of *Bubo bengalensis* in Alibab and Chiplun (Pande & Dahanukar 2011).

Owls being predominantly nocturnal, it is almost impossible to track their hunting activities, and to the best of my knowledge, only a few instances of observations have been documented in the wild earlier, viz.: *Bubo virginianus* or the Great Horned Owl (Toland 1986), *B. scandiaca* or the Snowy Owl (Boxall & Lein 1982), *Athene brama* or the Spotted Owlet (Kumar 1985), *A. noctua* or the Little Owl (Tome et al. 2011), *Asio flammeus* or the Short-eared Owl (Clark 1975; Toland 1986) and *Megascops asio* or the Eastern Screech Owl (Abbruzzese & Ritchison 2013).

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Furthermore, two of the documents (Tome et al. 2011; Abbruzzese & Ritchison 2013) do not attempt to present percentage of successful strikes in relation to the number of pounces. This is in stark contrast to diurnal raptors where the hunting behaviour of many species have been studied in detail - for example, Northern Sparrowhawk *Accipiter nisus*, White-tailed Fish Eagle *Haliaeetus albicilla*, Merlin *Falco columbarius*, Peregrine Falcon *Falco peregrinus* (Rudebeck 1950), Osprey *Pandion haliaetus*, Bald Eagle *Haliaeetus leucocephalus*, Northern Harrier *Circus hudsonius*, Northern Goshawk *Accipiter gentilis*, Sharp-shinned Hawk *Accipiter striatus*, Cooper's Hawk *Accipiter cooperi*, Broad-winged Hawk *Buteo platypterus*, Swainson's Hawk *Buteo swainsoni*, Red-shouldered Hawk *Buteo lineatus*, Red-tailed Hawk *Buteo jamaicensis*, Rough-legged Buzzard *Buteo lagopus*, Merlin *Falco columbarius*, American Kestrel *Falco sparverius*, Peregrine Falcon *Falco peregrinus* and Prairie Falcon *Falco mexicanus* (see Toland 1986).

This report attempts to co-relate the hunting success of *Bubo bengalensis* on anurans in relation to perch height which could be one more cog in the wheel towards unraveling the behavioural ecology of this little studied taxon. Perch height in relation to success rates has been studied in the Little Owl *Athene noctua* but the results seem inconclusive (Marples 1942) but some interesting data is available on diurnal raptors (Alivizatos et al. 2005).

METHODS

Aranya (11°58'N & 79°46'E), a centre for rain fed reforestation programmes near Ousteri (or Ossudu) Lake about 15km north-west of Puducherry City, is flanked by extensive ravines—the habitat of *Bubo bengalensis*. A pair of these owls occupied a defined territory (Ramanujam 2003) and were habituated to the author's presence from May 2001 to February 2003 (a period of 22 months) which

made it possible to observe their hunting of anurans sitting on a bund flanking a water catchment. This practice was adopted during the months of November 2001 to January 2002 when the owls allowed us to begin watching from a close range, and again from August 2002 to January 2003. The percentage of hunting success was determined thus: number of successful strikes x 100 / number of pounces. The percentage of hunting success was co-related to the height of the perch from which they pounced to give a fair idea of the strike success, viz., which was the most as well as the least successful.

RESULTS

A total of 146 pounces were recorded out of which 42 (28.7%) were successful (Table 1). The highest hunting success (52.1%) was when the owls pounced from a height of less than 2m, where of the 46 hunts observed 24 were successful. The hunting success diminished remarkably with a logarithmic trend (Fig. 1) as the owls pounced from higher vantage points and no success was met with when owls pounced from the lip of the reservoir which was over 6m in height. On 20 occasions the owls were observed to wade in water and were not successful in capturing any prey.

DISCUSSION

The owls we observed consumed only two species of anurans: the Paddyfield Frog or Cricket Frog *Fejervarya* sp. (Image 1a) and Marbled Balloon Frog *Uperodon systoma* (Image 1b). At the onset of the south-east monsoons we had observed the Common Indian Toad *Duttaphrynus melanostictus* and Dwarf Toad *Duttaphrynus scaber* breeding in this reservoir at the end of the month of July

Table 1. Outcome of hunts in relation to perch height

	Perch height (m)	Number of hunts		% successful
		observed	successful	
1	0*	20	0	0
2	<2	46	24	52.1
3	2-3	41	11	26.8
4	3-4	16	4	25.0
5	4-5	11	2	18.1
6	5-6	8	1	12.5
7	>6	4	0	0
		146	42	28.7

*wading in water

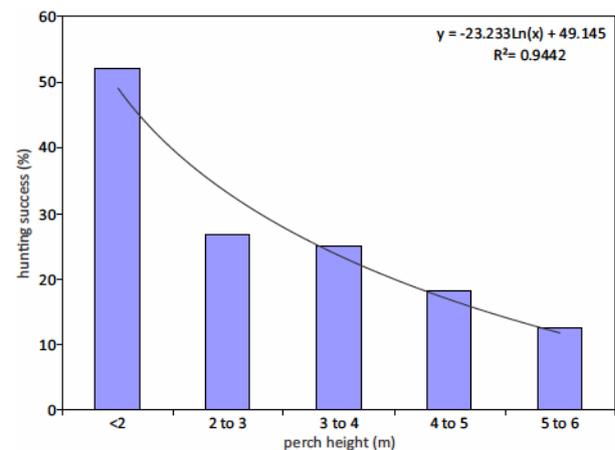


Figure 1. Percent anuran hunting success of *Bubo bengalensis* at Aranya as a function of perch height. Since there was no success at zero meters and more than 6m, these data are not plotted to avoid bias in the trend line.

Table 2. Outcome of hunts for five species of owls and 18 species of diurnal raptors

	Species	n hunts observed	% successful	Citation
1	Great Horned Owl <i>Bubo virginianus</i>	24	66.7	Toland 1986
2	Snowy Owl <i>Bubo (Nyctea) scandiaca</i>	51	43.1	Boxall & Lein 1982
3	Indian Eagle Owl <i>Bubo bengalensis</i>	126	28.7	Present study*
4	Spotted Owlet <i>Athene brama</i>	141	34.7	Kumar 1985
5	Short-eared Owl <i>Asio flammeus</i>	628	20.7	Clark 1975
6	Short-eared Owl <i>Asio flammeus</i>	60	43.3	Toland 1986
7	Osprey <i>Pandion haliaetus</i>	106	67.0	Toland 1986
8	White-tailed Sea Eagle <i>Haliaeetus albicilla</i>	60	5.0	Rudebeck 1950
9	Bald Eagle <i>Haliaeetus leucocephalus</i>	173	30.0	Toland 1986
10	Northern Harrier <i>Circus hudsonius</i>	411	33.8	Toland 1986
11	Northern Sparrow hawk <i>Accipiter nisus</i>	213	10.8	Rudebeck 1950
12	Northern Goshawk <i>Accipiter gentilis</i>	9	33.3	Toland 1986
13	Sharp-shinned Hawk <i>Accipiter striatus</i>	34	26.5	Toland 1986
14	Cooper's Hawk <i>Accipiter cooperi</i>	70	30.0	Toland 1986
15	Cooper's Hawk <i>Accipiter cooperi</i>	144	20.0	Roth & Lima 2003
16	Broad-winged Hawk <i>Buteo platypterus</i>	71	66.2	Toland 1986
17	Swainson's Hawk <i>Buteo swainsoni</i>	22	59.0	Toland 1986
18	Red-shouldered Hawk <i>Buteo lineatus</i>	80	58.8	Toland 1986
19	Red-tailed Hawk <i>Buteo jamaicensis</i>	465	60.6	Toland 1986
20	Rough-legged Hawk <i>Buteo lagopus</i>	189	55.6	Toland 1986
21	Merlin <i>Falco columbarius</i>	8	25.0	Toland 1986
22	Merlin <i>Falco columbarius</i>	80	28.0	Sodhi et.al. 1991
23	Merlin <i>Falco columbarius</i>	155	4.5	Rudebeck 1950
24	American Kestrel <i>Falco sparverius</i>	1,512	69.3	Toland 1986
25	Peregrine Falcon <i>Falco peregrinus</i>	260	7.3	Rudebeck 1950
26	Peregrine Falcon <i>Falco peregrinus</i>	16	18.8	Toland 1986
27	Prarie Falcon <i>Falco mexicanus</i>	14	21.4	Toland 1986

Note: *Concerns only anuran prey



Image 1. Anurans hunted by *Bubo bengalensis* at Aranya. (a) *Fejervarya* sp. and (b) *Uperodon systoma*.

in both 2001 and 2002, but the owls did not attack them perhaps because their parotid glands excrete a mild poison. Interestingly, the Eurasian Eagle Owl *Bubo bubo* is known to prey on toads, albeit in very small quantities (Tumurbat et al. 2009; Obuch 2014). 'Foot hunting' is an interesting behaviour and has been reported in *Tyto alba* (see Hadasch 1991) and *Bubo virginianus* (see McMillan 1998).

Owls have been eulogized as excellent pest control agents (for example, Pande & Dahanukar 2011), but their role is even more important in the control of invasive exotics - including some anurans. The Puerto Rican Frog *Eleutherus coqui* has invaded Hawaii and has negatively impacted the state's multimillion dollar floriculture, nursery and tourist industries; little is known about the ecological consequences of its invasion (Beard & Pitt 2005). What is known is that owls and raptors prey on these alien invasive frogs and it is estimated that up to 40% of the nestling diet of the Puerto Rican Screech Owl *Megascops nudipes* to be coquis (Snyder et al. 1987). It has also been suggested that coquis could serve as a food source to some endemic bird species like the Hawaiian Short-eared Owl *Asio flammeus sandwichensis* (Beard & Pitt 2005). Another Anuran, the African Clawed Frog *Xenopus laevis* is creating a serious problem in Chile and the Burrowing Owl *Athene cunicularia*

is having some effect of controlling numbers by predation in addition to two other bird species (Lobos & Jaksic 2005).

Kumar (1985) remarks "Hunting success of 35% for the Spotted Owlets represent higher success than other species' success (Table 30). Probably, the hunting success of nocturnal predatory species might be more comparatively to diurnal raptors. Because the prey species such as rodents or insects encounter with many potential diurnal predators, hence they will be more alert at predator attacks and thereby making low hunting success. During nights, the prey species have less number of potential predators and have more access to the predators making higher hunting success". This allusion could be because of the lack of literature in press at that time - "Table 30" in Kumar (1985) gives the success rates of just four species of diurnal raptors from one source (Rudebeck 1950) which may have biased the allusion. Since then more data has emerged and strike rates of many raptors are known today. Table 2 shows the hunting success rates of five species of owls in comparison to 18 species of diurnal raptors and the results are both comparable and variable between and among species. For example, among the owls *Bubo virginianus* has the highest strike rate (66.7%) but this is exceeded by *Pandion haliaetus* and *Falco sparverius*, and comparable to *Buteo platypterus*, *B. swainsoni*, *B. lineatus*, *B. jamaicensis* and *B. lagopus* - all over 50%. No other owl approaches that figure except *Bubo scandiaca* (43.1%) which during the breeding season is a diurnal hunter. Furthermore, if one compares the success rates of *Asio flammeus* in different areas and by different individuals it shows a significant variation (20.7% to 43.3% - more than twice). Even more startling is the intra-specific variation between *Falco peregrinus* and *F. columbarius*, and in both cases there seems to be a major variation to Rudebeck's data - in the first species 69.3% to 7.3% and in the second 25% and 28% to 4.5%. More empirical data in regard to prey spectrums / choices, prey abundance, hunting season, habitat, etc. is the need of the hour and more analysis is necessary before a holistic conclusion can be drawn in this regard.

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