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Short Communication

Spotted Owlet *Athene brama brama* (Temmink 1821)- A Potential Biocontrol Agent in Agricultural Landscape

V. Sunitha*, V. Vasudeva Rao, V. Ravinder Reddy, P. Venkateshwarlu, A.V.L.N. Ramalingeswar Rao and B. Naresh

All India Network Project on Vertebrate Pest Management, PJTSAU, Hyderabad, TS-500030, India

ABSTRACT

The present study was conducted to determine the role of spotted owlet as bio control agent in agricultural landscape by knowing its food habits. A total of 282 pellets were collected during the study period were analyzed and identified by using standard keys.The diet of the owlet was predominantly insects (51%) followed by rodents (33%), herpetofauna (9.5%) and unidentified invertebrates (6.5%). Among the rodents (33%) *Rattus rattus*, *Bandicota bengalensis*, *Funambulus palamaram*, *Mus musculus* and *Mus booduga*. The insects (51%) which includes Orthoptera (21%), Coleoptera (19%) and Dermaptera (11%) were predominantly recorded. The month wise analysis for the year 2015-17 showed that the diet of the spotted owlet closely related to availability of prey in the study area. The occurrences of insects were dominant during the month of April to September and from October to March the rodents were predominant. The overall analysis showed that the spotted owlet diet consists of predominantly insects followed by rodents, reptiles, amphibians (Opportunistic) and played significant role in reducing the various crop pests in the study range.

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VS and VVR presented the concept and designed the study, reviewed the work. VS, PV and BN collected, analysed and identified the study material. AVLNRR prepared GIS map. VS, VRR, BN wrote the manuscript.

Key words
Spotted owlet, Bio control agent, Agriculture.

In India, total 62 species of owls were reported, out of this, spotted owlet (*Athene brama*) is a common and most abundant species (Ali and Ripley, 1969). The species is predominantly distributed in diversified habitats such as agriculture fields, scrub forests, rocky out crops, abandoned buildings including human habitations. The spotted owlet is a carnivorous raptor and has some special character for hunting at night. Owls generally swallow their prey whole or in large pieces, and the indigestible parts (hair, bones, exoskeleton *etc*.) are regurgitated in the form of a pellet. The pH of an owls stomach is less acidic than that of many other predatory birds, and hence most of the bones of ingested prey are left undigested (Smith and Richmond, 1972). It predominantly feeds on insects followed by rodents, birds, reptiles, amphibians, annelids and arthropods (Kumar, 1985). Considerably the diversityof food items, it appears thatthese owlets may act as potential predators of several agricultural pests. A few sporadic studies on dietaryaspects on these species were reported. However, no authentic literatures on diet composition in relation to agricultural crops areexists. Hence, in the present study an attempt has been made to analyze dietary preference of spotted owlet by pellet analysis in and around agricultural crops of Rajendranagar environs.

Materials and methods

The present study was carried out in Rajendranagar environs (17°19'4.53"N, 78°24'9.70"E). The area consists of habitations intercepted with different agricultural and horticultural crops. A survey was carried out in different trees, buildings, electric poles crop fields and other perches at Rajendranagar surrounding areas in order to find out the roosting, nesting and perching sites of the spotted owlet. The indirect signs such as regurgitated pellets, milky white droppings and prey remain in the sites were considered in the present study for identification of roosting/nesting sites. The pellets of spotted owlets were collected from ARI campus (17°19'30.84"N, 78°23'47.61"E), college farm (17°19'21.48"N, 78°24'32.50"E), and AINPVPM centre (17°19'37.01"N, 78°24'36.01"E) from April 2015 to March 2017. A total of 282 pellets were collected during the study period (Table I; Supplementary Fig. S1).

Regurgitated pellets found at the sites were collected in polythene bags and brought to the laboratory. The collected pellets were kept in an oven at70°C for 24 h to

* Corresponding author: vanamsunitha10@gmail.com
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kill the associated invertebrate parasites. These pellets were then used for analysis. To record the diet composition of the spotted owlet, each pellet was first soaked in 8% sodium hydroxide solution for about two hours as described by Neelanarayanan *et al*. (1998) and Mittal (1997). The solution assisted in easy separation of the osseous remains (skulls and other bones) and chitinous contents like hair, debris etc. the contents were then sieved to separate all the prey remains from the dust and soil particles. To completely separate the prey remains from these unwanted components, a number of washings were given. Then the prey remains were put on filter paper and dried in oven for 24 h at 60°C. After complete drying, the skulls, bones, feathers, beaks and insect remains were separated out for identification of prey items (Shehab, 2005).

Table I.- Location wise number of collected pellets.

Location	Year	Area (GPS location)	Habitat type	Total No. of pellets collected
ARI farm	2014-15	17°19'30.84"N, 78°23'47.61"E	Trees near orchard area	68
College farm	2015-16	17°19'21.48"N, 78°24'32.50"E	Trees in crop field area	102
AINPVPM office	2016-17	17°19'37.01"N, 78°24'36.01"E	Trees in office area	112
Total				282

The identification of different prey items in the diet of spotted owlet was made by using the keys developed by Neelanarayanan *et al*. (1998). Different vertebrate prey items were identified on the basis of lower jaws, skull, limb bones and pectoral and pelvic girdles. Depending upon the number of skulls or lower jaws (left and right) or one skull or one pair of fore and hind limb bones were counted as remains of one prey item. Insect prey items were identified upto order level on the basis of undigested anatomical pieces such as heads, mandibles, wings, legs and stings (Naranthiran, 1989; Yalden, 2003). Different typical structural features on the basis of which insect remains found in pellets were classified into different orders are given below: (i) Coleoptera: Thick chitinized forewings forming hard and opaque elytra, (ii) Dermaoptera: Abdomen bearing strong movable forceps, short but heavily chitinized elytra and large hind wings, (iii) Orthoptera: Fan shaped hind wings covered with a network of the veins, antennae cetaceous or filiform legs variously modified, *e.g.* saltatorial (in grasshoppers).

Based upon the data, percentage of different prey items in the diet of spotted owlet was determined. The mean number of prey items consumed per pellet was also calculated. The individual species of rodents consumed was also identified by using typical skull characteristics of rodent species *i.e*. skull size condylobasal length, occipitonasal length, supraorbital ridges, rostrum length and mandibles length.The key for identification of different rodent skulls were followed as described by Talmale and Pradhan (2009).

Bandicota bengalensis: Cranial skull large; condylobasal length exceeds occipitonasal length; supraorbital ridges well developed; anterior palatal foramina long extending posteriorly up to first lamina of first upper molar and narrower at posterior than anterior end nasal short; diastema long.

Mus booduga: Cranial skull size small; rostrum long and shallow, its least depth only one half of the rostral length; palate long, extending posteriorly behind third upper molar; anterior palatal foramina long extending posteriorly between maxillary tooth row.

Mus musculus: Cranial: skull small; supraorbital ridges poorly developed; rostrum short and deep, its least depth two-thirds of rostral length; diastema present in both the jaws; anterior palatal foramina elongated, extending posteriorly between maxillary tooth rows.

Rattus rattus Cranial: skull medium sized; anterior palatal foramina long, reaching posteriorly up to molars; nasal short; palate long, extending posteriorly beyond third upper molars.

Funambulus palmarum (Indian palm squirrel): i) anterior incisive foramen is short ii) anterior incisive foramen starts just below the incisor and ends before infra orbitary groove.

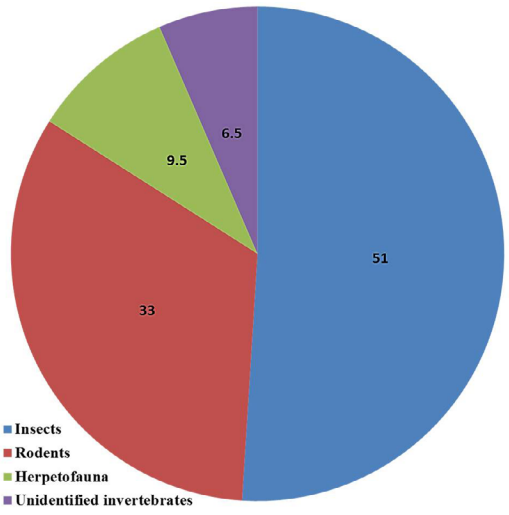

Fig. 1. Food preferences of spotted owlet.

Results and discussion

Analysis of 282 pellets resulted in to 1221 prey items as owl foods. The diet of the owlet was predominantly with insects (51%) followed by rodents (33%), herpetofauna (9.5%) and unidentified invertebrates (6.5%) (Table II; Fig. 1). Among the rodents (33%) the composition of species recorded includes *Rattus rattus*, *Bandicota bengalensis*, *Funambulus*, *Mus musculus* and *Mus booduga*.

Table II.- Year wise number of prey items recovered from collected pellets.

Prey items	2014-15	2015-16	2016-17	Total	% prey items
Rodents	135	130	138	403	33
Reptiles	24	13	12	49	4
Amphibians	26	22	18	66	5.5
Insects	214	220	190	624	51
Others	32	26	21	79	6.5
Total	431	411	379	1221	
Grand total			1221		

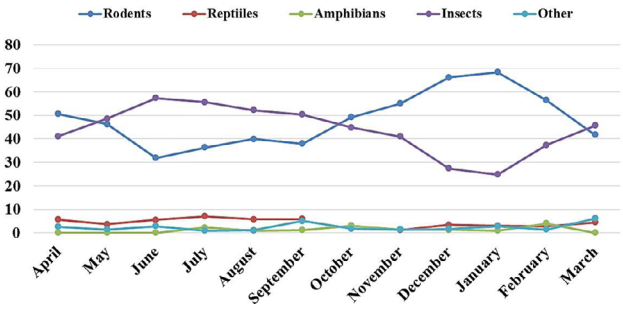

Fig. 2. Frequency of food preferred by spotted owlet in different months during 2015-17.

The major diet consists of insects (51%) which include Orthoptera (21%), Coleoptera (19%) and Dermaptera (11%). The other dietary items include, Amphibians, reptiles, birds, bats and other invertebrates. The month wise analysis for the year 2015-17showed that the diet of the spotted owlet closely related to availability of prey in the study area. The occurrences of insects were dominantduring the month of April to September and from October to March the rodents were predominant. This relationship represents opportunistic hunting by spotted owlets in various habitats as reasonably characterized availability (Fig. 2). The overall analysis showed that thespotted owlet diet consists of predominantly insects followed by rodents, reptiles, amphibians (opportunistic) and played significant role in reducing the various crop pests in the study range.

The diet mainly consisted of insects followed by rodents. Insects preyed upon by spotted owlet were predominantly of orders Coleopteran, Orthoptera and Dermaptera and some unidentified orders. The present findings on the proportion of invertebrate versus vertebrates in the diet of spotted owlets are similar to the trend reported for the species from the adjoining states of Andhra Pradesh (Kumar, 1985). Previous studies have reported the diet of the spotted owlet comprising of insects, earth worms, mice, lizards, frogs and birds (Sandhu, 1978; Majumdar, 1984; Ali and Ripley, 1987). In the present study, however the remains of earthworms and lizards were not observed in the pellets of spotted owlet. Zade *et al*. (2011) analyzed 52 pellets of spotted owlet in Maharashtra, India and determined the per cent relative frequency of occurrence of various food remains. The study indicated that insects belonging to the orders Orthoptera (grasshoppers), Coleoptera (beetles) and Dermaptera (ear wigs) occupied 51% of the diet followed by small mammals (33%). The remnants of the insects in the pellets comprised of wings, legs, antennae and head (Supplementary Fig. S2). The remnants of the vertebrates in the pellets comprised of bones (Supplementary Fig. S3). Ali and Santhanakrishnan (2012) found the diet of spotted owlet comprising mostly of arthropods (84.9%), *i.e.,* Coleoptera (40.9%) and Orthroptera (32.4%) insects followed by vertebrates (12.1%). In the present study insects alone constituted 51% of the diet of the spotted owlet. It is evident from the earlier studies as well as from the present study, that the species with an opportunistic feeding strategy, preying upon a wide spectrum of prey species available locally are able to thrive widely across the Indian sub-continent (Kumar, 1985; Ramanujam and Verzhutskii, 2004).

The presence of 51% insects and 33% of rodents found in the diet of spotted owlet in the present study indicates their potential in regulating rodent and insect populations in crop fields as one of the component in integrated pest management. By providing adequate roosting sites in preserving mature tree species, installing artificial nest boxes, T-shaped perches or poles and creating awareness among the public would enhance the population and conservation of spotted owlets may, however, be taken to attract them to the crop fields.

Supplementary material

There is supplementary material associated with this article. Access the material online at: https://dx.doi.org/10.17582/journal.pjz/20201206111201

Statement of conflict of interest

The authors have declared no conflict of interests.

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