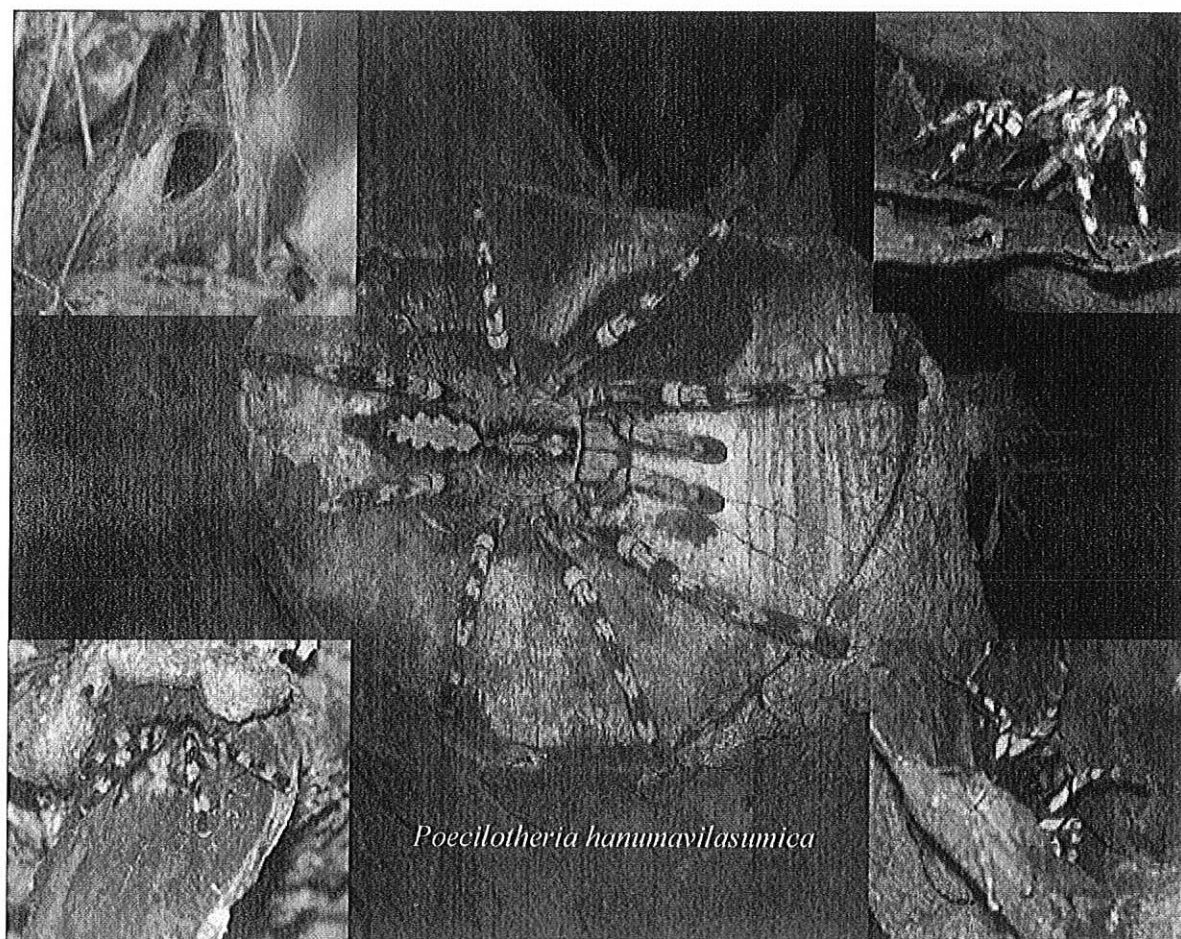


**STATUS AND CONSERVATION OF
POECILOOTHERIA HANUMAVILASUMICA
SMITH, 2004 ON RAMESHWARAM ISLAND,
TAMIL NADU, INDIA.**



Report to Oakland Zoo Conservation Funds, USA

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Rufford Small Grant (in part)

Cover Page Pictures:

Background Picture: *P. hanumavilasumica* female, photo by Manju Siliwal

Inset Pictures:

Upper Left: Nest of a juvenile *P. hanumavilasumica* on a Casuarina tree, photo by Sanjay Molur

Upper Right: *P. hanumavilasumica* female feeding on a large grasshopper, photo by Manju Siliwal

Lower Left: Female of *P. hanumavilasumica* sitting at the entrance of its burrow, photo by Sanjay Molur

Lower Right: Female of *P. hanumavilasumica* in attacking posture, photo by Manju Siliwal

STATUS AND CONSERVATION OF *POECILOTHERIA HANUMAVILASUMICA* SMITH, 2004 ON RAMESHWARAM ISLAND, TAMIL NADU, INDIA.

Introduction

The Old World arboreal theraphosids includes only one genus *Poecilotheria*, which is endemic to South Asia. This genus is represented by 14 species with seven endemic to India and Sri Lanka each (Molur & Siliwal, 2004; Platnick, 2005). Presence of this genus in other South Asian countries like Nepal, Bangladesh and Bhutan is not yet known. The seven species found in India are largely restricted to the dry deciduous and evergreen forests of Western and Eastern Ghats in India (Molur & Siliwal, 2004).

The genus *Poecilotheria* is popular in the pet trade market due to its striking colouration, large size, hairy body and aggressive nature. They are commonly known as 'Pokies'. *Poecilotheria* spp. appears to be in great demand in the pet markets of USA, UK, Europe and Hong Kong. After the inclusion of species under genus *Brachypelma* from South America in Appendix II of CITES in 1994, the pet trade appears to have shifted focus to *Poecilotheria* spp. from the Indian subcontinent, which is not protected under any law (<http://www.fws.gov/policy/library/99fr36893.html>).

In 2004, Andrew Smith discovered a new species of *Poecilotheria*: *P. hanumavilasumica* from a sacred grove of the Hanumavilasum Temple on Rameshwaram Island. This species was earlier misidentified by Simon (1885), and Annandale (1907), as *Poecilotheria fasciata* from the Island and later Gravely (1915) misidentified this as *Poecilotheria striata* from Pamban on Rameshwaram Island. *P. hanumavilasumica* is now known by the common name Rameshwaram Parachute Spider (Molur & Siliwal, 2004).

Male and female of *Poecilotheria* have identical patterns both dorsally and ventrally and before the final molt males resemble females in colouration. Males are slightly smaller and slender than females and have a total body length 2.5"-3", while females are about 3"-3.5" in length. After the final molt, the male genital structure commonly referred to as 'palp' develops, the pattern and colour on the dorsal side gradually starts fading and many males start losing hairs on the legs. Males have shorter life span than females and probably live up to one or two breeding seasons after maturity, while females are reported to live for ten years in captivity (http://www.minaxtarantulas.net/artskotsel/regalis_e.html). There is however no information available regarding the longevity of these spiders in the wild.

Very little is known on the distribution and status of this species and it is currently not known whether this species is also traded. The proposed study is the first on this species and was initiated to collect information on the general ecology and distribution of this species.

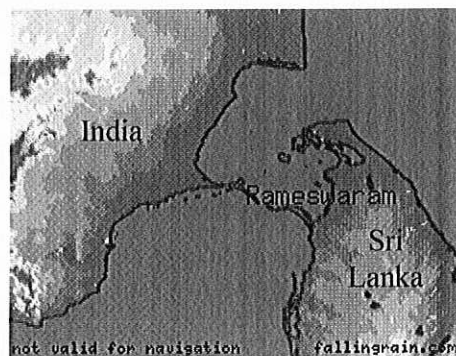
Objectives achieved

Following objectives were achieved during the present study:

1. Collected information on distribution, habitat association and abundance of *P. hanumavilasumica* on Rameshwaram Island.
2. Collected partial information on ecology and behaviour of *P. hanumavilasumica*.
3. Assessed the threats to the species on Rameshwaram Island.

Study area

This study was carried out from April 2004 to October 2005 in the Rameshwaram Island (approx. 61.8 sq km) situated 634 km from Chennai and 167 km from Madurai on the southeastern coast of Tamil Nadu, southern India. Located along Gulf of Mannar, the Rameshwaram Is. (9°28'33" N and 79°30'00" E), with an altitude of 22ft (9m) above msl, biogeographically lies in an important location as it was once connected to Sri Lanka via the Adam's bridge. This area receives rainfall usually during northeastern monsoon in October-November and the annual rainfall recorded for 2005 is 767.3mm. The climate is hot and humid almost throughout the year, with a mean max temp 31°C and min 25°C and the habitat is largely dry and semi arid type. In the early 20th century this island had *Acacia arabica* proliferating in scrublands with large groves of coconut *Cocos nucifera* and Palmyra palm *Borassus flabellifer*, with some rain fed cultivated lands (Smith, 2004). Due to anthropogenic activities in recent years *A. arabica* have reduced and the island is now dominated by economically important trees like Tamarind *Tamarindus indica*, palm, coconut and Casuarina *Casuarina equisetifolia*.



This island is famous for a historic Shiva temple, which is one of the important pilgrimage sites for Hindus. Nearly 16 plantations with the above mentioned trees of two to 10 hectares, belonging to the temple is present in the island. Few of these plantations are considered as sacred grooves (Raj, *per. comm.*). And, it is here in these plantations *P. hanumavilasumica* is known to occur. Two of these plantations mentioned below were chosen for this study.

Site 1. Hanumavilasum temple grove: This is the type locality of *P. hanumavilasumica*, and it is in the Aryagundur village, located about 5 km NW of the Rameshwaram temple. This site is considered as a sacred grove and is undisturbed, well protected by the Rameshwaram temple trust. Smith (www.thebts.co.uk/poecilotheria.htm) has proposed to establish this area as this first Tiger Spider Sanctuary in India. It is a 7.5-hectare plantation and consists of 116 tamarind, 163 palm and 9 coconut trees. 90% of the tamarind trees in this site are more than 50 years old. Apart from these economically important trees, there are 188 young planted shrubs or trees of *Albizia amara*, *Acacia*

planifrons, *Atalantia monophylla*, *Azadirachta indica*, *Canthium parviflorum*, *Cassine balae*, *Diospyros ovalifolia*, *Dichrostechys santapali*, *Ehretia laevis*, *Gmelina asiatica*, *Ficus benghalensis*, *Grewia heterotricha* and *Ziziphus* sp. on this site.

Site 2. Petrol Bunk Plantation: This site about four hectares is a private tamarind plantation and is located 1.5 km west of the Rameshwaram temple. The plot holds 90 tamarind and 15 palm trees with very poor shrub cover. And interestingly, a single rare species of tree *Madhuca longifolia* is present in this site. Here also tamarind trees are very old. Located close to the Rameshwaram city, this site is highly disturbed.



Tamarind plantation

Method

To first locate and identify sites for *P. hanumavilasumica* we carried out a three-day pilot survey in April 2004 in the plantations on the Rameshwaram Island. During the three day trip we interviewed local people about the presence of large-bodied spiders and then we searched the reported sites. Following this, the intensive study on distribution, abundance and behavioural ecology of *P. hanumavilasumica* were taken up from September 2004. To collect information on distribution of *P. hanumavilasumica* we surveyed all potential habitats that included plantations, reserve forests, secondary scrub and in around habitations. Information on tree species, tree height, tree girth, texture of tree trunk, canopy cover, height of the burrow, direction of burrow entrance, width and height of burrow entrance and depth of burrow were recorded. To confirm the identity of *P. hanumavilasumica*, spiders were caught occasionally in transparent containers to study ventral side patterns on their legs. All spiders caught were released back to the site of collection after taking photographs. Exuvia found during the study, were collected for species verification as other *Poecilotheria* species also likely to occur in the area.

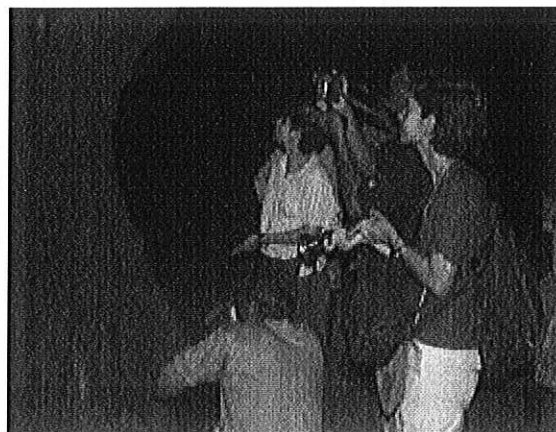


Ravi measuring GBH of a tamarind tree



Manju observing activity of spider in Site -1

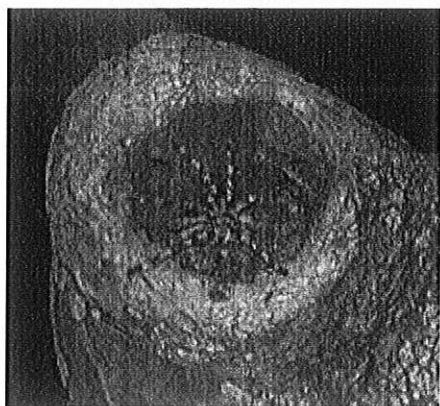
Population of spiders was estimated through total counts and was taken up only in the three identified sites, and done periodically across different times of the year during the study. During every total count exercise on average three people searched for spiders from 19:00 to 23:00 hrs, systematically scanning every tree and up to a height of 10 to 12 feet. On every sighting, information on the number and age class like spiderling, subadult and adult were recorded. We also searched for spider burrows in each of the trees during the total counts in the area. Behavioural studies on *P. hanumavilasumica* were carried out only in Site 1 and on select individuals. Seven adult female spiders were selected for this study and their burrows were marked, and the spiders were monitored for 7 days each every sampling period. Activity of the spiders was recorded from dusk to dawn and each spider was observed every 15 min during the night. Time when spiders moved out of their burrows and time when moved in were recorded. Activities like inside burrow, present at entrance, outside and away from burrow (waiting for prey), moving, feeding, courtship and mating were recorded. Information on location of spiders on the tree that is distance from burrow during the night was noted.



Team members observing the large-bodied spiders in Site - 1

Findings of the study

More than 100 man-hours were spent visiting different areas in Rameshwaram Is. to collect information on distribution and habitat association of *P. hanumavilasumica*. Other spiders seen during the study were also recorded (Table 4). Another 200 man-hours were spent estimating abundance of *P. hanumavilasumica* in the two study sites. Behavioural information was collected for over 90 hours during which 4312 individual behavioural observations of the seven focal individual spiders were obtained.



Female spider's nest in a large tamarind tree hole

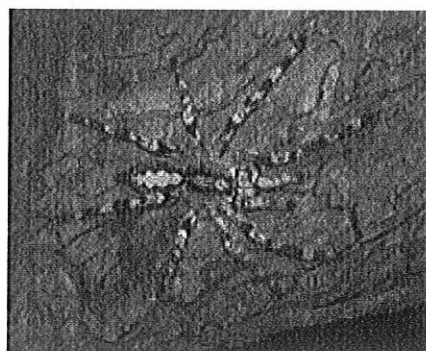
Distribution and habitat association of *P. hanumavilasumica*

Table 1. Localities from where *P. hanumavilasumica* was recorded

Code	Name of site	Location
Site -1	Hanumavilasum Sacred grove	It is in Aryagundur village, Rameshwaram Island
Site -2	Petrol Bunk Plantation	Private tamarind plantation, near Bus stop, Rameshwaram Island
Site -3	Ariyagundur Private Plantation	Private tamarind and palm plantation one km away from Hanu-Temp Site-I, Aryagundur
Site -4	Casuarina Plantation	Government plot with lot of Casuarina plantation on the southern coast of Rameshwaram
Site -5	Malvikkan's private plantation	Private plantation of Abdul Rahman Mavikkan, Madapam, Ramnad District
Site -6	Rajamani's plantation	Another private plantation about 3kms away from Site-5, Ramnad District

During the three-day pilot survey we visited five sites out of which in three we located 24 spiders in their burrows. Majority of these burrows were located in Tamarind trees while few were in *Casuarina equisetifolia*. Later, during the distributional surveys 15 sites were visited of which presence of *P. hanumavilasumica* were found in seven sites. Smith (2004) had previously recorded this species in three of these sites; the four other sites are new locality records for this species. All the localities where *P. hanumavilasumica* was found were in plantations (Table 1), with most natural habitat having been completely altered on Rameshwaram Island.

Spiders were located in both disturbed and undisturbed sites surveyed. It was observed that in all the plantations where spiders were found in good numbers, there were very old tamarind trees, suggesting that the spiders prefer old growth plantations. In the intensive study Site 1, of the 116 tamarind trees in the area spiders were recorded in 47 trees and these had an average GBH of 4 m. In these trees it was observed there were more number of tree holes/cavities with old growth, which the spiders used as burrows. Adult female spiders observed in the study site 1 especially were mostly observed in such large tamarind trees. These large tamarind trees also due to their dense canopy likely provided cover from predators. Interestingly, we also observed good number of spiders in young *Casuarina* plantations. This could be due to the presence of the loose bark of the tree, which offers number of hiding and burrowing places for the spiders. Local people also reported the spiders to be found occasionally in houses near plantations, which individuals are very likely the wandering males. No such males, however, were observed during our visits to the



Female of P. hanumavilasumica

different habitations in the area. On the whole, though *P. hanumavilasumica* was found to be common on the Rameshwaram Is., its distribution however appears to be patchy, which could be due to the alteration of natural habitat and increase in anthropogenic pressures.



Male of *P. hanumavilasumica*

On the mainland that is in Ramnad district, only one site - Mandapam was visited during the study. This site is a palm dominated plantation, located five km from the coast towards Rameshwaram Is. and is about three km from another plantation where the paratype has been recorded. In this site we found evidences in the form of burrows, suggesting the presence of an arboreal spider. Local people in the area also readily recognized the picture of *P. hanumavilasumica* shown to them. This however, requires confirmation as another closely related species *P. striata* also likely occurs in the area.

Table 2. Population count (mean $\pm$ SD) and encounter rate (ER/ha) of *P. hanumavilasumica* during the different sampling months of the two study sites.

Sampling months	Site 1 (7.5 ha)	ER/ha	Site 2 (4 ha)	ER/ha
Sep – Oct 2004	22.0 $\pm$ 12.2	14.7	10.8 $\pm$ 6.1	13.5
Nov – Dec 2004	16.4 $\pm$ 14.2	10.9	8.6 $\pm$ 10.5	10.8
Jun – Jul 2005	13.4 $\pm$ 10.6	8.9	6.0 $\pm$ 9.7	7.5
Sep – Oct 2005	55.4 $\pm$ 52.0	36.9	11.6 $\pm$ 10.5	14.5
Mean	107.2 $\pm$ 60.1	17.9	37 $\pm$ 33.7	11.6

Population count

In the two intensive study sites, an average of 144 spiders were recorded from the total counts of the two sites, with 107.2 $\pm$ 60.1 in Site 1 and 37 $\pm$ 33.7 in Site 2. And, an overall encounter rate of 17.9 and 11.6 spiders/hectare respectively were estimated for the study (Table 2). The difference in counts between the two sites is mainly because of the difference in vegetation structure. Also, Site 1 is undisturbed located well away from city while Site 2 is very disturbed being located close to the city and surrounded by habitations. Further, the population of spiders across the sampling months in the two sites showed a gradual decline followed by an increase in September – October 2005. The decline in population

Table 3. Population count (mean $\pm$ SD) and encounter rate (ER) of Age/Sex class of *P. hanumavilasumica* in the two study sites

Age/Sex Class	Site 1 (7.5 ha)	ER/ha	Site 2 (4 ha)	ER/ha
Male (7 to 9 cm)	4.8 $\pm$ 1.7	0.6	0.8 $\pm$ 1.0	0.2
Female (8 to 10 cm)	26.0 $\pm$ 11.5	3.5	9.8 $\pm$ 3.4	2.4
Subadult (5 to 8 cm)	21.8 $\pm$ 10.6	2.9	4.8 $\pm$ 2.8	1.2
Juvenile (2 to 5 cm)	41.5 $\pm$ 27.8	5.5	23.0 $\pm$ 4.2	5.8
Spiderlings (1.5 to 2 cm)	40.0 $\pm$ 62.3	5.3	8.0 $\pm$ 9.2	2.0

observed especially during June-July 2005 was due to the less number of females and sub adults seen in the area. During this time many of the burrows in the area had their entrance sealed with silk, which is likely related to the nesting activity by the females or moulting of the immature spiders. The increase in spiders in September – October 2005 was due to the emergence of subadults, and females along with their spiderlings from their burrows. An increase in juvenile population was also observed during this period.



Spiderlings at the entrance of their nest waiting for prey

During the study, only few males were encountered when compared to other age/sex classes (Table 3), which is because males are wanderers and do not have permanent burrows. The males seen during the study were only through chance encounters, observed moving on tree trunks and on ground. Females on the other hand, were sighted more during the study as they remain to the burrows throughout their life, and the same individuals were re-sighted more or less during each of the sampling months. Equal number of juveniles was encountered in both sites, however Site 1 had a high deviation in the mean, which is because in the month of September-October 2005 a high increase in juvenile population was seen. The reason for this increase was not clearly known though it could be that few spiderlings from this year nesting dispersed from the nest earlier and started to live independently as juveniles.

A high increase in spiderlings was also observed in Site 1 during September-October 2005 (Table 3), which coincided with the opening of the seven nesting burrows observed and these are the recently hatched spiders. And, a maximum of 35 spiderlings were seen with the adult female in the burrow in Site 1. In Site 2, only two nesting burrows were seen; one female with 12 spiderlings and the other only with four were seen.

Behavioural observations

Like majority of burrowing spiders, *Poecilotheria* are also sit-and-wait type of predators and do not forage very far from the burrow. Our observations on eight adult female *P. hanumavilasumica* in Rameshwaram Is. showed the same. Of the 4312 individual behavioural observations obtained during 88 hours of focal sampling 47% accounted for the spiders remaining only to the entrance of their burrows followed by 26 % to the spiders remaining within the burrow. These spiders were found to be strictly nocturnal and were

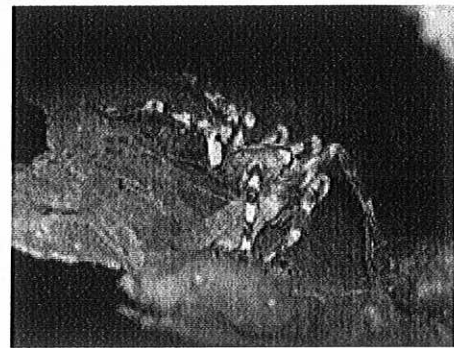


Female spider at the entrance of her burrow

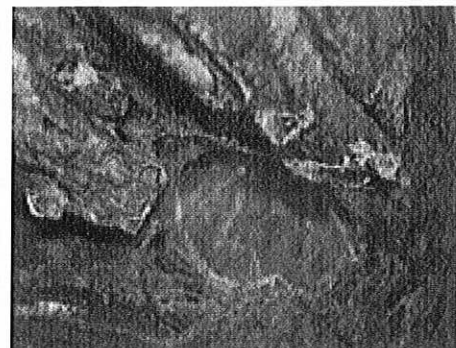
observed coming out of the burrow or remained at the entrance after dark between 18:30 to 19:00 hrs, and retreated into the burrow between 05:30 to 06:00 hrs. Between 20:00 hrs to midnight the spiders were found to be most active, with them moving in and out of the burrow or to shift their position near the entrance of the burrow. It was also observed that spiders were more active during darker nights than in bright moon lit nights; this however needs further confirmation.

Foraging activity in the spiders involved them moving and sitting away from the burrow entrance and accounted for 19% of the observations. The eight adult female spiders on average moved 49.3 ± 73.4 cm away from the burrow and ranged from 3 to 300 cm. Direct feeding observations only accounted for 6% of the overall activity, wherein the spiders attacked the prey when found within its range and then immobilized it. The spiders started to feed on smaller prey caught soon after immobilizing it and most often at the site of capture, and no silk was wrapped. While in the case of larger prey they first wrapped it with silk and then carried the prey to the burrow, and then started to feed on it there. Other activities like moving were very little with 2%, and most moving observations related to their foraging, which was not very far from their burrows. The adult females were not observed taking part in any mating or courtship activity during the study. Two males on separate occasions during September – October 2004, were observed approaching the burrow of two adult females and then the males were heard drumming on the tree trunk using their palps. The females at first did not respond but later when the males approached closer they charged and chased them away.

Difference in activity of the spiders between the sampling months was seen during the study. The activities observed for the period June-July 2005 represented in figure 1 is only based on 392 observation points as most focal individuals remained sealed within their burrows and were not visible. During the sampling month of November-December 2004 the spiders were found more often to remain to the burrows and low number of observations of staying away from burrow than in the other months. This was likely due to the abundant supply of food during this time, which is evident in the high percentage of feeding observations during this period. This was the end of the NE monsoon and with rains in the area, an increase in insect abundance was noticed at this time. The spiders did not have to venture out of the burrow for foraging as they caught their prey at the entrance itself. The spiders also remained more to the burrows during this period due to high windy and stormy weather conditions in the area.



Female with her prey (Grasshopper)

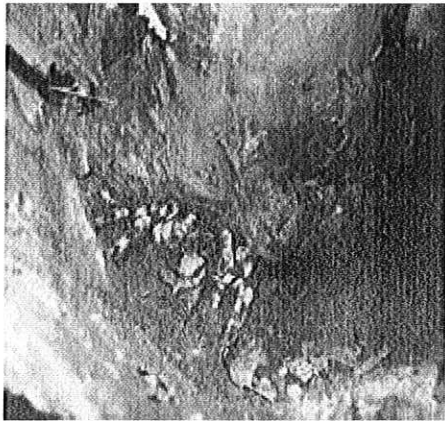


Sealed entrance of a nesting female burrow

In September-October 2005 high number of observations accounted for the spiders remaining at the entrance of the burrow. It was observed during this time the adult females were with spiderlings and probably because of this did not leave the safety of the burrow.

Diet

The spiders were observed feeding on winged termites, beetles (wood borer, rhinoceros beetle), grasshoppers and moths. Spiders were found feeding exclusively on winged termites that emerged after first



Female *P. hanumavilasumica* feeding on a beetle inside its burrow

rains in the area. On one occasion, we found a female catch 17 winged termites within a span of 15 min and held all of them in its chelicerae. Spiderlings were also observed catching termites and other insects that were at times three to four times larger than their own size. It was observed that the adult female with young at times caught its spiderling thinking it as a prey, but soon let go off it.

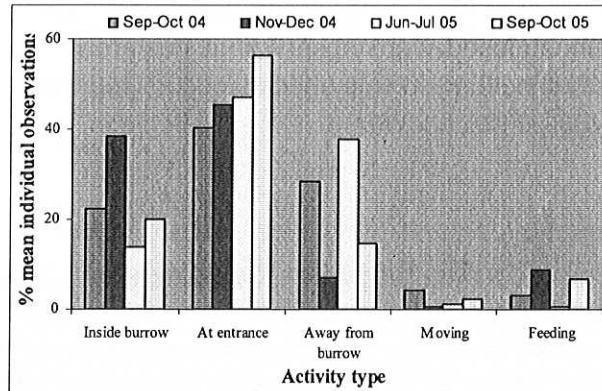
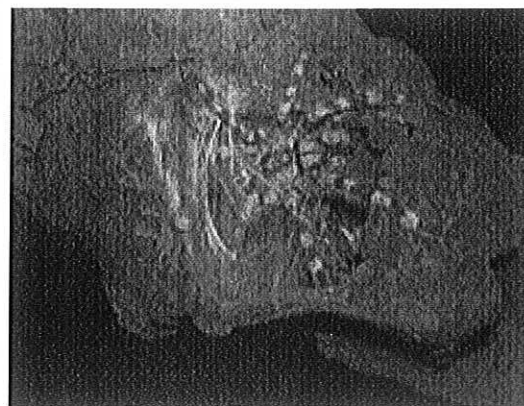


Figure. 1. Major activities of *P. hanumavilasumica* female spiders observed during different months

Burrow and nesting

P. hanumavilasumica are opportunist burrow dwellers, and were found using tree holes, crevices and cavities in the tree, and under bark. Burrows were largely



A juvenile spider in its silken nest

spiders close the entrance of the burrow with a thick layer of silk. Burrows with the entrance closed were observed in the area during January and again in June and July. Whether nesting in this species occurs round the year or restricted to particular time of the year is not known.

Threats

No current major threats to the spiders on Rameshwaram Island were observed during the study, though however, increasing human activities in and around the sites could likely lead to local extinctions of this species. Increase in tourism activity has resulted in conversion of plantations into human habitations and more such sites where presently good population of these spiders exist are in the process of being converted. Firewood collection and road widening works also likely have an impact on the populations in the area. Due to fear and lack of awareness about the spiders, local people very often kill the spiders on spotting it. Studies focusing on the breeding biology and dispersal in the species needs to be taken up to understand and monitor the long-term viability of different populations in the area, which will also be useful for future conservation action.

Acknowledgments:

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Table 4. List of spiders seen on Rameshwaram Island

Suborder Orthognatha

I. Family Barychilidae

1. *Sason robustum* (O. P.-Cambridge, 1883)

II. Family Theraphosidae

2. *Poecilotheria hanumavilasumica* Smith, 2004
3. *Plesiophrictus* sp.

Suborder: Labidognatha

I. Family Araneidae

4. *Gasteracantha mammosa* C.L. Koch, 1844,
5. *Gasteracantha geminata* (Fabricius, 1798)
6. *Argiope anasuja* Thorell, 1887
7. *Argiope aemula* (Walckenaer, 1842)
8. *Cyrtophora cicatrosa* (Stoliczka, 1869)
9. *Cyclosa confragra* (Thorell, 1892)
10. *Cyclosa* sp.
11. *Neoscona theisi* (Walckenaer, 1842)
12. *Neoscona mukerjei* Tikader, 1980
13. *Eriovixia excelsa* (Simon, 1889)
14. *Neoscona* sp.

II. Family Eresidae

15. *Stegodyphus sarasinorum* Karsch, 1891

III. Family Hersiliidae

16. *Hersilia savignyi* Lucas, 1836

IV. Family Oxyopidae

17. *Oxyopes* sp.
18. *Pucetia viridana*

V. Family Pholcidae

19. *Pholcus* sp.

VI. Family Salticidae

20. *Plexippus paykulli* (Audouin, 1826)

VII. Family Scytodidae

21. *Scytodes* sp.

VIII. Family Sparassidae

22. *Heteropoda venatoria* Linnaeus, 1767

IX. Family Tetragnathidae

23. *Nephilengys malabarensis* (Walckenaer, 1842)
24. *Tetragnatha* sp.

X. Family Thomisidae

25. *Thomisus* sp.

XI. Uloboridae

26. *Uloborus danolius* Tikader, 1969

Note: The list is mainly based on spiders encountered during night surveys.

Budget

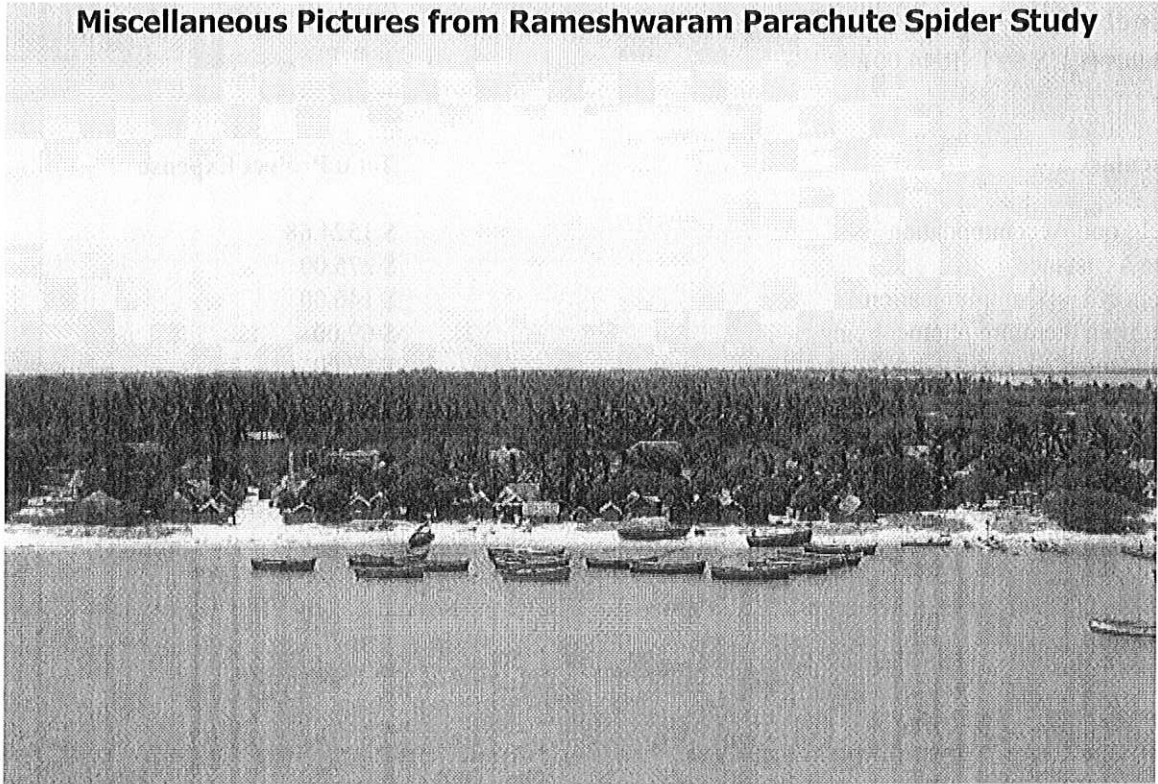
Accounts (1 US \$= INR 44.00)

Particulars	Total Project Expense
Travel/Food/Accommodation	\$ 1524.68
Office Assistance	\$ 275.00
Stationery and Communication	\$ 146.00
References/literature/photocopying	\$ 69.00
Contingency	\$ 87.00
Total Expenses	\$ 2101.68

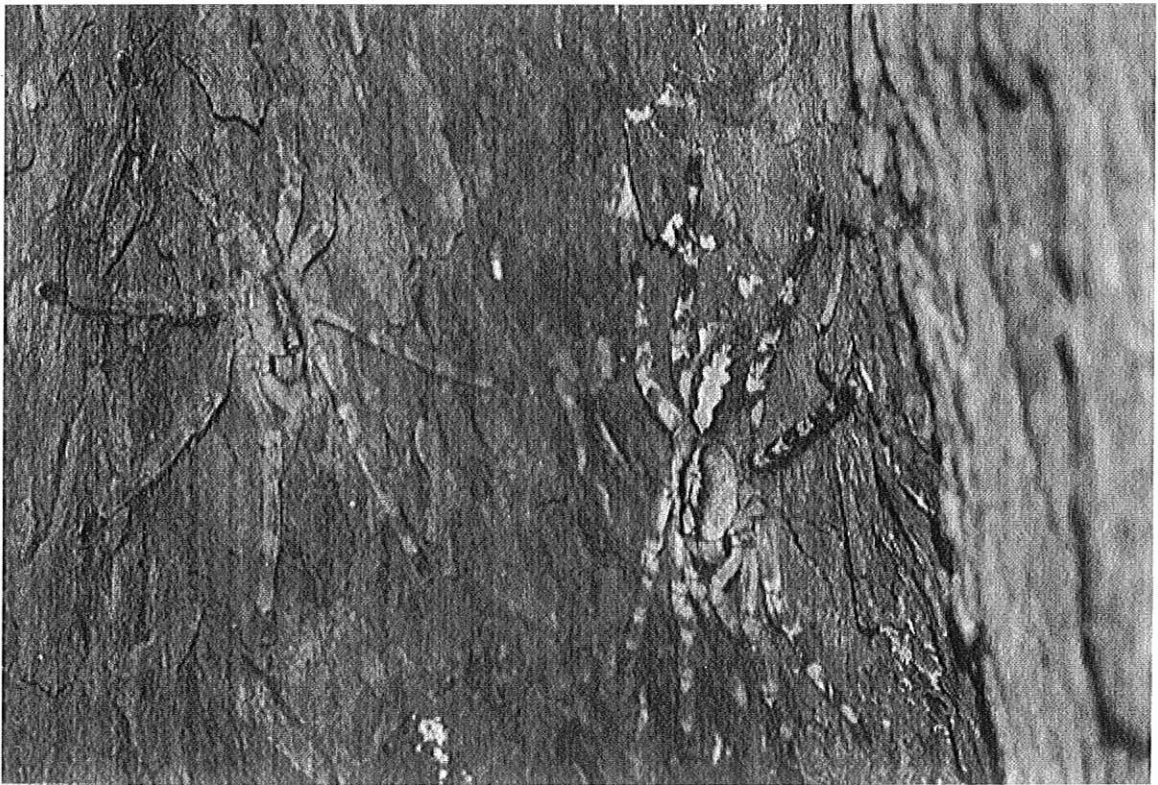
Travel / Food / Accommodation details

Date	Place	Tavel/Food/ Accom. (INR)
13-15 Apr 04	In and around Ramanad district including Rameshwaram Island, Tamil Nadu	13128.50
28 Sep-8 Oct 04	Rameshwaram, Tamil Nadu	16753.00
29 Nov-6 Dec 04	Rameshwaram, Tamil Nadu	13741.50
18-19 Jan 05	Rameshwaram, Tamil Nadu	1865.00
27 Jun-3 Jul 05	Rameshwaram, Tamil Nadu	9418.00
29 Sep-7 Oct 05	Rameshwaram, Tamil Nadu	12180.00
	Total: (In Indian Rupees)	67086.0
	In US Dollars	1524.68

Miscellaneous Pictures from Rameshwaram Parachute Spider Study



Rameshwaram Island, Tamil Nadu, a view from Pamban Bridge



Male (Left) and Female (Right) of Poecilotheria hanumavilasumica



Sealed Nest of female P. hanumavilasumica in Site 1



Spiderlings outside their nest on a tree trunk



Spiderling feeding on stick insect, which is 4-5 times longer than its total body length

