Status Survey of Endangered Species

WROUGHTON'S FREE-TAILED BAT

Otomops Wroughtoni

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ZOOLOGICAL SURVEY OF INDIA

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Otomops wroughtoni Thomas, 1913

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Status Survey of Wroughton's Free-tailed bat, *Otomops wroughtoni* Thomas, 1913

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INTRODUCTION

One of the fascinating families of Chiroptera is Molossidae, which has a wide range of distribution, both, in old and New World. This family of 16 genera and 86 species is found in the warmer parts of the world, from southern Europe and southern Asia south through Africa and Malaysia and east to the Fiji Islands, and from the central United States south through the West Indies, Mexico, and Central America to the southern half of South America. In India it is represented by only four species under two genera *viz. Tadarida* and *Otomops*. Though all the five species of Genus *Otomops* have a worldwide distribution, it is strictly confined to isolated pockets only. As far as the Genus *Otomops* is concerned, Jean Dorst (as cited in Brosset, 1962 c) has observed the scarcity of all the species of this genus throughout the area of its distribution (Tropical Africa, Asia and Oceania). He further states that most of these peculiarly structured and highly specialized species are known by a few examples only. *Otomops wroughtoni* (Thomas) is remarkable for its morphology, rarity and distribution, as it has been found to be restricted to a single cave in the Indian territory ever since its discovery in 1912. Thomas (1913) was the first author to describe the species. Since then it was studied in the field by Prater (1914), Brosset (1962 c), Topal & Ramakrishna (1981) and Bates *et al* (1994 c).

Considering the rarity and uniqueness of the species and with the idea of conducting a new status survey, the authors undertook a field study in March 2002. The present report is based on the past information and present observations made during the survey on the wroughton's free-tailed bat.

TAXONOMY

Thomas (1913 b) described the bat specimens collected from Barapede cave near Talewadi in Belgaum Dist., Karnataka State, as *Nyctinomus wroughtoni.* As per his conclusions this species was found to be belonging to Family Molossidae under the mammalian order Chiroptera. Subsequent revisionary taxonomic studies designated it as *Otomops wroughtoni.* Current taxonomic status of this highly specialized molossid bat is as under :

Class	MAMMALIA
Order	CHIROPTERA
Family	MOLOSSIDAE
Genus	***Otomops***
Species	***Otomops wroughtoni*** (Thomas)
Common Name	Wroughton's free-tailed bat

WORLD DISTRIBUTION OF *OTOMOPS* SPECIES

Bats inhabit most of the temperate and tropical regions of both the hemispheres though absent in certain remote, oceanic islands. They are not found in the colder parts of either hemisphere beyond the limit of tree growth. Distribution and record of the five species of *Otomops* are as below :

★ ***O. martiensseni*** : East Africa, Central African Republic, Djibouti, Ethiopia, Zaire, Kenya, Tanzania, Angola, Zimbabwe, Malawi, Natal (South Africa), Madagascar. Until recently, this species was known from only a single specimen from the Durban area but recently further observations have suggested that it may not be as rare as previously thought. Within South Africa, these bats are found only in Durban where they roost in the roofs of houses. (*Otomops martiensseni* (Matschie, 1897); ***Arch.*** *Naturgesch.* **63** (1) : 84, TL : Tanzania, Tanga, Magrotto Plantation)

★ ***O. wroughtoni*** : southern India; (*Otomops wroughtoni* Thomas, 1913; *J. Bombay Nat. Hist. Soc.* **22** : 87, TL : India, Mysore, Kanara, near Talewadi). Between the 21st and 26th of May 2002, the University of Victoria, B.C., Canada, witnessed a most significant event, the International Children's Conference on the Environment 2002. Eleven-year-old Vivek Danewale came half way around the world from Belgaum, India with his campaign to save the Otomops bats. As is popularly known, *Otomops wroughtoni,* even today is known from a single place in the world: Barapede Cave, Near Talewadi, Dist. Belgaum, Karnataka State, India, (Latitude 15° 25′ N and Longitude 74° 22′ E Altitude 800 m) (Map). The cave is about 2 kms away from Talewadi village, which is about 30 kms from Belgaum City in Karnataka State, India.

★ ***O. formosus*** : Java; (*Otomops formosus* Chasen, 1939; *Treubia,* **17**: 186, TL : Java, Tjibadak)

★ ***O. papuensis*** : Papua New Guinea; *(Otomops papuensis* Lawrence, 1948; *J. Mammal.,* **29** : 413, TL : Papua New Guinea, Gulf Prov., Vailala River)

★ ***O. secundus*** : Northeastern New Guinea. (*Otomops secundus* Hayman, 1952; in Laurie, *Bull. Br. Mus.* (Nat. Hist.), Zool., 1: 314, TL: Papua New Guinea, Madang Prov., Tapu)

SURVEYS IN CHRONOLOGICAL ORDER

Anderson discovered *Otomops wroughtoni* for the first time from India in 1912. The species was described and named for the first time by Thomas in 1913. Since then the cave was "revisited" on number of occasions, the chronological details of which are given in Table 1.

There might have been some definite unauthentic visits to the cave by others for vested interest. The above record also points out a fact that irrespective of the awareness of the extremely low population density, about 53 specimens have been collected for the museum records during last 80+ years. Since the field biologists/ zoologists are now fully aware of its stability in the taxonomic placement for more

Table 1

Sl. No.	Names of workers (Institutes)	Year	Population Estimate	Specimens collected
1.	Anderson (BNHS, Mumbai)	1912	40+	6
2.	Prater (BNHS, Mumbai)	1914	?	Fired 30 specimens in one gun shot
3.	Brosset and Humayun Abdul Ali (BNHS, Mumbai)	1961	40+	12
4.	G. Topal and Ramakrishna (ZSI, WRS, Pune)	1980	60+	1
5.	Bates, Harrison and Muni (BNHS, Mumbai)	1992	-	3
6.	Ramakrishna, M.S. Pradhan, and S.S. Thakur (ZSI, Kolkata/Pune)	March, 2002	75+	1

than 50 years, the species has been brought recently under Indian Wildlife (Protection) Act Schedule I (Part-1) and a complete ban is imposed on its collection for any academic or research purpose. This will enable *Otomops wroughtoni* population to stabilize and increase in number in this region in the forthcoming decades.

DIAGNOSTIC CHARACTERS

External Morphology

Wroughton's free-tailed bat, *Otomops wroughtoni,* is a large sized insectivorous molossid bat with a stout tail projecting conspicuously, beyond the narrow interfemoral membrane and with large ears of variable forms sometimes joining in the middle over the forehead. Its forearm length is in the range of 63-67 mm. The bat possesses some peculiar characters like margins of the ears are dotted with a number of small horny points, minute tragus triangular in shape, anterior border of the pinna with well developed extra lobe, face naked and with no hairs, nostrils with prominent projecting pads, mouth wide and fleshy etc. Pelage characteristic in colour. Dorsally it is rich glossy dark chocolate brown with thin white border on each flank extending to the groin and antebrachial membranes. Ventrally the bat is dull brown in colour with a contrasting greyish white colour on chest region. The shade of the fur is warm and distinctly coloured in live animals. However, it quickly fades after the preservation. A small gular sac is present in both the sexes.

Cranial Characters

Skull possesses condylo-canine length in the range of 21.8- 23.2-mm with an average of 22.5 mm. The skull is smooth and with a marked concavity present on the upper

braincase at the fronto-parietal suture. The occiput is bulbous. Basioccipital pits deep and well defined and with overhanging edges. Antero-external corners of the braincase prominent. Tympanic bullae large and elongated. Well-defined postorbital plates on zygoma present. M^3 complete with four cusps. The single upper incisor (i^2) simple and well developed. There are two or sometimes three lower incisors-which are small and bifid.

Measurements

External cranial and dental measurements (mm) (After Brosset, 1962; Bates and Harrison, 1997 and ZSI, WRS, Pune Collections).

Table 2

	Mean	Range
Head and Body	92.1	87.0—99.0
Tail	45.2	41.0—50.0
Hindfoot	11.8	10.0—14.0
Foreearm	64.9	62.0—67.0
Wing span (Maximum spread)	421.3	408.0—433.0
Fifth metacarpel	32.0	30.0—34.0
Fouth metacarpel	59.9	56.0—62.4
Third metacarpel	64.5	60.0—67.2
Ear	32.4	31.2—34.0
Greatest skull length	24.8	24.2—25.5
Condylo-canine length	22.5	21.8—23.2
Zygomatic width	13.1	12.6—13.3
Maximum Braincase width	11.2	10.9—11.3
Mamimum Braincase width	5.3	5.1—5.6
Maxillary upper toothrow (C-M^3)	9.0	8.8—9.5
Mandibular toothrow (C-M^3)	9.5	9.2—10.0
Mandible length	16.4	15.9—17.0

n = 20

Dental Formula : i : 1/2(3) c : 1/1 pm : 2/2 m : 3/3 = 30/32

ECOLOGY

Habitat : The most fascinating information of Wroughton's free tailed bat turned out to be about its habit and habitat. The species is known till this day from a single place all over the world: Barapede cave near Talewadi village in Belgaum Dist. in South India. The species is apparently confined to one diurnal biotope that is nothing but a vast natural cave situated on a large plateau rising above the thick forest patches at an altitude of 800 meters (2,600 feet). The cave entrance, high and broad, opens outside on to a grassy maidan, a good grazing ground for herds of Indian gaurs. The angiospermic vegetation that includes trees and bushes categories however, mostly conceals the entrance. The cave inside is about 40 m. deep, 25 m broad and 6-7 m high with dark corners, permanent patches of water and high degree of humidity. The floor vegetation is contrastingly different from the one found outside. Cave floor vegetation belongs entirely to the algal and moss components. There is another small cave like structure inside one of the dark corners of the main cave. The lime stonewalls and ceiling is full of lateral calciferous ramifications. These bats hide themselves in either deep narrow cracks or in number of holes or cavities in the shape of overturned funnels (Figure). This makes it utmost difficult to locate them. Since the cave has been almost concealed by natural growth of vegetation near the entrance, it becomes extremely difficult for a layman to locate it from outside. Moreover, during the daytime they keep silent and motionless hanging themselves by their feet with their heads down and muzzles protruding.

Habit : As stated earlier, *Otomops wroughtoni* is confined to one diurnal roost only. However, not much information is available on its feeding habits. The dentition of this bat is weak and appears to be unsuitable for crushing hard insects. But it is definite that the species is insectivorous like other large Molossid species, because, during the study conducted by Ramakrishna and his team for more than seven hours in March 2002, the team members could not smell the typical smell of guano of a frugivorous bat from any corner of the cave. Wroughton's free tailed bats are in the habit of taking shelter in small or big groups of 2 to 15 or even more individuals deep in the crevices, cracks and holes. They remain silent hence it is very difficult to locate the groups. Therefore, it generally becomes almost impossible to determine the colony size. It was also observed by the authors that these bats, when disturbed were more keen on "Walking side-ways" on the rough roof surface and hiding in the dark corners rather than on flying instantly to a distant place inside the cave.

The earlier surveyors (Brosset. 1962, Daniel *et al.* 1992 and Bates *et al.* 1994) have reported a peculiar habit. When disturbed, these bats flew with straight and strong flights within the cave from one hollow to another but never leaving the cave. The authors during their survey made similar observations in March 2002. However, it was surprising to notice that one bat, on sensing the disturbance, left the company of a small group of 5–6 bats in the crevices inside the cave and flew out of the cave with strong and straight flight. The bat instantly disappeared in the open. The bat did not return to the cave while the survey party remained in the cave. This change in behavior suggestive of the existence of additional diurnal hide out or a temporary roost somewhere in the adjoining area. A thorough intensive survey of the nearby caves by a team of experts may lead to some conclusions. With the same idea in the mind, the authors surveyed a few more caves of similar nature near the Barapede

cave but failed to locate any isolated roost of *Otomops wroughtoni*. A large cave almost of the same type situated at an altitude of 800 + m. in Bhimgad Fort within Bhimgad Wildlife Sanctuary was also thoroughly surveyed by the authors. Bhimgad cave is situated at an areal distance of less than 5 kms from Barapede cave. A large densely forested valley separates the two caves. No sign of Wroughton's free-tailed bat could be noticed in any of the caves including the one in Bhimgad Fort during the survey. The authors could not observe any other bat species during their period of inspection in Barapede cave, though co-existence of *Otomops wroughtoni* with *Megaderma spasma* and *Rhinolophus rouxi* had been reported in the past by Brosset (1962 c).

Prater (1914) reported winter season as a breeding season for *Otomops wroughtoni*, while Brosset (1962 c) pointed out uniqueness of Indian Chiropteran reproduction in winter season. Both of them have recorded females with young ones and some pregnant females with atleast one foetus each in the month of December. As per the comments of Brosset (1962 c) these bats give birth to their young ones in spring and early summer. According to him Asian Molossids have a sexual cycle quite contrary to the annual cycle of the greater number of Indian bats. Earlier Topal & Ramakrsihna (February, 1980) and during the present survey by the authors observed some subadults of *Otomops wroughtoni* in the month of March 2002. This confirms the observations made in the earlier reports of Prater (1914) and Brosset (1962 c).

POPULATION

Though *Otomops wroughtoni* roosts in one large cave only, it is rather difficult to estimate its population due to its peculiar habit of hiding in crevices and hollows. Earlier population estimate by Prater (1914), Brosset (1962) and Bates *et al* (1994) was around 40 + individuals with no segregation of sexes. However, population estimate studies conducted by Topal and Ramakrishna in 1980 and Ramakrishna, Pradhan and Thakur in 2002 have revealed occurrence of definitely more than 50 individuals in the cave during both the surveys. As per their estimate calculated in March 2002, there are around 75 + individuals living in separate groups with no sexual segregation in Barapede caves. The group size varies from 5 – 7 to 20 – 25 individuals. The two intensive surveys conducted by Zoological Survey of India survey parties have come out with a surprising finding that not only the population but also the habitat and its surroundings have remained unchanged and almost stable with hardly any noticeable major change in last more than 20 years. Ramakrishna has visited Barapede cave twice in a gap of 20 years. He found the nature of the cave and its surrounding habitat and the vegetation inside and outside the cave unchanged. The only differences that he could notice were the easy access to Talewade village through the thinning forest near Khanapur and the unfortunate wide publicity being given to the species. Even the monumental work of Indian Chiroptera by Brosset in 1962 did not draw attention of the biologists of that period towards this species. It's only after 1991 that *Otomops wroughtoni* came to the limelight and became a subject of interest through public awareness activities. **The authors, now, strongly wish to record a word of caution that the population should be left untouched if we really want to save it which has survived in this colony for more than 90 years after its discovery by Anderson in 1912.**

THREATS

The single diurnal roosting site in Barapede cave is the biggest and most important limiting factor for the population of Wroughton's free-tailed bat. The major threats to this ecoregion harbouring the bat stem from agriculture, mining and proposed hydroelectric project. All of these overarching threats are widespread throughout the bioregion. Most of the commercially valuable trees in this ecoregion have already been harvested (IUCN 1991). Mining for iron and manganese ore are now large contributors to habitat destruction. The grasslands of this ecoregion are highly vulnerable to fire, and frequent fires retard the growth and regeneration of shola forests. One of the major threat noticed in the area is frequent forest fires during summer (Fig.), which if uncontrolled may result in the damage to the ecology around the cave entrance, which ultimately will lead to the disappearance of the moist habitat, which the bat prefers. The degraded habitat will then be colonized by the exotic *Lantana camera* and *Eupatorium odorata,* which inhibit regeneration of native vegetation.

CONSERVATION MEASURES

At present *Otomops wroughtoni* (Thomas) has been included in the schedules of Indian Wildlife Protection Act (1972, as amended up to 2002). As per the IUCN 2000 guidelines the species has been listed under the category of Critically Endangered at global level on the IUCN Criteria basis of B 1 + bciii (CAMP Workshop Report, Feb. 2002).

RECOMMENDATIONS

In light of the above observations and the information received from various sources, it is strongly felt that *Otomops wroughtoni* (Thomas) needs immediate protection for the continued survival of the species. For this purpose the following conservation measures are suggested:

1. Full protection has been offered recently to *Otomops wroughtoni* (Thomas) by listing it in Schedule I (Part I) in the Indian Wildlife Protection Act. This will bring complete ban on collection of species for any purpose including academic and research purposes.
2. Though the cave is naturally concealed it is unguarded and, hence, can be exposed any time to human interference. Therefore, the cave should be guarded and fenced appropriately to avoid any sort of destructive activities inside the cave.
3. Possibility of the occurrence of another diurnal roosting site in adjoining areas cannot be ruled out. Therefore, thorough intensive and systematic surveys of all the caves existing in the Bhimgad region may be carried out by a team of experts to find out the possible existence of additional diurnal roosting site of this species. However, while conducting such survey, care must be taken to avoid disturbance of any type to the existing population.
4. Developmental activities of any kind must be stopped immediately in this region to protect the species from extinction due to habitat loss.

5. Efforts may be made to protect the cave from the occasional fire in the surrounding grassland habitat.
6. Agricultural activities should be totally banned in the immediate surrounding areas of the Barapede cave.
7. Talewadi village is situated just about 2 kms away from Barapede cave. Therefore the village boundary expansion in future should be refrained from extending further towards the cave to minimize the level of human interference.

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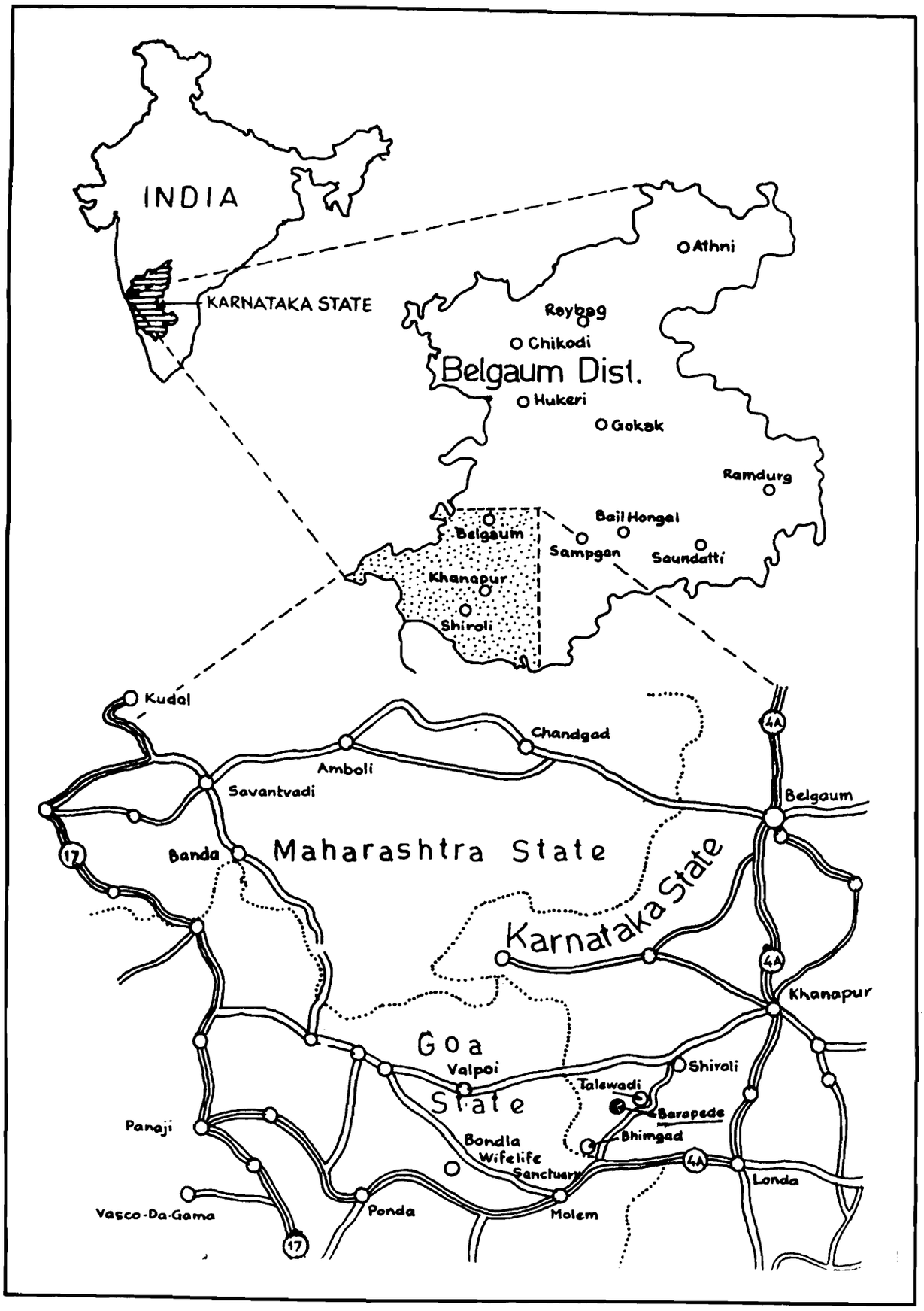
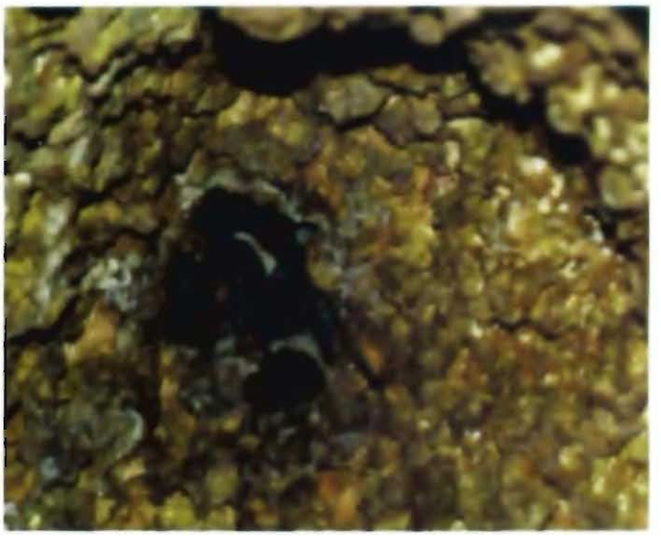


Location Map of Barapade Cave in India



Location of *Otomops* inside the cave

View of the cave from inside

Vegetation inside the cave entrance

Lushgreen Western Ghats leading to Barapade Cave

Entrance of Barapade Cave fully covered by vegetation.

Location and sideward movement of Bats

Otomops wronghtoni specimen from Barapade Cave

Close up view of Bat

Forest fire noticed nearer to Barapade Cave

Damage inflicted by forest fire

Aromatic leaves extracted from the forest area, kept for drying

Nearby Bhimgad caves surveyed for *Otomops*