

An avifaunal survey of Namdapha National Park: exploring the potential for bird tourism with local communities

A report submitted to the **Rufford Small Grants Foundation**
by **Umesh Srinivasan**



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Introduction

Ecotourism and wildlife tourism are increasingly being seen as viable conservation options that can provide economic benefits to communities residing around parks, and at the same time protect wildlife. In developing countries, especially in the tropics, community-based ecotourism (CBE) is especially relevant as a conservation tool, given the opportunities arising from high biodiversity as a tourist attraction, and the possibility to generate livelihoods for marginalised communities. Under the CBE model, the resident community in or around a wildlife habitat (such as a national park or wildlife sanctuary) has “substantial control and involvement in the ecotourism project, and the majority of benefits remain within the community” (International Ecotourism Society). CBE is often seen as a win-win solution, where a conservation ethic is fostered in resident communities through tangible economic benefits arising directly from wildlife and wild habitats, and has been shown to be a success, at least partially, in several parts of the world (review in Kiss 2004).

The Eastern Himalaya lies within a global biodiversity hotspot (Myers et al. 2000), where high biodiversity and endemism exists in a context of “exceptional habitat loss” (Myers et al. 2000). As such, sustainable tourism targeted towards this unique biodiversity, and with resident communities as beneficiaries, is likely to succeed in ensuring conservation of forest lands. Further, given that almost half the forest area in the state of Arunachal Pradesh in the Eastern Himalaya is community-owned and regulated, it is important to ensure sustainable use of such community-controlled lands.

There have been recent examples of successful community-based ecotourism from the state of Arunachal Pradesh. In 2005, a new bird species was discovered outside the Eaglenest Wildlife Sanctuary (Athreya 2005), on community land belonging to the Bugun tribe. Named the Bugun Liocichla, this species, along with a host of other rare or spectacular bird species, have become a major attraction for high income but low impact bird tourists. Today, Eaglenest Wildlife Sanctuary is on the global bird tour map, and the tourism infrastructure and business is managed by members

of the Bugun tribe. The Bugun also gain economic benefits from the project through a community fee paid by visitors, as well as gaining employment as staff in the tourist camps. This community-based ecotourism initiative has succeeded in that it is largely sustainable, and has also prevented the construction of a road by the Indian Army through the sanctuary, which would have destroyed a large part of the habitat.

Apart from Eaglenest, Arunachal Pradesh has more than 10 national parks and wildlife sanctuaries. Almost all are surrounded by, or have living in them, resident tribal communities. Hunting of wild game by tribal communities is a serious threat to wildlife in these parks (Datta et al. 2008), and habitat loss due to conversion of forests to agriculture, extraction of fuelwood, etc. also exists. One such park is the Namdapha National Park and Tiger Reserve in the Changlang district of eastern Arunachal Pradesh. The main tribal community (living on the eastern boundary of the park, and in a few settlements within it) is the Lisu. The Lisu practice settled rice cultivation in the valley of the Noa-dihing river, and are heavily involved in hunting, as well as conversion of forest to agricultural land. In response to these threats to the national park, a community-based conservation initiative seeks to minimise hunting and encroachment by addressing the socio-economic needs of the resident community by providing, among other things, access to healthcare, education and alternative livelihoods (Datta 2007).

As part of this larger community-based conservation initiative, this particular project was initiated to:

- (1) Explore the potential for bird tourism in and around Namdapha National Park. Given that the area has been poorly explored in terms of its biodiversity, it was vital to conduct a comprehensive survey of the avifauna of the region, focusing especially on species of tourism interest.
- (2) As a complementary activity, raise awareness about Namdapha National Park in the popular domain, through the creation of a comprehensive website detailing the flora, fauna, and the people of Namdapha and its surrounding areas.

Namdapha National Park: a broad overview

Geography

Namdapha National Park and Tiger Reserve (27°23'30" to 27°39'40"N, 96°15'2" to 96°58'33"E, 1985 km², 200 to 4500 m ASL) is situated in the Changlang district in the state of Arunachal Pradesh in north-east India (Fig. 1). The park is bordered by the Kamlang Wildlife Sanctuary to the north, Myanmar to the east and south, and the rest of Changlang district to the west. To the west lie community-owned lands of the Singpho and Tangsa tribes, with some villages of the Chakma tribe on the western border of the park. To the east of Namdapha is unclassified state forest claimed by the Lisu tribe, as well as a few settlements of the descendants of immigrants from Nepal.

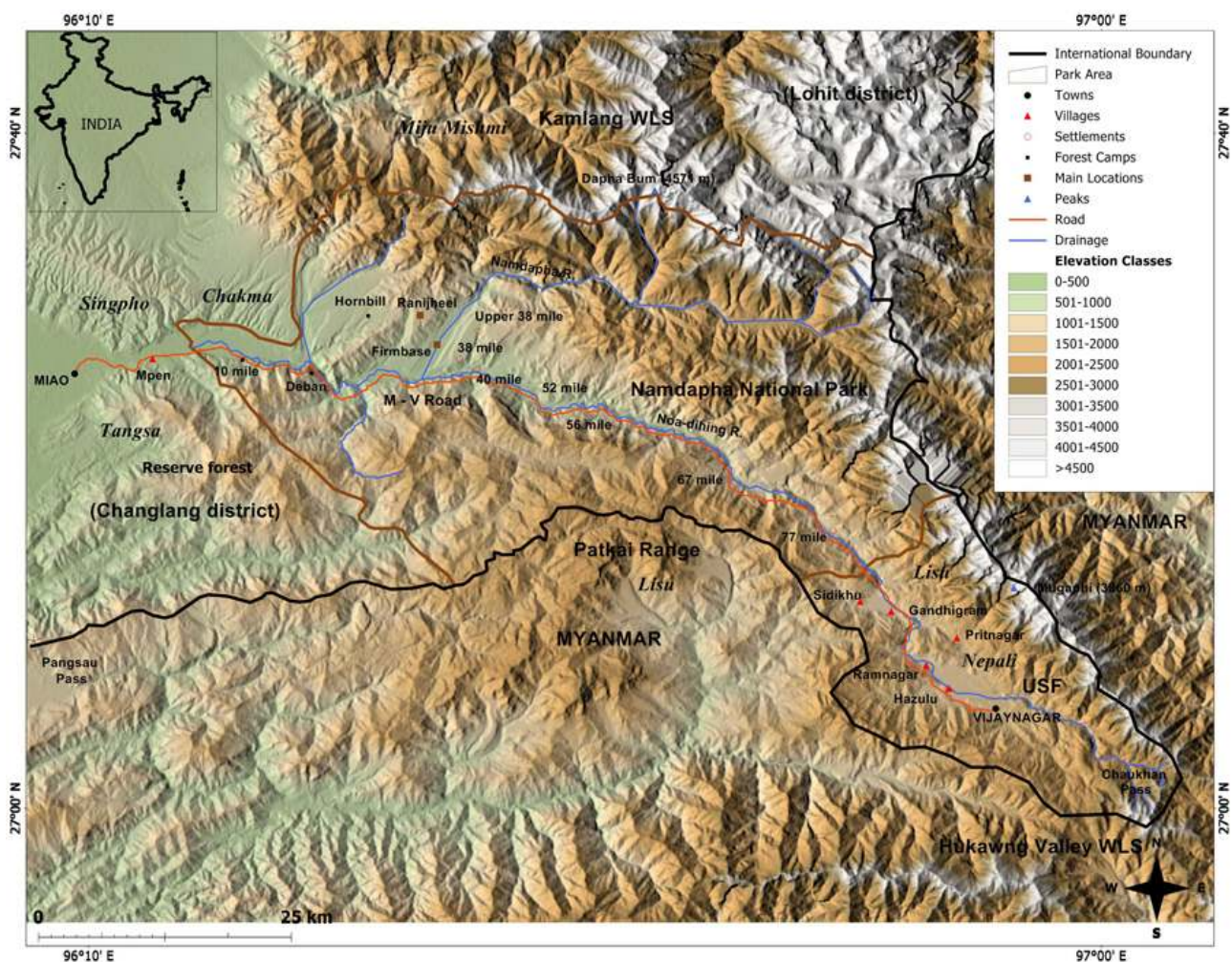


Figure 1: Map showing the physiography of Namdapha.

The Noa-dihing river runs through Namdapha National Park from west to east, as does the now

defunct Miao-Vijaynagar (MV) road, originally 157 km long. As of today, only about 17 km of the road is now motorable, from Miao (the park headquarters in the west) to Deban, on the western edge of the park. The main villages of the Lisu outside the park (to its east) are Gandhigram and Vijaynagar. Smaller Lisu settlements include Hazulu and Shidikhu. Within Namdapha, Lisu settlements exist at the 38th, 52nd and 77th mile distances of the MV road. Settled wet rice agriculture is practiced in all the settlements within Namdapha.

Given the remoteness and lack of any road communication between Gandhigram or Vijaynagar and Miao to the west of the park, most movement by Lisus from Gandhigram or Vijaynagar to the town of Miao is by foot. There is a 112 km long foot track through Namdapha, that largely follows the course of the Noa-dihing. It takes four to five days, for a fit person in good weather, to walk from Gandhigram to Miao. Often, the journey is made by the ill during the monsoon season, when the track is little more than a river of slush, and is punctuated by often large landslides.

Flora and fauna

The huge elevational gradient in Namdapha (200 to 4500 m above sea level) means that the park holds a broad range of habitats, from tropical rainforest (the northernmost in the world) at the lower elevations, to subtropical and temperate montane forest at the mid-elevations, and rhododendron shrubbery and alpine pasture at the highest elevations (Srinivasan et al. 2010). The highest areas are snowbound throughout the year. There are also extensive patches of bamboo at the low and mid elevations as well as patches of secondary forest and old fallows of swidden cultivation in some areas.

A multitude of habitats has contributed to the fact that the flora and fauna of Namdapha are amongst the world's most biodiverse. As reported to data, Namdapha has about 90 mammal species, including nine small and large cat species, seven species of primates, and over 15 species of civets

and mongooses. Higher elevations hold species such as red panda (*Ailurus fulgens*) and takin (*Budorcas taxicolor*). Prey species include wild pig (*Sus scrofa*), sambar (*Cervus unicolor*), gaur (*Bos frontalis*) and several species of goat-antelopes.

Namdapha is also an Important Bird Area (Islam & Rahmani 2004), and holds at least 491 bird species (Srinivasan et al. 2010). The park also harbours 11 of the 21 range-restricted and globally threatened species of the Eastern Himalaya, including White-bellied Heron (*Ardea insignis*), Cachar Wedge-billed Babbler (*Sphenocichla roberti*) and Beautiful Nuthatch (*Sitta formosa*). Several species are restricted to a few hill ranges south of the river Brahmaputra and do not occur in areas such as Nepal and north-central Arunachal Pradesh, important bird tour destinations. These include Snowy-throated Babbler (*Stachyris oglei*), Cachar Wedge-billed Babbler and Streaked Wren-babbler (*Napothera brevicaudata*).

Information regarding bird species occurrence in Namdapha comes mostly from birding tour reports (erratic in their coverage and detail). The mid and high elevations (1000 – 3000 m ASL) within the park, and community-owned forest land bordering the park remain unsurveyed and data-deficient. Restricted-range species such as Rusty-throated Wren-babbler (*Spelaeornis badeigularis*), Ward's Trogon (*Harpactes wardi*) and Mrs. Hume's Pheasant (*Syrmaticus humiae*), also species of interest to bird tourists, could potentially occur in the area.

Administration and people

Namdapha was declared a wildlife sanctuary in the year 1972, being declared a tiger reserve in 1983. The park headquarters are in the town of Miao, beyond the western boundary of the park. Being a tiger reserve, the park today is under the administrative oversight of a Field Director, and comes under the National Tiger Conservation Authority. Forest department presence in Namdapha is, at best, confined to the western part of the park, and the bulk of the Namdapha has no departmental posts or camps. Frontline anti-poaching staff posts (such as forest guards and watchers)

remain unfilled, and conservation or protection efforts by the forest department are woefully inadequate.

The Lisu are the tribe most closely associated with, and dependent on Namdapha. The Lisu were a migratory and nomadic tribe, practicing shifting cultivation in a region that now straddles the northern border between India and Myanmar, and settled in the Gandhigram-Vijaynagar area in the early 1930s. After the demarcation of the international border between India and Myanmar in 1972, the Lisus of Gandhigram and Vijaynagar received status as Indian citizens, but not scheduled tribe status, which all other tribes of Arunachal Pradesh enjoy. This has made it difficult for Lisus to compete with other tribes of Arunachal Pradesh on an equal footing with respect to jobs, etc.

The Lisu are largely dependent on settled wet rice cultivation and cultivation of other crops for their livelihood. However, access to markets is difficult given the terrain and the state of infrastructure, and most produce is consumed locally. There are few other options for employment or livelihood in Lisu settlements or villages.

The bird survey in Namdapha

As a preliminary step to future potential bird tourism, we conducted a comprehensive survey of the mid and high elevation in select locations within and adjacent to Namdapha National Park. Despite global recognition as a biodiversity hotspot, Namdapha has remained poorly explored, with only one systematic survey having been undertaken in the higher elevations (Ripley et al. 1991). This survey led to the discovery of species hitherto not reported from the area (such as the Fire-tailed Myzornis *Myzornis pyrrhoura*), as well as a previously undescribed subspecies of the Bar-winged Wren Babbler (*Spelaeornis troglodytoides indiraji*). We surveyed the mid and high elevations, with an emphasis on rare species or species of tourism value, that would prove attract to international tourists. Apart from forest and bamboo habitats, that make up the bulk of the area in and around Namdapha, we also surveyed areas around habitation, such as paddy fallows and swamp land for species of tourism value.

Locations and habitats

In all, we surveyed 22 locations, most of which were in the mid and high elevations of Namdapha and the community forest to its east. A list of the the habitats and locations is provided below (please see Appendices 1 and 2 for more details and Fig. 2 for a map showing the locations):

| Habitat | Locations | Administration |
|---|---|---------------------------------------|
| Primary evergreen forest | Deban, Bulbulia, Hornbill, Rani Jheel, Raja Jheel, Gachhile - 2 | National Park |
| Secondary evergreen forest, river bank, grassland | Musathi (38 th Mile MV Road), Firmbase, 65 th Mile MV Road, Miao Reserve Forest | National Park, Unclassed State Forest |
| Temperate forest | Gachhile – 1, Mugaphi – 2, Musala – 2 and Musala - 3 | National Park, Unclassed State Forest |
| Habitation, cultivation, orchards | Musala – 1, Shidiku, Gandhigram, Hazulu | Unclassed State Forest |

Figure 2: Locations visited during the bird survey in Namdapha and adjoining areas

Survey locations were selected based on two main criteria. These were that (a) the locations should be largely mid to high elevation areas, which have previously been poorly explored, and are likely to hold a number of species of tourism importance, and (b) the locations should be relatively easy to access, keeping in mind the requirements of tourists. It should be noted here that ease of access in Namdapha is a relative term, and reaching most of our survey locations (especially Mugaphi and Musala) took us two to three days of walking.

Methods

All travel to and from survey locations, as well as actual survey work, was carried out entirely on foot. We estimate that over the course of the entire survey period (November 2008 to January 2009), each person walked over 500 km. All bird sightings were recorded in field notebooks, as and when opportunistically encountered. Most records were sight records, although species with distinctive

calls (e.g. Chestnut-breasted Hill Partridge *Arborophila mandellii*) were recorded even based on aural records.

In addition to opportunistic records, we also focused intensively on confirming the presence of rare or spectacular bird species. This was done by creating a candidate list of species of tourism importance from each habitat, and obtaining recordings of the songs/calls of these species for tape playbacks. All recordings were obtained from www.xeno-canto.org/asia, a free online repository of bird calls. We played the taped calls of these species (e.g. Ward's Trogon *Harpactes wardi*) in the habitats they were most likely to occur, based on our past experience from other parts of Arunachal Pradesh. We also used tape playback, albeit very sparingly and in rare cases, to obtain photographs of species that were not previously recorded from the area for proof of presence.

Apart from our own prior expectations of species presence, we also interviewed several members of the Lisu tribe, who have an intimate knowledge of the birdlife of the area. We showed people field guides and illustrations of bird species, and asked for confirmation of their presence or absence, as well as details of what season and in what habitat these species were found. This allowed us to anticipate the occurrence of several unexpected species from the area, and led to us discovering, among other records, the seasonal presence of a white-headed race of the Black Bulbul (*Hypsipetes leucocephalus*) from the Vijaynagar area, hitherto not known from Indian limits (Srinivasan et al. 2009; Appendix 3). In addition to these methods, we also recorded the Lisu names for different bird species.

Results

We reported 62 'new' species from our survey, which have hitherto not been recorded in and around Namdapha (Srinivasan et al. 2009; 2010). These records take the overall checklist of bird species in Namdapha and adjacent areas to 491 species, making the region one of the bird rich in the world.

These include 84 babbler species, probably the highest for any national park or sanctuary in the world. A large number of the species we recorded were also of tourism importance, being either rare or range-restricted. Some of these species are highlighted below (please see Appendix 2 for a complete list of species of Namdapha and surrounding areas, and for more details in each record listed below):

Blyth's Tragopan (*Tragopan blythii*)

This globally vulnerable species was recorded thrice in two locations in temperate forest in bamboo undergrowth.

Tundra Swan (*Cygnus bewickii*)

Two birds seen in flight above Gandhigram, late morning, mid-December 2008 (Fig. 3). This represents the first photographic record of swans from anywhere in the subcontinent for over 80 years, and only the fifth record of swans from India.



Figure 3: Probable Tundra Swans over Gandhigram (all bird photographs by Umesh Srinivasan)

White-winged Wood Duck (*Cairina scutulata*)

Three sightings over two days from the same lake at 1700m ASL (Fig. 4). Globally endangered, and

the highest altitudinal record for this species globally.



Figure 4: A white-winged wood duck female at 1700m

Black-tailed Crake (*Porzana bicolor*)

Possibly only the third or fourth published record of this species from Arunachal Pradesh.

Apparently quite common in paddy fields and marshy areas around Gandhigram and Vijaynagar.

Black-necked Crane (*Grus nigricollis*)

One juvenile sighted, and apparently a single juvenile (Fig. 5) visits the paddy stubble each year near Gandhigram. A globally vulnerable species known now only from two other regular wintering sites in Arunachal (Sangti and Zemithang).



Figure 5: A juvenile Black-necked Crane in paddy stubble, Gandhigram

Ward's Trogon *Harpactes wardi*

A much sought after species in bird tours throughout south Asia due to its rarity, we recorded this

near threatened species at two locations (five to six birds in each location). This species appears to be common in its habitat, although it has not been reported before from Namdapha.



Figure 6: A male and a female Ward's Trogon recorded photographed in mossy temperate forest

Golden-crested Myna (*Ampeliceps coronatus*)

Only the third confirmed record of this species from the country (from Miao Reserve Forest, to the west of Namdapha).



Figure 7: A pair of Golden-crested Myna photographed in Miao Reserve Forest

'White-headed' Black Bulbul (*Hypsipetes leucocephalus*)

The first record of the white-headed race of the Black Bulbul from India; this subspecies is usually confined to south China and northern Thailand.



Figure 8: White-headed Black Bulbuls along with 'Black-headed' Black Bulbuls, Hazulu village

Lisu bird names

From interviews with members of the resident Lisu tribal community, we recorded over 250 Lisu names of birds. Whereas most names were species-specific, a few names denoted general bird families, especially small or very similar looking species such as warblers. The Lisu have an astounding knowledge of the birdlife of the area, and have names even for such relatively unobtrusive species such as the Large Wood-shrike (*Tephrodormis gularis*). The Lisu names we recorded are provided against the checklist in Appendix 2.

Conclusions

Bird species of Namdapha National Park and surrounding areas

That Namdapha and its surrounding areas have the bird diversity to attract serious high income and low impact tourists remains without doubt. In fact, the western part of the park does see low levels of tourism, especially centred around species such as White-bellied Heron (*Ardea insignis*), Snowy-

throated Babbler (*Stachyris oglei*), Beautiful Nuthatch (*Sitta formosa*) and Streaked Wren-babbler (*Napothera brevicaudata*). To these species (mostly low elevation species in the accessible western parts of the park), can be added highly sought after mid and high elevation species such as Ward's Trogon (*Harpactes wardi*), Naga Wren-babbler (*Spelaeornis chocolatinus*), Cachar Wedge-billed Babbler (*Sphenocihla roberti*) and Blyth's Tragopan (*Tragopan blythii*), most of which are major tourist draws in other birdwatching areas such as Eaglenest Wildlife Sanctuary and the Mishmi Hills.

Further, in addition to these species that might be found elsewhere in the state of Arunachal Pradesh, our survey indicates that the Black-necked Crane (*Grus nigricollis*), White-headed Black Bulbul (*Hypsipetes leucocephalus*) and Golden-crested Myna (*Ampeliceps coronatus*) are regular visitors, at least seasonally, to Namdapha and its surroundings. Certainly, the addition of some of these species, so far not reported from anywhere else on the bird circuit, makes Namdapha a must-see for any serious birdwatcher, even internationally.

Proximity to other important bird areas

A further advantage with Namdapha's location is that other national parks with diverse habitats and special bird species not found in Namdapha are close enough to Namdapha to be driven to.

Significantly, this includes Dibru-Saikhowa, a wildlife sanctuary in the floodplains of Assam, that is home to the Black-breasted Parrotbill (*Paradoxornis flavirostris*), Marsh Babbler (*Pellorneum palustre*) and Swamp Prinia (*Prinia cinerascens*), all specialties on the bird circuit.

Also, the presence of degraded forest and other habitats such as cultivation and habitation near Miao, on the western edge of the park, makes for more a more exciting birding experience than one would get from simply confining oneself to primary forest. Another area that is close to Namdapha and attracts birders thanks to its specialty species is Digboi (about a three hour drive), where one can sight species such as the Chestnut-backed Laughingthrush (*Garrulax nuchalis*). A

typical bird tour where tourists would get to see about 350 species would need to include Dibru-Saikhowa, the Digboi oil fields, Miao reserve forest, the western edge of Namdapha for the lowland tropical forest specialties, Gandhigram and Vijaynagar for species such as Black-necked Crane and White-headed Black Bulbul, and a mid-elevation temperate forest site for species such as rusty-capped Fulvetta (*Alcippe dubia*) and Ward's Trogon (*Harpactes wardi*). It must be noted that some species visit only during the winter, and the timing of a potential tour must take this into account.

Issues with potential bird tours in the area

The greatest hurdle in organising tourism in Namdapha is the lack of existing infrastructure and difficulties with access. Even birders visiting the western part of the park have to hike, and this makes it impossible for the elderly or infirm to visit the area. Getting to Gandhigram or Vijaynagar is even more complicated at the moment – most movement is by foot through sometimes forbidding terrain, which is often difficult to navigate during the dry season, let alone the monsoons.

At the moment, the forest department is building a semi-permanent road that is supposed to end up linking Miao and Vijaynagar. If this road is built and maintained, bird tourists will have access to habitats that hold species such as Black-necked Crane, Black-tailed Crake, Cachar Wedge-billed Babbler, and other such specialties. Further, driving along this road will also provide access to habitats that support other species such as Rufous-necked Hornbill (*Aceros nipalensis*), Brown Hornbill (*Anorhinus tickelli*) and several species of water-birds, in addition to species such as Snowy-throated Babbler and Large Scimitar Babbler (*Pomatorhinus hypoleucos*). An alternative option in reaching Vijaynagar or Gandhigram is the Indian Air Force sorties, that fly from Mohanbari (near Dibrugarh in Assam) to Vijaynagar. However, not only are these sorties erratic and dependent on the weather, but they being military flights might raise hurdles with transporting tourists from abroad. In all, air travel to and from Vijaynagar does not appear to be a viable option. The road linking Miao and Vijaynagar would also be essential in other respects, such as transporting

supplies and provisions (especially for a tourism business), which might not be readily available in the settlements east of the park. These items include things like bottled water, batteries and biscuits, all of which cannot be carried by a limited number porters. In any case, the lack of access would mean significantly low tourist numbers which would make community-based ecotourism unsustainable.

A further issue is with accessing the higher elevation areas above Gandhigram and Vijaynagar. For a bird tour to make the most of the time available, access must be available until at least 2700 m above sea level for a fair chance to sight the maximum possible number of bird species. Although reaching these elevations is possible for someone in good physical condition, at the moment, the terrain imposes a filter on the types of tourists who will be able to reach the higher elevations, and would definitely limit tourist inflow. Possible options in overcoming these limitations are to cut a rough road for four wheel drive vehicles or use pack animals to transport materials. However, the effort required in completing this would be massive, and would possibly take years to complete. As with other areas such as Eaglenest, is it very likely that road maintenance would be an eternal feature of any tourism program, given the heavy rainfall and steep terrain that causes regular landslides in the area.

In conclusion, although the ingredients for a successful bird tourism program are either present or are expected to be soon available, the financial and manpower effort in beginning comfortable and competitive bird tourism is expected to be massive.

The Namdapha National Park website: www.namdapha.in

One of the most important component of any conservation program is increasing general awareness, and this becomes especially important for a potential tourism-based conservation effort, where publicity is vital in generating both interest and income. As a result, we created a comprehensive website (www.namdapha.in) that aims to:

1. highlight the extraordinary biodiversity of Namdapha National Park and its environs
2. provide detailed information on the logistics of tourism to the area
3. provide auxiliary information on other wild areas, and the state of Arunachal Pradesh in general

The website is based on the Joomla! content management system, and was designed by Nipi software, Mysore. A comprehensive website of this nature necessarily has a large number of contributors, and the following people were involved in creating content for the website:

Umesh Srinivasan and Aparajita Datta researched and wrote a majority of the pages. Others who contributed write-ups (to 'more wild places') were Karthik Teegalapalli, Nandini Velho and Rohit Naniwadekar. R. Raghunath patiently created the high-quality detailed maps on the website.

www.namdapha.in also hosts a large collection of photographs on flora and fauna from the area, and we are indebted to the following people (in alphabetical order) for making their photographs available for use on the website: Alan Kelly Gardner, Anand MO, Aparajita Datta, Ashok Captain, Charudutt Mishra, Divya Mudappa/ TR Shankar Raman, Kalyan Varma, Karthik Teegalapalli, Manoj Nair, MD Madhusudan, Meghna Krishnadas, Nandini Velho, Prashanth NS, Raja Purohit, Robin Abraham, Rohit Naniwadekar, Samraat Pawar/ Ayesgul Birand, Shashank Dalvi, SU Saravanakumar, Ujjal Ghosh, Umesh Srinivasan and Viral Mistry.

The structure of the website

The website is structured to have an introductory home page, several 'first level pages' dealing with

broad themes, and 'second level pages' nested within the first level pages that describe or provide information on more specialised topics. Sometimes, within the second level pages are tabs that provide relatively more specialised information. The following is a list and hierarchy of the pages in

www.namdapha.in:

Home page

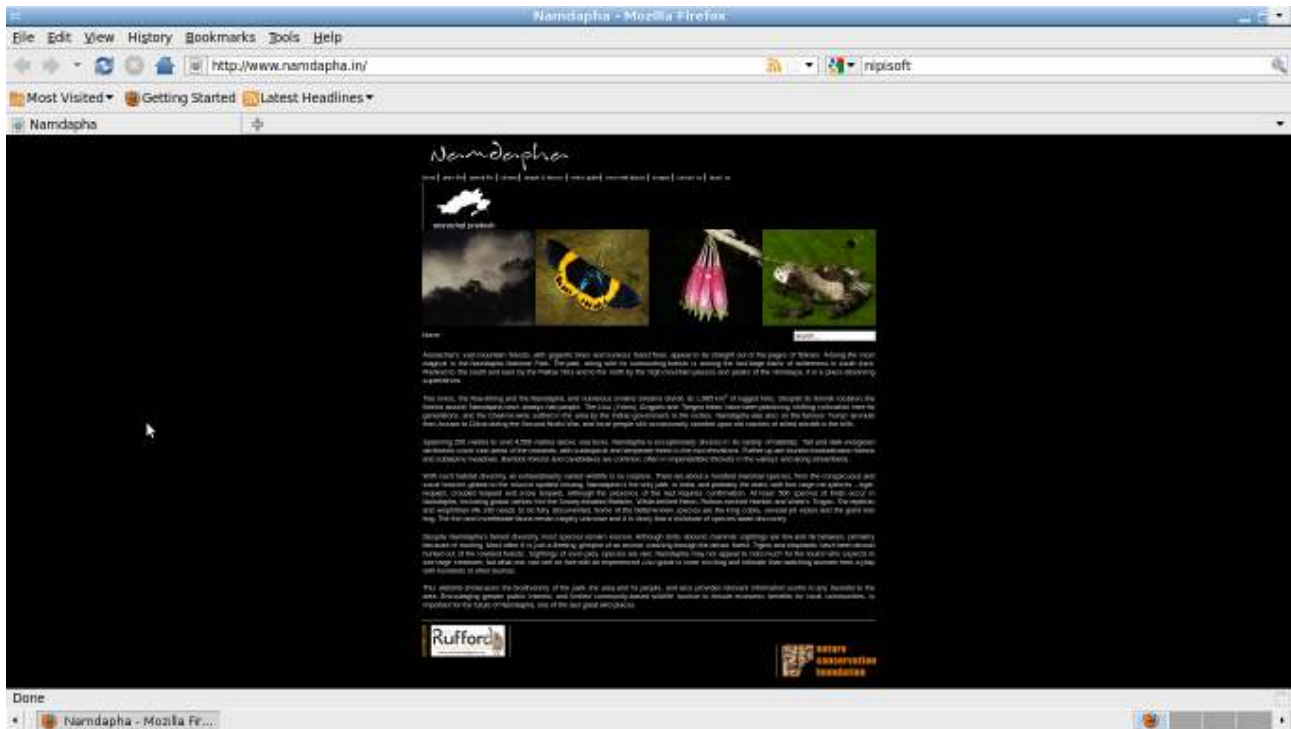


Figure 9: A screenshot showing the www.namdapha.in homepage

First level pages (numbered and italicised), second level pages (normal font), and tabs within second level pages (in smaller font):

1. Plant life

- low elevation rainforests
- grasslands
- subtropical forests
- temperate forests
- alpine meadows
- medicinal and edible plants
- orchids, mushrooms, other plants
- common trees & shrubs

2. Animal life

- invertebrates
- fish

- amphibians
- reptiles
- birds
- mammals
- little known species
- animal signs

3. *Climate*

4. *People and history*

- people
- history
- park creation and management
- conservation problems and threats
- conservation initiatives
- research and surveys

5. *Visitor guide*

- getting there
- where to stay
- permits
- exploring Namdapha
 - forest trails
 - camping
 - provisions and logistics
 - essential equipment & drugs
- viewing wildlife
- places of interest
- trekking routes
- useful addresses and links
- maps
- papers and articles
 - popular articles
 - books and book chapters
 - papers
 - reports and theses

6. *More wild places*

- Pakke
- Eaglenest
- Mouling
- Mehao
- Kamlang
- Tale Valley
- D'ering
- Kane
- Dibang
- Tawang
- Yordi Rabe Supse

- others

7. Images

- mammals
- birds
- reptiles
- amphibians
- invertebrates
- plants
- landscapes
- fish

8. Contact us

9. About us

10. Arunachal Pradesh

- history of the state
- people and cultural heritage
- climate and physiography
- floral and faunal diversity
- traveling in Arunachal

A brief description of the web pages

The *plant life* and *animal life* pages are general introductions to the the species found in Namdapha and belong to both these kingdoms of living creatures, and contain checklists of the important floral and faunal groups. Although most of the sub-pages in section are not yet complete, these pages do offer a detailed picture of Namdapha's biodiversity. The *climate* and *people and history* pages offer a general introduction to Namdapha's seasons and terrain, as well as trace the history of the area, including its role in World War II, and more recent developments. All these pages are enhanced by high-quality photographs, making them visually appealing.

Given the function that the website is to fulfill, by far the most detailed and informative pages is the *visitor guide* section. Different sub-sections under this theme offer precise and comprehensive information to the prospective visitor, including travel to and from Namdapha (*getting there*; which also provides information on bus timings, taxi fares, etc.), accommodation (*where to stay*) and extremely detailed information on how and where to obtain *permits* to visit the

area. *Exploring Namdapha* continues to provide the same level of detail, encompassing maps that show *forest trails* in the area, options for *camping*, issues dealing with *provisioning and logistics*, and finally a section on *essential equipment and medication*.

Other second-level pages under the *visitor guide* section are helpful tips on *viewing wildlife*, highlights on other *places of interest* in the vicinity, *trekking routes* within and outside the park, *maps* providing various types of information, and useful *addresses and links* for visitors. The *visitor guide* section is also meant to be a one-stop repository for all literature on Namdapha, and therefore carries four separate tabs which detail the *popular articles, books and book chapters*, scientific *papers and reports and theses* on the area and its wildlife.

A section on *more wild places* provides a park-by-park introduction to other national parks and wildlife sanctuaries in the state of Arunachal Pradesh, whereas another link introduces the state itself to the reader. Another comprehensive section in the website is the image gallery, that hosts, as of now, 608 images from Namdapha and the surrounding areas. This section is intended to showcase the biodiversity and landscapes of Namdapha. As of now, the gallery contains images grouped by the following categories (please note that some categories are further divided into sub-categories, e.g. birds, invertebrates):

| Category | Number of images (of different species) |
|-----------------|--|
| Mammals | 56 |
| Birds | 131 |
| Reptiles | 36 |
| Amphibians | 24 |
| Fish | 2 |
| Invertebrates | 153 |
| Plants | 185 |
| Landscapes | 18 |

Although the coverage of all taxa is not complete, we have made every effort to source photographs of species that were available, but very many species are not represented owing to the lack of

photographs. Photograph credits are indicated against each photograph, and a list of contributors has been added to the beginning of this section.

It is hoped that the depth and breadth of this website will make it a vital resource in supporting and catalysing any future tourism efforts in the area. Please see Appendix 4 for screenshots that detail a sample of the various pages on the website, as well as the image gallery. As already indicated, the website can be viewed at www.namdapha.in.

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Appendices

Appendix 1

Habitats surveyed during the bird survey in and adjacent to Namdapha National Park



Paddy stubble, Gandhigram



Temperate forest with bamboo undergrowth, Mugaphi



Burnt fallow with second growth in the background, Meludi



Montane lake at 1700 m above sea level, Musala



Swamp and marsh land with swidden fallows, Gandhigram



Montane bamboo at 3200 m above sea level, Mugaphi



Rhododendron without canopy, Mugaphi



Alpine grassland, Mugaphi



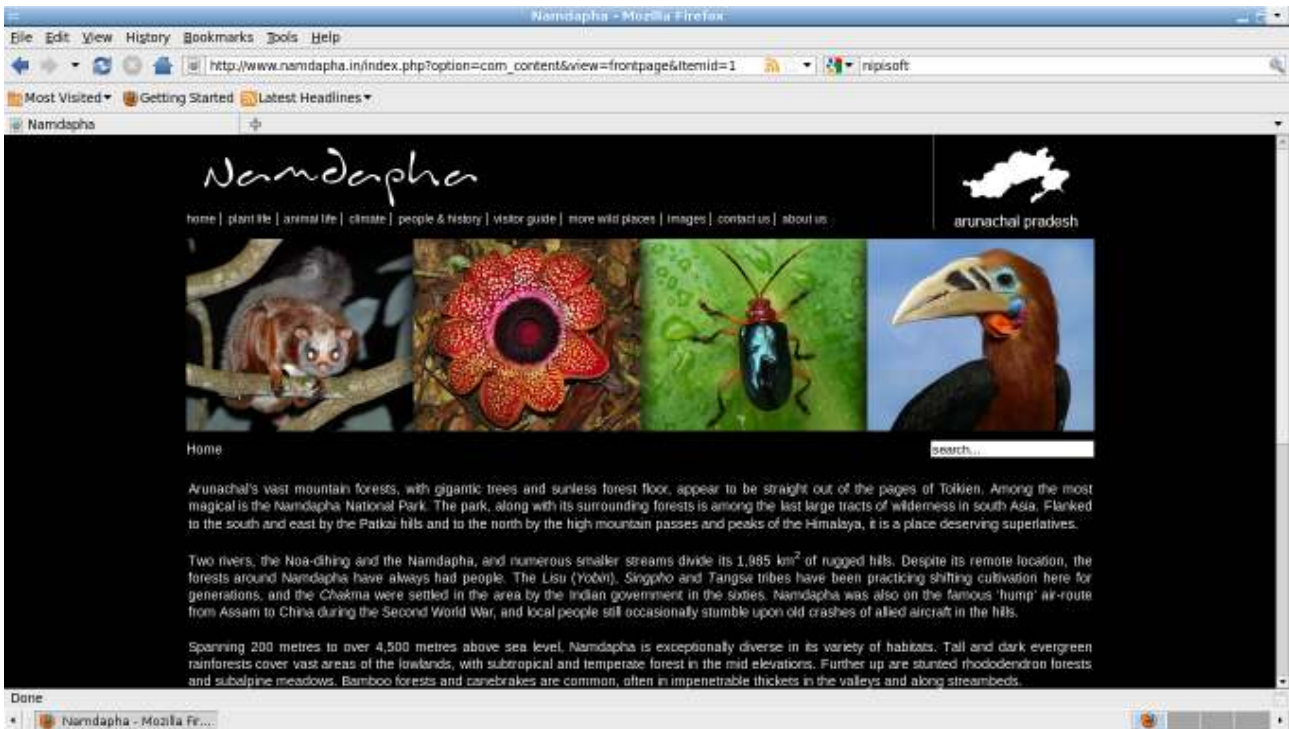
Riverbed grassland and streams, Firmbase

Appendix 2

Srinivasan, U, S Dalvi, MO Anand, R Naniwadekar & A Datta. 2010. The birds of Namdapha and surrounding areas: recent significant records and a checklist of the species. *Forktail*, 26, 92-116.

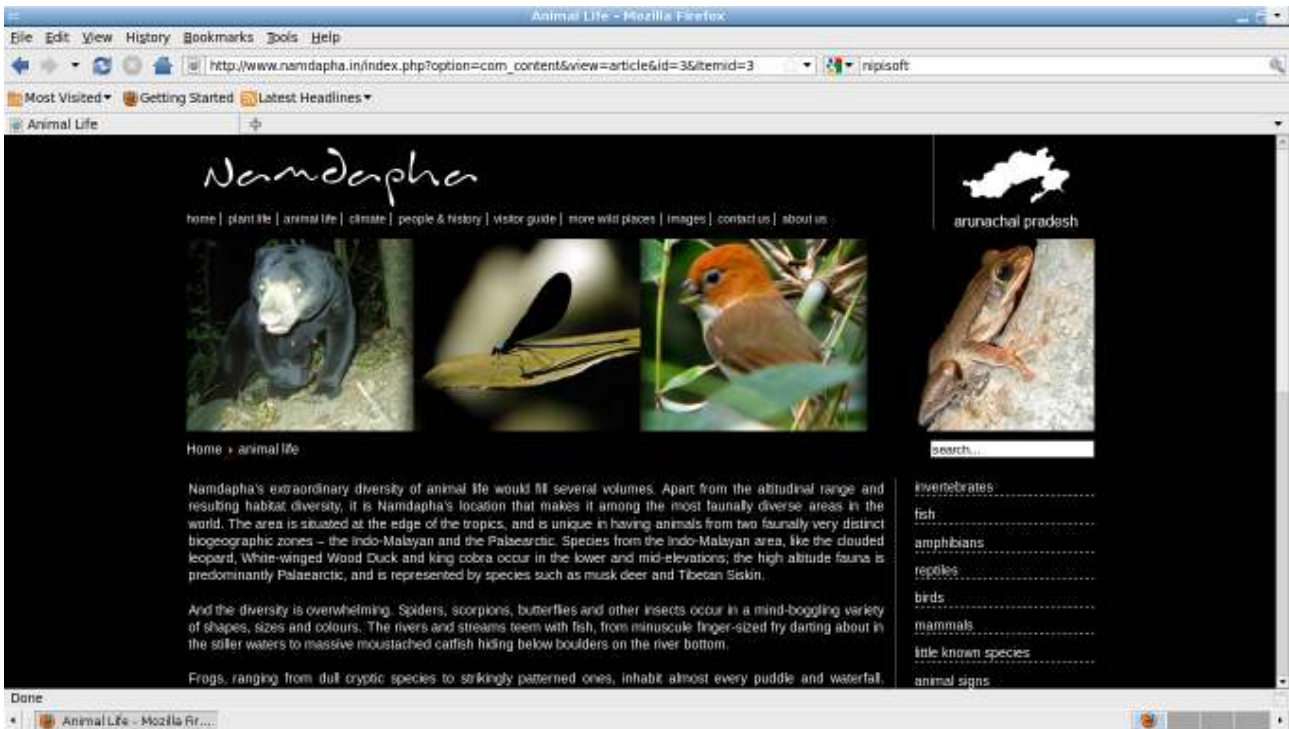
Appendix 2

Screenshots detailing a sample of pages from the www.namdapha.in website

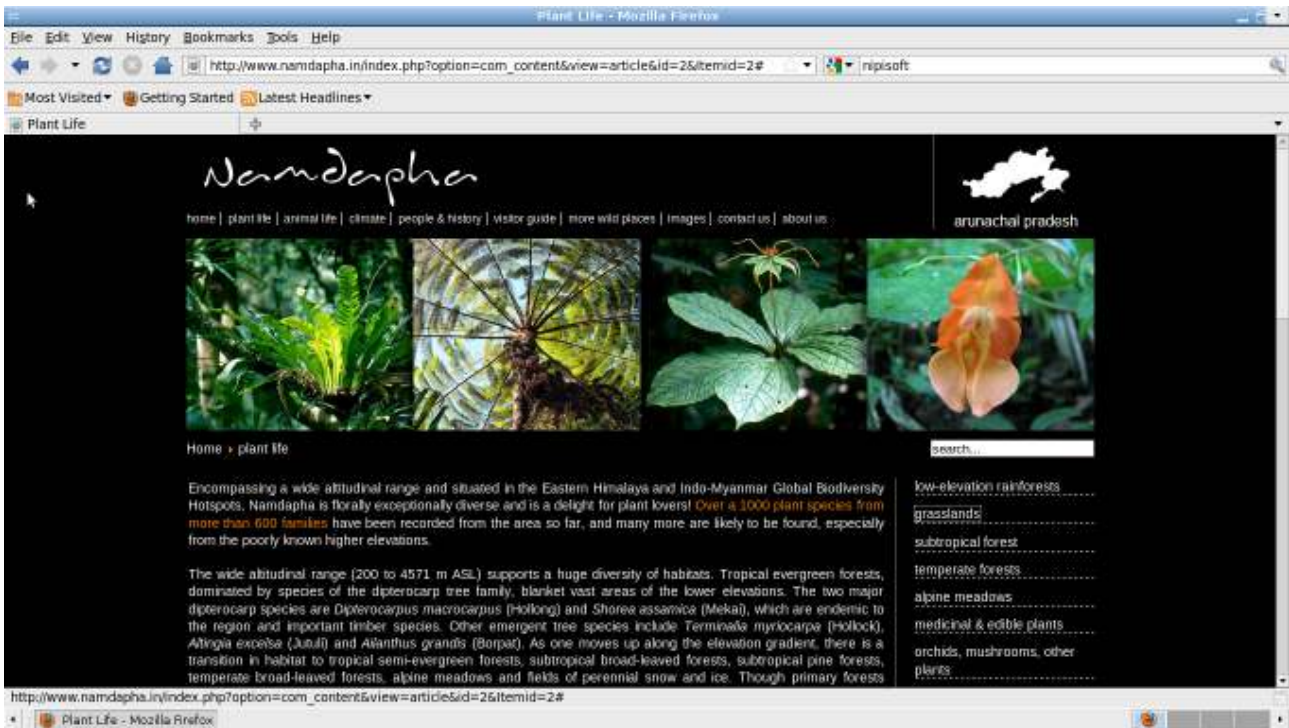


4.1: A view of the homepage

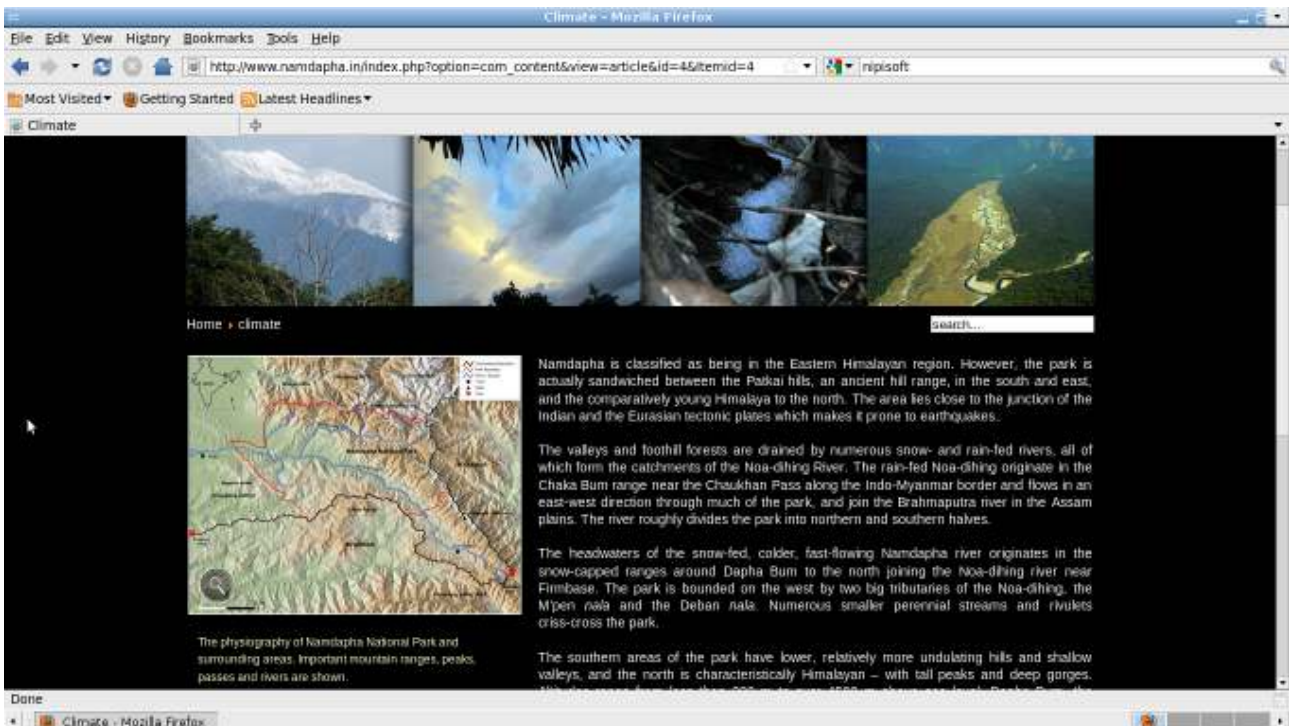
4.2: First level pages



4.2.1: The 'animal life' page



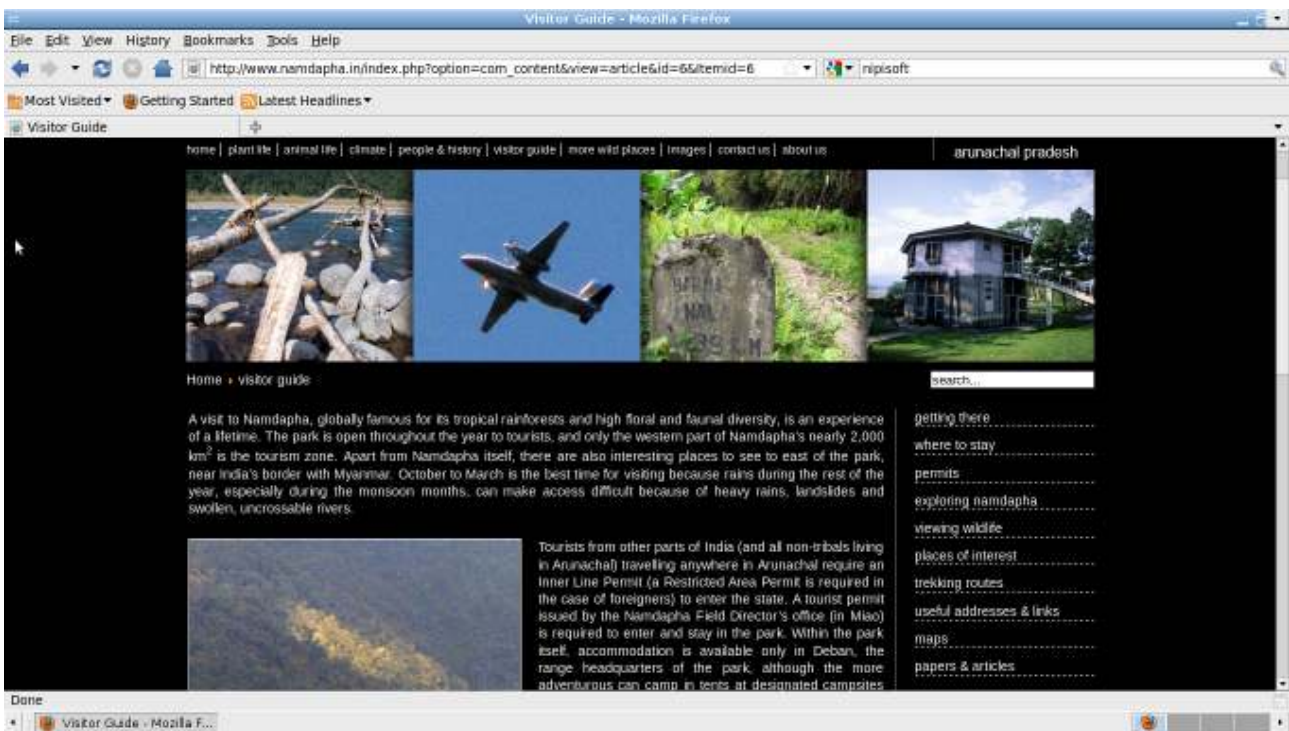
4.2.2: The 'plant life' page



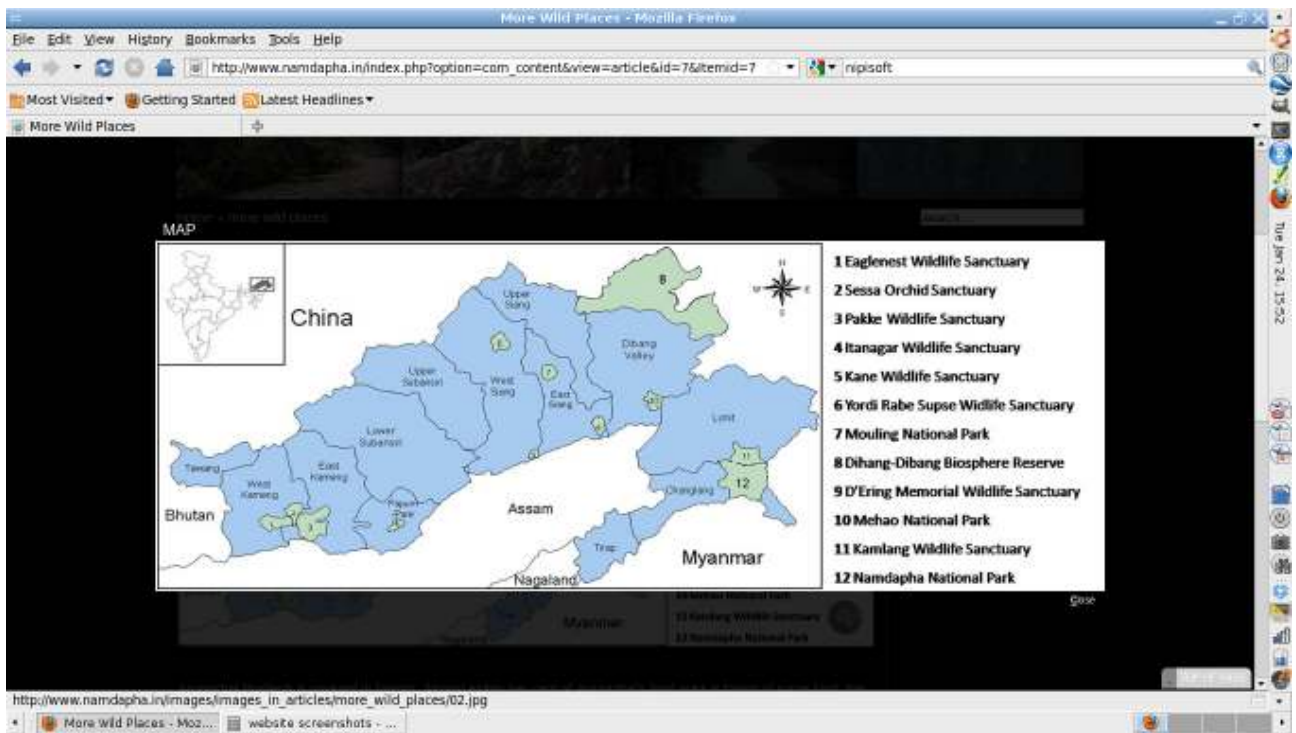
4.2.3: The 'climate' page



4.2.4: The 'people and history' page

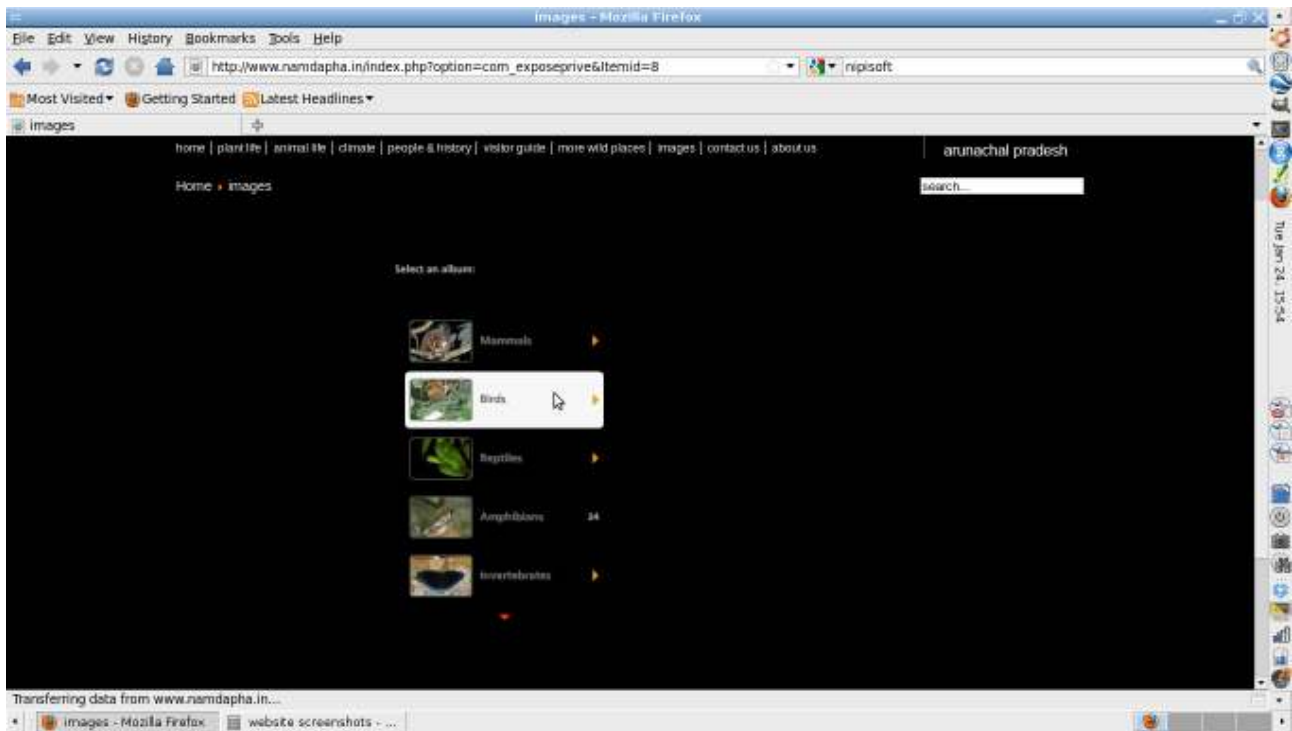


4.2.5: the 'visitor guide' main page

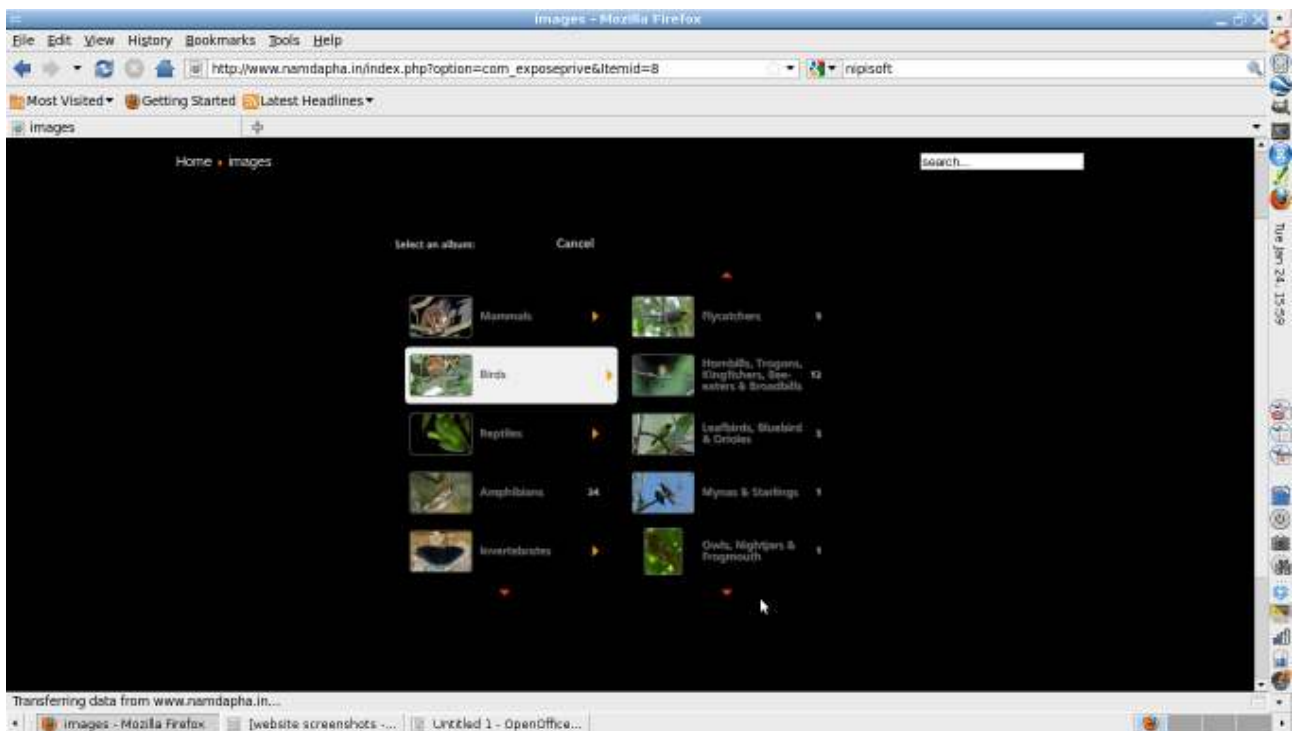


4.2.6: The 'more wild places' main page

4.2.7: The image gallery

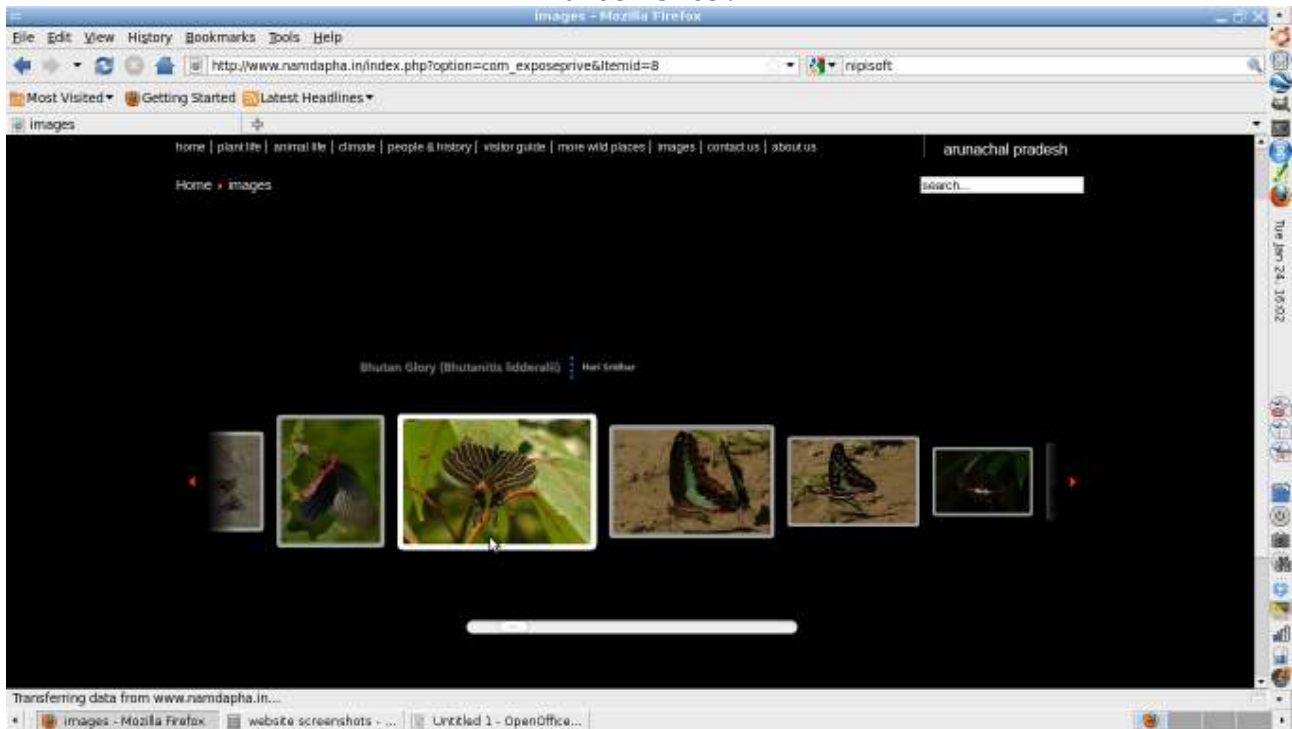


4.2.7.1: The 'images' main page showing a sample of the categories under which the images are grouped. Numbers against the categories indicate the number of images within each category. Where a category has been 'split' into sub-categories, a right-pointing arrow head indicates more detail within the category.

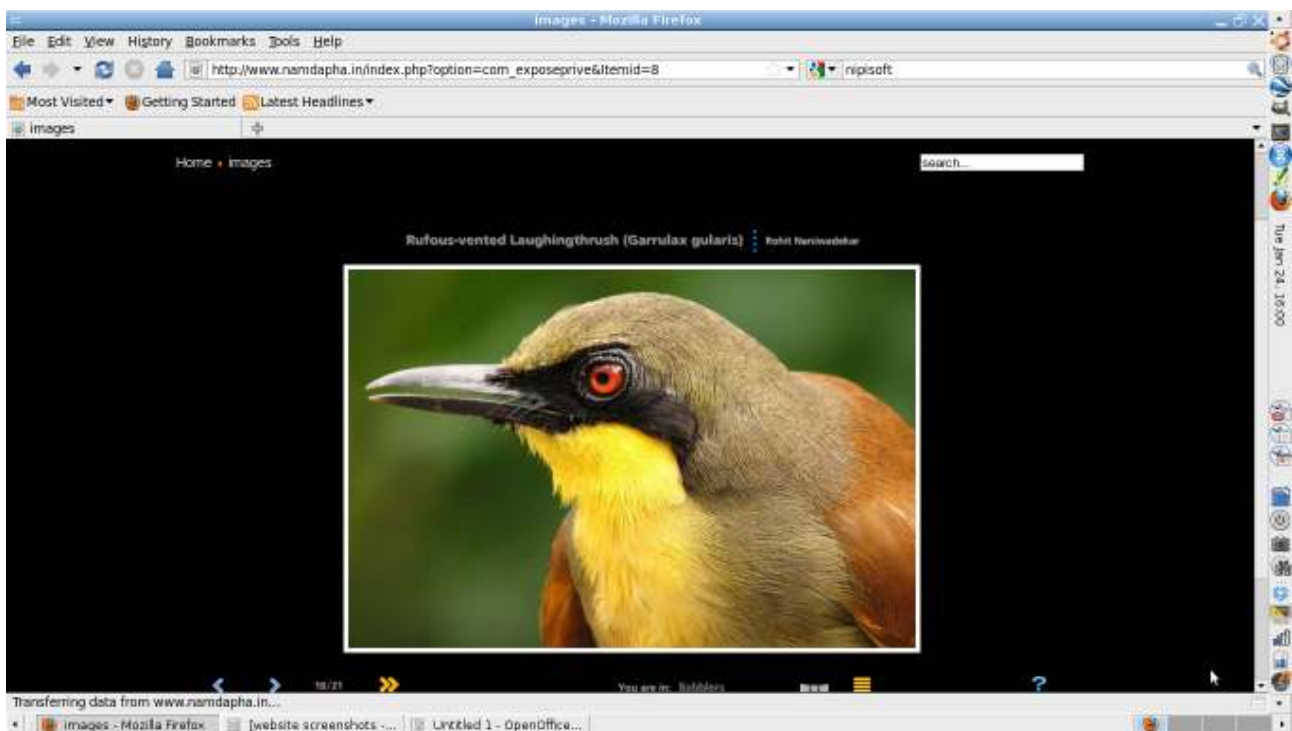


4.2.7.2: An example of an image category ('birds') that has been further divided into sub-categories (visible in this grab are 'flycatchers', 'hornbills, trogons, kingfishers, bee-eaters and barbets', 'leafbirds, bluebirds and orioles', 'mynas and starlings', and 'owls, nightjars and frogmouth').

Arrowheads above and below these visible categories indicate that there are more sub-categories under 'birds'.



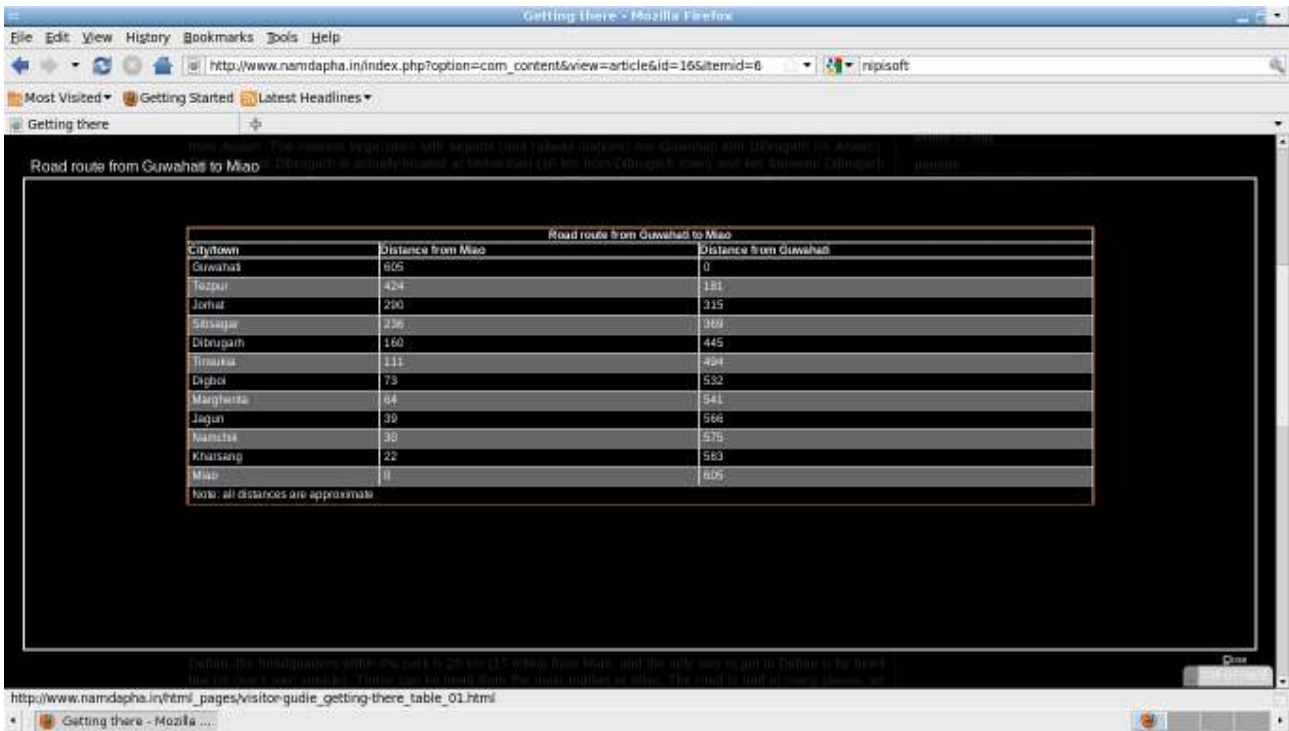
4.2.7.3: An example of the 'scrolling' image gallery of butterflies. The largest image (that can be made larger by clicking on it) is that of the Bhutan Glory. The photo credit (credited to Hari Sridhar) appears to the right of the species name.



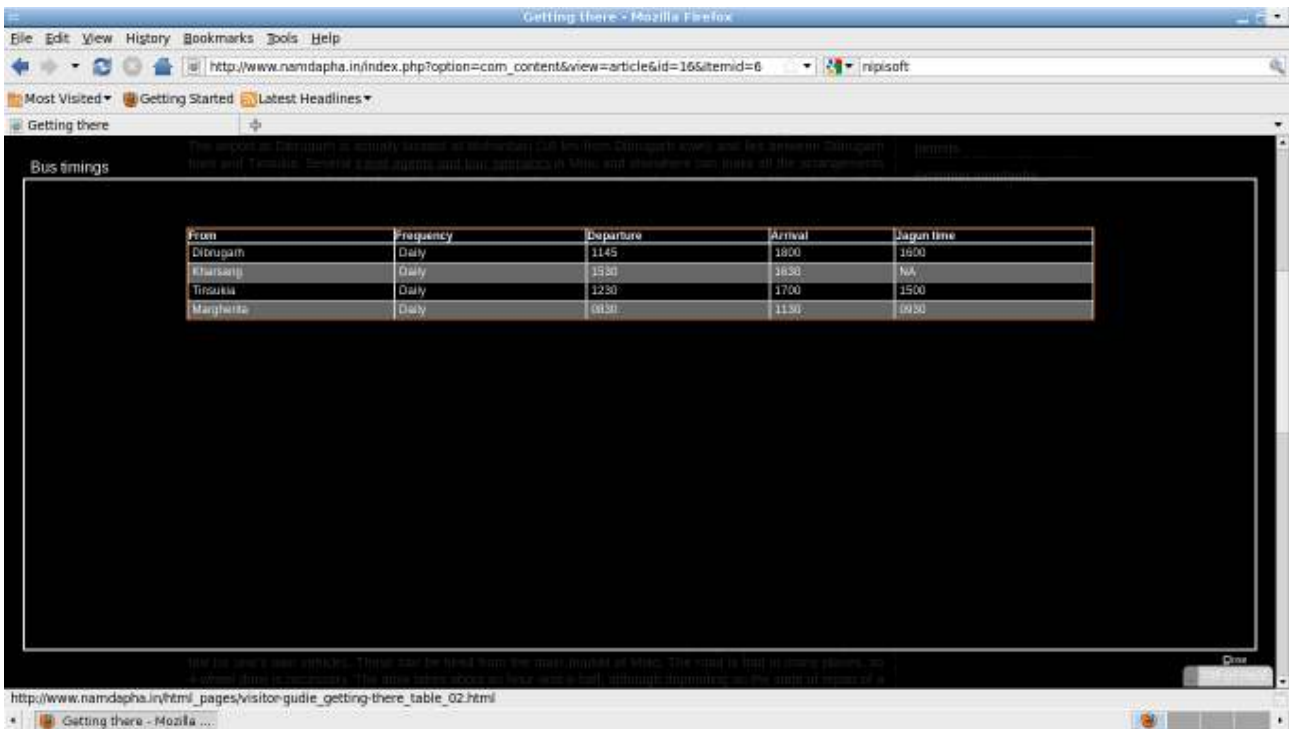
4.2.7.4: An example of the final size of display of a photograph in the gallery. This image is of a Rufous-vented Laughingthrush credited to Rohit Naniwadekar.

4.3: Examples of second-level pages, tabs with second level pages, and pop-up informative displays

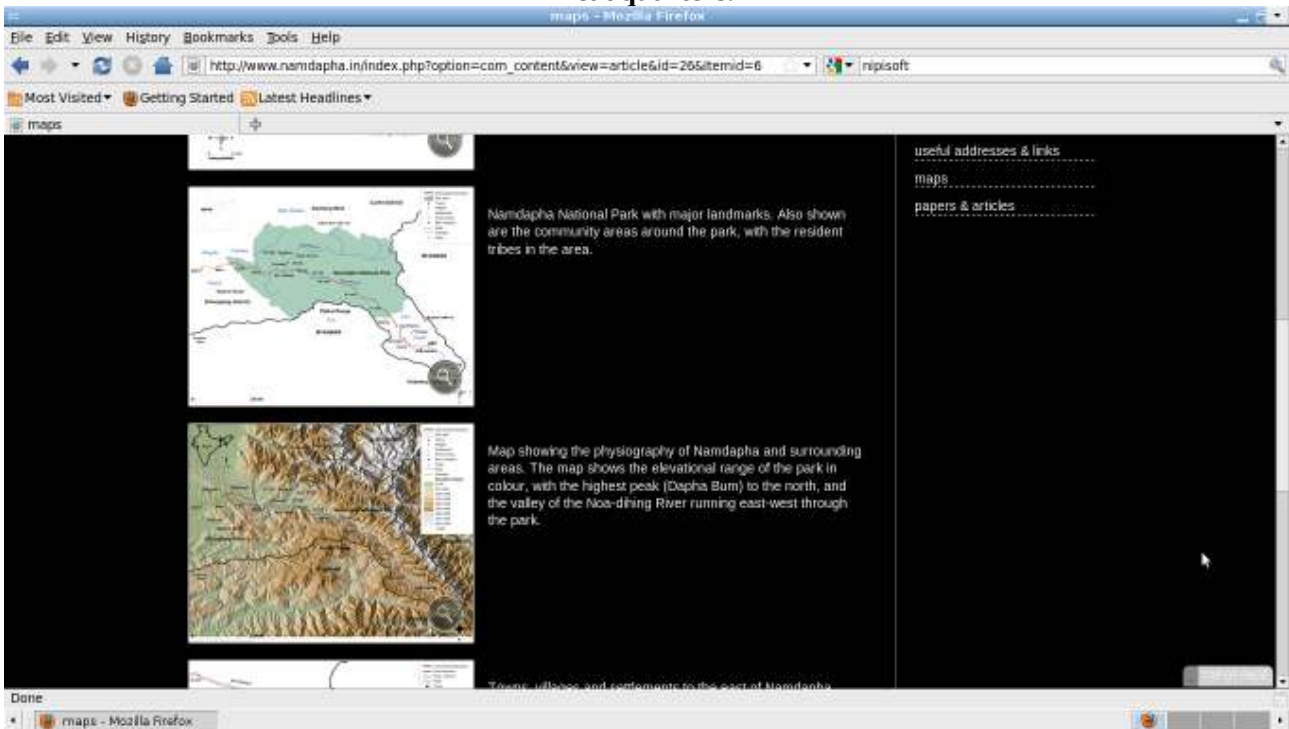
4.3.1: 'Visitor guide' sub-pages, tabs and pop-up displays



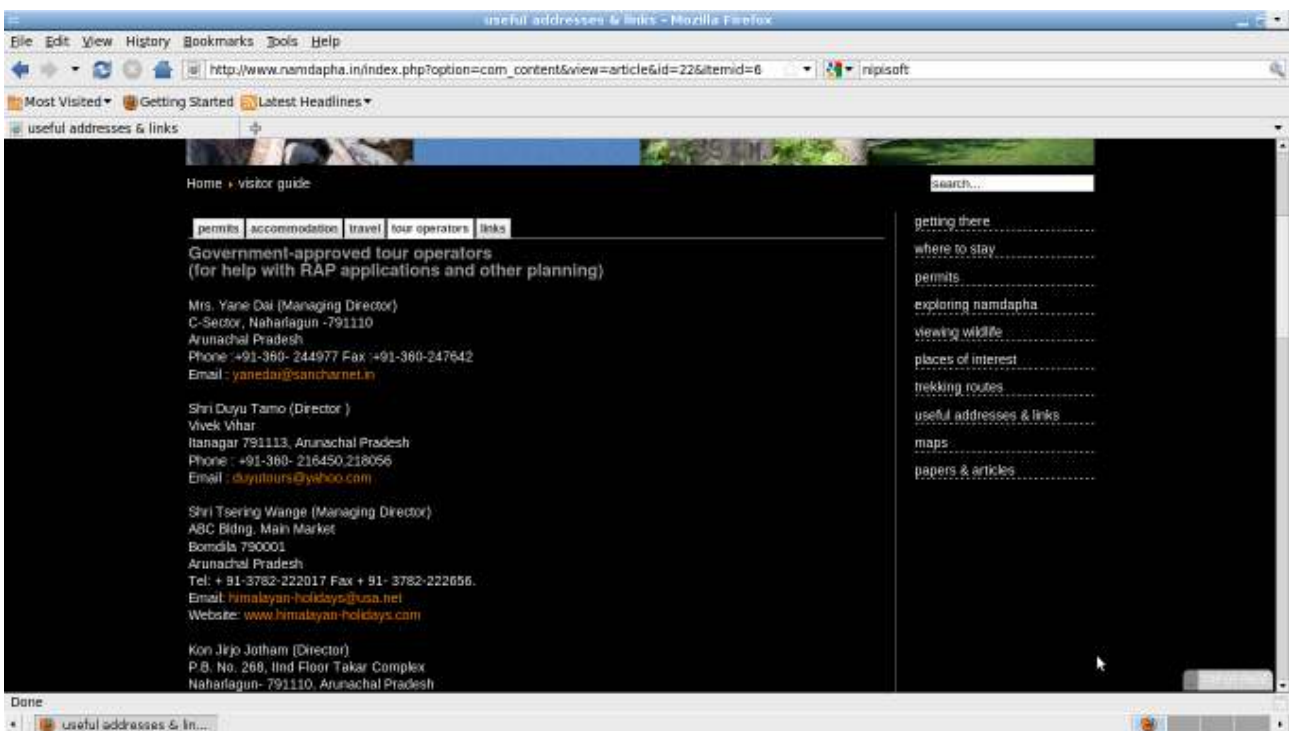
4.3.1.1: A pop-up display showing the road route to Namdapha with distances to the major towns and cities.



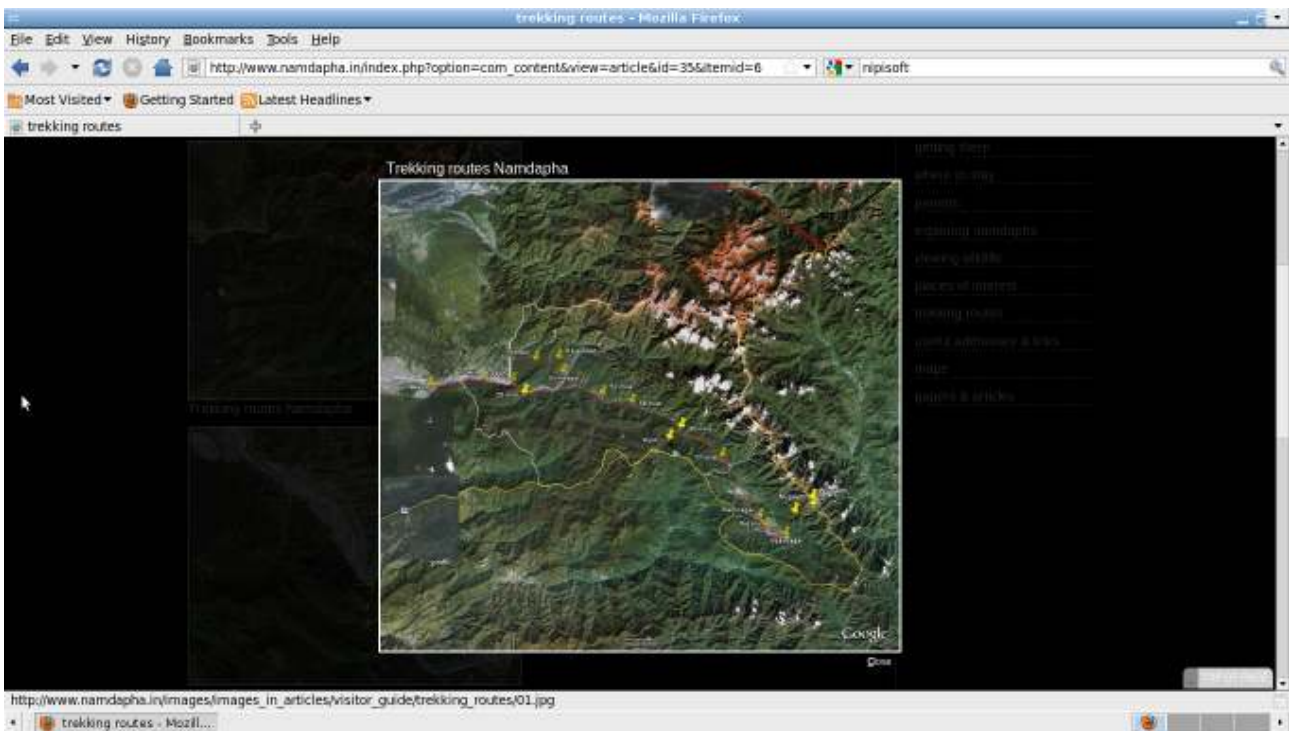
4.3.1.2: A second pop-up showing buds timings to and from Miao, Namdapha National Park headquarters.



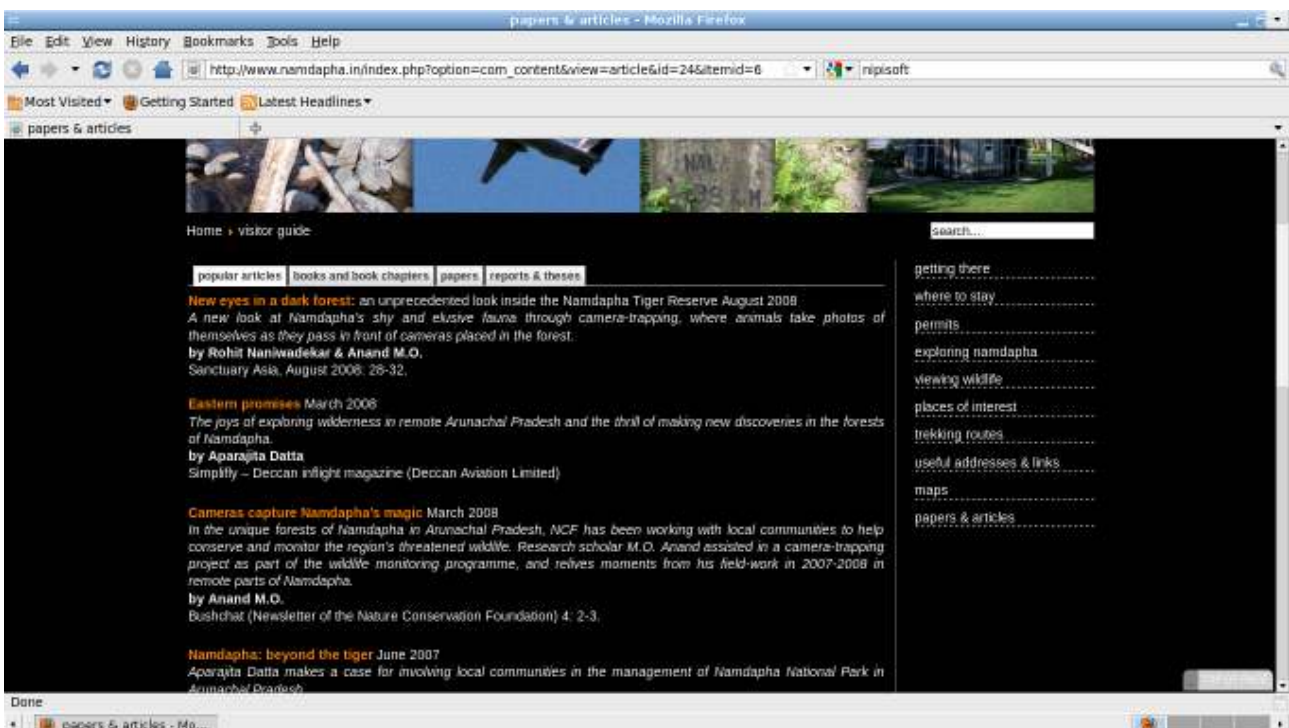
4.3.1.3: A screen grab showing a sample of the maps available on www.namdapha.in.



4.3.1.4: A screen grab showing a important address for obtaining permits to visits Namdapha.

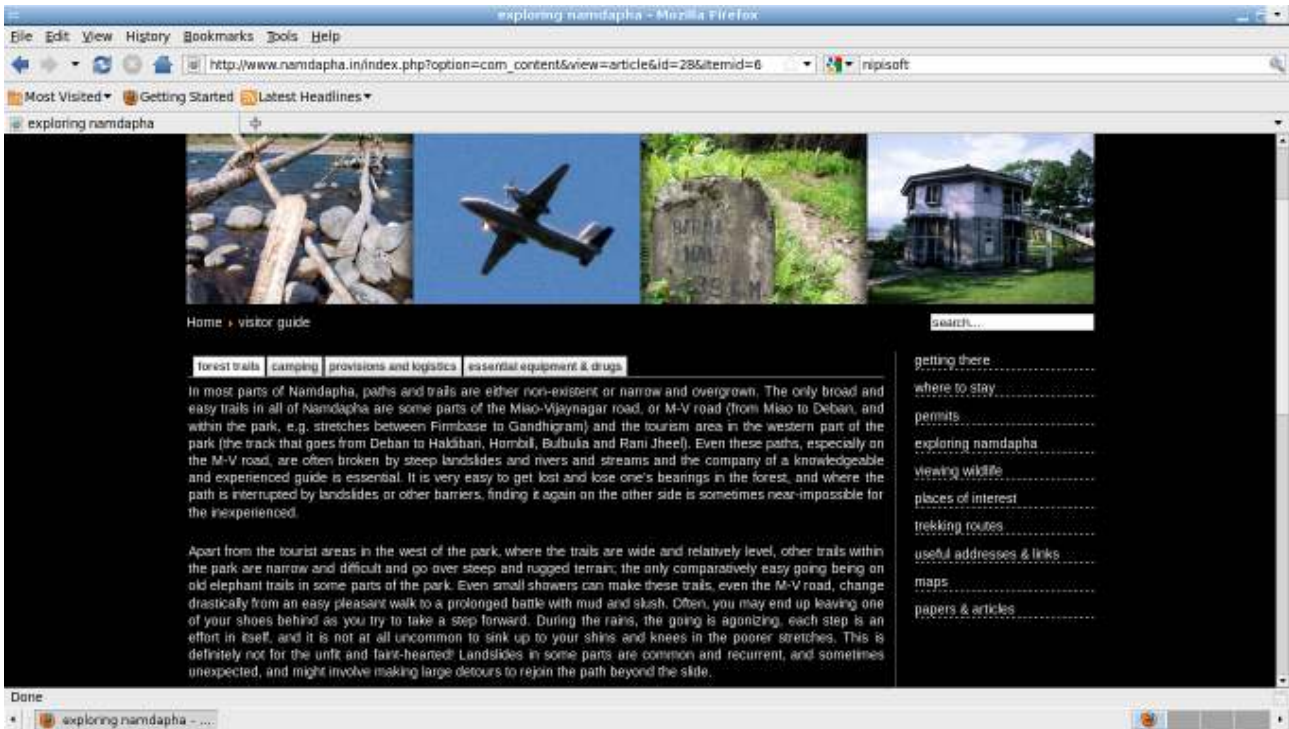


4.3.1.5: A screenshot showing one of the many trekking routes through Namdapha National Park.



4.3.1.6: A list of the popular articles written on Namdapha with a brief description of the content of the article. Several of these articles are available for download from the website.

4.4: The 'exploring namdapha' sub-page under the 'visitor guide' page, and tabs within it



4.4.1: The 'forest trails' tab under 'exploring namdapha'. Other tabs visible are 'camping', 'provisions and logistics', and 'essential equipment and drugs'.