

## Habitat assessment of Indian Grey Wolf (*Canis lupus pallipes*) from Pench Tiger Reserve (PTR), Central India

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www.jrasb.com || Vol. 5 No. 4 (2026): August Issue

Received: 10-08-2026

Revised: 24-08-2026

Accepted: 30-08-2026

### ABSTRACT

The Indian Grey Wolf (*Canis lupus pallipes*) is an endangered carnivore inhabiting across the fragmented landscapes of central India. In this study, we estimate the population status, distribution, and habitat utilization of Indian gray wolf in Pench Tiger Reserve (PTR), spanning Madhya Pradesh (MP) as well as Maharashtra. A total of 13 individuals were sighted with a higher density observed in open scrublands and grasslands of the buffer region. Current study highlights the effectiveness of indirect and direct survey methods to monitor elusive carnivores like Indian gray wolf and emphasizes the need for regular population assessments, habitat management, and mitigation of human-wolf conflict.

**Running Title-** Habitat Survey of Indian Wild Ass from the LRK, Gujarat

**Keywords-** Habitat assessment, Indian grey wolf (*Canis lupus pallipes*), Pench Tiger Reserve.

## I. INTRODUCTION

The Indian gray wolf (*Canis lupus pallipes*), represent one of the most ancient wolf lineages, inhabiting the Indian subcontinent (Aggarwal et al., 2003, Aggarwal et al., 2007, Sharma et al., 2004). This subspecies is believed to have diverged early from other wolf populations and is uniquely adapted to the semi-arid grasslands, scrublands, and open forest ecosystems of South Asia (Hennelly et al., 2021). In India, the Indian gray wolf is considered one of the most threatened large carnivores and is listed under Schedule I of the Wildlife Protection Act, 1972 which provides the highest level of legal protection to endangered species. Despite this protection, the species continues to face numerous anthropogenic and ecological threats across its distribution range (Mahajan et al., 2019).

The Indian Grey Wolf is a medium-sized, highly adaptable carnivore endemic to the semi-arid and dry grassland regions of India. These wolves typically inhabit landscapes characterized by open plains, scrub forests, rocky plateaus, and agricultural mosaics where prey availability and denning sites are suitable (White et al., 1990; Jhala, 1991). As a meso to apex predator in these ecosystems, the species plays a significant ecological role in regulating prey populations, maintaining trophic balance, and influencing the structure of biological communities (Anwar et al., 2012; Carbone, 1999). However, the species is currently considered endangered due to a combination of habitat fragmentation, prey depletion, human-wildlife conflict, and direct persecution (Jhala, 1993; Johnsingh et al., 2004; Chundawat et al., 2012; Bocci et al., 2017). Major strongholds for this subspecies include the states of Madhya Pradesh,

Rajasthan, Gujarat, and Maharashtra, where remnant grassland ecosystems still persist.

Within forested landscapes, wolves generally avoid areas heavily occupied by dominant apex predators such as tigers and Asiatic lions, as direct competition and predation risks may occur. Instead, they tend to occupy relatively open habitats and are often sympatric with other carnivores such as leopards and dholes (Kumar and Rahmani, 1995; Kumar, 1998; Bocci et al., 2017). This ecological segregation allows wolves to utilize niches that are less exploited by larger predators. Nevertheless, the long-term survival of this ancient wolf lineage is increasingly threatened by rapid land-use changes, expansion of agriculture and infrastructure, fast-moving highways, hybridization with free-ranging domestic dogs, transmission of infectious diseases, and retaliatory killing by pastoral communities due to livestock depredation (Chavez et al., 2005). According to recent studies (Jhala et al., 2022), the conservation status of the Indian wolf is extremely precarious and comparable to that of the tiger, yet conservation attention and dedicated management strategies remain relatively limited.

The Pench Tiger Reserve (PTR), located across the states of Madhya Pradesh and Maharashtra, is widely recognized for its tiger population and is primarily managed for the conservation of the Tiger (*Panthera tigris*). However, the reserve also supports a diverse carnivore community, including smaller and medium-sized predators such as wolves, leopards, and dholes. These carnivores play vital roles in maintaining ecosystem stability by regulating prey species and contributing to ecological processes that sustain biodiversity. The Maharashtra portion of PTR, in particular, contains extensive open scrubland and grassland habitats that provide suitable conditions for wolf habitation. Despite this, systematic ecological data on wolf distribution and population status within PTR remain extremely limited.

Therefore, the present study aims to contribute to the understanding of wolf ecology within the Pench landscape. Study aims to assess habitat preferences of wolves across different landscape features in both the Madhya Pradesh and Maharashtra regions of the reserve. By documenting habitat usage, movement patterns, and potential denning areas, the research seeks to identify key habitats essential for the long-term survival of the species. Ultimately, the findings of this study will help generate baseline ecological data that can support future monitoring programs and inform conservation planning for the Indian gray wolf within the Pench landscape and similar ecosystems across central India.

## II. MATERIALS AND METHODS

### Study Area

The Pench Tiger Reserve is located in two states of Central India i.e. Madhya Pradesh with 450 sq. km and Maharashtra which spans 308 sq. km (Figure 1). The

reserve comprises, a tropical dry deciduous forests dominated by teak (*Tectona grandis*) and sal (*Shorea robusta*). Riparian zones along seasonal streams and the Pench River. The buffer zones are moderately populated with villages and agricultural lands. Livestock grazing and limited human activity occur in open habitats, providing both opportunities for wolf prey and potential conflict. Seasonal temperatures range from 10-45°C, and annual rainfall is 1,200-1,400 mm, influencing prey availability and wolf movements.

### Field Work

A detail survey was carried out to investigate the population status of Indian gray wolf by tracking down the animal using vehicle or from any nearest possible shelter so as to avoid disturbance to the animal using a binocular (when sighted from distant places) and bare eyes (when sighted from close distances). Detail information about different areas and beats, explored during this study was provided in Table 1 and Table 2. The permission for field visit was previously sought out from chief conservator of forest (Permission Letter No. M.C/2808). A distance of almost 250-350 km<sup>2</sup> was travelled within the pench tiger reserve by recording the odometer of vehicle. Their habitat choice i.e., landforms (barren land or meadow), availability of water resources (waterholes, lakes, or stream channels), proximity with human interventions, and interspecific competitions were recorded from the major areas within the reserve for years. A total of 23 visits were made during 2018 to 2020 in summer (March to June) and winter (October to February) except rainy season. One of the major threats to Indian gray wolf is human-wildlife conflicts, which was assessed by interviews with the local residents.

## III. RESULTS AND DISCUSSION

The study was conducted in Pench Tiger Reserve (PTR) of the central Indian state of Madhya Pradesh and Maharashtra. The region of Maharashtra in PTR is divided into four core zones (Sillari, Chorbahuli, Khursapar, and Maudi) and four buffer zones (Sillari buffer, Khubala, Surewani, and Banera), while the region of Madhya Pradesh includes three core zones (Turia, Karmajhiri, and Jamtara) and three buffer zones (Rukhad, Khawasa, and Teliya). The observation of the study reveals the population of the Indian gray wolf is relatively higher in the buffer zone of Madhya Pradesh (0.6–0.8 wolves per sq. km) as compared to Maharashtra with the highest number of wolves sighted in the Khawasa Range (Table 1). A total of 13 wolves were sighted across PTR with Pack sizes ranging from 2-6 individuals (Table 1) which is found similar to the outcome of study published by Rabbani and Kumar, 2026. Most of the sightings of wolves were observed in the buffer zone of Khawasa region especially in human dominated areas. The absence of wolves in the core zone of PTR could be the outcome of higher densities of top carnivores like tiger, that mostly preferred to live in core zone. This moderate presence of

wolves in Madhya Pradesh core area may be the behaviour of avoidance of dense tiger habitat in PTR, followed by resource partitioning among large carnivores. As per the observation, the area of the Maharashtra is largely disturbed due to anthropogenic activities and habitat fragmentation and destruction that may largely contributed to this low density of wolf distribution. These findings emphasize the importance of including buffer areas in population assessments.

According to observation of study, wolves preferred to explore open scrublands, grasslands, and riverine edges, while occasionally, they are found in dense forest patches of Madhya Pradesh. Our findings also reveal that the maximum sighting events (65%) of wolves occur in open habitats as compared to forest edges (35%). While some records of wolves were found near human localities, villages and grazing areas in the buffer, indicating potential human-wolf conflict in the area. These findings are congruent with the outcome of the studies published by Rabbani and Kumar, 2026. Higher population densities and sightings of wolf in human settlements could be due to ample amount of availability of food including livestock carcasses and human waste near human populated areas (Jethva and Jhala 2004; Becker et al., 2008; Sharma et al., 2019). Due to this ample amount of food availability like livestock carcasses and human waste, wolves can compensate their limited approach to wild prey which may reduce the competition with higher carnivores in the core area of reserve (Becker et al., 2008).

The outcome of the study cast light on the importance of buffer zones that acts as a critical habitat for the elusive animal species like wolves. To manage the population of wolves in India, it very crucial to protect such buffer zones which acts as a potential habitat. As per the observation of previous studies, the required territorial range for the wolves ranging from 150–300 km<sup>2</sup> (Shahi, 1982; Jhala, 2003; Habib, 2007) solely focused on small habitat patches is insufficient. Conservation efforts should prioritize the protection of natural habitat features and the maintenance of wildlife corridors, enabling free movement between areas and promoting population connectivity (Sharma et al., 2019; Gubbi et al., 2020). Current data published in this research will be utilized as a baseline information towards the conservation of this endangered wolf's population in Pench Tiger Reserve (PTR).

#### **IV. CONCLUSION**

This study reveals restricted and stable population of Indian Grey Wolves in Pench Tiger Reserve, with higher population density in buffer zone and open scrublands. Stringent prey base management and Community awareness programs are required conflict in areas of both Madhya Pradesh and Maharashtra to reduce human-wolf in order to achieve the conservation goals of this endangered wild canid. The integration of

wolf conservation strategies into the broader management plan of PTR also needed. This study also demonstrates the importance of multi-method surveys which are essential to assess the population of highly elusive carnivores like Indian gray wolf which can guide effective conservation interventions in mixed-use protected landscapes.

#### **ACKNOWLEDGEMENT**

The authors are thankful to the Chief Conservator of Forest, and field staff of Pench Tiger Reserve, Madhya Pradesh for permission and extending their valuable help during this study.

#### **CONFLICT OF INTEREST**

The authors of this work declare that they have no conflicts of interest.

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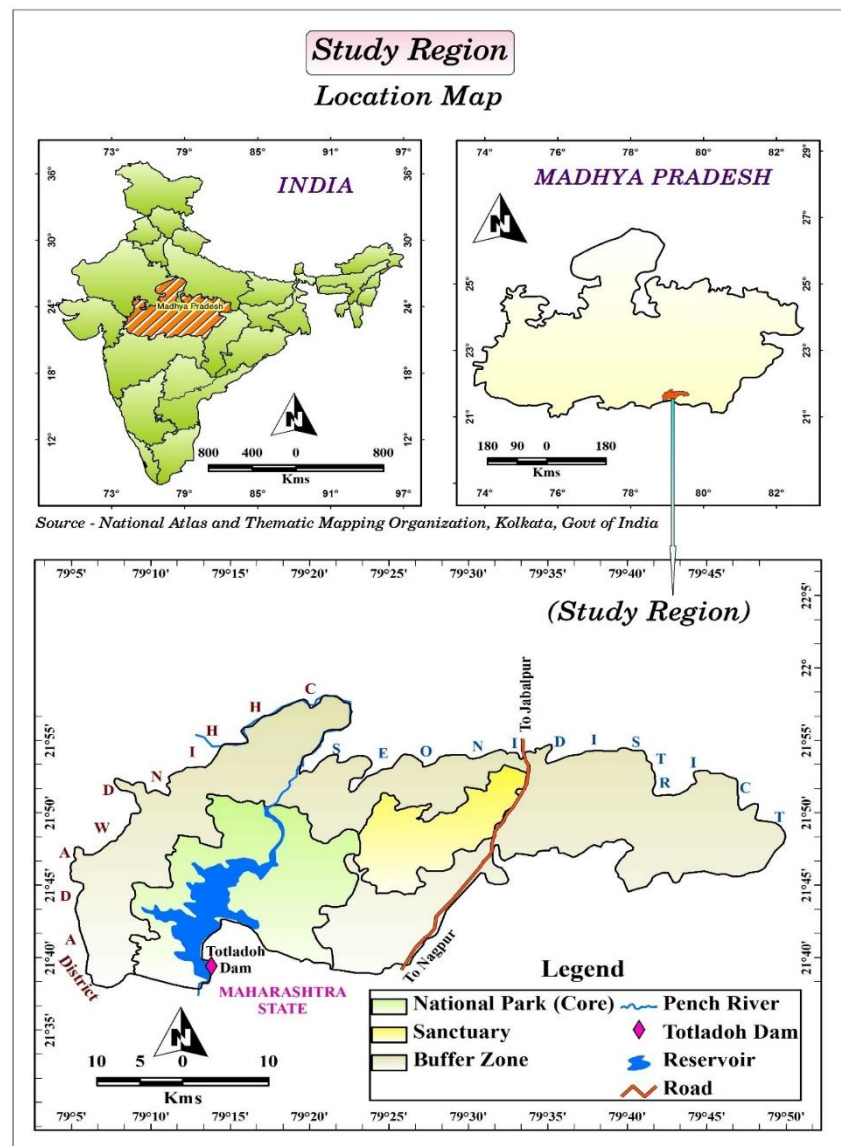


Figure 1. Map showing the detail location of study areas from the Pench Tiger Reserve, Central India.



Figure 2. Indian gray wolf documented in the Pench Tiger Reserve, Central India. A) The gray wolf documented in Khawasa beat B) Indian gray wolf crossing the highway, near toll plaza at Khawasa.

**Table 1. Detail information about various locations in PTR where Indian Gray wolf is sighted.**

| Range                                          | Circle    | Beat                 | GPS Location                     | No. of sighting |
|------------------------------------------------|-----------|----------------------|----------------------------------|-----------------|
| <b>Mowgli Sanctuary, Pench, Madhya Pradesh</b> |           |                      |                                  |                 |
| Kurai                                          | Rukhad    | Rukhad               | 21°51'41" N<br>79°29'13" E       | 1               |
| <b>Buffer Zone, Pench, Madhya Pradesh</b>      |           |                      |                                  |                 |
| Ghatkohka                                      | Vijaypani | Karmajhiri           | 21°50'40.33" N<br>79°17'49.22" E | 1               |
|                                                |           | Vijaypani (Jirewada) | 21°45'21.67" N<br>79°25'19.01" E | 1               |
|                                                |           | Aamajhiri            | -----                            | 1               |
|                                                | Khawasa   | Khawasa              | 22°56'46" N<br>74°20'56" E       | 3               |
|                                                |           | Kothar               | 21°41'32.13" N<br>79°25'28.62" E | 2               |
|                                                | Kohaka    | Telia                | 21°41'54.23" N<br>79°21'45.77" E | 2               |
|                                                |           | Amabari              | 21°44'18.54" N<br>79°21'53.68" E | 2               |

**Table 2. Details information of study area within Pench Tiger Reserve, explored during this study.**

| Range                                   | Circle    | Beat                    | GPS Location                                             | No. of sighting |
|-----------------------------------------|-----------|-------------------------|----------------------------------------------------------|-----------------|
| Mowgli Sanctuary, Pench, Madhya Pradesh |           |                         |                                                          |                 |
| Kurai                                   | Kurai     | Kurai                   | 21 <sup>0</sup> 48'49.80"N<br>79 <sup>0</sup> 29'21.09"E | 0               |
|                                         |           | Rayaarao                | 21 <sup>0</sup> 48'02.03"N<br>79 <sup>0</sup> 28'29.41"E | 0               |
|                                         |           | Potiya                  | 21 <sup>0</sup> 46'55.97"N<br>79 <sup>0</sup> 25'40.35"E | 0               |
|                                         | Rukhad    | Rukhad                  | 21 <sup>0</sup> 51'41"N<br>79 <sup>0</sup> 29'13"E       | 1               |
|                                         |           | Gandatola               | 21 <sup>0</sup> 53'06"N<br>79 <sup>0</sup> 31'48"E       | 0               |
|                                         |           | Patrai                  | 21 <sup>0</sup> 4'40.69"N<br>79 <sup>0</sup> 27'02.53"E  | 0               |
|                                         |           | Aalesur                 | 21 <sup>0</sup> 5'52.67"N<br>79 <sup>0</sup> 29'40.21"E  | 0               |
|                                         | Mureer    | Pachhim Mureer          | 21 <sup>0</sup> 50'46.9"N<br>79 <sup>0</sup> 23'03.7"E   | 0               |
|                                         |           | Purwa Mureer            | 21 <sup>0</sup> 50'16.8"N<br>79 <sup>0</sup> 26'29.8"E   | 0               |
|                                         |           | Dakshin Mureer          | 21 <sup>0</sup> 49'13.64"N<br>79 <sup>0</sup> 23'44.17"E | 0               |
|                                         | Khamrith  | Pachhim Khamrith        | 21 <sup>0</sup> 48'10.25"N<br>79 <sup>0</sup> 22'21.22"E | 0               |
|                                         |           | Purwa Khamrith          | 21 <sup>0</sup> 46'02.0"N<br>79 <sup>0</sup> 23'04.2"E   | 0               |
|                                         |           | Purwa Khamrith          | 21 <sup>0</sup> 46'02.0"N<br>79 <sup>0</sup> 23'04.2"E   | 0               |
| Buffer Zone, Pench, Madhya Pradesh      |           |                         |                                                          |                 |
| Ghatkohka                               | Ghatkohka | Alesur                  | 21 <sup>0</sup> 52'59.14"N<br>79 <sup>0</sup> 29'00.59"E | 0               |
|                                         |           | Uttar Murer             | 21 <sup>0</sup> 52'34.52"N<br>79 <sup>0</sup> 24'12.40"E | 0               |
|                                         |           | Salhe (Bel Dobri Sarra) | 21 <sup>0</sup> 51'44.75"N                               | 0               |

|            |            |                             |                                |   |
|------------|------------|-----------------------------|--------------------------------|---|
|            | Vijaypani  |                             | 79°22'41.05"E                  |   |
|            |            | Ghoghari (Richi)            | 21°51'22.20"N<br>79°19'32.93"E | 0 |
|            |            | Paraspani (Shankar madhiya) | 21°49'32.1"N<br>79°19'12.5"E   | 0 |
|            |            | Karmajhiri                  | 21°50'40.33"N<br>79°17'49.22"E | 1 |
|            |            | Tikali                      | 21°50'25.53"N<br>79°21'23.94"E | 0 |
|            |            | Barelipar                   | 21°50'25.53"N<br>79°21'23.94"E | 0 |
|            |            | Pipariya                    | 21°48'02.03"N<br>79°28'29.41"E | 0 |
| Khawasa    | Pipariya   | Mohgaon                     | 21°45'27"N<br>79°26'33"E       | 0 |
|            |            | Vijaypani (Jirewada)        | 21°45'21.67"N<br>79°25'19.01"E | 1 |
|            |            | Aamajhiri                   | -----                          | 1 |
|            | Khawasa    | Khawasa                     | 22°56'46"N<br>74°20'56"E       | 3 |
|            |            | Kothar                      | 21°41'32.13"N<br>79°25'28.62"E | 2 |
|            |            | Purwa Kohaka                | 21°42'45.12"N<br>79°23'04.12"E | 0 |
|            | Kohaka     | Telia                       | 21°41'54.23"N<br>79°21'45.77"E | 2 |
|            |            | Amabari                     | 21°44'18.54"N<br>79°21'53.68"E | 2 |
|            |            | Dholpur                     | 21°52'18.12"N<br>79°15'10.30"E | 0 |
|            |            |                             |                                |   |
| Kumbhapani | Halal      | Konapindarai                | 21°56'18.13"N<br>79°19'41.61"E | 0 |
|            |            | Sajpani                     | 21°55'31.55"N<br>79°16'52.44"E | 0 |
|            |            | Halal                       | 21°53'45.21"N<br>79°17'41.06"E | 0 |
|            |            | Singardip                   | 21°48'12.13"N<br>79°09'57.89"E | 0 |
|            | Thota      | Chargaon                    | 21°46'21.64"N<br>79°09'16.40"E | 0 |
|            |            | Gumtara                     | 21°49'21.64"N<br>79°09'16.40"E | 0 |
|            |            | Bandhan                     | 21°46'18.01"N<br>79°11'43.55"E | 0 |
|            |            | Dola                        | 21°48'49.47"N<br>79°15'67.93"E | 0 |
|            |            | Kumbhapani                  | 21°49'06.97"N<br>79°10'47.65"E | 0 |
|            | Kumbhapani | Jamtara                     | 21°50'46.47"N<br>79°16'16.91"E | 0 |
|            |            | Rampuri                     | 21°51'22.89"N<br>79°13'46.24"E | 0 |
|            |            | Pulpuldoh                   | 21°46'04.53"N<br>79°08'09.86"E | 0 |
| Khamarpani | Dongargaon | Kokiwada                    | 21°46'04.53"N<br>79°08'09.86"E | 0 |

|        |            |                    |                                    |   |
|--------|------------|--------------------|------------------------------------|---|
|        |            | Saliwada           | 21° 46' 48.71"N<br>79° 05' 31.35"E | 0 |
|        |            | Dudhgaon           | 21° 42' 09.58"N<br>79° 09' 02.65"E | 0 |
|        | Khamarpani | Kanhargaon         | 21° 42' 06.88"N<br>79° 07' 04.52"E | 0 |
|        |            | Karhayaa           | 21° 44' 24.13"N<br>79° 07' 13.83"E | 0 |
|        |            | Dakshin Rukhad     | 21° 52' 11.76"N<br>79° 31' 37.58"E | 0 |
| Rukhad | Rukhad     | Purwa Rukhad       | -----                              | 0 |
|        |            | Nayegaon           | 21° 53' 37.51"N<br>79° 34' 28.41"E | 0 |
|        |            | Gondatola          | 21° 53' 58.62"N<br>79° 31' 55.90"E | 0 |
|        | Mohgaon    | Mohgaon            | -----                              | 0 |
|        |            | Rajola             | 21° 54' 32.82"N<br>79° 35' 44.04"E | 0 |
|        |            | Darasi             | 21° 54' 14.36"N<br>79° 37' 21.53"E | 0 |
|        | Nayegaon   | Dakshin Khapa      | 21° 53' 29.65"N<br>79° 38' 05.61"E | 0 |
|        |            | Chandrapur         | 21° 49' 33.75"N<br>79° 37' 07.35"E | 0 |
|        |            | Purwa Kurai        | 21° 48' 27.54"N<br>79° 31' 09.34"E | 0 |
|        | Kurai      | Sawangi            | 21° 49' 32.15"N<br>79° 33' 35.85"E | 0 |
|        |            | Gorakhpur          | 21° 49' 03.07"N<br>79° 35' 38.50"E | 0 |
|        |            | Dulhapur           | 21° 53' 33.52"N<br>79° 43' 06.05"E | 0 |
| Aari   | Gangerua   | Atrawani           | 21° 53' 33.52"N<br>79° 43' 06.05"E | 0 |
|        |            | Magarkatha         | 21° 53' 33.52"N<br>79° 43' 06.05"E | 0 |
|        |            | Khapa              | 21° 53' 31.53"N<br>79° 38' 13.02"E | 0 |
|        |            | Sarekha            | 21° 52' 48.91"N<br>79° 45' 11.96"E | 0 |
|        | Sarekha    | Purwa Sakata       | 21° 50' 49"N<br>79° 42' 12"E       | 0 |
|        |            | Mirchiwadi         | 21° 52' 48.91"N<br>79° 45' 11.96"E | 0 |
|        |            | Uttar Nahlesarra   | 21° 50' 37.51"N<br>79° 47' 00.58"E | 0 |
|        | Nahlesarra | Pachhim Nahlesarra | 21° 50' 37.51"N<br>79° 47' 00.58"E | 0 |
|        |            | Kamthi             | 21° 48' 33.05"N<br>79° 47' 16.04"E | 0 |
|        |            | Bisapur            | 21° 48' 33.05"N<br>79° 47' 16.04"E | 0 |
|        |            | Nayegaon           | 21° 49' 10.47"N<br>79° 37' 53.30"E | 0 |
|        | Sakata     | Mohgaon            | 21° 48' 57.17"N<br>79° 39' 23.30"E | 0 |

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|  |  |                |                                                            |   |
|--|--|----------------|------------------------------------------------------------|---|
|  |  | Uttar Sakata   | 20 <sup>0</sup> 49' 19.32"N<br>79 <sup>0</sup> 48' 32.97"E | 0 |
|  |  | Dakshin Sakata | 20 <sup>0</sup> 49' 19.32"N<br>79 <sup>0</sup> 48' 32.97"E | 0 |