Status of Red Panda *Ailurus fulgens* in Neora Valley National Park, Darjeeling District, West Bengal, India

Jayanta Kumar MALLICK

Abstract

Temperate forests, above 2,100 m asl, in the upper Neora Valley National Park, Darjeeling District, West Bengal, India, have a dense canopy and thick undergrowth of *Abies*, *Acer*, *Juniperus*, *Lithocarpus*, *Magnolia*, *Quercus*, *Rhododendron*, *Yushania* and *Arundinaria*, which form prime habitat of Red Panda *Ailurus fulgens*. But this Vulnerable species is poorly known in this park, where only one preliminary survey has been conducted: by the Ashoka Trust For Research in Ecology and the Environment (ATREE) during 2006–2007. In 2009, a study was conducted to identify and evaluate Red Panda habitat in this short-listed World Heritage Site, involving literature review, questionnaire and ground surveys. Out of twenty-five forest compartments surveyed, Red Panda was sighted eleven times in five compartments (20%) within 2,350–3,170 m asl. Surveys of Red Panda, inclusion of contiguous Red Panda habitats in the park and joint park management, are specially recommended.

Keywords: conservation, habitat, survey, sighting, signs, threats

Introduction

Red Panda *Ailurus fulgens* is a flagship species in worldwide *in situ* and *ex situ* conservation (Glatston in press). The western, nominate, race is endemic to Eastern Himalayas, the range forming a crescent from Nepal, Tibet, Bhutan, north-eastern India (northern West Bengal, Sikkim, Arunachal Pradesh and, apparently, Meghalaya) up to western Yunnan province in China and northern Myanmar (Choudhury 2001). In northern West Bengal, the Vulnerable Red Panda is found in two national parks (NP), Singalila and Neora Valley, of Darjeeling District (Saha & Singhhal 1996, Ghose et al. 2007). Red Panda also inhabited Senchal Wildlife Sanctuary (Darjeeling District) in the past (Bahuguna & Mallick 2010: 196).

Study area

Being located in the Kalimpong subdivision, Neora Valley NP (88 km²) lies within 26°52′–27°7′N, 88°45′–88°50′E, falling under Bio-geographic Province 2C, the Central Himalayas, as classified by Wildlife Institute of India (Fig. 1). The park authorities divided Neora Valley into two ranges, Upper (Headquarters: Lava, the western entry point) and Lower (Headquarters: Samsing, the eastern entry point). The highest point is Rachila *danda* (peak) (3,170 m asl), which borders Sikkim to the north. The park has a wide altitudinal range (183–3,170 m asl) and climatic conditions (tropical/sub-tropical in its lower range and temperate in its higher range). Asian Elephants *Elephas maximus* used to migrate up to Rishila (on the north-west of Rachila) on the Sikkim and Bhutan border (O’Malley 1907) and *Hathi danda or elephant peak* (27°07′N, 88°44′E, altitude 3,159 m asl) in Rhenock block till 1940 (Anon. 2010). Until a December 1982 biological expedition, the rich biodiversity of Neora Valley NP was poorly known (Chowdhury 1983). Thereafter, Neora Valley was notified

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as a protected area in April 1986 and finally gazetted in December 1992. Neora Valley NP was short-listed as a World Heritage Site on 26 May 2009 (UNESCO World Heritage Centre 2009).

Methods

A study was conducted in 2009 by the author along with S. S. Giri, Officer-in-Charge, Upper Neora Range (Lava) and the subordinate field staff of that Range, to identify and evaluate Red Panda habitat in Neora Valley NP under Wildlife Division-II and two adjoining blocks of reserve forests of Kalimpong Division, based on a literature review, questionnaire survey and forest trail survey for direct sighting and signs like faecal pellets. The author himself conducted the questionnaire survey and supervised the progress of field work at site during the third week of February, May, October and December respectively.

Questionnaire survey

The questionnaire survey was conducted on a set pro forma (Table 1) among forest officials and camp staff, researchers, tourists/guides, the villagers of Mithuntar, Bhotetar, Mulkharg, Kolbong and Sakam including Eco-development and Forest Protection Committee members, and graziers and cultivators living in and around the park. These latter have very rarely entered the upper range since notification of the park. Colour photographs of eight species of small carnivores recorded in the park (Singhal & Mukhopadhyay 1998), namely Clouded Leopard Neofelis nebulosa, Marbled Cat Pardofelis marmorata, Hog Badger Arctonyx collaris, Masked Palm Civet Paguma larvata, Yellow-throated Marten Martes flavigula, Beech Marten Martes foina, Stripe-backed Weasel Mustela strigidorsa and Red Panda, were shown to the villagers for identification of Red Panda. No confusion was evident with any villager concerning Red Panda and any other species. Another possible confusion species, Common Palm Civet Paradoxurus hermaphroditus is believed to live up to only 1,500 m asl in the park and was not included. To overcome the language barrier, the help of a local interpreter was taken. Seven field stations, six in the upper and one in the lower range (Table 2), created for protection of the park, were visited for questionnaire survey among the staff posted there.

Ground survey

The dense forest on rugged terrain prevented straight-line transects. Four one-way trail-cum-trekking routes (combined length 53 km), three in Upper Neora and one in Lower Neora Range (Table 3), were walked in search of live Red Pandas. The study team conducted the ground survey during the pre-monsoon (February–May) and post-monsoon periods (October–January) and in the rainy season duringlement weather. During the study, approximately 288 hours, equivalent to 36 person-days (excluding inclement weather conditions [stormy, rainy, foggy, frosty and snowy], unproductive traversing and holidays) were used for habitat evaluation, direct Red Panda sighting, collection of its faeces and plant-parts eaten, and questionnaire survey.

Habitat

Neora Valley NP has three altitudinal zones of vegetation: lower hill, middle hill and upper hill forests. Tropical lower hill forest, mostly deciduous and semi-evergreen, extends up to about 750 m asl. Sub-tropical middle hill forest is found over 750–1,700 m asl, with abundant evergreen trees, dense canopy and undergrowth. Temperate upper hill forests (1,700–3,200 m asl) are also distinguished by the predominance of Lauraceae, Quercus lamellosa, Q. lineata, Q. spicata, Elaeocarpus lanceaefolius, Echinocarpaceae and Acer campbelli (Buk-Oak mixed vegetation) and Lithocarpus (High-level Oak) forests. The lower limit of upper hill forest, i.e. Lauraceous (Machilus–Michelia) forest occurs between 1,650 m asl and 2,100 m asl. Deep valleys have diverse shrubby (understorey) species forming mixed and mesophyll communities. Pure stands

Table 1. Data collection sheet for questionnaire survey on Red Panda Ailurus fulgens in Neora Valley NP and Kalimpong Division.

<table>
<thead>
<tr>
<th>Name of Respondent:</th>
<th>Designation/Identity:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date and Time of sighting evidences of the Panda:</td>
<td></td>
</tr>
<tr>
<td>Protected Area (PA)/Reserve Forest (RF) (specify):</td>
<td></td>
</tr>
<tr>
<td>Location (Block/Compartment):</td>
<td></td>
</tr>
<tr>
<td>Altitude/Topography:</td>
<td></td>
</tr>
<tr>
<td>General vegetation type:</td>
<td></td>
</tr>
<tr>
<td>Tree data:</td>
<td>Canopy cover %</td>
</tr>
<tr>
<td>Dominant tree species:</td>
<td></td>
</tr>
<tr>
<td>Shrub data:</td>
<td>Shrub cover %</td>
</tr>
<tr>
<td>Dominant shrub species:</td>
<td></td>
</tr>
<tr>
<td>Herb data:</td>
<td>Herb cover %</td>
</tr>
<tr>
<td>Dominant herb species:</td>
<td></td>
</tr>
<tr>
<td>Bamboo data:</td>
<td>Bamboo cover %</td>
</tr>
<tr>
<td>Dominant bamboo species:</td>
<td>Bamboo species used by Red Panda</td>
</tr>
<tr>
<td>Direct sighting of Red Panda: Yes/No</td>
<td></td>
</tr>
<tr>
<td>Number:</td>
<td>Adult/Sub-adult/young:</td>
</tr>
<tr>
<td>Indirect evidences: Foot prints/Faecal pellets/Feeding signs/Dead animal/Any other (Specify):</td>
<td></td>
</tr>
<tr>
<td>Perceptible threats (natural/anthropological like presence of gothhs or grazing inside forest/collection of forest produces/hunting/others (Specify):</td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Field stations (protection camps) visited for questionnaire survey in Neora Valley National Park, 2009.

<table>
<thead>
<tr>
<th>Name</th>
<th>Block/Compartment</th>
<th>Location</th>
<th>Lat</th>
<th>Long</th>
<th>Recorded altitude (m asl)</th>
<th>Range</th>
<th>Forest type</th>
<th>Recent Panda sighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Panda</td>
<td>Rashet 3</td>
<td>Chaudapheri</td>
<td>27°05′N</td>
<td>88°42′E</td>
<td>2,358</td>
<td>Upper hill</td>
<td>Quercus–Lithocarpus, plantations, Yushania–Arundinaria</td>
<td>Yes</td>
</tr>
<tr>
<td>Black Bear</td>
<td>Pankhasari 2</td>
<td>Dooley</td>
<td>27°04′N</td>
<td>88°42′E</td>
<td>2,052</td>
<td>Upper hill</td>
<td>Machilus–Michelia</td>
<td>No</td>
</tr>
<tr>
<td>Betula</td>
<td>West Nar 7</td>
<td>Betula</td>
<td>26°59′N</td>
<td>88°44′E</td>
<td>981</td>
<td>Lower hill</td>
<td>Engelhardtia–Schima–Castanopsis–Betula</td>
<td>No</td>
</tr>
<tr>
<td>Maple</td>
<td>Thosum 1</td>
<td>Bhotekhola</td>
<td>27°03′N</td>
<td>88°46′E</td>
<td>1,950</td>
<td>Upper hill</td>
<td>Quercus–Lithocarpus, Yushania–Arundinaria</td>
<td>No</td>
</tr>
<tr>
<td>Orchid</td>
<td>Thosum 3</td>
<td>Near Ruka</td>
<td>27°07′N</td>
<td>88°46′E</td>
<td>2,278</td>
<td>Upper hill</td>
<td>Quercus–Lithocarpus, Yushania, Rhododendron</td>
<td>Yes</td>
</tr>
<tr>
<td>Tiger</td>
<td>Rachila 13</td>
<td>Rachila</td>
<td>27°06′N</td>
<td>88°45′E</td>
<td>2,782</td>
<td>Upper hill</td>
<td>Quercus–Lithocarpus, Yushania</td>
<td>Yes</td>
</tr>
<tr>
<td>Serow</td>
<td>Rachila 14</td>
<td>Alubari</td>
<td>27°07′N</td>
<td>88°43′E</td>
<td>2,538</td>
<td>Upper hill</td>
<td>Quercus–Lithocarpus, Yushania</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 3. Trails surveyed in Neora Valley National Park, 2009.

<table>
<thead>
<tr>
<th>Starting point</th>
<th>Altitude (m asl)</th>
<th>Via</th>
<th>Terminal point</th>
<th>Altitude (m asl)</th>
<th>Length</th>
<th>Range</th>
<th>Recent Panda sighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lava Town</td>
<td>2,100</td>
<td>Lava forests</td>
<td>Chaudapheri</td>
<td>2,358</td>
<td>14 km</td>
<td>Upper</td>
<td>No</td>
</tr>
<tr>
<td>Chaudapheri</td>
<td>2,358</td>
<td>Zero Point, PHE source</td>
<td>Alubari</td>
<td>2,538</td>
<td>16 km</td>
<td>Upper</td>
<td>Yes</td>
</tr>
<tr>
<td>Alubari</td>
<td>2,538</td>
<td>Rachila</td>
<td>Jorepokhari</td>
<td>3,170</td>
<td>5 km</td>
<td>Upper</td>
<td>Yes</td>
</tr>
<tr>
<td>Mouchowki</td>
<td>1,170</td>
<td>Bhotekhola</td>
<td>Bhotekharka</td>
<td>1,950</td>
<td>18 km</td>
<td>Lower</td>
<td>No</td>
</tr>
</tbody>
</table>

* Altitude of the walked length includes stretches higher or lower than the start and end points.

of the dwarf bamboo *Yushania (= Arundinaria) maling* occur in small stretches of almost flat lands, particularly in the middle hills (Singhal & Mukhopadhyay 1998).

Red Panda was once recorded as low as 1,170 m asl, but now it is found only above 2,100 m asl in the upper Neora Valley NP (Ghose et al. 2007). Habitat here is composed of the bamboo, rhododendron, mixed deciduous and coniferous forests with dense canopy and hollow tree understory (Sharma 1990). Here, the minimum density of vegetation is greater than 40% canopy coverage except at Rachila Chawk, which was deforested in 1879 and brought under a regeneration programme in 1996 and 1997 (Singhal & Mukhopadhyay 1998). In the Buk-Oak mixed forest at 2,100–2,400 m asl, *Quercus lamellosa* dominates, with associates like *Q. lineata*, *Q. spicata*, *Castanopsis tribuloides*, *Acer campbellii*, *Machilus odoratissima*, *M. gammicaena* and *Elaeocarpus*, *Michelia excelsa* and *Backlandia*.

In the High-level Oak forest over 2,400–2,750 m asl, mainly in Rashet and Rachila blocks, *Lithocarpus pachyphylla* predominates, with common associates like *Q. lamellosa*, *Acer campbellii* and *Magnolia campbellii*. *Yushania maling* is found scattered all over *Quercus* and *Lithocarpus* forests.

Further higher zone (coniferous forest) harbours pure patches of *Tsuga* and undergrowth of bamboos and *Rhododendron*. The block or compartment data pertaining to the Red Panda habitat in the park is given in Table 4.

### Literature review

The 1982 expedition did not report any Red Panda sighting in Neora Valley. The first specific mammal survey in the higher elevations of the park (1994–1996) recorded 31 species, including Red Panda in the dense forest dominated by bamboo, at Pankhasari and Rachila (Biswas et al. 1999). In 2006 and 2007, a preliminary survey of Red Panda was conducted in six transects (17.33 km²) in Neora Valley NP (ATREE 2008). Anon. (2008) briefed the findings of this survey. Various websites, such as of Wildlife Division II ([www.jalpaiguirwlife.org (2007)]), Forest Directorate ([www.westbengaltourism.gov.in) and booklets published by them have popularised in the state during the last decade, in general terms, the Red Pandas in Neora Valley NP.

### Results

In all, 94 people (30 researchers, forest staff and officers having working experience in the park, 48 villagers living in and around the park and 16 tourists/guides) responded to the questionnaire survey. Only 23 respondents (24%), mostly field staff, had sighted Red Panda in the park. Statements of respondents unable to remember both the exact location and time of the encounter were not recorded.

In the study area, 34 sightings of Red Panda (31 in upper Neora Valley NP under Wildlife Division-II and three in contiguous Kalimpong Forest Division) during a period of 11 years, i.e. 1999–2009, were registered (Table 5). In 2009, Red Pandas were sighted on eleven occasions, giving the highest annual total dur-
Table 4. Survey of blocks/compartments in Red Panda habitat of upper Neora Valley NP*, 2009.

<table>
<thead>
<tr>
<th>Block</th>
<th>Compartments surveyed (total)</th>
<th>Compartments with evidence (total)</th>
<th>Area (ha)</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Altitude (m asl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rachila</td>
<td>1–17 (17)</td>
<td>2, 11, 12, 13, 14 (5)</td>
<td>1,759</td>
<td>27º05′–27º07′ N</td>
<td>88º43′–88º45′ E</td>
<td>1,400–3,150</td>
</tr>
<tr>
<td>Thosum</td>
<td>1–4 (4)</td>
<td>3 (1)</td>
<td>979</td>
<td>27º04′–27º05′ N</td>
<td>88º45′–88º46′ E</td>
<td>1,250–3,050</td>
</tr>
<tr>
<td>Rhenock</td>
<td>4b–5 (2)</td>
<td>4b (1)</td>
<td>691</td>
<td>27º07′ N</td>
<td>88º43′ E</td>
<td>1,200–3,000</td>
</tr>
<tr>
<td>Rashet</td>
<td>3–4 (2)</td>
<td>3, 4 (2)</td>
<td>299</td>
<td>27º05′–27º07′ N</td>
<td>88º42′–88º44′ E</td>
<td>1,450–2,650</td>
</tr>
<tr>
<td>4</td>
<td>25</td>
<td>9</td>
<td>3,728</td>
<td>27º04′–27º07′ N</td>
<td>88º42′–88º46′ E</td>
<td>1,200–3,150</td>
</tr>
</tbody>
</table>

*Rachila Chawk (Khasmahal area): 111 ha and strips on two sides of the park were not included.

Table 5. Sighting records of Red Panda in Neora Valley NP and adjacent Kalimpong Division.

<table>
<thead>
<tr>
<th>Date/Month/Year</th>
<th>Location</th>
<th>Source</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 1999</td>
<td>Upper range</td>
<td>Questionnaire survey: forest staff</td>
<td>First rescue during Tiger census, sent to Darjeeling Zoo for treatment.</td>
</tr>
<tr>
<td>March 2000</td>
<td>Upper range</td>
<td>Questionnaire survey: forest staff</td>
<td>Second rescue, sent to Darjeeling Zoo, but died on the way.</td>
</tr>
<tr>
<td>25 November 2002 (morning)</td>
<td>Rashet 3</td>
<td>Prince 2003</td>
<td>Panda bounding along the track, disappeared into the bamboo grove.</td>
</tr>
<tr>
<td>April 2005</td>
<td>Rashet 3</td>
<td>D. Ghose</td>
<td>1st Mile Road on the Pankhasari ridge. Miscellaneous tree species.</td>
</tr>
<tr>
<td>April 2005</td>
<td>Rashet 3</td>
<td>Questionnaire survey: forest staff</td>
<td>Plantation area.</td>
</tr>
<tr>
<td>April 2006</td>
<td>Rashet 3</td>
<td>Questionnaire survey: forest staff</td>
<td>Plantation area.</td>
</tr>
<tr>
<td>May 2006</td>
<td>Rachila 11</td>
<td>D. Ghose</td>
<td>Upward trail from Rashet 3 to Rachila 11, then downward slope to Zero Point.</td>
</tr>
<tr>
<td>6 September 2006</td>
<td>Rashet 4</td>
<td>ATREE 2008</td>
<td>Panda eating bamboo leaves / shoots in mixed vegetation with 60% bamboo undergrowth.</td>
</tr>
<tr>
<td>8 March 2007</td>
<td>Rashet 4</td>
<td>Questionnaire survey: forest staff</td>
<td>1st mile on Pankhasari ridge. Mixed vegetation.</td>
</tr>
<tr>
<td>2 April 2007</td>
<td>Ruka 4</td>
<td>Questionnaire survey: forest staff</td>
<td>Mostly <em>Y. maling</em> with scattered patches of <em>Rhododendron</em>. On the eastern slope of Thosum La <em>Lithocarpus</em> is found.</td>
</tr>
<tr>
<td>8 April 2007</td>
<td>Rachila 11</td>
<td>Questionnaire survey: forest staff</td>
<td>Broadleaved forest and bamboo thicket- <em>Rhododendron, Michelia, Alnus nipalensis, Q. lamellosa</em>, undergrowth <em>Arundinaria racemosa, Eupatorium adenophorum, Maesa chisia, Aesculus</em>, also ferns and mosses.</td>
</tr>
<tr>
<td>14 August 2007</td>
<td>Ruka 4</td>
<td>Questionnaire survey: forest staff</td>
<td>Beyond 100–200 m wide strip in the eastern boundary of the park.</td>
</tr>
<tr>
<td>5 November 2007</td>
<td>Rachila 13</td>
<td>Questionnaire survey: forest staff</td>
<td>Erstwhile forest village, evacuated and brought under plantation programme.</td>
</tr>
<tr>
<td>2 February 2008</td>
<td>Rashet 4</td>
<td>Questionnaire survey: forest staff</td>
<td>Above 2,200 m <em>Quercus, Rhododendron</em>, mixed with <em>Lithocarpus</em> and <em>Yushania</em> are found; <em>Y. maling</em> covers about 70% of the area above 2,300 m. <em>Arundinaria</em> occurs elsewhere. A large area along the Pankhasari ridge is unproductive. Mixed vegetation.</td>
</tr>
<tr>
<td>10 March 2008</td>
<td>Rashet 4</td>
<td>Questionnaire survey: forest staff</td>
<td>Mixed vegetation.</td>
</tr>
<tr>
<td>17 April 2008</td>
<td>Rashet 3</td>
<td>Questionnaire survey: forest staff</td>
<td>Mixed plantation of native hardwoods.</td>
</tr>
<tr>
<td>11 May 2008</td>
<td>Pankhasari-1 (Kalimpong Division)</td>
<td>Questionnaire survey: forest staff</td>
<td>Mixed vegetation. Carcass of an adult male found. Post mortem report not available.</td>
</tr>
</tbody>
</table>
Miscellaneous tree species; some plantations.

Rhenock 4b

Rachila 12

Study team

Rhenock 4b

Rachila 11

Study team

Rashet 3

M. Roy

A British tourist

Miscellaneous tree species; some plantations.

Mixed plantation (Rhododendron and Lithocarpus [native species]) area.

Eating acorns, sat on branch of an oak.

Sitting on a tree by Zero Point–Alubari trail.

Dwarf bamboo, Rhododendron mixed with oak and Buk-Oak.

Dwarf bamboo, Rhododendron mixed with oak and Buk-Oak.

Miscellaneous tree species; some plantations.

Mixed plantation area.

Miscellaneous tree species; some plantations.

Table 5 contd.

<table>
<thead>
<tr>
<th>Date/Month/Year</th>
<th>Location</th>
<th>Source</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 November 2008</td>
<td>Rachila 13</td>
<td>M. Roy</td>
<td>Oak forest and pure bamboo thickets. During Tiger census a Panda was sighted on a tree near Jorepokhri (3,128 m asl; on the way from Alubari), from 08h43 for 45 minutes. Lithocarpus predominates, changing to Rhododendron and Y. maling above 2,800 m asl. Y. maling covers about two-thirds of the area. Rhododendron is also found mixed with Lithocarpus and Quercus. The Panda was sitting on a tree (Anon. 2009). Miscellaneous tree species; some plantations. Mixed plantation (Rhododendron and Lithocarpus [native species]) area.</td>
</tr>
<tr>
<td>12 December 2008</td>
<td>Rachila 2</td>
<td>Questionnaire survey: forest staff</td>
<td></td>
</tr>
<tr>
<td>15 December 2008</td>
<td>Rhenock 4b</td>
<td>Questionnaire survey: forest staff</td>
<td></td>
</tr>
<tr>
<td>Early January 2009</td>
<td>Rashet 3</td>
<td>A British tourist</td>
<td></td>
</tr>
<tr>
<td>5 May 2009</td>
<td>Rachila 11</td>
<td>Study team</td>
<td></td>
</tr>
<tr>
<td>7 May 2009</td>
<td>Rashet 3</td>
<td>Study team</td>
<td></td>
</tr>
<tr>
<td>23 May 2009</td>
<td>Rashet 3</td>
<td>Study team</td>
<td>Eating acorns, sat on branch of an oak.</td>
</tr>
<tr>
<td>3 June 2009</td>
<td>Rachila 12</td>
<td>Study team</td>
<td>Sitting on a tree by Zero Point–Alubari trail.</td>
</tr>
<tr>
<td>9 June 2009</td>
<td>Rhenock 4b</td>
<td>Study team</td>
<td>Dwarf bamboo, Rhododendron mixed with oak and Buk-Oak.</td>
</tr>
<tr>
<td>12 June 2009</td>
<td>Rhenock 4b</td>
<td>Study team</td>
<td>Dwarf bamboo, Rhododendron mixed with oak and Buk-Oak. Miscellaneous tree species; some plantations.</td>
</tr>
<tr>
<td>24 July 2009</td>
<td>Rachila 11</td>
<td>Study team</td>
<td>Miscellaneous tree species.</td>
</tr>
<tr>
<td>20 October 2009</td>
<td>Rashet 4</td>
<td>Study team</td>
<td>Mixed plantation area.</td>
</tr>
<tr>
<td>17 November 2009</td>
<td>Rashet 3</td>
<td>Study team</td>
<td>Miscellaneous tree species; some plantations.</td>
</tr>
<tr>
<td>8 December 2009</td>
<td>Rachila 11</td>
<td>Study team</td>
<td></td>
</tr>
</tbody>
</table>

Discussion

Neora Valley is one of the oldest reserve forests in India, established in 1881 and under strict protection (free from commercial exploitation) since. Its upper range is recognised as the last virgin wilderness in West Bengal (UNESCO World Heritage Centre 2009).

ATREE, conducting the first Red Panda survey in upper Neora Valley NP, visited three forest camps and five villages, sighted two Red Pandas, one each in 2006 and 2007, photographed one of them and collected their pellets in six transects. They estimated a population of 28–32 Red Pandas in the upper Neora Valley by extrapolating their probable density in the surveyed transects to the rest of the area.

The present study found Red Pandas only in high, dense, moist temperate forest with thick undergrowth, where many trees are ancient and hollow, especially in the less accessible areas. However, Red Pandas were neither sighted nor reported in the Lauratious high forest. The park’s other two habitats, the sub-tropical forests in the middle hills and the tropical forests in the lower hills, do not support Red Pandas.

In dense canopy and thick undergrowth (visibility not more than 5–10 m, often less than 2 m), direct Red Panda sighting was very limited. Sighting in the Quercus–Lithocarpus forest with undergrowth of Yushania (2,100–2,400 m asl) was also not frequent. Most sightings were recorded in the second storey of the high forests, generally occurring above 2,400 m asl, particularly in Rashet and Rachila blocks, where Lithocarpus pachyphylia is the predominant tree species. Red Panda was often sighted in the plantations of native hardwood species (comparatively younger trees) in Rashet 3 compartment.

Red Panda sightings were confined to four forest blocks of the park, spread over 37 km² (Table 4). These four forest blocks account for about 43% of the total area of Neora Valley NP.

Even though there were no 2009 records, Red Panda was also reported during the questionnaire survey from outside the park in two adjoining blocks of Kalimpong Division, i.e. Pan-khasari (48 km²), south of Rashet (Chaudapheri) block and Ruka (18 km²), east of Rachila block. Only three sightings of Red Panda in these two Reserve Forests, in 2007 and 2008, were reported by the questionnaires. The combined Red Panda habitat in Neora Valley NP and these adjoining blocks of Kalimpong Division is about 103 km².

Prior to notification of the park, Red Panda was also recorded in Mouchoi forests (9.57 km²) under East Nar block, at an altitude of 1,311 m asl, in the lower Neora Valley NP (Sharma 1990). The cause of its disappearance is not clear. Red Panda has never been known in the entire West Nar block of the Lower Range...
Red Panda in Neora Valley in India

(Sharma 1990).

The present study gave no concrete evidence of seasonal migration of Red Panda in Neora Valley NP, but the methods used and overall small sample would not necessarily pick it up. Ghose et al. (2007: 9) observed that “during spring the Red Pandas are everywhere [whether Singalila NP or Neora Valley NP or both, was not specified] but during the monsoon they are only found in small patches”. This statement warrants further investigation.

Threats
The core Red Panda habitat in the upper hills is least affected of all the park’s habitats by anthropogenic threats because exploitation of forest resources and human movement are controlled there. Nonetheless, four direct and indirect threats to Red Panda and its habitat were identified.

Hunting: there were a few reports of hunters coming into Neora Valley NP from neighbouring areas (Ghose et al. 2007).

Conversion of natural high forests into plantations: starting in 1962, Kalimpong Division clear-felled high forest (except a few good quality patches in Neora Valley NP) for replacement by exotics like Cryptomeria japonica, Cupressus cashmeriana, Pinus patula and others, mixed with indigenous hardwood (broad-leaved) species. These stands remain in East Nar Block of lower Neora Valley NP. Up to 1992 (30 years), over 26 km² of suitable Red Panda habitat in the contiguous blocks of the park (Pankhasari and part of Rashet) was lost. In 1996, the Supreme Court of India has imposed a ban on exploitation and collection in Reserve Forests, National Parks and Wildlife Sanctuaries. Since then, this practice was discontinued.

Encroachments: before notification of the park, many neighbouring villagers used to spend several dry-season months in deep forests, making temporary cattle sheds (gothh) to facilitate cattle grazing. Moreover, there were a number of age-old forest villages inside the park. After notification, all forest villages in the upper range were shifted into the fringe areas and the land was regenerated through plantation of native species. For example, Rachilachawk was evacuated in 1996 and the village land was placed under a plantation programme with native species. During the ground survey, Red Panda was sighted in this area.

Expansion of tourism facilities: due to difficult terrain and lack of communication facilities, only adventurous trekkers usually visit the park with an approved guide. Beginning in 2008, more facilities are being opened up at Choudapheri (Red Panda camp). Construction of an all-weather road beyond Choudapheri, increased vehicular traffic and tourists in this prime Red Panda habitat may lead to environmental pollution and cause disturbance to Red Pandas.

Recommendations
While periodic surveys were carried out in Neora Valley NP in 2002 and 2004 for Tiger Panthera tigris, Himalayan Black Bear Ursus thibetanus, Gaur Bos gaurus and many even-toed ungulate species (e.g. deer), no such survey of Red Panda has been undertaken. A systematic survey might help in planning their conservation and management programmes.

The park authorities should maintain a Red Panda database (time, locality where found including vegetation, physical characteristics of the animal, disease and treatment, post mortem, etc.) for future studies.

Due to ban on felling in the protected areas by the Supreme Court of India, felling of exotic plantations within Neora Valley NP to allow natural forest regeneration is not practicable. The Red Panda habitats in two contiguous reserve forests (Ruka and Pankhasari blocks) of Kalimpong Division should be included within the park for implementation of the Wildlife (Protection) Act 1972, better management and conservation of Red Panda.

The local Forest Protection Committees and Eco-development Committees should also be motivated to actively participate in the joint protected area management.

The forest staff in the park should also be provided with

Fig. 2 (left to right). Red Panda near Jorepokhri, 22 November 2008; Dwarf bamboo Yushania maling; Rhododendron sp. (Photos: M. Roy).
modern equipment and training.

Conservation of this flagship species will assist the rich biodiversity in the study area as a whole.

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Table 6. Plants/parts consumed by Red Panda in Neora Valley National Park.

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Local name</th>
<th>Parts consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yushania maling</td>
<td>Maling bamboo</td>
<td>Tender leaves and shoots</td>
</tr>
<tr>
<td>Arundinaria hookeriana</td>
<td>Pareng bamboo</td>
<td>Tender leaves and shoots</td>
</tr>
<tr>
<td>Arundinaria aristata</td>
<td>Ratonigalo bamboo</td>
<td>Tender leaves and shoots</td>
</tr>
<tr>
<td>Actinidia striogosa</td>
<td>Tokiphal</td>
<td>Fruits</td>
</tr>
<tr>
<td>Rosa sericea</td>
<td>Khorsanay kara or Sisi chigehung</td>
<td>Seeds and sheaths</td>
</tr>
<tr>
<td>Schisandra grandiflora</td>
<td>Singaustro lahara (climber of the high hills)</td>
<td>Flowers and fruits</td>
</tr>
<tr>
<td>Brassatopsis</td>
<td>Chille Phutta</td>
<td>Fruits</td>
</tr>
<tr>
<td>Sorbus cuspidata</td>
<td>Tenga lahara (tree of high hills)</td>
<td>Fruits</td>
</tr>
<tr>
<td>Sorbus thomsonii</td>
<td>Pasi (tree of high hills)</td>
<td>Fruits</td>
</tr>
<tr>
<td>Lithocarpus pachyphylla</td>
<td>Oak tree</td>
<td>Acorns</td>
</tr>
<tr>
<td>Ephiphytic moss</td>
<td>—</td>
<td>Whole</td>
</tr>
<tr>
<td>Wild mushroom (macro fungi)</td>
<td>—</td>
<td>Whole</td>
</tr>
</tbody>
</table>

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