Community-based monitoring of southern yellow-cheeked gibbon (*Nomascus gabriellae*) in Da Te forest, Lam Dong Province, central Vietnam

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Summary

Dong Nai Conservation Landscape is situated centrally within the global range of southern yellow-cheeked gibbon and this species was identified as one of the Landscape’s conservation foci. Da Te forests represent a critical point in Dong Nai Conservation Landscape in terms of forest corridor for habitat connectivity and having a number of species of global conservation significance. Two monitoring surveys of southern yellow-cheeked gibbon in a Da Te forest were conducted in December 2007 and December 2008. The surveys estimated average density of 0.36 – 0.41 gibbon groups per km² of hearing area. Significant changes in average daily calling rate and cumulative number of calling groups per listening posts between 2 surveys were observed that related to newly increasing forest clearance for rubber plantation during second monitoring survey. A number of recommendations were made to mitigate forest loss and strengthen biodiversity conservation in the area.

Kết quả điều tra giám sát vượn má hung (*Nomascus gabriellae*) dựa vào cộng đồng ở rừng Đạ Tẻ, tỉnh Lâm Đồng

Tóm tắt

Vùng cảnh quan bảo tồn Đồng Nai nằm ở trung tâm vùng phân bố toàn cầu của loài vượn má vàng và loài vượn này đã được chọn là một trong số các trọng tâm bảo tồn của Vùng cảnh quan này. Rừng huyện Đạ Tẻ có vị trí rất quan trọng trong Vùng cảnh quan bảo tồn Đồng Nai với vai trò là hành lang rừng kết nối sinh cảnh trong Vùng cảnh quan và chứa đựng quần thể của một số loài có tầm quan trọng bảo tồn toàn cầu. Hai đợt khảo sát giám sát quần thể vượn má vàng ở rừng Đạ Tẻ đã được thực hiện vào tháng 12/2007 và tháng 12/2008. Kết quả cho thấy mật độ trung bình của vượn là 0.36-0.41 nhóm/km² điện tích vurgence. Có sự thay đổi đáng kể giữa 2 lần giám sát về tần số hót trong bình ngày và số nhóm vượn hót ở các điểm nghe do ảnh hưởng của việc khai thác rừng để chuyển sang trồng cao su và các hoạt động kinh doanh khác. Một số kiến nghị đã được đưa ra nhằm giảm thiểu sự mất rừng và tăng cường bảo tồn đa dạng sinh học trong vùng.
Introduction

Southern yellow-cheeked gibbon (*Nomascus gabriellae*) is globally threatened ("Vulnerable" in IUCN Red List, 2008), nationally threatened ("Endangered" in Vietnam Red Data Book, 2007) and endemic to Vietnam, Cambodia and Thailand. In Vietnam, this species is restricted to Southern Central Vietnam, from Gia Lai Province to Dong Nai Province and Tay Ninh Province. Dong Nai Conservation Landscape is situated centrally within the global range of the species, and the species is identified as one of the landscapes ‘conservation foci’, components of global biodiversity that are priorities for conservation action within the landscape (Pilgrim et al., 2006).

Da Te forests (Fig. 1) are situated in a critical point of Dong Nai Conservation Landscape. Firstly, Da Te forests are contiguous with forest in Cat Tien National Park (Cat Loc sector), that provides an important buffer to the national park. More importantly, Da Te forests provide the forest habitat contiguous with forests from Di Linh highlands to the North and forests from Dong Nai Province in the South. Therefore, Da Te forest is classified as one of areas of the first conservation priority in the Landscape by Biological assessment of the Dong Nai Conservation Landscape (Pilgrim et al., 2006) and "Action plan for Biodiversity conservation of Lam Dong Province, Period 2008-2020". The latter has set an aim to develop Da Te forest as a good forest corridor for habitat connectivity in the landscape. In order to provide scientific background for relevant management of Da Te forests and also for developing Pay-for-Environment Services (PES) policy of Da Te forests, in 2007, WinRock International have developed a Community-based Biodiversity Monitoring Programme for 6 key wildlife species including the southern yellow-cheeked gibbon. Two monitoring surveys were conducted in December 2007 and December 2008. This report represents the results of southern yellow-cheeked gibbon monitoring.

Materials and Methods

A listening post technique was used for monitoring southern yellow-cheeked gibbon in Da Te forest. Seven listening posts were randomly arranged in Da Te Forests (Quoc Oai and An Nhon Commune); the distance between two consecutive listening points was, at least, 3 km long to avoid overlapping count:

- Listening Post 1: Grassland 1 (forest comp.526); UTM 0773753/ 1288032; Alt. 584
- Listening Post 2: Grassland 2 (forest comp. 519B); UTM 0775498/ 1292877; Alt.630
- Listening Post 3: Đoi Tho area (forest comp. 520); UTM 0777348/ 1292296; Alt. 608
- Listening Post 4: Trang Phao grassland (forest comp. 525); UTM 0776457/ 1289821; Alt. 610
- Listening Post 5: Aircraft grassland (forest comp. 518); UTM 0769941/ 1292383; Alt. 566

Fig.1. Location of Da Te forest.
- Listening Post 6: Peak 551, near Suoi Dut junction (forest comp. 536); UTM 0769016/ 1288849; Alt. 527
- Listening Post 7: Dang Ji area (forest comp. 536); UTM 0776871/ 1285315; Alt. 448

The survey team consists of 21 people (5 staff of Da Te State Forest Enterprise, 2 staff of Da Te Forest Protection Unit and 14 residents of Quoc Oai and An Nhon Communes who work as commune forestry officials or as members of contracted commune forest protection teams). The survey team received a two-day training on survey technique before the first survey and one-day repeated training before second survey.

Two surveys were conducted in December 2007 and December 2008; each survey lasted for five consecutive days that allowed catching 98.4% gibbon groups heard at each post (following estimation in Cambodia by Rawson et al., in press). During survey time, three persons are quietly posted at each listening post. Listening surveys begin early in the morning 30 minutes before sunrise (5:00 am in December 2007 and 2008) and end three hours after sunrise (8:00 am in December 2007 and 2008). Sunrise time was taken from a GPS unit. When hearing a call the following information was recorded into the survey form:

- Time of calling start of each group.
- Time of calling bout end of a calling of each group. A calling bout is defined as being a series of calls without a break of more than 5 minutes between them. If a group stops calling for more than 5 minutes it should be considered as a new bout.
- Type of calls: solo or duet. Only duet calls are used for analysis.
- Compass bearing to the calling group.
- Estimate distance from the listening spot to the calling group as “near”(< 400 m), medium (400 – 800 m) and far (>800 m).
- Weather conditions at calling start time.
- Weather conditions at sunrise time.

The number of calling groups from each post for each morning is calculated by maximum number of groups heard on the morning or mapping the calls, with groups differentiated based on the direction and timing of calling. A cumulative count of number of calling gibbon groups for five days at each post is determined by mapping callings over five days. Then, an estimated number of gibbon groups for all listening posts (including calling and not calling groups) is estimated using the formula:

$$\sum c_i$$

$$x = \frac{\sum c_i}{p(m)}$$

$x$: the estimated number of gibbon groups from all listening posts,
$c_i$: cumulative number of calling gibbon groups heard in five days period at listening post $i$,
$p(m)$: calling probability for five day survey period = 0.894 (Rawson et al., in press.),
$i$: number of the listening post (1…7).

The average density of gibbon groups at listening area is:
\[
d = \frac{\Sigma c_i}{\Sigma a_i p(m) a_i}
\]

\(d\): the average density of gibbon groups in listening area;
\(a_i\): the hearing area of post \(i\) which is estimated based on hearing cycle with radius of 1.5 km (longest distance that gibbon calls can be heard from listening post); \(a_i = (1.5\text{km})^2 \times 3.1416 = 7.0676 \text{ km}^2\) (some adjustment from real terrain conditions may be necessary).

Due to low number of listening posts, total gibbon population number for whole area of Da Te forest will not be estimated and average density \((d)\) will be used for comparison between surveys. Additional index for comparison can also average daily calling rate \((R)\) which can be calculated using following formula:

\[
R_i = \frac{\Sigma G_k}{n}
\]

\(R_i\): average daily calling rate of gibbon at listening post \(i\);
\(G_k\): number of recorded calling groups for each survey day at post \(i\) \((k = \text{day 1 to day 5})\)
\(n\): number of survey days \((n = 5)\).

### Results and Discussion

Summary results of 2007 and 2008 gibbon monitoring surveys are presented in Table 1, Fig. 2 and 3 which include average daily calling rate for each listening post, mean value of average daily calling rate from all listening posts, cumulative number of calling groups from each listening post, total cumulative number of calling groups from all listening posts and average density of gibbon groups in hearing areas.

<table>
<thead>
<tr>
<th>Listening post</th>
<th>Average daily calling rate (group/day)</th>
<th>Cumulative number of calling groups (group)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
<td>2008</td>
</tr>
<tr>
<td>Post 1</td>
<td>1.8</td>
<td>0.2</td>
</tr>
<tr>
<td>Post 2</td>
<td>3.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Post 3</td>
<td>2.4</td>
<td>3.0</td>
</tr>
<tr>
<td>Post 4</td>
<td>2.2</td>
<td>4.0</td>
</tr>
<tr>
<td>Post 5</td>
<td>1.6</td>
<td>0.8</td>
</tr>
<tr>
<td>Post 6</td>
<td>0.8</td>
<td>0.6</td>
</tr>
<tr>
<td>Post 7</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Mean**

| Average density of gibbon groups in hearing areas | 0.41 groups/km² | 0.36 groups/km² |
Total cumulative number of calling groups is 18 for 2007 and 16 for 2008 and estimated density of gibbon groups per hearing area is 0.41 groups/km² for 2008 and 0.36 groups/km². This difference is not significant and does not mean that gibbon population in 2008 is less than those in 2007. The difference is very likely due to lower calling rates of the gibbon population during 2008 survey time than those in 2007. This no loss of gibbons is also supported by facts that no evidence of gibbon killing were recorded during period from December 2007 to December 2008 based on data from Da Te Forest Protection Unit (FPU), Da Te Forest Company (FC) and our interviewing local residents.

The monitoring results show significant change in average daily calling rate and cumulative number of calling gibbon groups. Both 2007 and 2008 surveys occur in December with very similar weather conditions, so seasonal change and weather-leading change can be ignored. This change obviously comes from different level of human impacts on forest. The forest disturbance during 2008 survey time is much higher during 2007 survey time. This relates to change in Da Te forest management system. In 2007, forest in monitoring area (Quoc Oai and An Nhon Communes) was under management of single Da Te State Forest Enterprise (SFE) and only small scale selected bamboo cutting occurred. In 2008, Da Te SFE was reformed into Da Te Forest Company and about 3,578 ha of forest in monitoring area has been allocated to 3-4 private companies for rubber tree plantation and other business purposes. Large portion of allocated forests is under clearing for growing industry trees (rubber trees, etc.). The forest clearing by these companies significantly stimulates illegal forest cutting and tree logging by local villagers. Consequently, the forests in the monitoring area are very disturbed by human encroachment, noise of timber cutting and forest destruction. The forest disturbance causes change in the home range location of gibbon groups (some gibbon groups have to move from disturbed areas to new safe areas) and depresses calling rate of the gibbon groups which results in smaller number of calling groups recorded in 2008.

The changes in average daily calling rate and cumulative number of calling groups are
significant for listening posts 1, 2 and 4. This clearly reflects the impacts of forest disturbance during monitoring survey. The reduction of average daily calling rate and cumulative number of calling groups from listening posts 1 and post 2 is due to increased forest disturbance by two private companies (Toan Xa and Dinh Thuan Companies) which conducted forest clearing during survey times, while increase of average daily calling rate and cumulative number of calling groups from listening posts 4 and possibly also from post 3 is due to movement of some gibbon groups from disturbed areas (Post 1 and 2) to these more safe areas. The reduction in post 5 and 6 is unclear, level of forest disturbance in this area was high in 2007 due to bamboo logging and remains high in 2008 due to increased human encroachment for private company establishment and illegal forest clearance and recorded calling rate is low for both years.

We could access only two studies with estimation of southern yellow-cheeked gibbon density using listening posts method. One in Cat Tien NP conducted by Technical Unit of Cat Tien NP in Cat Tien National Park, 2005) and another in Seima Biodiversity Conservation Area (SBCA), Mundulkiri Province, Cambodia (Rawson et al., in press).

Using a similar method of gibbon census and data analysis in SBCA (Cambodia) (Rawson et al., in press) obtained average density of southern yellow-cheeked gibbons in SBCA 0.71 ± 0.07 groups/km². This figure is almost twice as high as our estimated density of southern yellow-cheeked gibbon in Da Te forest area (0.36 - 0.41 groups/km²). Explanation for this may be better forest quality and fewer disturbances in SBCA in comparison with Da Te Forest.

In Cat Loc (a section of Cat Tien National Park) which shares border with Da Te forests, Kenyon (2007) and technical staff of Cat Tien conducted gibbon census using listening post method but with some differences in listening posts arrangement and gibbon call count techniques (Cat Tien National Park, 2005). In total, 55 gibbon groups were recorded from 357 km² of Cat Loc sector that gives average density of about 0.15 groups/km². This figure is much lower than our estimated density in Da Te monitored forest area (0.36 - 0.41 groups/km²). This difference can be explained partly by the method modification; the density was estimated for whole Cat Loc Section of Cat Tien NP not for hearing area which is much smaller than the Cat Loc Section as whole.

Due to low number of listening posts, the estimated density in this study (0.36 - 0.41 groups/km²) does not represent the gibbon density in total for the Da Te forest. However, this density indicates that Quoc Oai and An Nhon forests can support a population of gibbons and thus, Quoc Oai and An Nhon forests represent an important habitat extension for southern yellow-cheeked gibbons which inhabit in Cat Loc Section of Cat Tien NP and other surrounding forest area.

Conclusions and Recommendations

Two monitoring surveys for southern yellow-cheeked gibbon in Da Te forest (Quoc Oai and An Nhon communes) give estimated average density of 0.36 – 0.41 gibbon groups/km² of hearing area. This indicates the importance of Da Te forest as habitat expansion and corridor for gibbon populations from Cat Tien NP and adjacent forests. In order to protect the gibbon population and also to secure Da Te forest as forest corridor for the Dong Nai conservation landscape following activities need to conduct:

- Da Te FPU, Da Te FC, local authorities should increase its forest protection activities (regular patrol, inspection and enforcement) to prevent illegal forest destruction by local residents and forest over logging by private companies. Forest protection and biodiversity conservation
regulations should be acknowledged to all new forest owners for strict obey. In regard to forest areas, which are planned for conversion into plantation, all processes of forest cutting, infrastructure construction should be strictly monitored to mitigate negative impacts on local environment and biodiversity.

- An educational programme should be conducted to increase awareness of workers and staff members of the new companies on importance of Da Te forests for environmental protection and biodiversity conservation, national legislation on environmental protection and biodiversity conservation.

- Allocation of some area of Da Te forests to private companies for rubber plantation and other business activities will weaken the forest corridor function of Da Te forest, however, the corridor still remains and an effort should be made to maintain this corridor as much as possible. The forest product resources and biodiversity values of remained forests should be inventoried and assessed to develop sustainable use planning and relevant biodiversity conservation action.

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