

# A preliminary field survey and assessment of the effects of chemical toxin (dioxin) on primates in Ma Da area, Dong Nai province

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**Abstract.** We have recorded seven species, belonging to 3 families of primates in Ma Da area that was affected by chemical toxins during the Vietnam War. We have yet identified significant differences between the primate faunas of Ma Da area and Cat Tien National Park as well as the differences in morphology and behaviour of primates between these two areas. The small visible differences between the two faunas are mainly attributed to geographic topology, forest type and conservation management. Further studies on effects of Agent Orange on animals in Ma Da area should focus on carnivorous mammals, rodents, etc. to identify chemical toxins remained in those species and their effects.

**Keywords:** primates, Ma Da, Agent Orange, dioxin.

## 1. Introduction

The Vietnam War against U.S. Army had stopped for a long time, however, its consequence and effect on people and environment still exist. One of the significant effects is the chemical toxin used by U.S. Army during the war. This topic has become a focal

point in many projects conducted in Vietnam [1-3].

During the war, Ma Da area is among the areas most affected by herbicides (also known as Agent Orange) sprayed by the U.S. Army. Until now, we still can find fragments of herbicide tanks in some locations (Figs. 1-2). Ma Da area has been merged with some neighbouring areas renamed as Vinh Cuu Nature Reserve and Historical Relics since

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2006 after Decision No. 09/2006/QĐ by the People's Committee of Dong Nai province.

In this paper, we would like to present our research results on the effect of chemical toxin on primate species in Vinh Cuu Nature Reserve and Historical Relics (in short, herein we call Ma Da area). This study was part of two projects, titled "*Assessment the effect of chemical toxin on bio-diversity and the changing of ecology systems in Ma Da area (Dong Nai Binh Phuoc, Binh Duong provinces) and Bien Hung lake (Bien Hoa City)*" and "*A research on the effect of dioxin on process of ecosystems and the changing of genetic and protein structure in some species in Ma Da area*", both belong to National Program 33 to

overcome the effects of chemical toxins used during the Vietnam War against U.S. Army.



Fig. 1. A remained fragment of an herbicide tank in the studied area (photo: Le Khac Quyet)

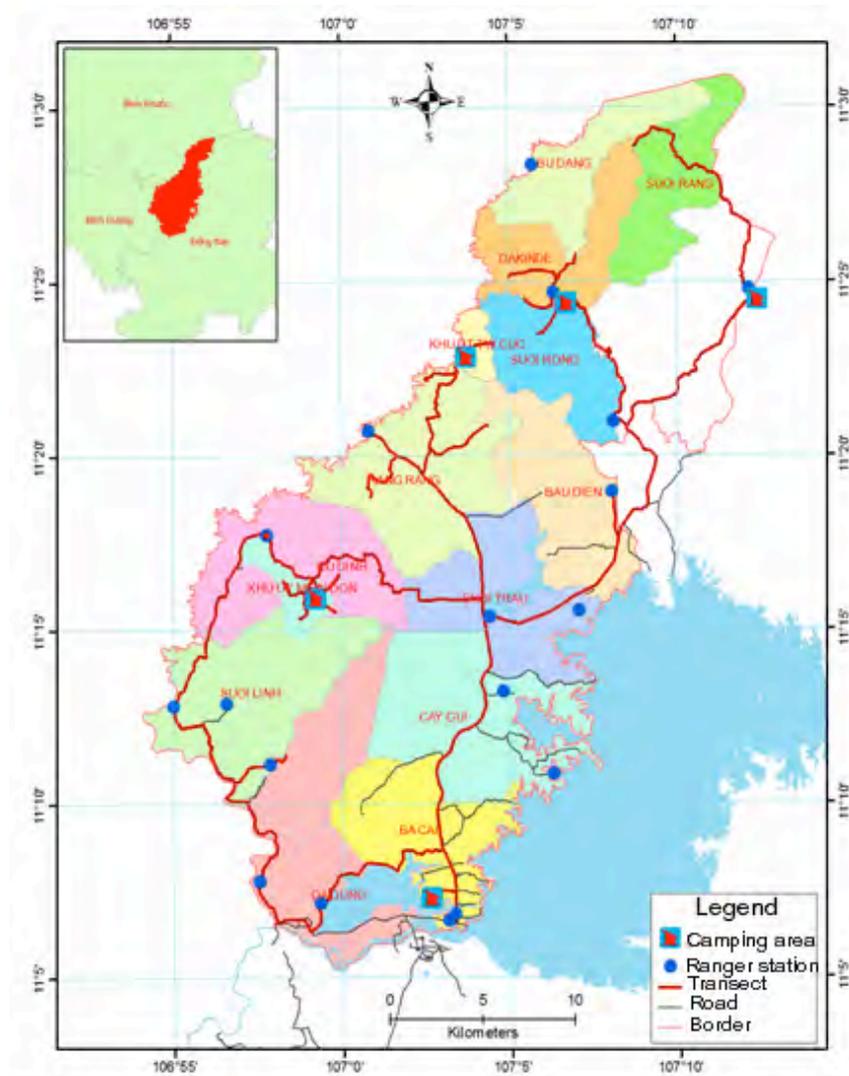


Fig. 2. Map of Ma Da area marked with survey transects

## 2. Materials and methods

In the studied area, we have conducted field surveys in the following locations:

- Rang Rang and Ba Cai (old Canh Doi airport) area - Ma Da forestry farm
- Sub-farm No.4 - Hieu Liem forestry farm
- Sub-farm No.2 - Vinh An forestry farm

In addition, Cat Tien National Park was chosen as a control area because this area was not affected by Agent Orange during the war.

We have conducted nine field trips, from 2003-2009, with a total duration of about 150 days.

We used different methodologies for surveys, namely, interviewing (local people), field survey (day and night time), data analysis, forest vegetation analysis, using GPS to locate

field transects, sample collecting, which followed Geissmann & Vu Ngoc Thanh (2001) and Long *et al.* (2005) [4, 5].

### 3. Results and discussion

#### 3.1. List of primate species at studied locations

Based on interview information, there are seven primate species occurring in the studied area (Table 1). Comparing with the control area - Cat Tien National Park (NP) and some other NPs, the local primate faunas are similar. However, local population size of some species is higher in Cat Tien and other NPs than in Ma Da area (Fig. 3).

In general, the primate fauna in Ma Da area and Cat Tien NP is diverse in species number and population size of each species. However, population size of each species is now decreasing seriously, especially in Ma Da area. There is no significant difference between the primate fauna in Ma Da area and in Cat Tien NP. A small difference on population size of each species caused by several natural factors such as: forest type, topography, management, etc.

Besides, the diversity of other vertebrate groups of mammals, reptiles, amphibians in Ma Da are about the same as Cat Tien NP but higher than some other NPs [6].

#### 3.2. Effects of chemical toxin on regional primate species in the research location

Because natural forests in the studied area were reduced by the war and by recent economic development, primates and other animals only distribute in some limited areas such as primary forest and good secondary forest without or with few impacts from people activities.

Previously, Ma Da area was a military base of the South Vietnam Liberation Army, thus it was one of the significant areas seriously affected during the war. The U.S. Army had dropped thousands ton of bombs, bullets and thousands liters of chemical toxin. These activities have caused serious deforestation of a very large area. As a result, it directly or indirectly caused negative effects on animals, including primates inhabiting the area.

Research results suggested that primates, together with other animal species, and even local people have been being poisoned by chemical toxin that U.S. Army used during the Vietnam War. The chemical toxin seriously affected not only the existing of animal species but also the covering forest and vegetation. These effects have taken away suitable habitats of many animal species, including primates. This could be the main effect on reducing number of species and number of individual of each species in the research area.

Table 1. List of primate species in Ma Da area and Cat Tien NP

No.	Common name	Scientific name	Conservation status		
			VN	IUCN	ND32
1.	Pygmy Loris	<i>Nycticebus pygmaeus</i>	VU	VU	IB
2.	Stamp tailed Macaque	<i>Macaca arctoides</i>	VU	VU	IIB
3.	Long tailed Macaque	<i>Macaca fascicularis</i>			IIB
4.	Pig tailed Macaque	<i>Macaca leonina</i>	VU	VU	IIB

No.	Common name	Scientific name	Conservation status		
			VN	IUCN	NĐ32
5.	Rhesus Macaque *	<i>Macaca mulatta</i>	EN	EN	IIB
6.	Black Shanked Douc Langur	<i>Pygathrix nigripes</i>	EN	EN	IB
7.	Silvered Langur	<i>Trachypithecus villosus</i>	VU	DD	IB
8.	Yellow cheeked Gibbon	<i>Nomascus gabriellae</i>	EN	VU	IB

Notes: (\*) The species is not a native species in the studied area, but they were released into Cat Tien NP when confiscated (Fig. 4); VN: Vietnam Red Book (Ministry of Scientific Technology and Institute of Science and Technology): EN – Endangered; VU – Vulnerable; IUCN: IUCN Red list (IUCN, 2009): EN – Endangered; VU – Vulnerable; E – Threatened; DD – Data deficiency; ND 32: Degree 32/2006/ND-CP: IB – IB appendix: to ban hunting, trading and using; IIB – IIB appendix: to be allowed to hunt, trade and use with permission.

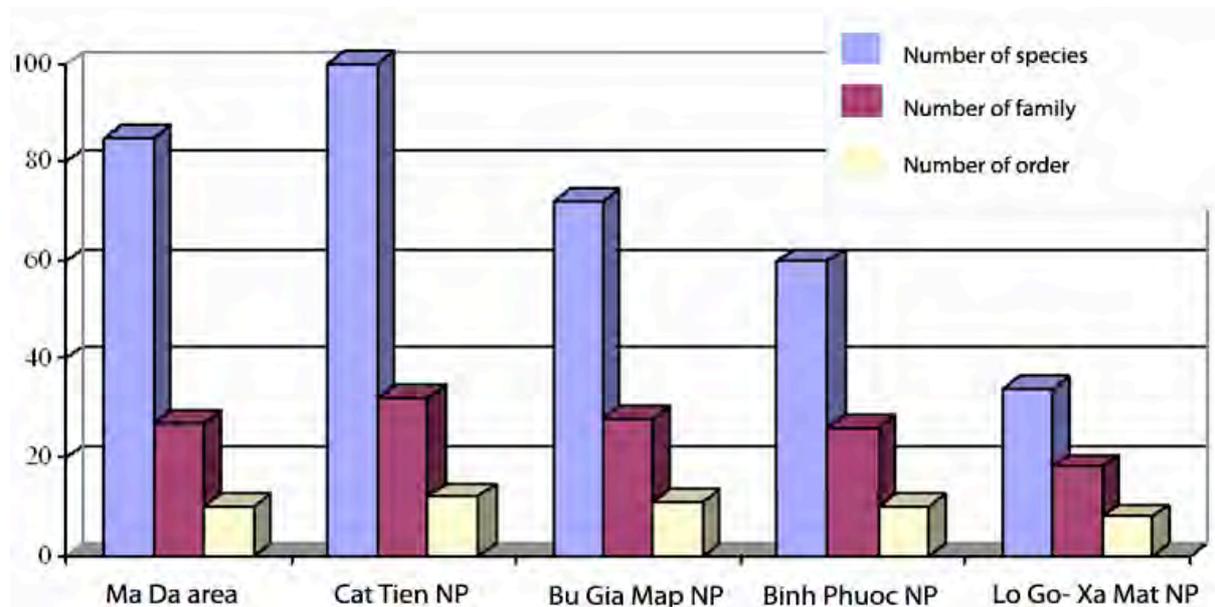


Fig. 3. Comparing the number of mammal species between Ma Da area with other closed NPs

After the war, the social-economic development has also brought a significant impact on natural resources protection and management in the area, especially illegal logging and changing forest area for farming. These activities have existed for many years, but only now they have received more attention from the public.

Based on our preliminary results, we can see that the effect of chemical toxin used by the U.S. Army during the war is not obvious at macroscopic level (population and community).

This is supported by the comparison between the faunas of Ma Da area (affected by dioxin) and Cat Tien area (not affected by dioxin). It might have some effects at microscopic level (gene, cell, and individual). However, we have not identified those effects due to the limitation of our research techniques. A recent study stated that there is no proof that the dioxin exists in leaf that leaf eating monkeys use [6]. We have also collected samples several primate species in Ma Da area but have not analyzed them yet [7].



Fig. 4. Rhesus Macaque (*Macaca mulatta*) in Cat Tien NP (photo: Vu Ngoc Thanh)

#### 4. Conclusion

According to research results, there are total seven primate species in Ma Da area and Cat Tien NP. Although quite high diversity of species number but individual number of each species is decreasing seriously, especially in Ma Da area. We have not found significant difference, both qualitatively and quantitatively,

between primate faunas of Ma Da area and Cat Tien NP. We have yet identified the effects on chemical toxin used by U.S. Army during the war on the primates in the studied area. Further studies on effects of Agent Orange on animals in Ma Da area should focus on carnivorous mammals, rodents, etc. to identify chemical toxins remained in those species and their effects. Subsequent studies also need to focus on the effects of chemical toxins on primates at cellular and molecular levels, using molecular techniques.

People activities, such as hunting, trapping, forest product collecting and farming, do not seriously affect forest and wildlife including primate species. We recommend the improvement of the effectiveness of forest protection, management and awareness activities on biodiversity conservation to rangers and local communities at Ma Da area. We also suggest developing alternative livelihood models to improve life standard for local communities.

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## Điều tra và đánh giá sơ bộ ảnh hưởng của chất độc hóa học đối với khu hệ linh trưởng ở khu vực Mã Đà, tỉnh Đồng Nai

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Ghi nhận sự có mặt của 7 loài, 3 họ thuộc khu hệ thú linh trưởng tại khu vực Mã Đà tỉnh Đồng Nai, khu vực bị rải chất độc hóa học trong chiến tranh. So sánh với khu hệ thú linh trưởng tại Vườn Quốc gia Cát Tiên nơi không bị rải chất độc hóa học thì không thấy sự khác biệt về hình thái, tập tính. Không có sự khác biệt về thành phần khu hệ linh trưởng giữa khu vực Mã Đà và Vườn Quốc gia Cát Tiên. Những khác biệt nhỏ, chủ yếu là số lượng cá thể của mỗi loài giữa hai khu hệ này là do các yếu tố tự nhiên quyết định như: địa hình-địa mạo, kiểu rừng, các hoạt động thực thi pháp luật. Các nghiên cứu về ảnh hưởng của chất độc hoá học do Mỹ sử dụng trong chiến tranh lên động vật tại khu vực Mã Đà trong tương lai nên tập trung vào các động vật như thú ăn thịt, thú

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