

STATUS MONITORING AND CONSERVATION ISSUES OF *TEINOPALPUS IMPERIALIS* HOPE (LEPIDOPTERA: PAPILIONIDAE), AN ENDANGERED BUTTERFLY OF NEPAL

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ABSTRACT

Teinopalpus imperialis an endangered swallowtail butterfly of high conservation value is encompassed into the Appendix II of CITES (Convention of International Trade of Endangered Species). This butterfly prefers its habitat at the altitudinal range of 2180 - 3000 m and emerges out for a brief period in summer months of May till July first week annually. This target species dwells in the broad leaved evergreen and mixed forest of Oaks (*Quercus* spp.).

This specific work made an extensive study of *Teinopalpus imperialis* with respect to its population status, associated habitats and prevailing threats in Phulchoki Mountain (Lalitpur District), Nagarjun –Shivapuri National Park (Kathmandu District) and Nagarkot Mountain (Bhaktapur District). This revealed out the occurrence of 21 individual populations of this butterfly in the Phulchoki Mountain and 8 individuals in the Nagarjun forest. Nagarkot of Bhaktapur district did not represent any of this species due to prevailing high impact on its habitat area.

Keywords: CITES appendix, Phulchoki, pupa, population, impact

INTRODUCTION

Teinopalpus imperialis (Hope, 1843), an endangered swallowtail butterfly has a narrow distribution range confined to limited pockets of the country. The nominate race of this butterfly occurs in some specific areas of Kaski, Lalitpur, Kathmandu and Bhaktapur Districts with no records from rest of the country. Since its first record made by Ramsay in eighteenth century and Smith in 1989, no monitoring process was adopted to determine its existing population and conservation status. The Kaiser-I-Hind is confined to the thickly wooded districts at the altitude of 2000 to 3500 m in Nepal, north-eastern India, Bhutan, and China (Smith, 1989). Of the CITES listed species found in Nepal viz. *Teinopalpus imperialis*, *Troides aeacus* and *T. helenus*, the first one is said to carry high demand for the illegal dealers and traders.

This is a fast flying butterfly especially on tree-tops. Males are known to descend down to rest on ground vegetations. Male sucks moisture contains of the leaves and visits moist areas frequently. This butterfly prefers open space of the forested hills and mountain tops. Males are territorial and aggressive to other intruding males. This is a localized species found at the elevations of 2180 m to 3000 m in Nepal while in India its record has been made at 1820 m to 3000 m in the broad leaved evergreen forest mixed with conifers and often with oaks (Talbot, 1939).

The elevation of the Phulchoki Mountain ranges up from Godavari at 1400 m to the maximum

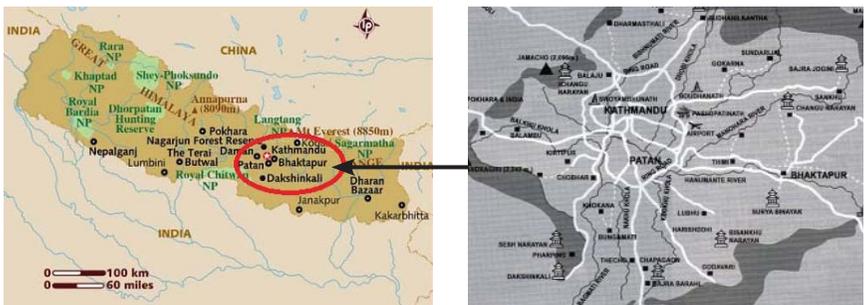
elevation of 2735 m. This vertical zonation represents forests of *Schima wallichii* and *Castanopsis indica* on the lower slope, while the upper part comprises *Quercus lamellosa* and *Q. lanata* mixed with *Rhododendron arboreum*, and the highest elevation represents *Q. semicarpifolia* with spreading bamboo species. This mountain shelters many interesting faunal components including endemic *Turdoides nepalensis* (Spiny Babbler) besides many other bird species (Fleming *et al.*, 1976). Nagarjun-Shivapuri National Park has good representation of interesting components of the biodiversity. This park has interesting floral species like *Spiraea micrantha*, *Arenaria glandulosa*, *Anemone vitifolia*, *Clematis buchania*, *Ranunculus diffuses*, *Thalictrum foliolosum*, *Schisandra grandiflora*, *Berberis asiatica*, *Holboelia latifolia* etc which are widely spread (DPR, 1973) in this part. Nagarkot of Bhaktapur district represents notable vegetations like *Pinus roxburghii*, *Viburnum sps*, *Hypericum sps*, *Schima wallichii*, *Quercus glauca*, *Euphorbia sps*, *Berberis aristata*, *Prunus cerasoides* etc.

MATERIALS AND METHODS

This study considered the months of mid May to July first week during which this butterfly is on wing in central Nepal. Frequency of this species was noted carefully without repetition. Field data like elevation, date, time and locality was recorded to accuracy into the data sheet. Literatures were also surveyed to obtain further information on its association to habitat vegetations (Igarashi, 1987; Talbot, 1939; Laithwaite, 1975). Eleven visits were made to the study sites in May to July first week. Smith (1989) and Khanal and Smith (1997) were consulted to confirm its species identification. The floral species collected in and around the habitats of the target species were identified at the Natural History Museum in Kathmandu besides consulting literatures by Polunin and Stainton (1984) and Stainton (1988). Plants collected at the three different study sites have been deposited at the Natural History Museum, Kathmandu.

STUDY AREAS

a. Phulchoki Mountain of Lalitpur District Phulchoki Mountain lies at 16 km southeast of Kathmandu city and stands at 27° 58' N to 85° 39'E and 27° 83' N to 85°38'E. This mountain comprises a mixture of limestone and low-grade metamorphic marble. Notable butterflies recorded in Phulchoki are *Troides aeacus* (Golden Birdwing), *Achillides krishna* (Krishna Peacock), *Dilipa morgiana*, *Delias belladona* (Hill Jezebel) and *Teinopalpus imperialis* (Kaiser E Hind).



MAP 1. Nepal Map and location Map of the study area indicated by black spots

b. Shivapuri-Nagarjun National Park of Kathmandu District.

This place at 27° 45' N and 85° 15' E represents mixed broad leaved forest. Common butterflies found here are *Metaporia agathon* (Great Blackvein), *Catopsilia pomana* (Lemon Emigrant), *Zemerus flegyas* (Punchinello), *Aglais cashmirensis* (Tortoise Shell), *Danaus aglea* (Glassy Tiger), *Pieris brassicae* (Large Cabbage White), *Papilio memnon* (Great Mormon) etc.

c. Nagarkot of Bhaktapur District

The Nagarkot hill on its geographical stand of 27° 65' N to 85° 41' E lies at 2111 m of elevation from msl. Butterfly diversity noted here are mainly, Large Cabbage White (*Pieris brassicae*), Pale Clouded Yellow (*Colias fieldii*), Common Tortoise Shell (*Aglais cashmirensis*), Glassy Tiger (*Danaus aglea*), Common Tiger (*Danaus chryssipus*), Common Peacock (*Achillides polyctor*) etc.

RESULTS

This study in May to July of 2009 was specially designed to monitor the population and conservation status of *Teinopalpus imperialis*, a CITES listed (Appendix II) and endangered butterfly found in three adjoining districts of Kathmandu Valley. The current population data resulted from this study is provided below.

Description of species

Wing span: 90-120 mm. Forewing has a dark curved line and blackish indistinct band. Outer margin has white fringes. Hindwing contains dark discal line at distal side with golden yellow area. Sub-marginal lunules are greenish yellow, single yellow tipped tail in male. The size of female is little larger than the male. Forewing of female has grey bands. Hind wing with a large grey area. Presence of two tails, one is shorter at vein 6 and next longer at vein 4.



PHOTO 1. *Teinopalpus imperialis*
on *Quercus semicarpifolia* Tree in
Phulchoki Top.

Population Data

TABLE 1. Population data of *Teinopalpus imperialis* in three places of Kathmandu valley

Place	Altitude	Total Observation	Date	Time of Sightings
Phulchoki	2700 to 2734 m	May- X June=12 specimens	May 22, 27, June 3, 7, 8, 16, 26, 27, 29	9 AM to 11.45 A.M
		July=9 specimens	July 3, 7, 18, 24, 28.	9 AM to 12 Noon
Nagarjun	2300-2350 m	May= X June=8 specimens	May 24, June 5, 10, 23, 24,	8.30 A.M to 12.30 PM
		July=4 specimens	July 5, 21, 14	
Nagarkot	2100-2190 m	May = X June = X July = X	May 29, June 24, July 10, July 16	9 A.M. to 2 P.M

Population Pie Chart

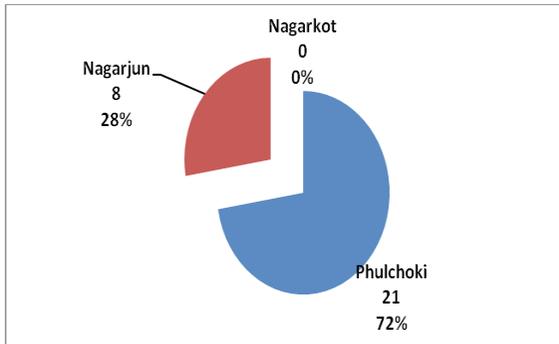


FIG.1. Percentage wise population of *T. imperialis* in study sites.

DISCUSSION

Significant study of Baruwa (2010) analyzed the effects of season, forest type, rainfall, year, altitude, and geographical position on the species assemblages of Papilionid butterflies in Assam of India. Results showed that the rainfall, forest type, and season accounted for most variance in the Papilionid abundance. Rainfall was strongly correlated with the abundance of some species. Diverse habitat preferences were found at the elevation of 1500–2000 m where

85 species occurred. This elevation is influenced basically with the warm temperate climate sheltering butterflies of different habitat types. Cold climatic condition, scarce vegetation and few preferable habitats are the main causes of less diversity in higher elevation (Khanal *et al.*, 2012). Seasonal environments (tropical and temperate regions) and climate gradients like temperature and precipitation play an important role in defining the differences in habitat preferences, biology, adult activity, reproductive strategy, and adaptive polyphenisms of butterflies (Brakefield & Larson, 1984; McLeod, 1984).

The adult of this butterfly emerges out from its pupal case normally at the end of May when optimum temperature prevails. According to Igarashi (1987) this butterfly starts its appearance in late April in Darjeeling of India when the later becomes abundant in the latter half of May. It can also be seen in June but the population declines in July and becomes scarce in August. His study made in the Tiger Hill of Darjeeling revealed that this butterfly is a univoltine species. He mentioned that the *Magnolia campbelli* of the family Magnoliaceae is the food plant of this butterfly (Igarashi, 1987; Haribal, 1992). The next food plant as described in some literatures is a shrub called *Daphne* sps. (Talbot, 1939; Lathwaite, 1975; Gosh *et al.*, 1983; Munroe, 1961; Okano, 1983; Collin & Morris, 1985). *Achillides krishna* is a rare and endangered butterfly was also noted in the same habitat of *Teinopalpus imperialis* at 2734 m in the Phulchoki Mountain. Though not listed under the CITES Appendix, this species has been listed as Endangered under the IUCN Red List Status.

Though *Teinopalpus imperialis* was first described in 1843, its life history was not well documented until 1986 (Igarashi & Fukuda, 2000). This swallowtail produces two broods per year (spring and late summer) (Igarashi, 2001). Females are much larger and rarer than males.

Considering its high trade value and rare status, *Teinopalpus imperialis* has been listed into the CITES Appendix II since 1987 (Federal Register, 2004). According to IUCN, nearly 14% of the total species of this family (78 species) is being threatened or the species community is on severely declining stage. Among 46 species that need to be protected (listed in appendix I and II of CITES), Vietnam has 4 species, namely *Teinopalpus aureus*, *Teinopalpus imperialis*, *Troides helena* and *Troides aeacus* (Lien, 2011). The accelerating rate of habitat loss has altered the status of one hundred and forty two species of Nepalese butterflies into the threat category (NRDB, 1995).

The Kaiser-I-Hind swallowtail does not represent a monotypic genus. The current threats of habitat destruction and illegal collections are moderate to low in magnitude due to its wide distribution in some countries, but imminent due to ongoing habitat destruction, high market value for specimens, and inadequate domestic protections for the species or its habitat (Federal Register, 2009). It also states that its current status is still not known in Bhutan, India, Laos, Myanmar and Nepal (before initiation to this study).

Conservation Issues

Considering its illegal trade and high conservation value this butterfly is protected by the respective Conservation Acts in different countries. In Nepal, this species is protected by Appendix II of CITES and Threatened Category of the National Red Data Book (1995). The Indian Wildlife Act of 1972 has listed this butterfly under the Schedule II (Collins & Morris,

1985). This swallowtail is listed under the Wildlife Reservation and Protection Act of 1992 in Thailand, which makes it illegal to collect (whether wild or dead) or to have the species in one's possession (Thai Government, 1992). According to Lien (2012), this species is very rare with scattered small populations in high altitude areas of Vietnam where natural forests are disturbed. Destruction of natural forest and over-collection has threatened this butterfly in this country. According to him this butterfly carry high conservation value in Vietnam.

Impact factors on the habitat of *Teinopalpus imperialis* in Kathmandu Valley:

- Phulchoki Mountain Top: Most of the trees are cut down except few trees of *Quercus semicarpifolia* in its habitat area. During this study the species were observed resting on these trees.
- Nagarjun Forest: This is the next potential area for this butterfly. The habitat at Nagarjun top or Jhama Cho (2130 m) is highly disturbed with hanging religious flags; these are installed massively upon the temple area with no free space for the movement to this butterfly. Majority of the trees are cut down except few trees of *Castanopsis tribuloides* in which *Teinopalpus* usually settled.
- Nagarkot: No *Teinopalpus imperialis* was seen at Nagarkot though occurred here a decade back (Khanal & Smith, 1997). The habitat for this species is heavily pressurized with human activities, constructions and deforestation.
- Haphazard collections of fodders and fiber plants are causing heavy impact on the habitat of this butterfly.
- Forest fire in Phulchoki caused an extreme loss of its habitat area in 2009. *Quercus semicarpifolia* also suffered with this fire.
- Different bamboo species are spreading around the mountain area which also has depressed the population of the relevant plant species of the target butterfly.

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REFERENCES

- BARUWA, K K; SLOWIK, J; BOBO, K S; MUEHLENBERG, M (2010) Correlations of rainfall and forest type with Papilionid assemblages in Assam in northeast India. *Psyche* 2010, Article ID 560396:10.
- BRAKEFIELD, P M; LARSEN T B (1984) The evolutionary significance of dry and wet season forms in some tropical butterflies. *Biological Journal of the Linnean Society* 22(1):1–12.

- COLLINS, M N; MORRIS, M G (1985) *Threatened swallowtail butterflies of the world*. IUCN, Gland, Switzerland; 200–202 pp.
- DPR, (1973) Flora of Nagarjun. *Bulletin of Department of Medicinal Plants (No. 4)*. Ministry of Forest, Nepal Government, Kathmandu, Nepal.
- FLEMING, R L., SR., FLEMING R L, JR.; BANGDEL, L S (1976) *Birds of Nepal*. FLEMING, R L SR., Box 229, Kathmandu, Nepal; 337 pp.
- FEDERAL REGISTER, (2008). *Endangered and threatened wildlife and plants: Annual notice of findings on resubmitted petitions for foreign species*. US Fish and Wildlife Service, Department of Interior, July 29, United States 73(146): 44095–44096.
- FEDERAL REGISTER, (2009). *Endangered and threatened wildlife and plants: Annual notice of findings on resubmitted petitions for foreign species: Annual description of progress of listing actions*. US Fish and Wildlife Service, Department of Interior, August 12, United States; 74(154): 40540–40560.
- GHOSH, S K; MANDAL, D K (1983) *Review of Kaiser-I-Hind butterfly, Teinopalpus imperialis* Hope. Unpublished manuscript: 3.
- HARIBAL, M 1992. *The butterflies of Sikkim himalaya*. Sikkim Nature Conservation Foundation, Gangtok Sikkim, India; 207 pp.
- HOPE, F W (1843). *Trans. Linn. Soc. Lond* 19(2): 131.
- IGARASHI, S; FUKUDA, H (2000) *The life histories of Asian butterflies*, Vol. II, Tokai University Press, Japan; 427 pp.
- IGARASHI, S (1987) On the life history of *Teinopalpus imperialis* Hope in northern India and its phylogenetic position in the Papilionidae. *Tyo to Ga* 38(3): 115–151.
- IGARASHI, S (2001) Life history of *Teinopalpus aureus* in Vietnam in comparison with that of *T. imperialis*: *Butterflies*. No. 30 (December. 10, 2001), The Butterfly Society of Japan; pp. 4–24.
- KHANAL, B; CHALISE M K; SOLANKI, G S (2013) Threatened butterflies of central Nepal. *Journal of Threatened Taxa* 5(11): 4612–4615.
- KHANAL, B; CHALISE M K; SOLANKI, G S (2012) Diversity of butterflies with respect to altitudinal rise at various pockets of the Langtang National Park, central Nepal. *International Multidisciplinary Research Journal* 2(2): 41–48. Available Online: <http://irjs.info/>.
- KHANAL, B; SMITH, C (1997) *Butterflies of Kathmandu valley*. Tecpress Service, Bangkok, Thailand: 3.
- LAITHWAITE, E; WATSON, A; WHALLEY, P E S (1975) *The Dictionary of butterflies and moths in colour*. George Rainbird Limited, UK; 145 pp.
- LIEN, H (2011) *Precious butterfly Teinopalpus aureus in Vietnam*. Vietnam Academy of Science and Technology, Vietnam.
- LIEN, V V (2012) Two butterflies species of rare and specious genus *Teinopalpus* Hope, 1843 in Vietnam 34(3): 323–327.
- McLEOD, L (1984) *Seasonal Polyphenism in African Precis butterflies*, In Vane-Wright, R I.; ACKERY, P R (eds) *The biology of butterflies*. Symposium of the Royal Entomological Society, Academic Press, London, UK; pp. 313–315.
- MUNROE, E (1961) The classification of the Papilionidae (Lepidoptera). *Canadian Entomologist Supplement* 17: 1–51.

- NEW, T R (1991) *Swallowtail butterflies: An action plan for their conservation*. IUCN, Gland, Switzerland; 288 pp.
- NRDB, (1995) *Red data book of the fauna of Nepal*. Biodiversity Profile Project, Technical Report No.4, Department of National Parks and Wildlife Conservation, Nepal Government, Kathmandu, Nepal; 150 pp.
- OKANO, K (1983) Some ecological notes on *Teinopalpus*. *Tokurana* 5:94–1100 (in Japanese).
- Polunin, O; Satinton, A (1984) *Flowers of the Himalaya*. Oxford University Press. UK; 580 pp.
- SMITH, C (1989) *Butterflies of Nepal*. Tecpress Service, Bangkok, Thailand; 38 pp.
- Stainton, A. (1988). *Flowers of the Himalaya: A Supplement*. Oxford University Press, Oxford India Paperbacks, New Delhi.
- TALBOT, G (1939) *The Fauna of British India, including Ceylon and Burma. Butterflies (Papilionidae & Pieridae)*, Vol. I, Taylor and Francis, London, UK; pp. 246–249.
- THAI GOVERNMENT (1992). Act for the conservation and protection of wildlife B.E. 2535, FAL No. 43, 1993, Thailand; 265–267