

Appendix 1

For multivariate analysis, the butterfly abundance data from 20 fixed transects of 5 study sites were pooled by season, year and forest type.

Sites	Season	Year	Transect	Forest type
1	Dry	1	T1	SCF
2	Dry	1	T2	SCF
3	Dry	1	T3	CF
4	Dry	1	T4	CF
5	Wet	1	T1	SCF
6	Wet	1	T2	SCF
7	Wet	1	T3	CF
8	Wet	1	T4	CF
9	Dry	2	T1	SCF
10	Dry	2	T2	SCF
11	Dry	2	T3	CF
12	Dry	2	T4	CF
13	Wet	2	T1	SCF
14	Wet	2	T2	SCF
15	Wet	2	T3	CF
16	Wet	2	T4	CF

Notes: Categorical variables: 1) Forest type - Scattered/Open forest/Gap = SCF
Closed forest = CF

2) Season – Dry and Wet seasons

Appendix 2

2.1: Environmental variables for ordination of Papilionidae species assemblages showing their abundance and distribution in study sites (S1, S2 & S3) in Garbhanga range.

Site	Latitude	Longitude	Average Total		Forest	Season	Year
			Altitude (m) MSL	Rainfall (mm)			
1	26.05261	91.46426	102	0	SC	Dry	1
2	26.05116	91.46289	88	16	SC	Dry	1
3	26.04507	91.46087	170	61	CL	Dry	1
4	26.04384	91.46011	183	83	CL	Dry	1
5	26.05261	91.46426	102	344	SC	Wet	1
6	26.05116	91.46289	88	379	SC	Wet	1
7	26.04507	91.46087	170	243	CL	Wet	1
8	26.04384	91.46011	183	25	CL	Wet	1
9	26.05261	91.46426	102	0	SC	Dry	2
10	26.05116	91.46289	88	19	SC	Dry	2
11	26.04507	91.46087	170	30	CL	Dry	2
12	26.04384	91.46011	183	121	CL	Dry	2
13	26.05261	91.46426	102	200	SC	Wet	2
14	26.05116	91.46289	88	316	SC	Wet	2
15	26.04507	91.46087	170	28	CL	Wet	2
16	26.04384	91.46011	183	149	CL	Wet	2

2.2: Environmental variables for ordination of Papilionidae species assemblages showing their abundance and distribution in study sites (S4 & S5) in Rani range.

Site	Latitude	Longitude	Average	Total	Forest	Season	Year
			Altitude (m) MSL	Rainfall (mm)			
1	26.01433	91.3551	70	0	SC	Dry	1
2	26.01425	91.35513	70	16	SC	Dry	1
3	26.04506	91.36109	70	61	CL	Dry	1
4	26.01519	91.35363	68	83	CL	Dry	1
5	26.01433	91.3551	70	344	SC	Wet	1
6	26.01425	91.35513	70	379	SC	Wet	1
7	26.04506	91.36109	70	243	CL	Wet	1
8	26.01519	91.35363	68	25	CL	Wet	1
9	26.01433	91.3551	70	0	SC	Dry	2
10	26.01425	91.35513	70	19	SC	Dry	2
11	26.04506	91.36109	70	30	CL	Dry	2
12	26.01519	91.35363	68	121	CL	Dry	2
13	26.01433	91.3551	70	200	SC	Wet	2
14	26.01425	91.35513	70	316	SC	Wet	2
15	26.04506	91.36109	70	28	CL	Wet	2
16	26.01519	91.35363	68	149	CL	Wet	2

Notes:

Independent variables: Year (Year 1 – 2003 and Year 2 – 2004)

Rain (Total rainfall of the sampling months)

Altitude

Geographical position (Latitude and Longitude)

Appendix 3

Permutation tests for CCA under direct model :

3.1 : Garbhanga range (pooled abundance data of 3 study sites)

Model: cca (formula = km2 ~ lat + long + alt + forest + season + year + class + rain + relative humidity + temp^r. data = km2env)

	Df	Chisq	F	N.Perm	Pr(>F)	
Model	6	0.6165	9.6932	200	< 0.005	***
Residual	9	0.0954				

Significance codes: 0 '****' 0.001 '***' 0.01 '**' 0.05 '.' 0.1 ' ' 1

3.2 : Rani range (pooled abundance data of 2 study sites)

Model: cca (formula = km8 ~ lat + long + alt + forest. + season. + year + class + rain + relative humidity + temp^r. data = km8env)

	Df	Chisq	F	N.Perm	Pr(>F)	
Model	6	0.3298	5.4097	200	< 0.005	***
Residual	9	0.0914				

Significance codes: 0 '****' 0.001 '***' 0.01 '**' 0.05 '.' 0.1 ' ' 1

Appendix 4

Systematic list of Papilionidae of Rani-Garbhanga Reserve Forest, Assam, Northeast India, identified during the two-year survey (2001-2002). The geographic range classification follows Spitzer et al. 1993.

Genera	Scientific name	Wing span (mm)	Status	Geographic range score	Habitat association by forest type based on CCA results
<i>Atrophaneura</i>	<i>Atrophaneura dasarada</i> Moore, 1857	100-140	NR / NT	1	Closed forest
	<i>Atrophaneura polyeuctes</i> Doubleday, 1842	100-130	NR	3	Closed forest
	<i>Atrophaneura varuna</i> Westwood, 1842	88-136	NR	2	Closed forest
	<i>Atrophaneura aidoneus</i> Doubleday, 1845	100-120	NC / NT	3	Closed forest
	<i>Atrophaneura sycorax</i> Grose-Smith, 1885	110-130		3	Closed forest
<i>Troides</i>	<i>Troides aeacus</i> C & R Felder, 1860	120-190	V/NT	2	Closed forest
	<i>Troides helena</i> C & R Felder, 1865	140-190	V	3	Closed forest
<i>Pachliopta</i>	<i>Pachliopta aristolochiae</i> Fabricius, 1775	80-110	VC/ NT	3	Scattered/open forest
	<i>Pachliopta hector</i> Linnaeus, 1758	90-100	NT	3	Closed forest
<i>Papilio</i>			(Protected)		
	<i>Papilio polytes</i> Cramer 1775	80-100	VC/NT	3	Intermediate
	<i>Papilio memnon</i> Linnaeus, 1758	120-150	C / NT	3	Closed forest
	<i>Papilio castor</i> Wd., 1909	100-130	C / NT	1	Closed forest
	<i>Papilio helenus</i> Linnaeus, 1758	100-120	C/ NT	4	Closed forest
	<i>Papilio nephelus</i> Westwood, 1845	115-130	C/ NT	2	Closed forest
	<i>Papilio polyctor</i> Moore, 1758	120-150	C/ NT	3	Closed forest
	<i>Papilio paris</i> Linnaeus, 1758	90-120	C	3	Closed forest
	<i>Papilio krishna</i> Moore, 1857	120-130	UC	2	Closed forest
<i>Chilasa</i>	<i>Papilio demoleus</i> Linnaeus, 1758	80-100	VC	4	Scattered/ open forest
	<i>Chilasa clytia</i> Linnaeus, 1758		C/ NT	3	Closed forest
<i>Pathysa</i>			(Protected)		
	<i>Pathysa aristeus</i> Doubleday, 1846	85-90	Protected	1	Scattered/open forest
	<i>Pathysa antipathies</i> Fabricius, 1787	80-95		3	Scattered/Open forest
	<i>Pathysa xenocles</i> De Niceville, 1897	85-120	C/ NT	1	Scattered/Open forest
<i>Graphium</i>	<i>Pathysa macareus</i> Fruhstorfer, 1902	80-100	C/ NT	4	Scattered/Open forest
	<i>Graphium doson</i> C&R Felder, 1864	70-80	S	4	Scattered/Open forest
	<i>Graphium agammemnon</i> Linnaeus, 1758	85-100	C/NT & S	4	Scattered/Open forest
<i>Lamproptera</i>	<i>Graphium sarpedon</i> Linnaeus, 1758	80-90	S	4	Scattered/Open forest
	<i>Lamproptera meges</i> Tytler	40-50	NT /V	3	Intermediate
	<i>Lamproptera curius</i> Fabricius, 1787	40-50	NT/V	3	Intermediate

Notes: NR = Not Rare, NT = Not Threatened, NC = Not Common, C = Common, S = Secure, VC= Very Common,

UC = Uncommon, V = Vulnerable (IUCN, 2006)

Geographic range classification (Spitzer et al. 1993):

1 = Eastern Himalayas, Yunnan and Northern Indo-China, 2 = North India and all Indo-China,

3 = Oriental (Indo-Malayan region), 4 = Indo-Australian region (Australasian tropics), 5 = Palaeotropics,

6 = Larger than Palaeotropics – Cosmopolitan