

CONTENT

	Page
Acknowledgement	i
List of Figures	iii
List of Tables	x
List of Plates	xiii
Abstract	xiv

GENERAL INTRODUCTION

a) Life cycle	02
a.i) Egg	02
a.ii) Larvae	03
a.iii) Pupae	05
a.iv) Adult	06
b) Distribution	08
c) Significance of fireflies	10
Objectives	12

CHAPTER 1: Taxonomic Revisions of fireflies in Sri Lanka

1.1 Introduction	13
1.1.1 Taxonomic revisions of firefly fauna in the world	13
1.1.2 Taxonomic revisions of fireflies in Sri Lanka	17
1.1.3 History of Insect collections deposited at the Department of National Museums, Colombo, Sri Lanka	21
1.1.4 Objective of the study	22

1.2 Materials and Methods	23
1.2.1 Specimen selection and data collection	23
1.2.2 Identification of species	23
1.2.3 Systematic revision and classification	23
1.3 Results	24
1.3.1 Observed species of fireflies deposited at the Department of National Museums, Colombo	24
1.3.2 Revised systematics of fireflies deposited at the Department of National Museums, Colombo	28
1.4 Discussion	30
1.5 Conclusion	33
CHAPTER 2: Systematics, abundance and diversity of Subfamily Luciolinae fireflies in selected habitats of Sri Lanka	
2.1 Introduction	34
2.1.1 Taxonomic characters of Luciolinae adults	34
2.1.1.1 Head region	34
(a) Head	34
(b) Antennae	34
(c) Mouth parts	35
2.1.1.2 Thoracic region	35
(a) Thorax	35
(b) Wings	36
(c) Legs	36
2.1.1.3 The Abdomen	37
(a) Abdominal segmentation	37
(b) Ventricle 7	37
(c) Light organ	38
(d) Tergite 8	38
(e) Aedeagus	39
(f) Aedeagal sheath	39

2.1.1.4 Dorsal colour pattern of the body	39
2.1.2 Taxonomic characters of Luciolinae Larvae	40
(a) The head	40
(b) The thorax	41
(c) The abdomen	41
2.1.3 Diversity, habitats and geographical distribution	42
2.1.4 Genera of Subfamily Luciolinae recorded in Sri Lanka	45
2.1.4.1 Genus <i>Luciola</i>	45
2.1.4.2 Genus <i>Asymmetricata</i>	45
2.1.4.3 Genus <i>Curtos</i>	46
2.1.4.4 Genus <i>Abscondita</i>	46
2.1.5 Objective of the study	47
2.2 Materials and methods	47
2.2.1 Sampling period	47
2.2.2 Site selection	47
2.2.2.1 Terrestrial grasslands	51
2.2.2.2 Fresh water associated lands	52
2.2.2.3 Paddy fields	52
2.2.3 Field methods	54
2.2.3.1 Field survey	54
2.2.3.2 Collection of specimens	55
2.2.4 Identification of species	55
2.2.5 Morpho-metric measurements	56
2.2.6 Technique of genitalia dissection of Luciolinae fireflies	57
2.2.7 Data Analysis	58
2.3 Results	61
2.3.1 Systematics and selected ecological remarks of fireflies of Sub family Luciolinae	61

2.3.1.1 Species of Luciolinae recorded from the selected habitats in nine Provinces	61
2.3.1.3 Systematics and selected ecological remarks of species of Luciolinae recorded from the study conducted in Sri Lanka	63
(i) <i>Abscondita perplexa</i> (Walker, 1858)	64
(ii) <i>Abscondita promelaena</i> (Walker, 1858)	70
(ii.a) Morphological variations of <i>Abs. promelaena</i> (Male) in Sri Lanka	74
(iii) <i>Abscondita</i> Sp.(Probably <i>Abs. cerata</i>) (Olivier, 1911)	76
(iv) <i>Asymmetricata humeralis</i> (Walker, 1858)	80
(v) <i>Curtos costipennis</i> (Gorham, 1880)	85
(vi) <i>Luciola cingulata</i> (Olivier, 1885)	89
(vii) <i>Luciola extricans</i> (Walker, 1858)	93
(viii) <i>Luciola horni</i> (Bourgeois, 1905)	96
(ix) <i>Luciola praeusta</i> (Kiesenwetter, 1874)	100
2.3.2 Relative abundance, occurrence and diversity of Subfamily Luciolinae fireflies recorded from habitats selected in nine Provinces of Sri Lanka	104
2.3.2.1 Species richness of Luciolinae fireflies among nine Provinces of Sri Lanka	104
2.3.2.2 Relative abundance and habitat diversity of Luciolinae among selected habitats of nine Provinces of Sri Lanka	105
2.3.2.3 Occurrence of species of Luciolinae in nine Provinces of Sri Lanka	107
(a) Uva Province	107
(a) Sabaragamuwa Province	107
(b) Southern Province	108
(c) Northwestern Province	108
(d) Western Province	109
(e) Central Province	109
(f) Eastern Province	110

(g) Northern Province	110
(h) North central Province	111
2.3.2.4 Occurrence of species of Luciolinae among selected three habitats of Sri Lanka	111
(a) Terrestrial grassland	111
(b) Paddy field	112
(c) Fresh water associated land	113
2.3.2.5 Diversity of Luciolinae among nine Provinces of Sri Lanka	113
2.3.2.6 Diversity of Luciolinae among selected habitats in Sri Lanka	114
2.4 Discussion	115
CHAPTER 3: Systematics, abundance and diversity of Subfamily Lampyrinae, Ototretadrilinae-Ototretinae complex and Genus <i>Cautires</i> and <i>Cantheris</i> fireflies in selected habitats of Sri Lanka	
3.1 Introduction	123
3.1.1 Subfamily Lampyrinae	123
3.1.1.1 Genus <i>Diaphanes</i>	124
(i) Adult male	124
(ii) Adult female	125
3.1.1.2 Genus <i>Lamprigera</i>	126
(i) Adult male	126
(ii) Adult female	127
3.1.2 Subfamily Ototretadrilinae- Ototretinae complex and Genus <i>Cautires</i> and <i>Cantheris</i>	127
3.1.2.1 Subfamily Ototretadrilinae-Ototretinae complex	128
3.1.2.1.1 Genus- <i>Stenocladus</i>	129
(i) Adult male	129

(ii) Adult female	130
3.1.2.2 Genus <i>Cautires</i> and <i>Cantheris</i> fireflies	130
3.1.3 Objective of the study	131
3.2 Materials and methods	131
3.2.1 Sampling period	131
3.2.1.(a) Sampling period for Subfamily Lampyrinae	131
3.2.1.(b) Sampling period for Subfamily Ototretadrilinae-Ototretinae and genus <i>Cautires</i> and <i>Cantheris</i>	132
3.2.2 Site selection	132
3.2.2.(a) Sites selection for Subfamily Lampyrinae	132
3.2.2.(b) Sites selection for Subfamily Ototretadrilinae-Ototretinae and genus <i>Cautires</i> and <i>Cantheris</i>	132
3.2.3 Field methods	133
3.2.3.1 Field survey	133
3.2.3.1.(a) Field survey for Subfamily Lampyrinae	133
3.2.3.1.(b) Field survey for Subfamily Ototretadrilinae-Ototretinae and genus <i>Cautires</i> and <i>Cantheris</i>	134
3.2.3.2 Collection of specimens	135
3.2.3.2. (a) Collection of specimens of Subfamily Lampyrinae	135
3.2.3.2. (b) Collection of specimens of Subfamily Ototretadrilinae- Ototretinae and genus <i>Cautires</i> and <i>Cantheris</i>	135
3.2.4 Identification of species	135
3.2.4.(a) Identification of species of Subfamily Lampyrinae	135
3.2.4.(b) Identification of species of Subfamily Ototretadrilinae-Ototretinae and genus <i>Cautires</i> and <i>Cantheris</i>	136
3.2.5 Morpho-metric measurements	137
3.2.6 Technique of genitalia dissection of Lampyrinae fireflies	137
3.2.7 Data Analysis	138

3.3 Results	140
3.3.1 Systematic description and selected ecological remarks of Sub family Lampyrinae fireflies recorded in Sri Lanka	140
3.3.1.1 Recorded species of Lampyrinae	140
3.3.1.2 Systematics and selected ecological remarks of species of Lampyrinae recorded from the study conducted in Sri Lanka	141
(i) <i>Lamprigera tenebrosa</i> (Walker, 1858)	142
(ii) <i>Diaphanes lutescens</i> (Walker, 1858)	148
(iii) <i>Diaphanes vitrifera</i> (Walker, 1858)	154
3.3.1.3 Occurrence, relative abundance and diversity of Subfamily Lampyrinae fireflies recorded from habitats selected in nine Provinces of Sri Lanka	160
3.3.1.3.1 Occurrence of Lampyrinae fireflies among nine Provinces of Sri Lanka during the study period	160
3.3.1.3.2 Relative abundance and habitat diversity of Lampyrinae among selected habitats of nine Provinces of Sri Lanka during the study period	160
3.3.1.3.3 Diversity of Lampyrinae among nine Provinces of Sri Lanka	162
3.3.2 Systematic description and selected ecological remarks of Subfamily Ototretadrilinae- Ototretinae and Genus <i>Cautires</i> and <i>Cantheris</i> fireflies recorded in Sri Lanka	163
3.3.2.1 Recorded species of Subfamily Ototretadrilinae- Ototretinae and Genus <i>Cautires</i> and <i>Cantheris</i>	163
3.3.2.2 Systematics and selected ecological remarks of Subfamily Ototretadrilinae-Ototretinae and Genus <i>Cautires</i> and <i>Cantheris</i> recorded from the study conducted in Sri Lanka	164
3.3.2.2.1 Subfamily Ototretadrilinae- Ototretinae complex	164
(i) <i>Stenocladius</i> sp. 1(Fairmaire, 1878)	164

(ii) <i>Stenocladus</i> sp. 2 (Fairmaire, 1878)	169
3.3.2.2.2 Genus <i>Cautires</i>	172
(i) <i>Cautires dingus</i> (Linnaeus, 1758)	172
3.3.2.2.3 Genus <i>Cantheris</i>	175
(i) <i>Cantheris dimidiata</i> (Linnaeus, 1758)	175
(ii) <i>Cantheris</i> sp. 1 (Linnaeus, 1758)	178
(iii) <i>Cantheris</i> sp. 2 (Linnaeus, 1758)	181
(iv) <i>Cantheris</i> sp. 3 (Linnaeus, 1758)	184
(v) <i>Cantheris</i> sp. 4 (Linnaeus, 1758)	187
(vi) <i>Cantheris</i> sp. 5 (Linnaeus, 1758)	190
(vii) <i>Cantheris</i> sp. 6 (Linnaeus, 1758)	193
3.3.2.3 Occurrence and diversity of Subfamily Ototretadrilinae- Ototretinae and Genus <i>Cautires</i> and <i>Cantheris</i> recorded from terrestrial grassland habitats in nine Provinces of Sri Lanka	197
3.3.2.3.1 Occurrence of Subfamily Ototretadrilinae- Ototretinae and Genus <i>Cautires</i> and <i>Cantheris</i> species among selected grasslands in nine Provinces of Sri Lanka during the study period	197
3.3.2.3.2 Diversity of Subfamily Ototretadrilinae- Ototretinae and Genus <i>Cautires</i> and <i>Cantheris</i> species among selected grasslands in nine Provinces of Sri Lanka	199
3.4 Discussion	200
3.5 Conclusion	203
GENERAL DISCUSSION	205
REFERENCES	210

List of Figures

Figure	Page
General Introduction	
Figure 01: External morphology of firefly adult (male), e.g., Genus <i>Luciola</i> (a) Dorsal view, (b) Ventral view	06
Chapter 02	
Figure 2.1: Sub-sampling sites of nine Provinces of Sri Lanka	47
Figure 2.2: Morpho-metric characters of adult male firefly	57
Figure 2.3:	
(i) <i>Abs. perplexa</i> (Male); (a) dorsal morphology, (b) ventral morphology	64
(ii) Taxonomic characters of <i>Abs. perplexa</i> (Male); (c) pronotum & mesocutelum, (d) elytral morphology, (e) apex of elytra, (f) abdominal sternites & legs, (g) light organ in sternite 6 & 7- semi lunar-type, (h) head & antennae, (i) aedeagus, (j) aedeagal sheath	65
(iii) <i>Abs. perplexa</i> (Female); (l) ventral morphology, (m) light organ in sternite 6, (n) ovipositor of female	67
(iv) <i>Abs. perplexa</i> (Larva); (o) dorsal morphology, (p) orange mark on prothorax (q) ventral abdominal morphology	67
(v) <i>Abs. perplexa</i> (Larvae)(Line diagram); (r) dorsal side, (s) ventral side	68
(vi) <i>Abs. perplexa</i> (Eggs); (t) an egg cluster on dead leaf, (u) eggs	68
Figure 2.4:	
(i) <i>Abs. promelaena</i> (Male); (a) dorsal morphology, (b) ventral morphology	70
(ii) Taxonomic characters of <i>Abs. promelaena</i> (Male); I pronotum & mesocutelum, (d) elytral morphology, (e) shallow punctures on elytra, (f) light organ in sternite 6 & 7- semicircular shaped, (g) abdominal sternites & legs, (h) antennae, (i) apex of elytra, (j) aedeagus, (k) aedeagal sheath	71

(iii)	<i>Abs. promelaena</i> (Female); (l) ventral morphology, (m) light organ in sternite 6, (n) ovipositor of female	73
(iv)	<i>Abs. promelaena</i> (I) (Male); (o) dorsal morphology, (p) ventral morphology, (q) head, pronotum & mesocutellum, (r) abdominal sternites; 4 & 5 black, 6 & 7 light organ	74
(v)	<i>Abs. promelaena</i> (II) (Male); (s) dorsal morphology, (t) ventral morphology, (u) head, pronotum & mesocutellum, (v) abdominal sternites; 4 brownish yellow, 5 black, 6 & 7 light organ	74
(vi)	<i>Abs. promelaena</i> (III) (Male); (w) dorsal morphology, (x) ventral morphology, (y) head, pronotum & mesocutellum, (z) abdominal sternites; 4 brown, 5 black, 6 & 7 light organ	74

Figure 2.5:

(i)	<i>Abscondita</i> sp. (Probably <i>Abs. cerata</i>) (Male); (a) dorsal morphology, (b) ventral Morphology	76
(ii)	Taxonomic characters of <i>Abscondita</i> sp. (Probably <i>Abs. cerata</i>) (Male); (c) pronotum & mesocutelum, (d) abdominal sternite 5(two black patches),6 & 7 (pentagonal shaped light organ), (e) thoracic legs, (f) elytra with apex black, (g) head & antennae, (h), aedeagus (i) aedeagal sheath	77
(iii)	<i>Abscondita</i> sp. (Probably <i>Abs. cerata</i>) (Female); (j) ventral morphology, (k) light organ in sternite 6 and broad ovipositor	79

Figure 2.6:

(i)	<i>A. humeralis</i> (Male); (a) dorsal morphology, (b) ventral morphology	80
(ii)	Taxonomic characters of <i>A. humeralis</i> (Male); (c) pronotum & Mesocutelum, (d) elytral morphology, (e) antennae, (f) light organ in sternite 6 & 7- bipartite and asymmetrical tergite 8, (g) abdominal sternites, (h) legs, (i) elytral punctures, (j) aedeagus, (k) aedeagal sheath	81
(iii)	<i>A. humeralis</i> (Female); (l) ventral morphology, (m) light organ in sternite 6 and two posterior cerci	83
(iv)	<i>A. humeralis</i> (Larva); (n) lateral morphology, (o) line diagram- dorsal, (p) Line diagram- ventral	83

Figure 2.7:

(i)	<i>C. costipennis</i> (Male); (a) dorsal morphology, (b) ventral morphology	85
(ii)	Taxonomic characters of <i>C. costipennis</i> (Male); I pronotum & mesocutelum, (d) elytral morphology, (e) head & antennae, (f) legs	86

& abdomen, (g) light organ in sternite 6 & 7- triangular shaped, (h) humeral carina & punctures on elytra, (i) aedeagus, (j) dorsal view of aedeagus, (k) aedeagal sheath

- (iii) *C. costipennis* (Female); (l) dorsal morphology, (m) light organ in sternite 6 & ventral morphology 88

Figure 2.8:

- (i) *L. cingulata* (Male); (a) dorsal morphology, (b) ventral morphology 89
- (ii) Taxonomic characters of *L. cingulata* (Male); (c) pronotum & mesocutelum, (d) abdominal sternite 5(dark brown),6 & 7 (“v shaped light organ), (e) elytra with little black patch in apex, (f) elytral punctures, (g) head, antennae & legs, (h) aedeagus (i) aedeagal sheath 90
- (iii) *L. cingulata* (Female); (j) ventral morphology, (k) light organ in sternite 6 and two posterior cerci 92

Figure 2.9:

- (i) *L. extricans* (Female); (a) dorsal morphology, (b) ventral Morphology 93
- (ii) Taxonomic characters of *L. extricans* (Female); (c) pronotum & mesocutelum, (d) abdominal sternites 2- 5(black),6 (light organ) and legs (e) elytra in apical 1/3 black, (f) Light organ, (g) antennae (h) punctures on elytra 94

Figure 2.10:

- (i) *L. horni* (Male); (a) dorsal morphology, (b) ventral morphology. 96
- (ii) Taxonomic characters of *L. horni* (Male); (c) pronotum & mesocutelum, (d) abdominal sternites, (e) light organ in sternites 6 & 7, (f) elytral morphology, (g) antennae, (h) fine punchers of elytra, (i) aedeagus, (j) aedeagal sheath 97

Figure 2.11:

- (i) *L. praeusta* (Male); (a) dorsal morphology, (b) ventral morphology 100
- (ii) Taxonomic characters of *L. praeusta* (Male); (c) pronotum & mesocutelum, (d) elytral morphology, (e) light organ in sternite 6 & 7- posterior pointed, (f) head & antennae, (g) legs & abdomen(h) aedeagus, (i) aedeagal sheath 101

Figure 2.12: Relative abundance and habitat diversity of Luciolinae among selected habitats in nine Provinces of Sri Lanka 105

Figure 2.13: Proportions of the species occurrence in Uva Province 107

Figure 2.14:	Proportions of the species occurrence in Sabaragamuwa Province	107
Figure 2.15:	Proportions of the species occurrence in Southern Province	108
Figure 2.16:	Proportions of the species occurrence in NorthWestern Province	108
Figure 2.17:	Proportions of the species occurrence in Western Province	109
Figure 2.18:	Proportions of the species occurrence in Central Province	109
Figure 2.19:	Proportions of the species occurrence in Eastern Province	110
Figure 2.20:	Proportions of the species occurrence in Northern Province	110
Figure 2.21:	Proportions of the species occurrence in North Central Province	111
Figure 2.22:	Proportions of the species occurrence in terrestrial grasslands of Sri Lanka	111
Figure 2.23:	Proportions of the species occurrence in paddy fields of Sri Lanka	112
Figure 2.24:	Proportions of the species occurrence in fresh water associated lands of Sri Lanka	113

Chapter 03

Figure 3.1:	Sub-sampling sites of nine Provinces of Sri Lanka	132
Figure 3.2:		
(i)	<i>L. tenebrosa</i> (Male); (a) dorsal morphology, (b) ventral Morphology	142
(ii)	Taxonomic characters of <i>L. tenebrosa</i> (Male); I pronotum & mesocutelum, (d) significantly emarginated posterior part of abdomen (e) 8 abdominal sternites (f) sternite 7; two spot like light organs, (g) thorax and legs, (h) head & antennae, (i) two apical spurs of legs	143
(iii)	Taxonomic characters of <i>L. tenebrosa</i> (Male); (j) aedeagus, (k) aedeagal sheath (l) magnified aedeagus, (m) magnified aedeagal sheath	144
(iv)	Female & the egg of <i>L. tenebrosa</i> ; (n) female with lighting, (o)female dorsal morphology (p) the egg (q) the egg in natural environment	145
(v)	Larvae of <i>L. tenebrosa</i> ; (r) dorsal morphology, (s) ventral morphology (t) morphology of thorax, (u) line diagram-dorsal, (v) line diagram- ventral	146

Figure 3.3:

- (i) *D. lutescens* (Male); (a) dorsal morphology, (b) ventral morphology 148
- (ii) Taxonomic characters of *D. lutescens* (Male); (c) pronotum & mesocutelum, (d) antennae and head (e) elytra, (f) thorax & legs (g) 8 abdominal sternites (h) light organ strips 149
- (iii) Taxonomic characters of *D. lutescens* (Male); (i) aedeagus, (j) aedeagal sheath 150
- (iv) Female of *D. lutescens*; (i) dorsal morphology, (j) ventral morphology (k) pronotum & elytral rudiments, (l) antennae & head region (m) abdominal segments with pink posterior margin- dorsal (n) last abdominal segments with light organ- ventral 151
- (v) Larvae of *D. lutescens*; (o) dorsal morphology, (p) ventral morphology (q) abdominal segments- ventral side, (r) line diagram- dorsal, (s) line diagram- ventral 153

Figure 3.4:

- (i) *D. vitrifera* (Male); (a) dorsal morphology, (b) ventral morphology 154
- (ii) Taxonomic characters of *D. vitrifera* (Male); © pronotum & mesocutelum, (d) elytra, (e) antennae and head, (f) thorax & legs (g) 8 abdominal sternites (h) light organ spots 155
- (iii) Taxonomic characters of *D. vitrifera* (Male); (i) aedeagus, (j) aedeagal sheath 156
- (iv) Larvae of *D. vitrifera*; (k) larvae in natural environment, (l) head & mouthparts, (m) pro, meso & metathorax region, (n) abdominal segments (o) light organ & ventral abdominal morphology, (p) line diagram-dorsal, (q) line diagram-ventral 158

Figure 3.5: Relative abundance and habitat diversity of Lampyrinae among selected habitats in nine Provinces of Sri Lanka during the study period 161

Figure 3.6:

- (i) *Stenocladus* sp. 1 (Male); (a) dorsal morphology, (b) ventral morphology 164
- (ii) Taxonomic characters of *Stenocladus* sp. 1 (Male); (c) head and antennae (d) pronotum, mesocutelum and base of elytra, (e) thorax, legs and 8 abdominal sternites, (f) elytral morphology and significantly emarginated posterior part of abdomen 165

- (iii) Female of *Stenocladius* sp. 1; (g) dorsal morphology (h) ventral morphology, (i) thorax with vertical black strips (j) abdominal segments- dorsal with pair of black spots, (k) abdominal segments-ventral with two lines of light organ spots, (l) line diagram-dorsal, (m) line diagram- ventral 167
- (iv) Larvae of *Stenocladius* sp. 1; (n, o) dorsal morphology, (p) ventral morphology 168

Figure 3.7:

- (i) *Stenocladius* sp. 2 (Male); (a) dorsal morphology, (b) ventral morphology 169
- (ii) Taxonomic characters of *Stenocladius* sp. 2 (Male); (c) pronotum, mesocutelum and base of elytra, (d) elytral morphology, (e) head, antennae and legs, (f) abdominal sternites. 170

Figure 3.8:

- (i) *Cautires dingus* (Male); (a) dorsal morphology, (b) ventral morphology 172
- (ii) Taxonomic characters of *Cautires dingus* (Male); (c) antennae, (d) pronotum, mesocutelum and base of elytra, (e) thorax, legs and abdominal sternites, (f) elytral morphology 173

Figure 3.9:

- (i) *Cantheris dimidiata* (Male); (a) dorsal morphology, (b) ventral morphology 175
- (ii) Taxonomic characters of *Cantheris dimidiata* (Male); (c) pronotum, mesocutelum and base of elytra, (d) antennae (e) head, thorax and abdominal sternites, (f) legs, (g) elytral morphology, (h) posterior part of elytra; ventrally curved apex & last abdominal sternites 176

Figure 3.10:

- (i) *Cantheris* sp. 1 (Male); (a) dorsal morphology, (b) ventral morphology 178
- (ii) Taxonomic characters of *Cantheris* sp. 1 (Male); (c) head, pronotum, mesocutelum and base of elytra, (d) antennae (e) thorax and legs, (f) abdominal sternites, (g) elytral morphology, (h) three hair lines of elytra 179

Figure 3.11:

- (i) *Cantheris* sp. 2 (Male); (a) dorsal morphology, (b) ventral morphology 181
- (ii) Taxonomic characters of *Cantheris* sp. 2 (Male); (c) antennae, (d) pronotum, mesocutellum and base of elytra, (e) head, thorax and legs, (f) abdominal sternites, (g) elytral morphology 182

Figure 3.12:

- (i) *Cantheris* sp. 3(Male); (a) dorsal morphology, (b) ventral morphology 184
- (ii) Taxonomic characters of *Cantheris* sp. 3 (Male); (c) pronotum, mesocutellum and base of elytra, (d) antennae,(e) elytral morphology, (f) apex of elytra, (g) apically curved elytra, (h) thorax, legs & abdominal sternites 185

Figure 3.13:

- (i) *Cantheris* sp. 4 (Male); (a) dorsal morphology, (b) ventral morphology 187
- (ii) Taxonomic characters of *Cantheris* sp. 4 (Male); (c) pronotum, mesocutellum and base of elytra, (d) antennae,(e) head, thorax and legs (f) elytral morphology,(g) abdominal sternites 188

Figure 3.14:

- (i) *Cantheris* sp. 5 (Male); (a) dorsal morphology, (b) ventral morphology 190
- (ii) Taxonomic characters of *Cantheris* sp. 5 (Male); (c) head, pronotum and mesocutellum, (d) antennae,(e) thorax and legs (f) elytral morphology, (g) abdominal sternites (h) layer of hairs on elytra 191

Figure 3.15:

- (i) *Cantheris* sp. 6 (Male); (a) dorsal morphology, (b) ventral morphology 193
- (ii) Taxonomic characters of *Cantheris* sp. 6 (Male); (c) head, pronotum and mesocutellum, (d) antennae,(e) thorax and legs (f) abdominal sternites, (g) elytral morphology 194

- Figure 3.16:** Occurrence of Otoretadrilinae- Otoretinae and Genus *Cautires* and *Cantheris* species in selected grasslands in nine Provinces of Sri Lanka 198

List of Tables

Table	Page
Chapter 01	
Table 1.1: Revision of classification of fireflies	14
Table 1.2: List of fireflies recorded in the world	15
Table 1.3: List of insects recorded under fireflies in Sri Lanka	17
Table 1.4: List of firefly species originally recorded from Sri Lanka	19
Table 1.5: List of Luciolinae fireflies from Sri Lanka with present location of type specimen	20
Table 1.6: List of species categorized as fireflies at the Department of National Museums, Colombo	24
Table 1.7: List of fireflies deposited at the Department of National Museums, Colombo and their revised classification according to the updated systematics in South-east Asia	28
Chapter 02	
Table 2.1: Diversity and geographical distribution of Luciolinae fireflies recorded from South-east Asia and Australo-pacific regions in the world	44
Table 2.2 (i): Description of the selected locations and habitats in nine Provinces of Sri Lanka	48
Table 2.2 (ii): Description of the selected locations and habitats in nine Provinces of Sri Lanka	49
Table 2.3: Sampling method of the Subfamily Luciolinae fireflies in selected sites of nine Provinces of Sri Lanka	54
Table 2.4: Luciolinae recorded from the study conducted in nine Provinces of Sri Lanka	61
Table 2.5: Luciolinae fireflies recorded from nine Provinces of Sri Lanka	62
Table 2.6: Measurements of male Luciolinae (in mm)	103

Table 2.7:	Measurements of female Luciolinae (in mm)	103
Table 2.8:	Measurements of Luciolinae Larva (in mm)	103
Table 2.9:	Species richness and percentage of Luciolinae recorded from nine Provinces of Sri Lanka	104
Table 2.10:	Shannon-Wiener diversity index values of Luciolinae among nine Provinces of Sri Lanka	114
Table 2.11:	Shannon-Wiener diversity index values of Luciolinae among selected habitats of Sri Lanka	114

Chapter 03

Table 3.1:	Description of the selected habitats in nine Provinces of Sri Lanka	133
Table 3.2:	Sampling method of Subfamily Ototretadrilinae-Ototretinae and genus <i>Cautires</i> and <i>Cantheris</i> in nine Provinces of Sri Lanka	134
Table 3.3:	Species of Lampyrinae recorded from the study conducted in Sri Lanka	140
Table 3.4:	Measurements of male Lampyrinae (in mm)	159
Table 3.5:	Measurements of female Lampyrinae (in mm)	159
Table 3.6:	Measurements of Lampyrinae Larva (in mm)	159
Table 3.7:	Lampyrinae fireflies recorded from nine Provinces during the study	160
Table 3.8:	Shannon-Wiener diversity values of Lampyrinae among nine Provinces of Sri Lanka	162
Table 3.9:	Subfamily Ototretadrilinae-Ototretinae and Genus <i>Cautires</i> and <i>Cantheris</i> recorded from the study conducted in Sri Lanka	163
Table 3.10:	Measurements of male <i>Stenocladus</i> , <i>Cautires</i> and <i>Cantheris</i> species (in mm)	196
Table 3.11:	Measurements of female <i>Stenocladus</i> sp. 1 (in mm)	196
Table 3.12:	Measurements of Larva of <i>Stenocladus</i> sp. 1 (in mm)	196

Table	Subfamily Ototretadrilinae- Ototretinae and Genus <i>Cautires</i> and	197
3.13:	<i>Cantheris</i> species recorded from grasslands in nine Provinces during the study	
Table	Shannon-Wiener diversity values of Subfamily Ototretadrilinae-	199
3.14:	Ototretinae and Genus <i>Cautires</i> and <i>Cantheris</i> species among selected grasslands in nine Provinces of Sri Lanka	

List of Plates

Plate		Page
General Introduction		
Plate 1:	Life stages of fireflies	02
Plate 2:	Firefly Eggs	03
Plate 3:	Firefly larva	04
Plate 4:	Firefly pupae	05
Chapter 01		
Plate 1.1:	A dry specimen of <i>Diaptoma greeni</i> damaged due to growth of fungi	27
Plate 1.2:	Damaged specimen of <i>Atelius expansicornis</i>	27
Plate 1.3:	Storage boxes in Museum with missing specimens	27
Plate 1.4:	Disorganized specimens with unclear labels	27
Plate 1.5:	Specimens collected in the 18 th century	27
Chapter 02		
Plate 2.1:	Terrestrial grassland	53
Plate 2.2:	Fresh water associated land	53
Plate 2.3:	Paddy field	53