

Taxonomical and Ecological Studies on Family Ichneumonidae (Order: Hymenoptera) in Egypt

A Thesis

Submitted for the Award of the degree of Ph.D. (Entomology)

BY

**Salah El-Din Anwar El-Azab
B.Sc., M.Sc. (Entomology)**

Supervisors

**Prof. Dr. Hashim Ali Abdel-Rahman
Professor of Entomology,
Faculty of Science, Ain Shams University**

**Prof. Dr. Magdi Mohammad Salem
Professor of Insect Taxonomy,
Plant Protection Research Institute, Agriculture Research Center**

**Late Prof. Dr. Mohammad Mostafa El-Gamal
Professor of Insect Taxonomy
Plant Protection Research Institute, Agriculture Research Center**

**Dr. Said M. Ali
Assistant Prof. of Entomology,
Faculty of Science, Ain Shams University**

**Entomology Departement
Faculty of Science
Ain Shams University**

**Cairo
2007**

Biography

Date and place of birth: 5. 10. 1966, Cairo

Date of graduation: 1988

Degree Awarded and grades: B. Sc. (Entomology), Good.
M. Sc. 1997 (Entomology)

Date of registration: June, 1999

Current position: Assistant Researcher, Taxonomy
Department, Plant Protection
Research Institute, Agriculture
Research Center

Supervisors

Prof. Dr. Hashim Ali Abdel-Rahman

Professor of Entomology,
Faculty of Science, Ain Shams University

Prof. Dr. Magdi Mohammad Salem

Professor of Insect Taxonomy,
Plant Protection Research Institute,
Agriculture Research Center

Late Prof. Dr. Mohammad Mostafa El-Gamal

Professor of Insect Taxonomy
Plant Protection Research Institute,
Agriculture Research Center

Dr. Said M. Ali

Assistant Prof. of Entomology,
Faculty of Science, Ain Shams University

ACKNOWLEDGEMENTS

It is a great honor for the author to finish the work with many thanks to Prof. Dr. Hashim Ali Abdel-Rahman, Professor of Entomology, Entomology Department, Faculty of Science, Ain Shams Univ., who spent much time helping me, really, without his support, advice and encouragement, this work could not have been completed.

I would especially like to express my deep thanks to Prof. Dr. Magdy M. Salem, Head of Insect Taxonomy Department, Plant Protection Research Institute, Agriculture Research Center, for his continuous helpful suggestions and support in preparing and finishing this work. His direct supervision is highly appreciated.

My deep thanks are due to late Prof. Dr. Mohamed M. El-Gamal, Professor of Insect Taxonomy, Plant Protection Research Institute, Agriculture Research Center for his inspiration and guidance in the beginning of this work.

I sincerely thank Dr. Saied M. Ali, Assistant Professor of Entomology, Faculty of Science, Ain Shams Univ. for his patience and pushing me forwards.

Many thanks to Prof. Dr. Mostafa Badr Professor of Insect Taxonomy, Plant Protection Research Institute, Agriculture Research Center, who suggested the title of this thesis, in addition to his identification of the Lepidopterous pests.

I would like to express my sincere gratitude to Dr. Isabel M. Moya and Caroline Martin, Ichneumon taxonomists in the Entomology Department, Madrid Natural History Museum, Spain, who provided many facilities to examine the Palaearctic ichneumons in their collection.

Special thanks to Mr. Taira Yokomori, Naha Plant Protection Research Institute, Okinawa Japan for his trustful support to visit Osaka and Tokyo Insect Collections in 2003.

Many thanks to Prof. Dr. Hassan H. Fadl, Dr. Mosaad M. Hassan my colleagues, Dr. Ahmed S. Hendawy, Dr. Ashraf A. Turkey, Dr. Mahmoud S. Abdel-Daiem, Dr. Khalid A. El-Badawy, Dr. Mohamed Badawy for their kind help and support.

Deep appreciation is for my mother, brother and sisters for their continuous help and encouragement.

Many thanks to all the staff members and colleagues in Insect Taxonomy Department, Plant Protection Research Institute, Agriculture Research Center, and to all the staff members and colleagues in the Entomology Department, Faculty of Science, Ain Shams University for their kind cooperation in different ways.

Finally, I can't forget the role of the Egyptian Academy of Science and Technology which enabled this thesis to see the light.

LIST OF TABLES AND PLATES

Tables:	Page
Table (1): Field survey of the ichneumonid flies in Egypt.	47
Table (2): Geographical distribution of ichneumonid wasps in Egypt.....	69
Table (3): Monthly occurrence date of the ichneumonid wasps in Egypt.....	78
Table (4): Representation of the ichneumonid species in the Egyptian reference insect collections.....	89
Table (5): Host insect records for ichneumonid species in Egypt.....	97
Plates:	
Plate 1 (Figs 1-26): Diagnostic characters of Family Ichneumonidae.....	111
Plate 2 (Figs. 1-5): Diagnostic characters of Subfamily Anomalinae.....	119
Plate3 (Figs 1-3): Diagnostic characters of Genus <i>Anomalon</i>	124
Plate 4 (Figs 1-2): Diagnostic characters of Genus <i>Barylypa</i>	133
Plate 5 (Figs 1-2): Diagnostic characters of Subfamily Banchinae.....	143
Plate 6 (Figs 1-2): Diagnostic characters of Genus <i>Exetastes</i>	148

Plates	Page
Plate7 (Figs 1-2): Diagnostic characters of Genus <i>Sezeuctus</i>	156
Plate 8 (Figs 1-6): Diagnostic characters of Subfamily <i>Campopleginae</i>	168
Plate 9 (Figs 1-4): Diagnostic characters of Genus <i>Bathyplectes</i>	173
Plate 10 (Figs 1-3): Diagnostic characters of Geuns <i>Casinaria</i>	181
Plate 11 (Figs 1-23): Diagnostic characters of Genus <i>Diadegma</i>	194
Plate 12 (Figs 1-2): Diagnostic characters of Genus <i>Nepiesta</i>	224
Plate 13 (Figs 1-2): Diagnostic characters of Genus <i>Sinophora</i>	232
Plate 14 (Figs 1-4): Diagnostic characters of Genus <i>Venturia</i>	239
Plate 15 (Figs 1-6): Diagnostic characters of Subfamily <i>Cremastinae</i>	246
Follow Plate 15 (Figs 7-8): Diagnostic characters of Genus <i>Cremastus</i>	251
Follow Plate 15 (Figs 9-11): Diagnostic characters of Genus <i>Pristomerus</i>	266
Plate 16 (Figs 1-3): Diagnostic characters of Subfamily <i>Ctenopelmatinae</i>	281

Plates	Page
Plate 17 (Figs 1-2): Diagnostic characters of Genus <i>Diplazon</i>	295
Plate 18 (Figs 1-7): Diagnostic characters of Subfamily Ichneumoninae.....	303
Plate 19 (Figs 1-4): Diagnostic characters of Subfamily Mesochorinae.....	320
Plate 20 (Figs 1-4): Diagnostic characters of Subfamily Ophioninae.....	336
Plate 21 (Figs 1-4): Diagnostic characters of Genus <i>Clistorapha</i>	342
Plate 22 (Figs 1-16): Diagnostic characters of Genus <i>Enicospilus</i>	351
Plate 23 (Figs 1-22): Diagnostic characters of Genus <i>Ophon</i>	384
Plate 24 (Figs 1-10): Diagnostic characters of Subfamily Phygadeuontinae.....	420
Plate 25 (Fig 1): Diagnostic characters of Genus <i>Dichrogaster</i>	435
Plate 26 (Figs 1-7): Diagnostic characters of Genus <i>Gelis</i>	445
Plate 27 (Figs 1-3): Diagnostic characters of Genus <i>Goryphus</i>	460
Plate 28 (Figs 1-5): Diagnostic characters of Genus <i>Mesostenus</i>	468

Plates	Page
Plate 29 (Figs 1-2): Diagnostic characters of Genus <i>Osprynchotus</i>	475
Plate30 (Figs 1-5): Diagnostic characters of Genus <i>Pycnoceryptus</i>	488
Plate 31 (Figs 1-15): Diagnostic characters of Subfamily Pimplinae.....	497
Plate 32 (Figs 1-3): Diagnostic characters of Genus <i>Apecthis</i>	503
Plate 33 (Figs 1-2): Diagnostic characters of Genus <i>Dolichomitus</i>	511
Plate 34 (Fig 1): Diagnostic characters of Genus <i>Echthromorpha</i>	518
Plate 35 (Fig 1): Diagnostic characters of Genus <i>Exeristes</i>	525
Plate 36 (Figs 1-3): Diagnostic characters of Genus <i>Itoplectis</i>	537
Plate 37 (Figs 1-5): Diagnostic characters of Genus <i>Pimpla</i>	549
Plate 38 (Figs 1-6): Diagnostic characters of Genus <i>Netelia</i>	578

ABSTRACT

A revisionary survey based on materials kept in the main reference insect collections in Egypt and available information in the literature was made to recognize the ichneumonid fauna of Egypt. In the mean time, an extensive field survey covering various geographical zones was carried out.

A total of 152 species and subspecies belonging to 50 genera of 13 subfamilies were recognized, of which one species is introduced to science as new and eleven species are new records to Egypt.

All ichneumonid taxa (subfamilies, genera and species) are diagnosed, keyed, supported with synonyms, illustrations and distributional data; together with taxonomical, biological and ecological remarks and comments. Nomenclatorial taxonomic changes and categories emendations were made to provide up to date list of all ichneumonid species known to occur in Egypt.

Also, a list of host pests (parasitized by ichneumon wasps) that may be of value in biological control and IPM programs is provided.

Key words: Ichneumonidae, Taxonomy, Ecology, Hymenoptera, Parasitica, Egypt.

CONTENTS

Item	Page
I- INTRODUCTION.....	1
II- LITERATURE REVIEW.....	4
A. Ecology and Economic Importance.....	4
B. Taxonomy.....	15
III- MATERIALS AND METHODS.....	39
A- Ecological survey.....	39
B- Taxonomy.....	40
IV- RESULTS.....	45
A- Ecological study.....	45
1- Field survey	45
2- Revisionary survey.....	67
3- Host insect records for the ichneumonid flies in Egypt.	96
B. Taxonomy.....	103
– Family: Ichneumonidae.....	103
– Key to Subfamilies of Family Ichneumonidae.....	104
1– Subfamily: Anomaloninae Foerster, 1869.....	116
– Key to genera of subfamily Anomaloninae.....	117
– Genus <i>Anomalon</i> Panzer, 1804.....	121
– Key to species of genus <i>Anomalon</i>	123
– <i>Anomalon foliator</i> (Fabricius, 1798).....	126
– <i>Anomalon. venustulus</i> Tosquinet, 1896.....	128
– Genus <i>Barylypa</i> Föerster, 1868.....	130
– Key to species of Genus <i>Barylypa</i> Föerster.....	132

Item	Page
– <i>Barylypa humeralis</i> (Brauns, 1895).....	135
– <i>Barylypa rufa</i> (Holmgren, 1857).....	136
– Genus <i>Porizonopteron</i> Meyer, 1931.....	138
– <i>Parizonopteron metatarsator</i> Shaumar, 1966.....	139
2– Subfamily: Banchinae Wesmael, 1845.....	141
– Key to genera of Subfamily Banchinae.....	142
– Genus <i>Exatastes</i> Gravenhorst (1829).....	145
– Key to species of genus <i>Exetastes</i>	146
– <i>Exetastes bicoloratus</i> Gravenhorst, 1829.....	150
– <i>Exetastes syriacus</i> Schmiedeknecht, 1908.....	151
– Genus <i>Syzeuctus</i> Förster, 1868.....	153
– Key to species of Genus <i>Sezeuctus</i>	155
– <i>Syzeuctus Caudulator</i> Shaumar, 1966.....	158
– <i>Syzeuctus heluanensis</i> Schmiedeknecht, 1900.....	160
– <i>Syzeuctus pallidator</i> Aubert, 1966.....	161
– <i>Syzeuctus. tigris</i> Seyrig, 1926.....	162
3– Subfamily: Campopleginae Foerster, 1869.....	164
– Key to genera of Subfamily Campopleginae.....	165
– Genus <i>Bathyplectes</i> Förster, 1868.....	170
– Key to species of Genus <i>Bathyplectes</i>	172
– <i>Bathyplectes carthaginensis</i> Smits, 1913.....	175
– <i>Bathyplectes subcinctus</i> (Gravenhorst, 1829).....	176
– Genus <i>Casinaria</i> Holmgren, 1859.....	178
– Key to species of Genus <i>Casinaria</i>	180

Item	Page
– <i>Casinaria albipalpis</i> (Gravenhorst, 1829).....	183
– <i>Casinaria albipalpis aegyptiator</i> Shaumar, 1978.....	184
– <i>Casinaria tenuiventris</i> Gravenhorst, 1829.....	185
– <i>Casinaria trochanterator</i> (Aubert, 1964).....	187
– Genus <i>Diadegma</i> Förster, 1868.....	188
– Key to species of Genus <i>Diadegma</i>	190
– <i>Diadegma aegyptiator</i> Shaumar, 1966.....	200
– <i>Diadegma areolaris</i> Holmgren, 1860.....	201
– <i>Diadegma armillata</i> (Gravenhorst, 1966).....	202
– <i>Diadegma auranticolor</i> Shaumar, 1978.....	204
– <i>Diadegma chrysosticta</i> (Gmelin, 1790).....	205
– <i>Diadegma cinnabaritor</i> Aubert, 1970.....	206
– <i>Diadegma claripennis</i> Thomson, 1885.....	208
– <i>Diadegma interrupta</i> Holmgren, 1860.....	209
– <i>Diadegma lactibiator</i> Aubert, 1964.....	211
– <i>Diadegma monospila</i> (Thomson, 1887).....	212
– <i>Diadegma oranginator</i> Aubert, 1964.....	213
– <i>Diadegma orientator</i> Aubert, 1965.....	215
– <i>Diadegma polygona</i> Aubert, 1964.....	216
– Genus <i>Lemophagus</i> Townes, 1965.....	217
– <i>Lemophagus försteri</i> Tschek, 1870.....	219
– Genus <i>Nepiesta</i> Förster, 1868.....	221
– Key to species of Genus <i>Nepiesta</i>	223
– <i>Nepiesta obliscator</i> Shaumar, 1966.....	226

Item	Page
– <i>Nepiesta ocellator</i> Aubert, 1966.....	227
– <i>Nepiesta oraniensis</i> Schmeidiknesht, 1913.....	228
– Genus <i>Sinophorus</i> Föerster, 1868.....	229
– Key to species of Genus <i>Sinophorus</i>	231
– <i>Sinophorus egregious aegyptiacus</i> Schmiedeknecht, 1909.....	234
– <i>Sinophorus xanthostomus</i> (Gravenhorst, 1829).....	235
– Genus <i>Venturia</i> Föerster, 1868.....	237
– Key to species of Genus <i>Venturia</i>	238
– <i>Venturia canescens</i> (Gravenhorst, 1829).....	241
– <i>Venturia</i> sp.	243
4– Subfamily: <i>Cremastinae</i> Foerster, 1869.....	244
– Key to species of Subfamily <i>Cremastinae</i>	245
– Genus <i>Cremastus</i> Gravenhorst, 1829.....	248
– Key to species of Genus <i>Cremastus</i>	249
– <i>Cremastus aegyptiacus</i> Szepligetti, 1905.....	253
– <i>Cremastus cephalotes</i> Sedivy, 1970.....	254
– <i>Cremastus flavator</i> Shaumar, 1978.....	256
– <i>Cremastus hierochticus</i> Schmiedeknecht, 1910.....	256
– <i>Cremastus venustulus</i> Tosquient, 1896.....	258
– Genus <i>Eucremastus</i> Forester, 1868.....	260
– <i>Eucremastus pugillator</i> Shaumar, 1966.....	261
– Genus <i>Pristomerus</i> Curtis, 1836.....	263
– Key to species of Genus <i>Pristomerus</i>	265

Item	Page
– <i>Pristomerus pallidus</i> Thomson, 1890.....	268
– <i>Pristomerus vulnerator</i> Panzer, 1799.....	269
– <i>Pristomerus</i> sp.	271
– Genus <i>Temelucha</i> Foerster, 1868.....	271
– Key to species of Genus <i>Temelucha</i>	273
– <i>Temelucha decoratus</i> Gravenhorst, 1829.....	273
– <i>Temelucha observator</i> Aubert, 1977.....	275
– <i>Temelucha ophthalimicus</i> (Holmgren, 1858).....	276
– <i>Temelucha szepligetii</i> Dalla Torre, 1901.....	277
5– Subfamily: Ctenopelmatinae Foerster, 1869 (= Scolobatinae).....	279
– Key to genera of Subfamily Ctenopelmatinae.....	279
– Genus <i>Euryproctus</i> Holmgren, 1855.....	283
– <i>Euryproctus numidicus</i> Schmiedeknecht, 1900.....	284
– Genus <i>Himertosoma</i> Schmiedeknecht, 1900.....	285
– <i>Himertosoma superba</i> Schmiedeknecht, 1900.....	287
– Genus <i>Priopoda</i> Holmgren, 1855.....	288
– <i>Priopoda aegyptiator</i> Shaumar, 1966.....	290
6– Subfamily: Diplazontinae Viereck, 1918.....	292
– Genus <i>Diplazon</i> Nees, 1818.....	292
– Key to species of Genus <i>Diplazon</i>	294
– <i>Diplazon laetatorius</i> (Fabricius, 1804).....	297
– <i>Diplazon tetragonus</i> (Thunberg, 1824).....	298
7– Subfamily: Ichneumoninae Latreille, 1802.....	301