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Araştırma

COMPOSITION, HABITAT DISTRIBUTION AND SEASONAL ACTIVITY OF PIMPLINAE (HYMENOPTERA: ICHNEUMONIDAE) IN NORTH-EAST ANATOLIA REGION OF TURKEY

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ABSTRACT: This study was carried between 1996 and 2007 (March-October) to determine Pimplinae (Ichneumonidae) species found in North-East Anatolia Region of Turkey. Totally 55 species to determined in two two different regions (East Black Sea and North Anatolia) belonging to Pimplinae family. The species composition, seasonal activity and habitat distribution of species determined in this region were described in this investigation.
Key Words: Ichneumonidae, species composition, habitat distribution, seasonal activity.

TÜRKİYE'NİN KUZEYDOĞU ANADOLU BÖLGESİ'NDE PIMPLINAE (HYMENOPTERA: ICHNEUMONIDAE) TÜRLERİNİN TÜR KOMPOZİSYONLARI, MEVSİMSEL AKTİVİTELERİ VE HABİTAT DAĞILIŞLARI

ÖZET: 1996–2007 (Mart-Ekim) yılları arasında yürütülen bu çalışmada, Kuzey Doğu Anadolu Bölgesi'nde bulunan Pimplinae (Ichneumonidae) türleri değerlendirilmiştir. Çalışma sonucunda bu alt familyaya ait toplam 55 tür 2 farklı bölge (Doğu Karadeniz ve Kuzey Anadolu)'den tespit edilmiştir. Araştırmada, bölgede tespit edilen bu türlerin tür kompozisyonları, mevsimsel aktiviteleri ve habitat dağılışları da verilmiştir.
Anahtar Sözcükler: Ichneumonidae, Tür Komposizyonu, Habitat Dağılışı, Mevsimsel Aktivite.

1. INTRODUCTION:

This study was conducted in two different areas (area A and area B) (Figure 1) located North-East Anatolia region in Turkey. The area A included Artvin, Bayburt, Gümüşhane and Rize provinces and surroundings area where samples taken from 200 to 1210 m altitude.

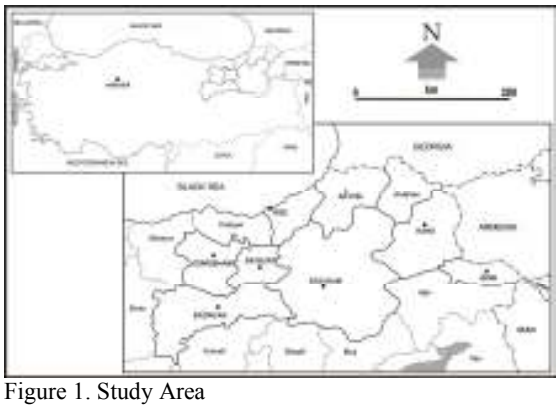

Figure 1. Study Area

The area B included Erzincan, Erzurum, Iğdır and Kars. The samples were taken from this area from 850 to 2200 m altitude.

The objective of this study is to determine species composition, seasonal activities and habitat distribution of Pimplinae species in these two regions. The specific microclimatic landscape features, soil types, as well as flora and fauna formation of two areas were also determined.

The subfamily Pimplinae is the most diverse subfamily in the Ichneumonidae family. The subfamily associated with a very wide range of hosts (Gauld, 1984). Common hosts for the subfamily are larvae and pupae of Coleoptera, Hymenoptera, and Lepidoptera. Lepidoptera and Coleoptera include many species that cause considerable damage on forest and horticulture plants. As a result of, Pimplinae is very important in terms of biological control and and has a key role.

Total species in the subfamily Pimplinae have been recorded occurring in Turkey compile 77 speceies in 30 genera (Çoruh and Özbek, 2008).

Many studies regarding importance on biological control of this group were recorded: Uğur (1985) reported that, *Pimpla turionellae* (L.) feed on 82 lepidopter species. In the literature; *Exeristes roborator* F., *Dolichomitus populneus* (Ratzeburg), *D. tuberculatus* Geoffroy, *Gregopimpla inquisitor* (Scopoli), *G. malacosomae* (Seyrig), *Itoplectis alternans* (Gravenhorst), *I. maculator* (F.), *I. tunetana* (Schmiedeknecht), *Pimpla illecebrator* (Villers), *P. instigator* (F.), *P. spuria* (Grav.), *P. turinellae* L., *Scambus* (s.str.) *brevicornis* (Gravenhorst) and *S. calobata* Gravenhorst are determined important parasitoids for *Saperda populnea* L. (Coleoptera: Cerambycidae); *Diplolepis mayri* Schld (Hymenoptera: Cynipidae); *Malacosoma neustria* (L.), *M. franconica* L. (Lepidoptera: Lasiocampidae); *Aporia crataegi* L., *Mamestra brassicae* (L.) (Lepidoptera: Pieridae); *Acleris rhombana* D. & S., *Archips rosanus* (L.), *Lobesia botrana* Schiff, *Rhyaciona pinicolona* Doub., *Tortrix viridana* (L.) (Lepidoptera: Tortricidae); *Yponomeuta malinellus* Zeller, *Y. padellus* (L.) and *Y. rorellus* Hubn. (Lepidoptera: Yponomeutidae); (Doğanlar, 1986; Kansu et al., 1986; Özdemir, 1994; Erol and Yaşar 1996; Gençer and Doğanlar 1999; Özbek et al., 1999;

Yıldırım et. al., 1999; Doğanlar, 2003; Çoruh et. al., 2004; Çoruh and Özbek, 2008; Özbek et. al., 2009).

2. MATERIALS and METHODS

The insect materials were collected by sweeping insect net from area A and area B located North-East Anatolia region in Turkey during 1996–2007 years. The insect samples were killed in ethyl asetate and brought to the laboratory. The materials mentioned in this study were deposited in the Entomology Museum, Erzurum, Turkey (EMET). Undetermined specimens were identified by Dr. Janko Kolarov (Bulgaria). Plant specimens were collected by hand and were pressed and they were deposited at the Herbarium of Plant Protection Department. Plant specimens were identified by Dr. İrfan Çoruh (Turkey).

3. RESULTS and DISCUSSION

Results of this study indicate that, 55 ichneumonid species in Pimplinae were found in regions A and B. It was also observed that all species were feeding with nectar of flowers.

3.1. Species Composition:

Below the characteristics of regions are given:

A Region:

This is a typical plantation including around 6000 plant species. Average altitude of this region has 1000 m sea level and this region has humid and mild climate conditions while there are provinces in the area A has altitude higher than 1000 m sea level, very humid and cold climatic conditions. This region can be divided into four sub-regions and including below plant communities determined by Atalay, 1994:

1. Fagetum belt (*Fagus orientalis* Lipsky) (500-1200 m): *Tilia rubra* DC, *Acer platanoides* L., *Ulmus campestris* L., *Quercus petraea* Lieble., *Carpinus orientalis* Mill., *Vibirnum lantana* L., *Ribes biebersteini* Berl.
2. Chestnut belt (*Castanea sativa* Mill.) (400-600 m): *Quercus petraea* Lieble., *Sorbus torminalis* L., *Frangula alnus* Mill., *Berberis vulgaris* (Berb)., *Juglans regia* L.; *Salix alba* L., *Smilax excelsa* L., *Rubus discolor* Weihe & Nees; *Carpinus orientalis* Mill., *Ulmus carpinifolia* Gleditsch.
3. Fagetum-Picetum belt (900-100 m): *Carpinus betulus* L., *Ulmus glabra* Huds, *Acer cappadocicum* Gleditsch, *Quercus hartwissiana* Steven, *Taxus baccata* L., *Sorbus terminalis* L., *Rubus discolor* Weihe & Nees.
4. Juniper belt (800-1400 m): *Ulmus glabra* Huds, *Quercus syspirensis* C.Koch, *Q. pontica*, C.Koch, *Picea orientalis* (L.); *Taxus baccata* L., *Pinus sylvestris* L.

B Region:

The altitude of this region is higher than A region and located in part of East Anatolia. The majority of this region has high altitude. Most plateaus are around 2000 m from sea level, and the mountainous regions beyond the plateaus are 3000 m and higher. Depression plains are located between the mountains and plateaus. The southern mountain ranges of Erzurum city, Palandöken Mountains, with the altitudes of 2200-3176 m. The topographic and climatic structures province has the opportunity of host rich and diverse fauna and flora (Yıldırım and Strumia, 2000). Climate in this region is terrestrial. That is, winters are long and hard; summer is very short and warm. Vegetation of this area divides into three groups as shown below by Atalay, 1994:
1. Steppe belt: (800-1200 m): *Astragalus* sp., *Acantholimon* sp., *Thymus* sp., *Artemisia* sp., *Stipa lagascae* R., *Senecio vernalis* Waldst. et Kit.
2. Mountains stepe belt: (1800-2000 m): *Aster alpinus* L., *Thymus fallax* F., *Hieracium spurium* L., *Falcaria vulgaris* F., *Poa longifolia* Trin., *Cirsium arvense* (L.), *Eryngium campestre* L., *Mentha longifolia* L.
3. Forest belt: (1300-2700 m): *Pinus sylvestris* L., *Quercus* spp.

Table 1, 2 and 3 shows land type, forest plantation and grandland plants of area which from Pimplinae species collected (Serin, 2008; Çoruh and Çoruh, 2008).

Table 1. Land Type of the Study Region.

Land type	Region A (%)			Region B (%)				
	Artvin	Bayburt	Gümüşhane	Rize	Erzincan	Erzurum	Iğdır	Kars
Agriculture land	9,67	36,13	25,94	13,22	17,14	18,40	32,74	34,70
Grandland	12,76	28,03	40,25	31,74	37,98	64,70	40,60	3,30
Forest land	52,98	4,01	21,80	23,81	8,90	8,80	25,80	25,70
Out of Agriculture	24,59	31,83	12,01	31,23	35,98	8,10	0,86	36,30

Table 2. Forest Plantation of the Study Region

Species	Region A				Region B			
	Artvin	Bayburt	Gümüşhane	Rize	Erzincan	Erzurum	Iğdır	Kars
Pinus sylvestris L.	x	x	x		x	x		x
Fagus sp.	x			x				
Picea orientalis (L.)			x					
Pinus nigra Arnold.		x	x					
Pinus brutia Ten.				x				
Abies sp.	x		x					
Pinus pinea L.								
Picea orientalis (L.)	x			x				
Cupressus sempervirens L.								
Quercus sp.	x		x		x	x		
Carpinus sp.	x			x				
Acer sp.	x		x					
Fraxinus sp.								
Castanea sativa Mill.	x			x				
Platanus orientalis L.								
Ulmus glabra Huds.	x							
Populus sp.		x	x					
Salix sp.			x				x	
Alnus glutinosa Mill.			x	x				

3.2. Habitat Distribution:

As shown in Table 4, Pimplinae prefer the zonal type habitat. If we look at Table 4, it can be clearly seen that a total of 16 species are found in region A (% 23.19 of the all species) and 14 species found in both region A and B. On the other hand, region A has 2 unigue species (*Scambus* (s.str.) *sagax* Hart. and *Rhyssa persuasoria* (L.)), which not found in region B. In region A, among these species, *Exeristes roborator* (F)., *Scambus* (*Endromopoda*) *detritus* (Holmg.) and *Itoplectis maculator* (F.) are more common than the others, suggesting this species can produce more than one generation within year. On the other hand, *Scambus* (s.str.) *planatus* Hart., *S.* (s.str.) *sagax* Hart., *S.* (s.str) *signatus* Pfeffer, *Tromotobia ovivora* (Boheman), *Zaglyptus varipes* Grav., *Pimpla hypochondriaca* Retz., *P. spuria* Gravenhorst and *Rhyssa persuasoria* (L.) is less common species in this area. Consequently, the unique *S.* (s.str.) *sagax* and *R. persuasoria* which found region A can be adapted vegatation and climatic properties of this region.

53 species have been recorded in the subfamilies Pimplinae of the family Ichneumonidae in region B (% 76.81 of the all species). Among these species, *Exeristes roborator* (F)., *Scambus (Atelophadnus) nigricans* (Thom.), *S.* (*Endromopoda*) *phragmitidis* Perkins and *P. spuria* Gravenhorst are more common than the others in this region. On the other hand, *Delomerista mandibularis* (Grav.), *Hybomischos septemcinctorius* (Thung.), *Perithous divinator* (Ros.), *P. scurra* Panzer, *Clistopyga rufator* Holmgren, *Acropimpla pictipes* Grav., *Dolichomitus populneus* (Ratz.), *Ephialtes manifestatotor* (L), *Gregopimpla inquisitor* (Scopoli), *G. malacosomae* (Seyrig), *Iseropus stercorator* (F.), *Liotrypon crassisetus* (Thomson), *S.* (s.str.) *calobatus* Grav., *S.* (s.str.) *foliae* (Cushman), *S.* (s.str.) *planatus* Hartig, *S.* (s.str.) *vesicarius* (Ratz.), *Tromatobia oculatoria* (F.), *T. ovivora* (Boheman), *Zaglyptus varipes* (G.), *Itoplectis alternans* (Gravenhorst), *I. aterrima* Jussila, *Pimpla caucasica* Kasp., *P. contemplator* (Müll.), *P. coxalis* Habermehl, *P. rufipes* Brul., *P. turionellae* L., *Strongylopsis belua* Kuzin, *Schizopyga podagrica* Grav., *Polysphincta tuberosa* Grav., *Zabrachypus primus* Cushman and *Megarhyssa perlata* (Christ) are less common species in this area. As a result, we can say that these species can be adapted vegetation and climatic properties of Region B.

When consider both A and B region, it can be said that *E. roborator* is more common species than the others found in each regions. *S.* (*A.*) *nigricans,* and *I. maculator* are collected from five different areas; *S.* (*E.*) *detritus*, *S.* (*E.) phragmitidis*, *Pimpla artemonis*, *P. illecebrator* and *P. spuria* are collected four different areas. The other species are collected from a few areas.

Table 3. Grandland plant of the Study Region.

Plant Species	Habitats	
	Region A	Region B
Acer monspessulanum L.	x	x
Achillea biebersteinii Afan.		x
A. biserrata M.	x	
A. millefolium L.		x
Alchemilla pseudocartalinica Juz.	x	
Anacamptis pyramidalis (L.)		
Antemis cretica L.		x
A. tinctoria L.	x	
Ammi visnaga (L.)	x	
Arabis caucasica Willd.		x
Arctium minus (Hill)	x	
Astragalus christianus L.		x
Astrantia maxima Pallas	x	
Carum carvi L.		x
Centaurea macrocephala Muss.	x	
Chaerophylum aureum L.	x	
Cirsium arvense (L.)		x
Coronilla orientalis Mill.	x	x
Cotinus coggyria Scop.		x
Daucus carota L.		
Eguisetum ramosissimum Desf.		x
Ephedra major Host		x
Eryngium billardieri Delar		x
Euphorbia virgata Waldst. & Kit.		x
Ferula communis L.		x
F. orientalis L.		x
Galium incanum Sm.		x
Gypsophila bicolor (Freyn & Sint.)		x
Heracleum sphondylium L.	x	
Hypericum hyssopifolium Chaix		x
H. scabrum L.		x
Irıs pseudacarus L.	x	
Juniperus communis L.		x
Linum mucronatum Bertol.		x
Papaver orientale L.		x
Pimpinella corymbosa Boiss.	x	
P. tragium Vill.		x
Potentilla crantzii (Grantz)	x	
Primula elatior (L.)	x	
Ranunculus cuneatus Boiss.		x
Rhus coriaria L.		x
Senecio platyphyllus DC.	x	
Seselis libanotis (L.) W. Koch	x	x
Trifolium ambiguum M. Bieb.		x
T. hybridum L.		x
Silene saxatilis Sims	x	
Sisymbrium alatum K.		x
Tanacetum punctatum (Boiss. & Noe)	x	
Veronica orientalis Miller		x
Ziziphora clinopodioides Lam.	x	
Zosima absinthifolia (Went.)		x

Table 4. Prefered Habitats by Pimplinae Species

Species	Region A					Region B		
	Artvin	Bayburt	Gümüşhane	Rize	Erzincan	Erzurum	Iğdır	Kars
Delomerista mandibularis (Grav.)								x
Hybomischos septemcinctorius (Thun.)						x		
Perithous divinator (Rossius)						x		
Perithous scurra Panzer						x		
Clistopyga rufator Holmgren						x		x
Acropimpla pictipes Grav.						x		
Dolichomitus populneus (Ratzeburg)								x
D. tuberculatus Geoffroy						x		x
Ephialtes manifestator L.						x		
Exeristes arundinis Kriechbaumer					x			
E. roborator F.		x	x	x	x	x	x	x
Gregopimpla inquisitor (Scopoli)						x		
G. malacosomae (Seyrig)						x		
Iseropus stercorator (F.)						x		
Liotrypon crassisetus (Thomson)						x		
Paraperithous gnathaulax (Thomson)						x		x
Scambus (A.) nigricans (Thomson)	x	x				x	x	x
S. (E.) arundinator F.						x		x
S. (E.) detritus (Holmgren)		x		x	x	x		
S. (E.) phragmitidis Perkins		x				x	x	x
S. (s.str.) *brevicornis* (Grav.)				x		x		x
S. (s.str.) *calobatus* Grav.						x		
S. (s.str.) *foliae* (Cushman)						x		
S. (s.str.) *planatus* Hartig		x				x		
S. (s.str.) *sagax* Hartig		x						
S. (s.str) *signatus* Pfeffer				x		x		
S. (s.str) vesicarius (Ratzeburg)						x		
Tromatobia oculatoria (F.)						x		
T. ornata (Grav.)						x		x
T. ovivora (Boh.)				x		x		
Zaglyptus multicolor (G.)						x		x
Z. varipes (G.)	x							x
Itoplectis alternans (G.)						x		
I. aterrima Jussila						x		
I. maculator (F.)	x	x	x			x		x
I. tunetana (Sch.)						x		x
I. viduata Grav.						x		x
Pimpla arcadica Kasparyan						x		x
P. artemonis Kasparyan		x		x		x		x
P. caucasica Kasparyan						x		
P. contemplator (Müller)						x		
P. coxalis Habermehl								x
P. hypochondriaca (Retzius)		x				x	x	
P. illecebrator (Villers)	x	x				x		x
P. rufipes Brulle						x		
P. sodalis Ruthe						x		x
P. spuria Grav.	x				x	x		x
P. turionellae L.						x		
Strongylopsis belua Kuzin						x		
Schizopyga podagrica Grav.						x		
Polysphincta tuberosa Grav.						x		
Zatypota bohemani (Holmgren)						x		x
Zabrachypus primus Cushman						x		
Rhyssa persuasoria (L.)	x							
Megarhyssa perlata (Christ)						x		

3.3. Seasonal Activity:

Considering seasonal activity of these species in both A and B region, in general species collected between 3 rd and 9 th months of the years. However, 6 th and 8 th months had more dense population (Table 5, 6). In terms of gender, region A including same proportion of male and female individual. However, in region B the female rate is high between 3 rd and 9 th months in year (Table 7, 8).

Table 5. Seasonal Activity of Pimplinae Species in Region A

Species	Months						
	3	4	5	6	7	8	9
Exeristes roborator		x		x	x	x	
Scambus (A.) nigricans				x	x	x	x
S. (E.) detritus			x	x	x	x	
S. (E.) phragmitidis	x			x	x	x	
S. (s.str.) *brevicornis*				x	x		x
S. (s.str.) *planatus*					x		
S. (s.str.) *sagax*					x		
S. (s.str.) *signatus*					x	x	
Tromotobia ovivora				x	x		
Zaglyptus varipes					x	x	
Itoplectis maculator		x		x	x		
Pimpla artemonis			x	x	x	x	
P. hypochondriaca				x	x	x	
P. illecebrator			x	x	x	x	
P. spuria			x	x	x	x	x
Rhyssa persuasoria							x

Table 6. Seasonal Activity of Pimplinae Species in Region B

Species	Months							
	3	4	5	6	7	8	9	10
Delomerista mandibularis				x	x			
Hybomischos septemcinctorius				x		x		
Perithous divinator				x	x	x		
P. scurra				x				
Clistopyga rufator					x	x		
Acropimpla pictipes							x	
Dolichomitus populneus			x	x	x	x		x
D. tuberculatus					x	x		
Ephialtes manifestator					x			
Exeristes arundinis						x		
E. roborator		x		x	x	x		
Gregopimpla inquisitor					x			
G. malacosomae					x			
Iseropus stercorator					x	x		
Liotrypon crassisetus					x			
Paraperithous gnathaulax					x			
Scambus (Atelophadnus) nigricans				x	x	x	x	
S. (E.) arundinator					x	x	x	
S. (E.) detritus			x	x	x	x		
S. (E.) phragmitidis	x			x	x	x		
S. (s.str.) brevicornis				x	x		x	
S. (s.str.) calobatus					x	x		
S. (s.str.) foliae			x	x				
S. (s.str.) planatus					x			
S. (s.str.) signatus					x	x		
S. (s.str.) vesicarius						x	x	
Tromatobia oculatoria					x	x		
T. ornata			x	x	x	x		
T. ovivora				x	x			
Zaglyptus multicolor						x		

Table 6. Seasonal Activity of Pimplinae Species in Region B (Continue)

Species	Months							
	3	4	5	6	7	8	9	10
Z. varipes					x	x		
Itoplectis alternans				x				
I. aterrima						x		
I. maculator		x		x	x			
I. tunetana					x	x		
I. viduata					x	x		
Pimpla arcadica				x		x		
P. artemonis			x	x	x	x		
P. caucasica				x	x			
P. contemplator				x	x			
P. coxalis							x	
P. hypochondriaca				x	x	x		
P. illecebrator			x	x	x	x		
P. rufipes		x		x		x		
P. sodalis				x		x		
P. spuria			x	x	x	x	x	
P. turionellae				x	x			
Strongylopsis belua				x				
Schizopyga podagrica					x			
Polysphincta tuberosa					x			
Zatypota bohemani						x		
Zabrachypus primus					x			
Megarhyssa perlata			x					

Table 7. State of Male-Female in Region A

Species	Region A	
	♀	♂
Exeristes roborator	x	x
Scambus (*A.*) *nigricans*	x	x
S. (*E.*) *detritus*	x	x
S. (*E.*) *phragmitidis*	x	x
S. (*s.str.*) *brevicornis*	x	x
S. (*s.str.*) *planatus*	x	x
S. (*s.str.*) *sagax*		x
S. (*s.str.*) *signatus*	x	x
Tromotobia ovivora		x
Zaglyptus varipes	x	
Itoplectis maculator	x	x
Pimpla artemonis	x	x
P. hypochondriaca	x	x
P. illecebrator	x	x
P. spuria	x	x
Rhyssa persuasoria	x	

Table 8. State of male-female in Region B

Species	Region B	
	♀	♂
Delomerista mandibularis	x	
Hybomischos septemcinctorius	x	
Perithous divinator	x	x
P. scurra		x
Clistopyga rufator	x	
Acropimpla pictipes	x	
Dolichomitus populneus	x	x
D. tuberculatus	x	
Ephialtes manifestator	x	
Exeristes arundinis	x	
E. roborator	x	x
Gregopimpla inquisitor		x
G. malacosomae		x
Iseropus stercorator		x
Liotrypon crassisetus		x
Paraperithous gnathaulax	x	
Scambus (*A.*) *nigricans*	x	x
S. (*E.*) *arundinator*	x	
S. (*E.*) *detritus*	x	x
S. (*E.*) *phragmitidis*	x	x
S. (s.str.) *brevicornis*	x	x
S. (s.str.) *calobatus*	x	x
S. (s.str.) *foliae*		x
S. (s.str.) *planatus*	x	x
S. (s.str.) *signatus*	x	x
S. (s.str.) *vesicarius*	x	x
Tromatobia oculatoria	x	x
T. ornata	x	x
T. ovivora		x
Zaglyptus multicolor	x	x
Z. varipes	x	
Itoplectis alternans	x	x
I. aterrima	x	x
I. maculator	x	x
I. tunetana	x	x
I. viduata	x	x
Pimpla arcadica	x	
P. artemonis	x	x
P. caucasica	x	x
P. contemplator	x	
P. coxalis	x	
P. hypochondriaca	x	x
P. illecebrator	x	x
P. rufipes	x	x
P. sodalis	x	x
P. spuria	x	x
P. turionellae	x	x
Strongylopsis belua	x	
Schizopyga podagrica	x	
Polysphincta tuberosa	x	
Zatypota bohemani	x	x
Zabrachypus primus	x	
Megarhyssa perlata	x	

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