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Diversity and biogeographical remarks on “Symphyta” of Sicily (Hymenoptera)

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SUMMARY

The present contribution deals with a zoogeographic analysis of the sawfly-fauna of Sicily in a wider Mediterranean insular context. The sawfly-fauna of Sicily currently includes 119 species (6 of which doubtfully present) comprised within nine families (number of species in brackets): Xyelidae (2), Xiphydriidae (1), Siricidae (2), Orussidae (4), Cephidae (12), Argidae (10), Cimbicidae (5), Diprionidae (2) and Tenthredinidae (75). The analysis of chorotypes shows a higher percentage of species having a wide distribution (49% in total, specifically: Holarctic 8%; Palaearctic 4%; West-palaearctic 5%; Eurasian 32%). A high percentage of species has an European distribution (44%, of which 7% extended to Maghreb). Very low is the percentage of West-mediterranean species (2%) and the endemic one of Italy (only 1%), whereas the Sicilian endemic species is more conspicuous (4%). The comparison of the sawfly-fauna of Sicily with other insular contexts of Mediterranean basin, based on a linear regression of species number vs. insular area and multivariate analyses (cluster analysis and neighbour-joining), shows that it is the most diversified and rich-species.

INTRODUCTION

The “Symphyta” include more than 8300 described species (Taeger and Blank, 2008; Taeger et al., 2010) within 15 families, mostly belonging to Tenthredinidae. The “Symphyta”, also called sawflies, are traditionally considered as suborder of Hymenoptera mainly on the basis of a unique morphological feature, namely the configuration of the abdomen without the so called “wasp waist”, which represents an autapomorphy of the Apocrita. Thus, the unique commonly shared morphological character is clearly a plesiomorphism and sawflies are currently considered as a paraphyletic assemblage (a grade) and not a true clade (see Vilhelmsen, 2006).

The “Symphyta” are mostly phytophagous during the larval stages, including a strict mycetophagy and xylophagy, while imagos are pollinophagous and nectariphagous, although a few Tenthredinidae are also predators. However, among the wide assemblage of Symphyta the small family Orussidae includes

ectophagous parasitoids of xylophagous larvae of other insects, mostly belonging to Buprestidae and Cerambycidae (Coleoptera); orussids indeed has represented a very interesting group from a phylogenetic point of view for the comprehension of the evolutionary history of Hymenoptera (Vilhelmsen, 2006).

On the basis of the checklist by Masutti and Pesarini (1995), in Italy there are more than 600 species of "Symphyta"; only 63 of them were recorded for Sicily at that time, including some species whose presence in the Island is considered doubtful. More recently, Pesarini and Turrisi (2001) provide a faunistic monograph dedicated to Sicily in which the sawfly species number has been increased to 109.

HISTORICAL INVESTIGATIONS ON SICILIAN "SYMPHYTA"

One of the most ancient contributor to the study of the Sicilian sawflies is the Italian entomologist V. Ghiliani who provided a catalogue of Hymenoptera collected in Sicily (Ghiliani, 1842), including a few species of "Symphyta", in some cases with generic indications of locality. A few additional data were added subsequently by the French entomologist J. Sichel (1860). The well known contributions by Berlese (1889-1890) and A. Costa (1894) represent important attempts to reorganize and update the data on Italian sawflies including those for Sicily, even if mostly not original but taken from literature. However, the most relevant contributions during the 19th Century were published by the Sicilian entomologist T. De Stefani Perez (1883, 1886, 1894); these data were successively summarized and increased in the well known catalogue of Sicilian Hymenoptera (De Stefani Perez, 1895), which however lacks geographic indications of localities. After this fruitful period, the study of Sicilian sawflies became progressively neglected during the 20th Century with contributions mostly dealing with the wider context of the European or Italian sawfly-fauna or the faunistics of single groups (Ghigi, 1915; Trautmann, 1922; Bischoff, 1928; Guiglia, 1946, 1952, 1954, 1965). During the last three decades several contributions have been published, mostly dealing with investigations on single species or small group of species (Pesarini and Pesarini, 1980; Zombori, 1980, 1985; Liston, 1983; Schedl, 1987; Taeger, 1991; Bella and Turrisi, 1998, 2003; Turrisi, 1999, 2007, 2010; Turrisi and Bella, 1999; Tomarchio and Turrisi, 2002; Pesarini and Turrisi, 2003a, b, 2006; Turrisi and Turrisi, 2008). Only in recent times the first organic faunistic survey of Sicilian sawflies has been published by Pesarini and Turrisi (2001).

MATERIALS AND METHODS

The checklist of Sicilian "Symphyta" (included in Tab. I) is based mainly on Pesarini and Turrisi (2001), but includes the data subsequently published. For

Tab. I – Checklist of “Symphyta” from the main insular Mediterranean contexts and binary matrix of presence/absence of the species. Symbols: 0 (absence); 1 (presence); ? (doubtful presence).

N.	Family/species	Sicily	Sardinia	Corsica	Canary Islands	Balearic Islands	Crete	Cyprus
	Xyelidae							
1	<i>Xyela curva</i> Benson, 1938	1	0	0	0	0	0	0
2	<i>Xyela graeca</i> J.P.E.F. Stein, 1876	1	0	1	0	0	1	?
	Xiphydriidae							
3	<i>Xiphydria picta</i> Konow, 1897	0	1	1	0	0	0	0
4	<i>Xiphydria camelus</i> (Linnaeus, 1758)	1	0	0	0	0	0	0
	Sirexidae							
5	<i>Sirex juvencus</i> (Linnaeus, 1758)	0	1	0	0	0	0	0
6	<i>Sirex noctilio</i> Fabricius, 1773	0	1	1	1	0	0	1
7	<i>Tremex</i> sp. (Turrisi, unpubl.)	1	0	0	0	0	0	0
8	<i>Urocerus franzinii</i> C. & F. Pesarini, 1977	0	1	0	0	0	0	0
9	<i>Urocerus gigas</i> (Linnaeus, 1758)	1	1	0	0	0	0	1
	Orussidae							
10	<i>Mocsarya syriaca</i> Benson, 1936	0	0	0	0	0	1	0
11	<i>Orussus abietinus</i> (Scopoli, 1763)	1	1	1	0	0	0	0
12	<i>Orussus moroi</i> Guiglia, 1954	0	0	0	1	0	1	0
13	<i>Orussus taorminensis</i> (Trautmann, 1922)	1	0	0	0	0	0	0
14	<i>Orussus unicolor</i> (Latreille, 1811)	1	0	0	0	0	0	0
15	<i>Pseudoryssus henschii</i> (Mocsáry, 1810)	1	0	0	0	0	1	1
	Cephalidae							
16	<i>Calameuta (Calameuta) festiva</i> Benson, 1954	0	0	0	0	0	0	1
17	<i>Calameuta (Calameuta) filiformis</i> (Eversmann, 1847)	1	0	0	0	0	0	1
18	<i>Calameuta (Calameuta) haemorroidalis</i> (Fabricius, 1781)	1	1	1	0	0	1	0
19	<i>Calameuta (Calameuta) idolon</i> (Rossi, 1794)	1	1	1	0	0	1	1
20	<i>Calameuta (Calameuta) moreana</i> (Pic, 1916)	0	0	0	0	0	0	1

21	<i>Calamenta (Calamenta) pallipes</i> (Klug, 1803)	0	1	0	0	0	0	0	0
22	<i>Calamenta (Calamenta) pygmaea</i> (Poda, 1761)	1	1	1	1	1	1	0	0
23	<i>Cephus brachycercus</i> C.G. Thomson, 1871	0	1	0	0	0	0	0	0
24	<i>Cephus fimpennis</i> Eversmann, 1847	0	1	0	0	0	0	0	0
25	<i>Cephus gracilis</i> A. Costa, 1860	1	0	0	0	0	0	0	0
26	<i>Cephus pygmaeus</i> (Linnaeus, 1767)	1	1	1	0	0	0	1	0
27	<i>Cephus spinipes</i> (Panzer, 1801)	1	0	0	0	0	0	0	0
28	<i>Hartigia helleri</i> (Taschenberg, 1871)	1	1	1	0	1	0	0	0
29	<i>Hartigia linearis</i> (Schränk, 1781)	0	1	0	0	0	0	0	0
30	<i>Hartigia nigra</i> (Harris, 1776)	1	1	0	0	0	0	0	0
31	<i>Janus compressus</i> (Fabricius, 1793)	0	1	0	0	1	0	0	0
32	<i>Pachycephus snyderi</i> Stein, 1876	0	0	0	0	0	0	0	1
33	<i>Syrista parreyssii</i> (Spinola, 1843)	0	0	0	0	0	0	0	1
34	<i>Trachelus flavicornis</i> (Lucas, 1846)	1	0	0	0	0	0	0	0
35	<i>Trachelus libanensis</i> (Ed. André, 1881)	0	0	0	0	0	0	0	1
36	<i>Trachelus tabidus</i> (Fabricius, 1775)	1	1	1	1	1	1	1	1
37	<i>Trachelus troglodyta</i> (Fabricius, 1787)	1	1	1	0	0	0	0	0
	Argidae								
38	<i>Aprosthemia bifidum</i> (Klug, 1834)	1	0	0	0	0	0	0	0
39	<i>Aprosthemia instratum instratum</i> (Zaddach, 1859)	0	0	1	0	0	0	0	0
40	<i>Arge cyanocrocea</i> (Forster, 1771)	1	0	1	0	0	0	0	1
41	<i>Arge enodis</i> (Linnaeus, 1767)	1	1	1	0	0	0	0	0
42	<i>Arge melanochra</i> (Gmelin, 1790)	1	?	0	0	0	0	1	1
43	<i>Arge ochropus</i> (Gmelin, 1790)	1	1	1	0	1	1	1	1
44	<i>Arge pagana</i> (Panzer, 1798)	1	1	1	0	0	0	0	0
45	<i>Arge risetica</i> (Linnaeus, 1758)	1	0	0	0	0	0	0	0
46	<i>Arge scita</i> (Mocsáry, 1880)	0	0	0	0	0	0	1	1

47	<i>Arge syriaca</i> (Mocsáry, 1880)	1	0	0	0	0	0	0	0	1
48	<i>Arge ustulata</i> (Linnaeus, 1758)	1	0	0	0	0	0	0	0	0
49	<i>Arge</i> sp. (gr. <i>nigripes</i> Retzius, 1783)	1	0	0	0	0	0	0	0	0
50	<i>Sterictiphora angelicae</i> (Panzer, 1799)	0	0	1	0	0	0	0	0	0
	Cimbicidae									
51	<i>Abia sericea</i> (Linnaeus, 1767)	1	1	0	0	0	0	0	0	0
52	<i>Cimbex connatus</i> (Schrank, 1776)	0	0	1	0	0	0	0	0	0
53	<i>Cimbex femoratus</i> (Linnaeus, 1758)	1	0	0	0	0	0	0	0	0
54	<i>Corynis crassicornis</i> (Rossi, 1790)	1	0	0	0	0	0	0	0	0
55	<i>Corynis italica</i> (Lepeletier, 1823)	1	0	0	0	0	0	0	0	0
56	<i>Corynis obscura</i> (Fabricius, 1775)	1	0	0	0	0	0	0	0	0
57	<i>Corynis sanguinea</i> (Snellen van Vollenhoven, 1878)	0	0	0	1	0	0	0	0	0
58	<i>Corynis similis</i> (Mocsáry, 1880)	0	0	0	0	0	0	0	1	1
	Diprionidae									
59	<i>Diprion pini</i> (Linnaeus, 1758)	1	1	0	0	0	0	0	0	1
60	<i>Gilpinia fruetorum</i> (Fabricius, 1793)	1	0	0	0	0	0	0	0	0
61	<i>Gilpinia virens</i> (Klug, 1812)	0	0	0	0	0	1	0	0	0
	Megalodontesidae									
62	<i>Megalodontes cephalotes</i> (Fabricius, 1781)	0	0	1	0	0	0	0	0	0
	Pamphiliidae									
63	<i>Neurotoma nemoralis</i> (Linnaeus, 1758)	0	1	0	0	0	0	0	0	0
64	<i>Neurotoma saltuum</i> (Linnaeus, 1758)	0	1	0	0	0	0	0	0	0
	Tenthredinidae									
65	<i>Aglaostigma (Astochus) aucupariae</i> (Klug, 1817)	1	0	0	0	0	0	0	0	0
66	<i>Allantus (Allantus) viennensis</i> (Schrank, 1781)	1	0	0	0	0	0	0	0	0
67	<i>Allantus (Emphytus) calceatus</i> (Klug, 1818)	0	1	0	0	0	0	0	0	0
68	<i>Allantus (Emphytus) cinctus</i> (Linnaeus, 1758)	1	1	1	0	0	0	0	0	0

96	<i>Cheviniia mediterranea</i> (Lacourt, 2003)	0	0	1	0	0	0	0	0
97	<i>Cladius (Cladius) pectinicornis</i> (Geoffroy, 1785)	1	1	1	1	1	0	0	1
98	<i>Cladius (Priophorus) brullei</i> (Dahlbom, 1835)	0	1	0	0	0	0	0	0
99	<i>Cladius</i> sp. nov. (Pesarini & Turrisi unpubl.)	1	0	0	0	0	0	0	0
100	<i>Claremontia brevicornis</i> (Brischke, 1883)	0	1	0	0	0	0	0	0
101	<i>Craesus alniastri</i> (Scharfenberg, 1805)	0	1	1	0	0	0	0	0
102	<i>Craesus septentrionalis</i> (Linnaeus, 1758)	0	1	1	0	0	0	0	0
103	<i>Dineura stilata</i> (Klug, 1816)	0	?	0	0	0	0	0	0
104	<i>Dolerus (Achaetoprion) triplicatus</i> (Klug, 1818)	1	0	0	0	0	0	0	0
105	<i>Dolerus (Dolerus) etruscus</i> (Klug, 1818)	1	0	0	0	0	0	0	0
106	<i>Dolerus (Poodolerus) gonager</i> (Fabricius, 1781)	1	0	0	0	0	0	0	0
107	<i>Dolerus (Poodolerus) niger</i> (Linnaeus, 1767)	1	0	0	0	0	0	0	0
108	<i>Empria archangeliskii</i> Dovnar-Zapolskij, 1929	0	0	0	0	0	0	0	1
109	<i>Empria excisa</i> (C.G. Thomson, 1871)	0	1	1	0	0	0	0	0
110	<i>Empria longicornis</i> (C.G. Thomson, 1871)	1	0	0	0	0	0	0	0
111	<i>Empria sexpunctata</i> (Serville, 1823)	1	0	0	0	0	0	0	0
112	<i>Endelomyia aethiops</i> (Gmelin, 1790)	0	1	0	0	0	0	0	0
113	<i>Eriocampa ovata</i> (Linnaeus, 1761)	1	1	1	0	0	0	0	0
114	<i>Eurhadinoceraea ventralis</i> (Panzer, 1799)	1	0	0	0	0	0	0	0
115	<i>Eutomostethus ephippium ephippium</i> (Panzer, 1798)	0	0	1	0	0	0	0	0
116	<i>Eutomostethus gagathinus</i> (Klug, 1816)	1	0	0	0	0	0	0	1
117	<i>Eutomostethus luteiventris</i> (Klug, 1816)	0	1	1	0	0	0	0	0
118	<i>Euura (Euura) purpureae</i> Kopelke, 1996	0	1	1	0	0	0	0	0
119	<i>Euura (Gemmura) mucronata</i> (Hartig, 1840)	?	0	0	0	0	0	0	0
120	<i>Fenella nigrita</i> Westwood, 1839	0	0	1	0	0	0	0	0
121	<i>Fenusa (Fenusa) dohrnii</i> (Tischbein, 1846)	0	0	1	0	0	0	0	0
122	<i>Femisella horvutana</i> (Klug, 1818)	1	0	0	0	0	1	0	0

123	<i>Haltidamia affinis</i> (Fallén, 1807)	0	1	1	1	0	0	0	0	1	1	1
124	<i>Hemedyta annularis</i> Cameron, 1891	1	0	0	0	0	0	0	0	0	0	0
125	<i>Heterarthritis cypricus</i> Schedl, 2005	0	0	0	0	0	0	0	0	0	0	1
126	<i>Heterarthritis imbroensis</i> Schedl, 1981	0	0	0	0	0	0	0	0	0	1	0
127	<i>Heterarthritis vagans</i> (Fallén, 1808)	0	0	0	1	0	0	0	0	0	0	0
128	<i>Heterarthritis wuestneii</i> (Konow, 1905)	0	0	1	1	0	0	0	0	0	0	0
129	<i>Hoplocampa brevis</i> (Klug, 1816)	1	?	0	0	0	0	0	0	0	1	1
130	<i>Hoplocampa chrysorrhoea</i> (Klug, 1816)	1	0	0	0	0	0	0	0	0	0	1
131	<i>Hoplocampa crataegi</i> (Klug, 1816)	1	1	1	1	0	0	0	0	0	0	1
132	<i>Hoplocampa flava</i> (Linnaeus, 1761)	0	1	0	0	0	0	0	0	0	0	0
133	<i>Hoplocampa fivicornis</i> (Panzer, 1801)	0	0	1	1	0	0	0	0	0	0	0
134	<i>Hoplocampa minuta</i> (Christ, 1791)	0	0	0	0	0	0	0	0	0	0	1
135	<i>Hoplocampa</i> sp. (cf. <i>H. crataegi</i> Klug, 1816)	1	0	0	0	0	0	0	0	0	0	0
136	<i>Macrophya</i> (<i>Macrophya</i>) <i>albicincta</i> (Schrank, 1776)	1	0	1	1	0	0	0	0	0	0	0
137	<i>Macrophya</i> (<i>Macrophya</i>) <i>albipuncta</i> (Fallén, 1808)	1	0	0	0	0	0	0	0	0	0	0
138	<i>Macrophya</i> (<i>Macrophya</i>) <i>alboannulata</i> A. Costa, 1859	1	0	0	0	0	0	0	0	0	0	0
139	<i>Macrophya</i> (<i>Macrophya</i>) <i>annulata</i> (Geoffroy, 1785)	1	0	0	0	0	0	0	0	0	0	0
140	<i>Macrophya</i> (<i>Macrophya</i>) <i>aphrodite</i> Benson, 1954	0	0	0	0	0	0	0	0	0	0	1
141	<i>Macrophya</i> (<i>Macrophya</i>) <i>crassula</i> (Klug, 1817)	0	0	1	1	0	0	0	0	0	0	0
142	<i>Macrophya</i> (<i>Macrophya</i>) <i>diversipes</i> (Schrank, 1782)	1	0	0	0	0	0	0	0	0	0	0
143	<i>Macrophya</i> (<i>Macrophya</i>) <i>militaris</i> (Klug, 1817)	0	0	1	1	0	0	0	0	0	0	0
144	<i>Macrophya</i> (<i>Macrophya</i>) <i>montana</i> (Scopoli, 1763)	1	0	0	0	0	0	0	0	0	0	0
145	<i>Macrophya</i> (<i>Macrophya</i>) <i>ribis</i> (Schrank, 1781)	1	0	0	0	0	0	0	0	0	0	0
146	<i>Macrophya</i> (<i>Macrophya</i>) <i>rufipes</i> (Linnaeus, 1758)	1	0	1	1	0	0	0	0	0	0	0
147	<i>Macrophya</i> (<i>Macrophya</i>) <i>teutona</i> (Panzer, 1799)	?	0	0	0	0	0	0	0	0	0	0
148	<i>Macrophya</i> (<i>Pseudomacrophya</i>) <i>punctumalbum</i> (Linnaeus, 1767)	1	0	0	0	0	0	0	0	0	0	0
149	<i>Mesonetra lanigera</i> Benson, 1954	0	0	0	0	0	0	0	0	0	0	1

150	<i>Mesoneura opaca</i> (Fabricius, 1775)	0	1	0	0	0	0	0	0
151	<i>Monardis plana</i> (Klug, 1817)	0	0	0	1	0	0	0	0
152	<i>Monophadnoides ruficrus</i> (Brullé, 1832)	0	0	1	0	0	0	0	0
153	<i>Monophadnus latus</i> A. Costa, 1894	0	1	0	0	0	0	0	0
154	<i>Monophadnus spinolae</i> (Klug, 1816)	1	0	0	0	0	0	0	0
155	<i>Monostegia abdominalis</i> (Fabricius, 1798)	1	1	0	0	0	0	0	0
156	<i>Monsoma pulveratum</i> (Retzius, 1783)	0	1	1	0	0	0	1	1
157	<i>Nematinus bilineatus</i> (Klug, 1819)	0	1	1	0	0	0	0	0
158	<i>Nematinus luteus</i> (Panzer, 1804)	0	0	1	0	0	0	0	0
159	<i>Nematinus steini</i> Blank, 1998	0	1	1	0	0	0	0	0
160	<i>Nematius (Nematius) luteus</i> (Panzer, 1801)	0	1	1	0	0	0	0	1
161	<i>Nematius (Paranematius) wahlbergi</i> C.G. Thomson, 1871	0	?	0	0	0	0	0	0
162	<i>Nematius (Pteronidea) fagi</i> Zaddach, 1876	0	0	1	0	0	0	0	0
163	<i>Nematius (Pteronidea) myosotidis</i> (Fabricius, 1804)	1	0	1	0	0	0	0	0
164	<i>Nesoselanchia morio</i> (Fabricius, 1781)	1	0	0	0	0	0	0	0
165	<i>Periclista (Periclista) albida</i> (Klug, 1816)	1	0	0	0	0	0	0	0
166	<i>Periclista (Periclista) cretica</i> (Schedl, 1981)	0	0	0	0	0	0	1	0
167	<i>Periclista (Periclista) sicelis</i> Pesarini & Turrisi, 2003	1	0	0	0	0	0	0	0
168	<i>Pontania (Eupontania) pedunculata</i> (Hartig, 1837)	0	0	1	0	0	0	0	0
169	<i>Pontania (Eupontania) viminalis</i> (Linnaeus, 1758)	0	1	1	0	0	0	0	0
170	<i>Pontania (Pontania) cyrnea</i> Liston, 2005	0	0	1	0	0	0	0	0
171	<i>Pontania (Pontania) proxima</i> (Serville, 1823)	?	1	1	0	0	0	1	1
172	<i>Pristiphora (Gymnonychus) abbreviata</i> (Hartig, 1837)	0	1	0	1	1	0	0	1
173	<i>Pristiphora (Gymnonychus) maesta</i> (Zaddach, 1876)	0	0	1	0	0	0	0	0
174	<i>Pristiphora (Lygaeonematus) abietina</i> (Christ, 1791)	0	0	1	0	0	0	0	0
175	<i>Pristiphora (Micronematus) monogyniae</i> (Hartig, 1840)	0	0	1	0	0	0	0	0
176	<i>Pristiphora (Pristiphora) aphantoneura</i> (Förster, 1854)	0	?	0	0	0	0	0	0

204	<i>Tenthredo (Tenthredella) velox</i> (Fabricius, 1798)	?	0	0	0	0	0	0	0	0
205	<i>Tenthredo (Tenthredo) scrophulariae</i> Linnaeus, 1758	1	0	0	0	0	0	0	0	0
206	<i>Tenthredo (Tenthredo) zona</i> Klug, 1817	1	0	0	0	0	0	0	0	0
207	<i>Tenthredo (Zonuleto) distinguenda</i> (Stein, 1885)	1	0	0	0	0	0	0	0	0
208	<i>Tenthredopsis litterata</i> (Geoffroy, 1785)	1	0	0	0	0	0	0	0	0
209	<i>Tenthredopsis nassata</i> (Linnaeus, 1768)	1	0	0	0	0	0	0	0	0
210	<i>Tenthredopsis nebrodensis</i> A. Costa, 1894	1	0	0	0	0	0	0	0	0
211	<i>Tenthredopsis scutellaris</i> (Fabricius, 1798)	1	0	0	0	0	0	0	0	0
212	<i>Tomostethus melanopygius</i> (A. Costa, 1859)	1	0	0	0	0	0	0	0	0
	Total	113	73	75	10	19	28	37		
	(Doubtful records)	(6)	(5)	-	-	-	-	(1)		

each species the chorotype is defined taking into account the criteria and terminology proposed by La Greca (1963). The Sicilian sawfly-fauna is compared within a wider Mediterranean context taking into consideration the main islands, whose organic data, coming from recent investigations mainly during the latter decades, are available (Tabs. I-II). The data were taken from specific contributions dealing with different insular contexts (Schedl, 1979, 1981, 1987, 1993, 2002, 2008; Schedl and Kraus, 1988; Schedl and Báez, 1992; Schedl and Ritzau, 1995; Pesarini and Turrisi, 2001) included in the recent checklist of European sawflies (Taeger et al., 2006) and in the more recent catalogue of World "Symphyta" (Taeger and Blank, 2008). These data were included in a digital matrix of presence/absence (Tab. I) to perform some statistical analyses. The specific richness has been correlated with the extension of each insular context through linear regression (with a previous logarithmic conversion) (Mac Arthur and Wilson, 1967; Hammer et al., 2001). The faunistic similarity has been obtained through multivariate analyses (cluster analysis using the Ward algorithm and neighbour-joining based on Jaccard algorithm) (Hammer et al., 2001).

DIVERSITY OF THE SAWFLY-FAUNA OF SICILY

Based upon available faunistic data provided by Pesarini and Turrisi (2001) and subsequent additions (Tomarchio and Turrisi, 2002; Pesarini and Turrisi,

Tab. II – Comparative synopsis of sawfly-fauna of the main Mediterranean insular contexts (surface in bracket under the name). Doubtful records are not included (see Tab. I).

	Sicily (25 426 km ²)	Sardinia (23 813 km ²)	Corsica (8 680 km ²)	Canary Islands (7 273 km ²)	Balearic Islands (5 014 km ²)	Crete (8 336 km ²)	Cyprus (9 251 km ²)
Xyelidae	2	0	1	0	0	1	0
Xiphydriidae	1	1	1	0	0	0	0
Siricidae	2	4	1	1	0	0	2
Orussidae	4	1	1	1	0	3	1
Cephalidae	12	13	7	2	4	4	8
Argidae	10	3	6	0	1	3	5
Cimbicidae	5	1	1	1	0	1	1
Diprionidae	2	1	0	0	1	0	1
Megalodontesidae	0	0	1	0	0	0	0
Pamphiliidae	0	2	0	0	0	0	0
Tenthredinidae	75	47	56	5	13	16	19
Total	113	73	75	10	19	28	37

2003a, 2006; Turrise, 2007, 2010; Turrise, unpubl.) or systematic and nomenclatural changes (Taeger et al., 2006; Taeger and Blank, 2008), the sawfly-fauna of Sicily currently consists of 119 species within nine families (Tab. I) including 6 doubtful recorded species. This number of species is relatively high considered within a Mediterranean insular context, but it is relatively low compared with the Italian fauna as a whole, although it is well known a strong negative North-South gradient as regard the number of sawfly-species. Three families represented in Italy, namely Blasticotomidae, Pamphiliidae and Megalodontesidae, which indeed include a limited number of species, are not currently recorded for Sicily (Masutti and Pesarini, 1995; Pesarini and Turrise, 2001). The sawfly-fauna of Sicily will probably become significantly richer and diversified with additions from further investigations, especially in the Northern mountains and in the South-Eastern territories (Iblean area) of the Islands which seem to be the less known areas within Sicily.

REMARKS ON CHOROTYPES

The zoogeographic analysis of the sawfly-fauna of Sicily, primary based on the comparison and analysis of chorotypes (Fig. 1), shows a higher number of widely distributed species (49% belonging to: Holarctic 8%; Palaearctic 4%; West-Palaearctic 5%; Eurasian 32%). A relevant percentage includes species having an European distribution (44%, of which 7% extended to Maghreb). The widespread species are mostly well distributed

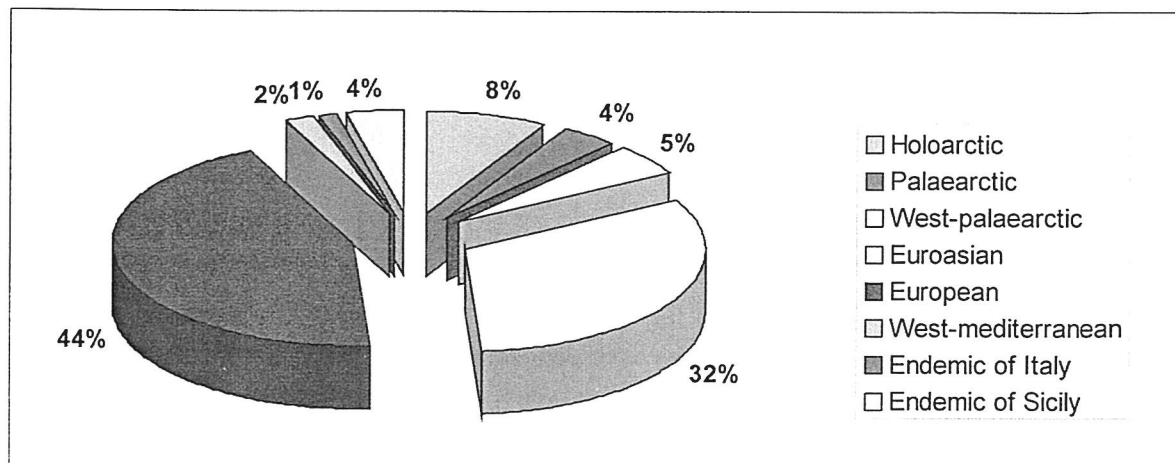
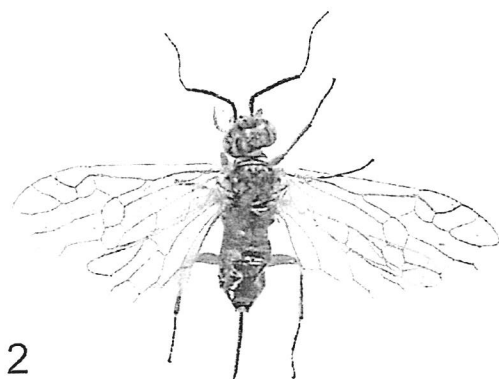


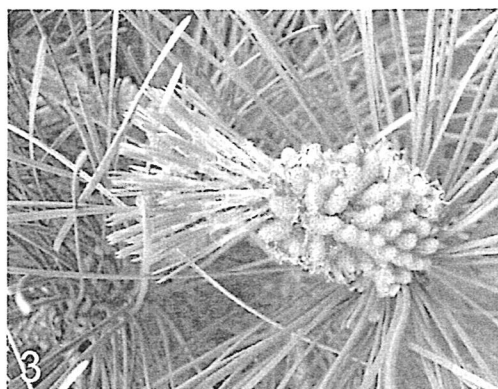
Fig. 1 – Chorological subdivision of “Symphyta” from Sicily.

in Italy, but in several cases they are relatively rare in the central and meridional regions and known on the basis of a few specimens (e.g. the Xyelidae: *Xyela curva* (Figs. 2-3) and *Xyela graeca*, the Xiphydriidae: *Xiphydria camelus*, and the Tenthredinidae: *Aneugmenus coronatus*, *Strongylogaster xanthocera* and *Eurhadinoceraea ventralis*). An interesting component of species has a distribution centered in North Europe and partly in North Asia (the so called Borealic species) which have a very scattered distribution in Italy, especially in the central and meridional regions, including Sicily, generally limited to montane and wood-rich areas (e.g. *Xiphydria camelus*, *Diprion pini*, Figs. 4-5, *Stromboceros delicatulus*, *Macrophya albipuncta* and *Empria longicornis*).

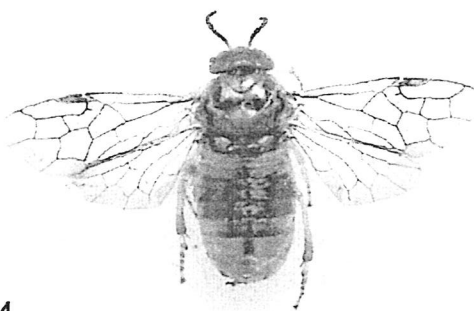
The prevalence of widespread Palaeartic and European (Fig. 6) chorotypes clearly indicates that the sawfly-fauna of Sicily has been outlined in its actual composition mainly during the palaeoclimatic changes of Plio-pleistocene. During glaciations rich contingents of orophilous and mesophilous species, having mainly a North European and North Asian origin, have expanded to South reaching also Sicily, which clearly represented a true wide “refuge”. This contingents have also enriched the Italian fauna (mainly Alpine and Apennine territories) but with a negative North-South gradient (Turrisi, 2007, 2010). Our biogeographical evidences and faunistic data show that no other Mediterranean Island has received so strong contingents of “invasive” species, and this phenomenon explains the relatively “less insularity” of Sicily within the Mediterranean insular contexts. The percentages of West-Mediterranean (2%) and Italian endemic (only 1%) species are both very modest (Figs. 7-8), whereas the percentages of Sicilian endemisms is higher (4%), including some recently described and undescribed species (Pesarini and Turrisi, 2003a, unpubl.).



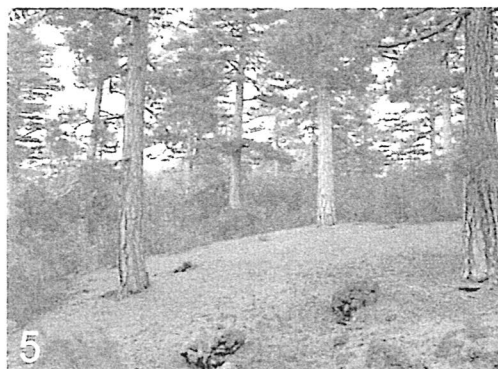
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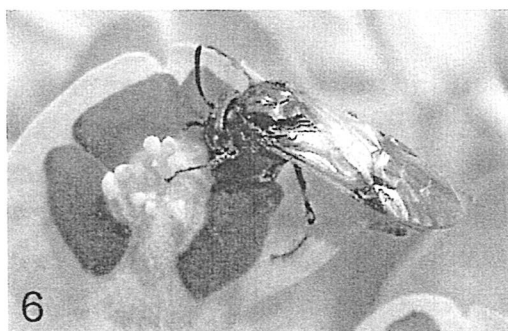


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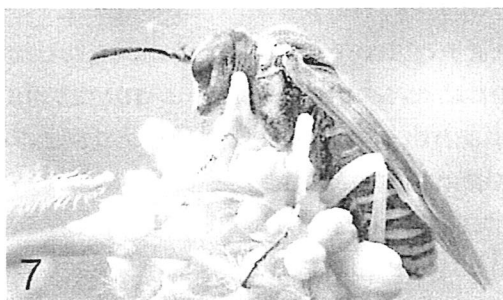


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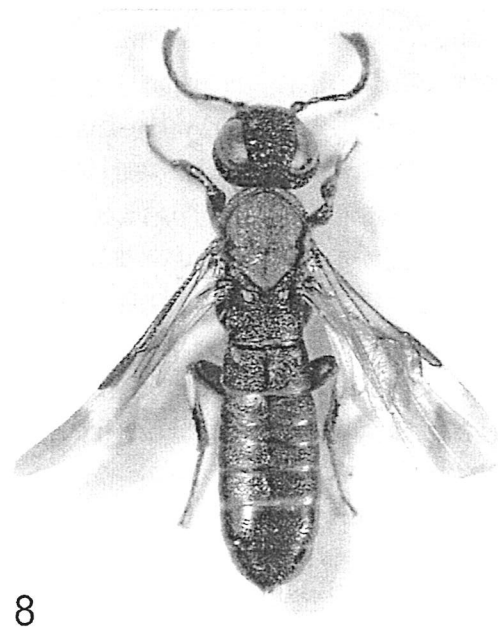
Figs. 2-5 – “Symphyta” of Sicily: 2, *Xyela curva* (Xyelidae), having an Euro-anatolian distribution; 3, micro sporophylls of *Pinus laricio calabrica* (Loud.) Cesca et Peruzzi into which feed the larvae of *Xyela curva*; 4, *Diprion pini* (Diprionidae), having a Palaearctic distribution. 5, wood of *Pinus laricio calabrica* (Loud.) Cesca & Peruzzi of Etna where have been collected *Xyela curva* and *Diprion pini*.



6



7



8

Figs. 6-8 – “Symphyta” of Sicily: 6, *Arge cyanocrocea* (Argidae), having a Palaearctic distribution. 7, *Tentredo (Cephaledo) meridiana* (Tenthredinidae) and 8, *Orussus taorminensis* (Orussidae) both having a West-Mediterranean distribution.

BRIEF COMPARATIVE REMARKS ON SICILIAN SAWFLY-FAUNA WITHIN THE MEDITERRANEAN INSULAR CONTEXTS

The comparison of the Sicilian sawfly-fauna within the main Mediterranean insular contexts shows that Sicily is the most rich and diversified area (Tabs. I-II). The regression analysis of the species number vs. insular surface (Fig. 9) shows a relatively good congruence of the predictive models of insular biogeography (Mac Arthur and Wilson, 1967). The scatter plot is better approached to the "best straight line" as regard Balearic Islands, Sardinia, Sicily, Cyprus and Crete, whereas that one of Corsica and Canary Islands is marginal within the fiducial limits of 95% calculated for the same straight line. In detail, Corsica has a higher ratio species number/insular surface compared with the other insular contexts and thus a richer sawfly-fauna. Conversely, Canary Islands have a lower ratio species number/insular surface and thus a remarkable degree of "oceanity".

The multivariate analyses (Figs. 10-11) based on two different algorithm (see "Materials and methods") show a congruent similarity and the dendrograms obtained have the same topology of the different components. Sicily shows a faunistic composition distinctly differentiated from the other insular contexts considered, and represents a distinct group with a low similiarity degree. This could be probably explained by the relatively high species number and by the differentiated composition of species, especially as concern the family Tenthredinidae. The remaining faunas represent another wide assemblage where it

is possible to put in evidence three well differentiated subgroups highly congruent with affinity prediction based on biogeographical inferences. The first subgroup is the "Sardo-Corse complex", the second is represented by the "East-Aegean

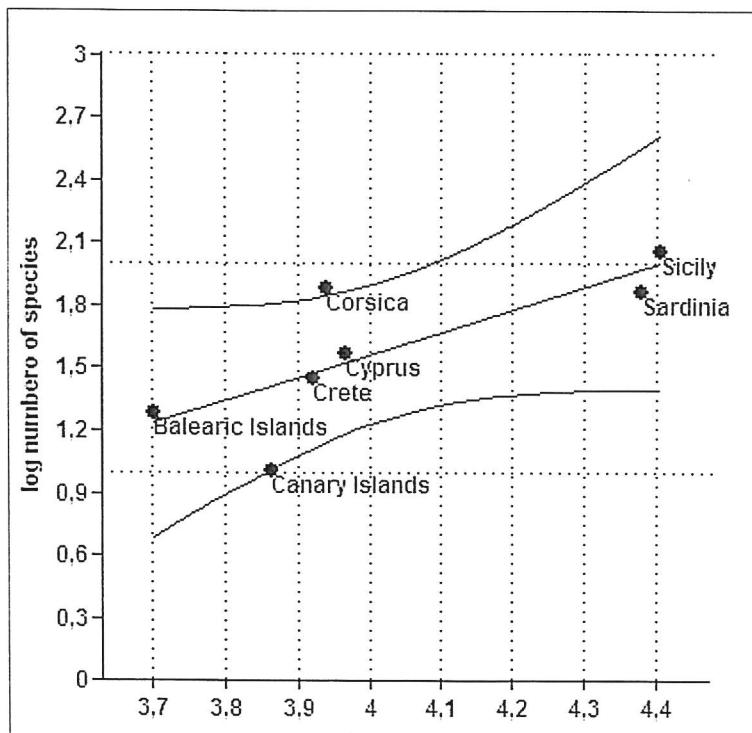


Fig. 9 - Linear regression of the species number of "Symphyta" vs. the surface of the different Mediterranean insular contexts considered, $y = 1,092 - 2,8107x$; $r = 0,77612$; $p (0,040207)$.

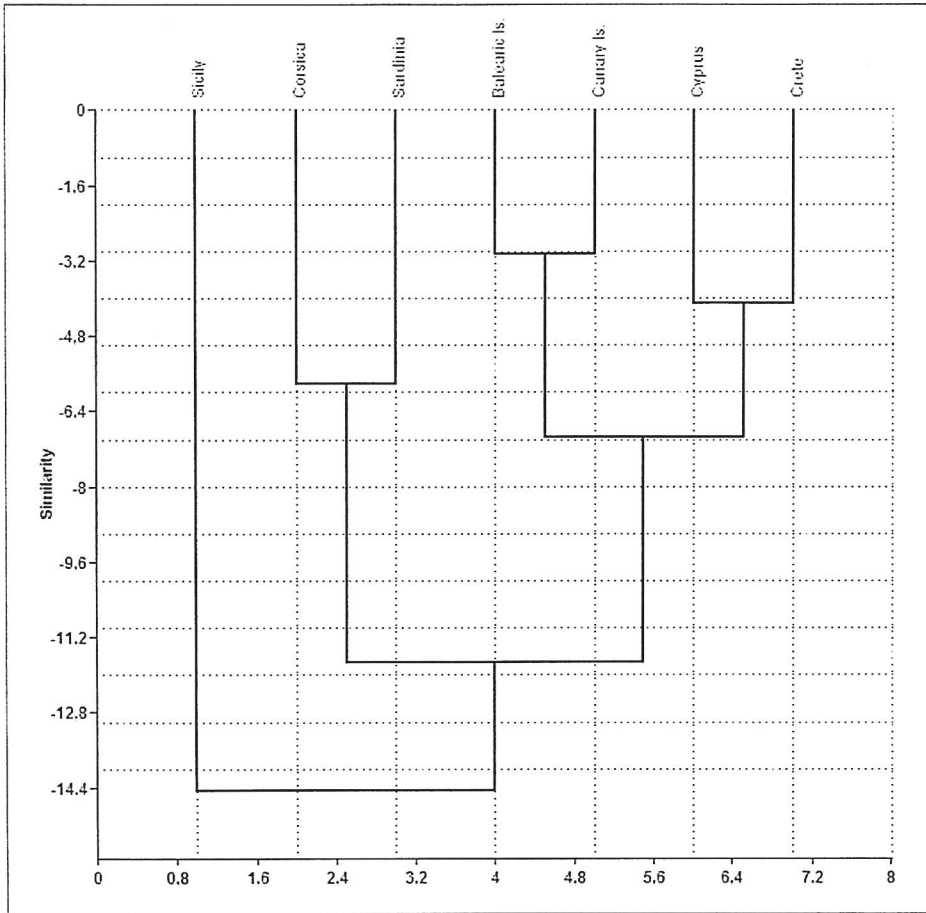


Fig. 10 – Dendrogram obtained from the binary matrix in Tab. I through a multivariate analysis (cluster analysis based on Ward algorithm).

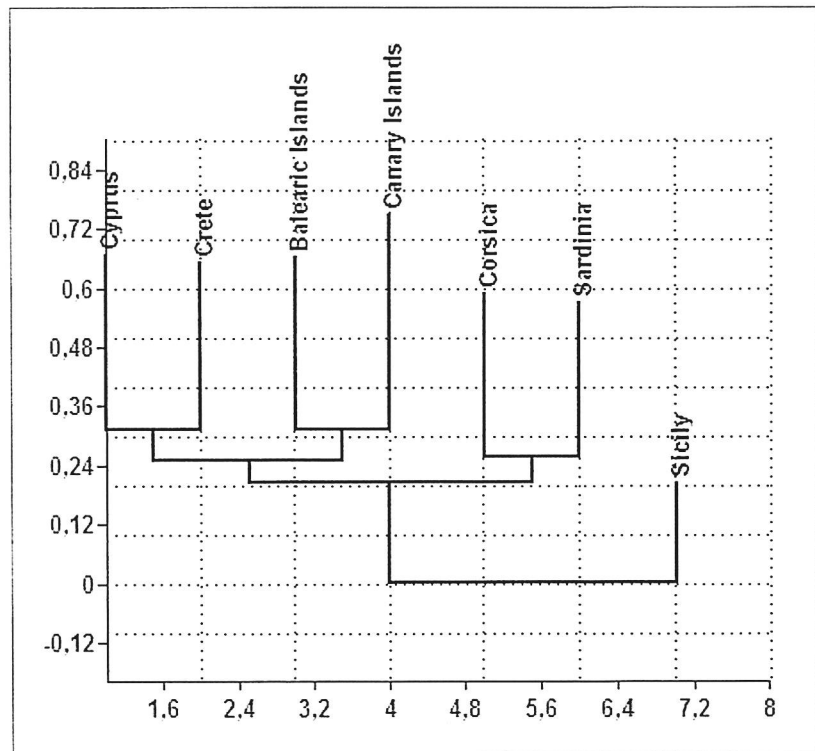


Fig. 11 – Dendrogram obtained from the binary matrix in Tab. I through a multivariate analysis (neighbour-joining based on Jaccard algorithm).

Mediterranean complex” (including Cyprus and Crete), and finally the third one is the “West-Mediterranean insular complex” including Balearic Islands and Canary Islands.

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