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## ABSTRACTS

### **KEYNOTE LECTURES, COMMUNICATIONS, POSTERS**

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# 4.3 = FIRST ASSESSMENT OF THE BOX TREE MOTH (*CYDALIMA PERSPECTALIS*) INVASION IN NAT2000 HABITAT 5110 IN LIGURIA

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The Box tree moth, *Cydalima perspectalis* (Walker, 1859) (Lepidoptera: Crambidae), is an alien invasive species accidentally introduced in Europe from China, out of its primary range which extends from India to the Russian Far East, Corea and Japan. Several species and varieties of Box (*Buxus sempervirens* L.), including cultivars and hybrids (1), are the most important hostplants for its larvae. The first record of *C. perspectalis* from Europe (Germany, Baden-Württemburg) dates back to 2007; since then the species underwent fast spreading into several other European countries: The Netherlands, Great Britain, Switzerland, France, Austria, Italy, Belgium, Hungary, Romania, Czech Republic, Slovakia, Turkey, Croatia, Spain and Greece.

In Italy, it was firstly recorded in October 2010 in a garden nearby Vicenza (Veneto) (2), and thereafter in Lombardia, Emilia Romagna, Toscana, Friuli Venezia Giulia, Liguria, and Piemonte. In Liguria, the Box three moth has been recorded for the first time in summer 2013 in Hanbury Botanical Garden (Ventimiglia, Imperia), probably arriving from France, but reputedly it was present in the surroundings of Genoa before that time. Records from this region, and from Italy as a whole, were at first exclusively from parks and gardens. Following observations carried out on 22<sup>nd</sup> July 2016 in Vara Vallley (Eastern Liguria), one of us (FB), working for the State Forestry Corp, informed the Regional Agency for Environmental Protection (ARPAL) about a severe attack suffered by wild *Buxus* plants.

In the framework of the project «ALIEM - Action pour Limiter les risques de diffusion des espèces Introduites Envahissantes en Méditerranée» (EU Program Italie/France "Maritime" 2014-2020, Axe 1), we started to monitor immediately the development of the infestation in the Habitat "5110. Stable xerothermophilous formations with *Buxus sempervirens* on rock slopes (*Berberidion*)", protected after the EU 92/43 Directive. Monitoring surveys were carried in Special Areas of Conservation (SACs), above all in SAC "IT1342806 Monte Verruga - Monte Zenone - Roccagrande - Monte Pu", where Habitat 5110 has a major role in vegetation and landscape. Observations were nevertheless carried out outside the SACs, throughout the region (3).

Due to the lack of a standardised protocol, during surveys visual inspections were carried out on plant crowns, with particular attention to youngest leaves and twigs, recording the various developmental stages of the pest and estimating both average damage on individual plants and land cover by the vegetation formation. Attack intensity was evaluated as damaged phytomass for each plant and based also on population density of *C. perspectalis* larvae. Damage levels were then represented after a value scale subdivided into three grades. Visual inspections following also the so-called "walking census method" and attention was dedicated also to spotting eggs and other juvenile instars of the pest on Box plants (4).

Approximately 70% of the 516 hectares monitored were severely damaged and 22% were moderately damaged.

On 13<sup>rd</sup> October 2016, Parks and Biodiversity Office of Regione Liguria sent a request to the Ministry of Environment asking for the registration of *C. perspectalis* in the Official Italian List of Invasive Alien Species. This action was considered necessary because the Box tree moth is not listed at present in the "Executive Regulation (EU) 2016/1141 of the Commission of 2016 July 13<sup>rd</sup>" that provides a list of alien invasive species of relevance for the Union in application of the 1143/2014 (EU) regulation by the European Parliament and Council.

The resilience of natural Box tree formations will also have to be assessed, so for the capacity by *C*. *perspectalis* larvae to shift to other hostplants "*in situ*" in case Box tree would be missing.

1) H.H. Inoue, S. Sugi, H. Kuroko, S. Moriuti A. Kawabe (1982) Moths of Japan. Kodansha, Tokyo, Japan

2) FEI (Forum Entomologi Italiani) (2010) Cydalima perspectalis (Walker, 1859) - Crambidae – Vicenza http://www.entomologiitaliani.net/public/forum/phpBB3/viewtopic.php?t=12721

3) V. Raineri, F. Bonechi, D. Caracciolo, P. Cresta, M. Mariotti (2017) Boll. Mus. Ist. Biol. Univ. Genova, 79, in press 4) M. Jervis, N. Kidd (eds) (1996) Insect natural enemies: Practical approaches to their Study and Evaluation. Chapman & Hall, London

## 4.3 = First assessment of the Box Tree Moth (Cydalima perspectalis) invasion in NAT2000 habitat 5110 in Liguria

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CYDALIMA PERSPECTALIS AND ITS SPREAD IN EUROPE, ITALY AND LIGURIA The Box tree moth, Cydalima perspectalis (Walker, 1859) (Lepidoptera: Crambidae), is an alien invasive species accidentally introduced in Europe from China, out of its primary range which extends from India to the Russiar Far East, Corea and Japan. It can produce from 1 to 5 generations per year depending on the climate. Several species and varieties, cultivars and hybrids of Box are the most important hostplants for its larvae. The preference would be for *Buxus sempervirens* L. var. *rotundifolia* Baill., but further observations on field and experiments are needed. The first record of *C*. perspectalis from Europe dates back to 2007, when larvae were found defoliating a bush of *B. sempervicens* in Baden-Wirthemburg. Since then the species underwent fast spreading into several other European countries. <u>Tables 1 and 2</u> show the progress of species spread on the basis of the first

records in each European countries and Italian regions. As it happens for most invasive species during the first phases of their spreading, so far there are neither natural enemies capable of keeping the moth populations under control nor forms of resistance developed by infested plants. Regarding climate, the Box tree moth seems to be a "hard" resistant species, as in fact it tolerates also quite low temperatures, down to -16 C°. For this reason it has an enormous spread potential, especially in most southern European countries, in particular Italy. As in countries of origin C. perspectalis feeds also on Euonymus japonicus Thunb., E. alatus (Thunb.). Siebold, Ilex purpurea Hassk., Pachysandra terminalis Siebold & Zucc. and Murraya paniculata (L.) Jack, and in Sochi on Ruscus colchicus Yeo, Ruscus aculeatus L., Eriobotrya japonica (Thunb.) Lindl., Acer campestre L., Fraxinus excelsior L. and Rubus spp., there is a high risk that the species may shift on other spontaneous plants of our flora.

In Liguria the Box three moth was observed for the first time in summer 2013 in Hanbury Botanical Gardens (Ventimiglia, IM) by the Gardens's staff, probably arriving from France and it has been widespread in 2014. Records from this region, and from Italy as a whole, were at first exclusively from parks and gardens. Following observations carried out on 22<sup>nd</sup> July 2016 in Carme of Stadomelli (SP), one of us (F.B.), working for the State Forestry Corp, informed the Regional Agency for Environmental Protection (ARPAL) about a severe attack suffered by wild Buxus plants via a concise report in which concern about ongoing defoliation was raised, and C. perspectalis put forward as the likely pest.

IMPORTANCE OF BUXUS COMMUNITIES AND HABITAT 5110 The Ligurian spontaneous formations of *Buxus* are essentially comprised within Natura 2000 Habitat 5110, "Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.)", which is protected after the EU 92/43 Directive, under the Annex I. According to the Natura 2000 European Database (http:// ec.europa.eu/

environment/nature/natura2000/data/index\_en.htm) in the European Unior environment/nature/natura/2000/data/index\_en.htm) in the European Union Habitat 5110 is known for 310 Natura 2000 sites (SCIs, SPAs and SACs) distributed across 9 countries: France, Spain, Italy, Belgium, Germany, Greece, Portugal, Luxembourg, and the UK. The 33 Italian sites are in Umbria, Liguria, Marche, Abruzzi, Tuscany, Latium, the autonomous province of Trento and with uncertain in Basilicata. In Tab.3 the six Ligurian Natura 2000 SACs (Fig. 2) including Habitat 5110 are

listed along with their extension. They all pertain to the Mediterranean biogeographical region and have been subjected to conservation measures. In Italy, Liguria is the only region to show particular formations of *Buxus* settled on ophiolitic bedrock which are reminiscence of those exclusively occurring in some localities between northern Greece and Albania. Most of these formations, from east Liguria, are referable to syntaxon Euphorbio ligusticae - Genistetum desoleanae Nowak 1987 corr. Vagge 1997 buxetosum sempervirentis Mariotti 1994, placed in the alliance Alyssion bertolonii Pignatti 1977 (Rosmarinetalia officinalis Br.-Bl. ex Molinier 1934). Recently the association with Genista desoleana (and thereafter its sub-association with Buxus) has been placed in Genistion lobelii Molinier 1934 (Ononidetalia striatae Br.-Bl. 1950; Festuco valesiacae - Brometea erecti Br.-Bl. & Tüxen ex Br-Bl. 1949). Regarding its physiognomy and structure, the vegetation appears as "pseudo-macchia" or "supra-mediterranean shrubs", and it is naturalistically valuable for its restricted occurrence on ultramaphic grounds and the presence of (semi)exclusive plants associated to ophiolites, including several endemic species or with restricted range of distribution. Moreover, the Box tree enters with significant levels of coverage into shrub- and treelayers of other forestal associations, such as relatively xerophilous ones dominated by Live oak, Cork oak or *Quercus pubescens*, but also into more meso-hygrophilous ones, with alders and hornbeams in marshland or riparial areas.

In Liguria, the Box tree is also characteristic of some forest formations dominated by Maritime pine, described as a distinct association named Buxo sempervirentis - Pinetum pinastri Biondi and Vagge 2015.

METHODS

In the framework of the project «ALIEM - Action pour Limiter les risqu diffusion des espèces Introduites Envahissantes en Méditerranée» (EL Program Italie/France "Maritime" 2014-2020, Axe 1), we started to monito immediately the development of the infestation in the Habitat 5110.

Due to the lack of a standardised protocol to monitor plant damage, during surveys visual inspections were carried out on plant crowns, with particular attention to youngest leaves and twigs, recording the various developmental stages of the pest and estimating both average damage on individual plants and land cover by the vegetation formation. Attack intensity was evaluated as damaged phytomass (dry or lacking) for each plant and also as the amount of C. perspectalis larvae present on the plants, based on direct observations of L perspectans larvae present on the plants, based on direct observations or massive infestations (e.g. a large density of specimens, at different larvae instars, on the same plant; caterpillars using silk threads to increase their spread, etc.). Damage levels were then represented after a value scale subdivided into three grades: 1, minimum; 2 medium; 3, serious. Visual inspections following also the so-called "walking census method" and attention was dedicated also to spotting eggs and other juvenile instars of the part of the provident the spectrum of the provident of the part of the provident of the p

the pest on Box plants.

Infestation by C. perspectalis in Liguria spans from one extreme to the other that is from the French to the Tuscanian borders, and affects both gardens and spontaneous Box tree formations. Our surveys show that the most part of Habitat 5110 has suffered strong defoliation, between 70% and 80% of its

In Tab. 4 we report the estimated area percentage of Habitat 5110 which shows clear signs of infestation in all considered SACs.

Bibliographical references: see Mariotti M., Bonechi F., Caracciolo D., Cresta P., Raineri V., 2017. *Cydalima perspectalis* (Waller, 1859) (Lepidoptera, Crambidae) and the threats for the Natura 2000 Habitat 5110 in Liguria (NW-Italy). Boll. Mus. Ist. Biol. Univ. Genova, 79: 215-236.

Year	Country	Source		
	Germany	Krüger, 2008; Korycinska, & Eyre, 2009		
2007	The Netherlands	Muus et al., 2009		
	Switzerland	EPPO, 2008; Käppeli, 2008		
	France	Feldtrauer et al., 2009		
2008	Great Britain	Mitchell, 2009		
2009	Austria	Rodeland, 2009		
	Liechtenstein	Slamka, 2010		
2010	Italy	FEI, 2010		
2011	Belgium	Castells et al., 2011		
	Czech Republic	Šumpich, 2011		
	Hungary	Sáfián & Horváth, 2011		
	Romania	Szekely et al., 2011		
	Slovenia	Matjaž Jež in Sáfián & Horváth, 2011		
	Turkey (European	Hizal, 2012		
	Croatia	Koren & Črne, 2012		
	Georgia	Matsiakh, 2014		
2012	Russia	CABI/EPPO, 2012; Matsiakh, 2014		
	Slovakia	Pastoralis et al., 2013		
2013	Denmark	Hobern, 2013		
	Bulgaria	Beshkov et al., 2015		
2014	Montenegro	Hrnčić & Radonjić, 2014		
	Spain	Pérez-Otero et al., 2014		
	pain Pérez-Otero et al., 2014 Iosnia-Hercegovina Ostojic et al., 2015			
	Greece	Strachinis et al. 2015		
	Serbia	Konjević et al., 2015; Stojanović et al., 2015		
2017	Albania	Mariotti in Mariotti et al. (2017).		

Tab.1. - Chronology of the spread of C. perspectalis in European countries

Year	Italian region	Source		
2010	Veneto	FEI, 2010		
2012	Lombardia	Tantardini et al., 2012		
	Piemonte	Regione Piemonte, 2014		
	Emilia Romagna			
	Sicilia	Bella, 2013		
	Friuli-Venezia Giulia	Governatori, 2013		
2013	Lazio	Regione Lazio, 2014; FEI, 2014b		
	Marche	FEI, 2013		
	Liguria	Mariotti et al. 2017		
2014	Abruzzo	Demetra, 2016; FEI, 2015		
	Umbria	Demetra, 2016		
2015	Trentino Alto Adige	Ferrari, 2015 (Province of Trento)		
	Campania	Regione Campania, 2015		

Tab. 2. - Chronology of the spread of C. perspectalis in Italian regions

N.	SAC code and Name	Surface (ha)	Surface habitat 5110 (ha)	%
	IT1331909 Monte Zatta - Passo Bocco - Passo Chiapparino - Monte Bossea	3,034.00	95.78	3.16
2	IT1333307 Punta Baffe - Punta Moneglia - Val Petronio	1,308.00	13.08	1.00
	IT1342806 Monte Verruga - Monte Zenone - Roccagrande - Monte Pu	3,757.00	391.47	10.42
4	IT1343412 Deiva - Bracco - Pietra di Vasca – Mola	2,031.00	3.89	0.19
5	IT1343415 Guaitarola	581.00	1.16	0.20
6	IT1344422 Brina e Nuda di Ponzano	239.00	23.90	10.00
	Total	10,950.00	529.28	4.83

Tab.3. - Ligurian SACs with the presence of Habitat 5110

n.	SAC code and name	Estimated area Habitat 5110 (ha)	% infested area	Damage grade
	IT1331909 M. Zatta -	95.78	70	3- serious
	Passo Bocco - Passo		30	2- medium
	Chiapparino-M. Bossea		-	1- minimum
	IT1342806 Monte	391.47	70	3- serious
	Verruga - M. Zenone - Roccagrande - M. Pu		20	2- medium
			10	1- minimum
3	IT1343412 Deiva - Bracco - Pietra di Vasca - Mola	3.89	70	3- serious
			30	2- medium
			-	1- minimum
4	IT1343415 Guaitarola	1.16	70	3- serious
			30	2- medium
			-	1- minimum
5	IT1344422 Brina e Nuda di Ponzano	23.90	70	3- serious
			30	2- medium
			-	1- minimum
Total		516.20 ha	361.34 ha	3- serious
			115.71 ha	2- medium
			39.15 ha	1- minimum

ted damage caused by Cydalima perspectalis during assessment in summer 2016





Fig. 2. Ligurian SACs and presence of the habitat 5110. The number is referred to the first column of Tab. 3.



Fig. 3. Larva of C. perspectalis and its damage on leaves and young twigs of Buxus tree



