Wild bee communities across *Vespa velutina* invasion gradient

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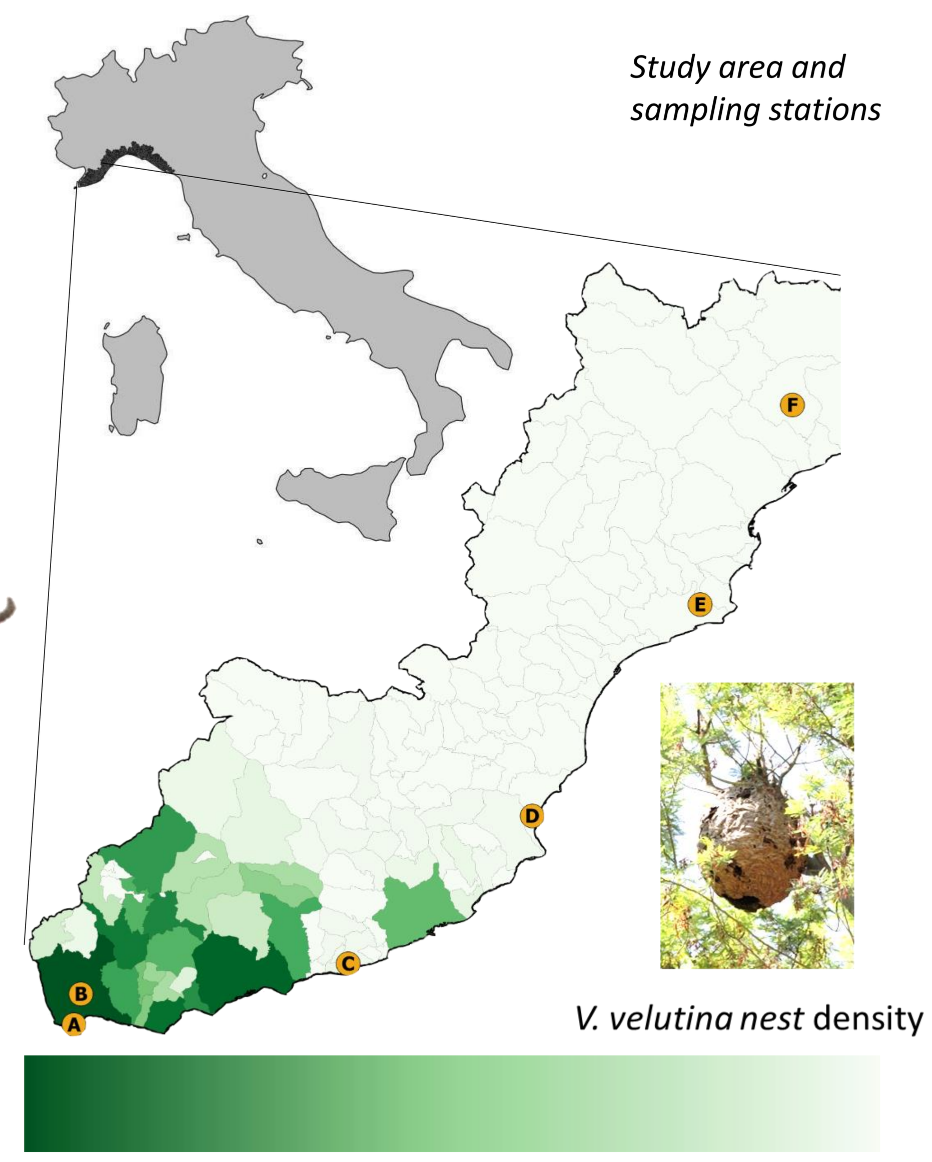
Introduction:

Wild bees provide pollination ecosystem service and their decrease could threaten the pollination efficiency. Worldwide, scientists are reporting a decrease of wild bees as consequence of human land use. Further impact on wild bee communities could be caused by interactions with invasive alien species, however this issue have been poorly studied. Under the EU funded LIFE STOPVESPA project, a study was performed since 2016 on the status and trends of wild bee communities in the Liguria region (Italy) in order to evaluate the presence of any *V. velutina* impacts on wild bees.

Has biodiversity loss occurred due to *V. velutina?*

Which wild bees species could be more affected by *V. velutina*?



Objectives of the study:

- comparing the status of wild bee communities in *V. velutina* invaded area vs. communities without the presence of the hornet;
- assessing which wild bee species could be more affected by *V. velutina*

Vespa velutina

Lepeletier 1836

Vespa velutina, or yellow-legged hornet, preys on honeybees (*Apis mellifera*) and other insect species to feed its brood. This alien hornet behaves as invasive species in Europe and may causes losses to beekeeping industry and to biodiversity in natural ecosystems. *V. velutina* is organized in annual colonies and the predation intensity grows at the same rate of the colony.

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Methods:

***Vespa velutina* colonies:**
A total of 57 nests of *V. velutina* were collected during years 2015 - 2016 in Liguria (Italy). The following assumption has been formulated: **great nests dimension corresponds to high predation intensity.**

Bee sampling: Wild bees were collected every 20 days from March to November. We used a pan-trap protocol in 6 areas (A-F) having different yellow-legged hornet nest densities 23 monitoring sessions were performed in 2016 and 2017. Wild bees have been identified at species or morpho-species level.

The 3 pan-traps (white, blue and yellow) per cluster

Example *of* 5 pan-trap clusters

Results:

Wild bee abundance have a peak in June when *V. velutina* predation is low. **Wild bee species with late summer flight periods appear as the most threatened groups** by *V. velutina.*

	feb	mar	apr	may	jun	jul	aug	sep	oct	nov
Melittidae								1	1	
Melitta								1	1	
Andrenidae	31	31	99	108	50	2				
Andrena	31	31	99	91	33	2				
Panurgus				17	17					
Halictidae	2	21	80	142	360	228	73	18	27	2
Halictus			11	26	92	67	32	4	4	2
Lasioglossum	2	21	69	115	267	161	41	14	23	
Sphecodes				1						
Systropha					1					
Colletidae			1		15	11	24	3	19	
Colletes							1		6	
Hylaeus			1		15	11	23	3	13	
Megachilidae	1	5	39	38	25	11	13	2	5	
Anthidium		1	1	22	13	1	2			
Chelostoma				1	1					
Heriades					3	5	6	1	2	
Hoplitis			1	2						
Megachile				2	2	2	3	1	3	
Osmia	1	4	37	11	6	2				
Stelis						1	2			
Apidae	4	11	32	30	30	23	36	5	16	2
Amegilla								2		
Anthophora		1	2	1	1					
Bombus	2	5	23	8	17	4	8		3	2
Ceratina			2	11	6	14	25	2	10	
Eucera	1	3	3	7	2					
Nomada	1	2	2	1						
Tetralonia						1				
Xylocopa				2	4	4	3	1	3	

High V.velutina predation

Wild bee flight period and vulnerability to Vespa velutina. Numbers represents abundance

In this study, 1680 wild bee specimens were collected and divided between 150 morpho-species; 25 new species for Liguria region are reported, of these ***Andrena (Agandrena) asperrima* (Pérez 1985)** was never previously found in Italy.

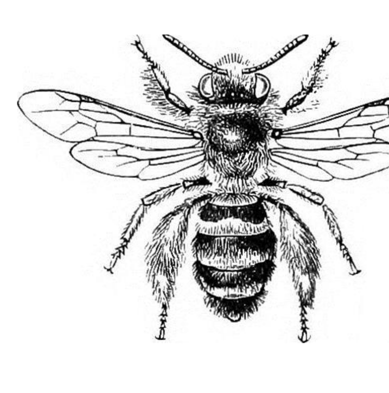
Colletidae
Colletes hederae (Schmidt & Westrich, 1993)
Hylaeus (Lambdopsis) *annularis* (Kirby, 1802)

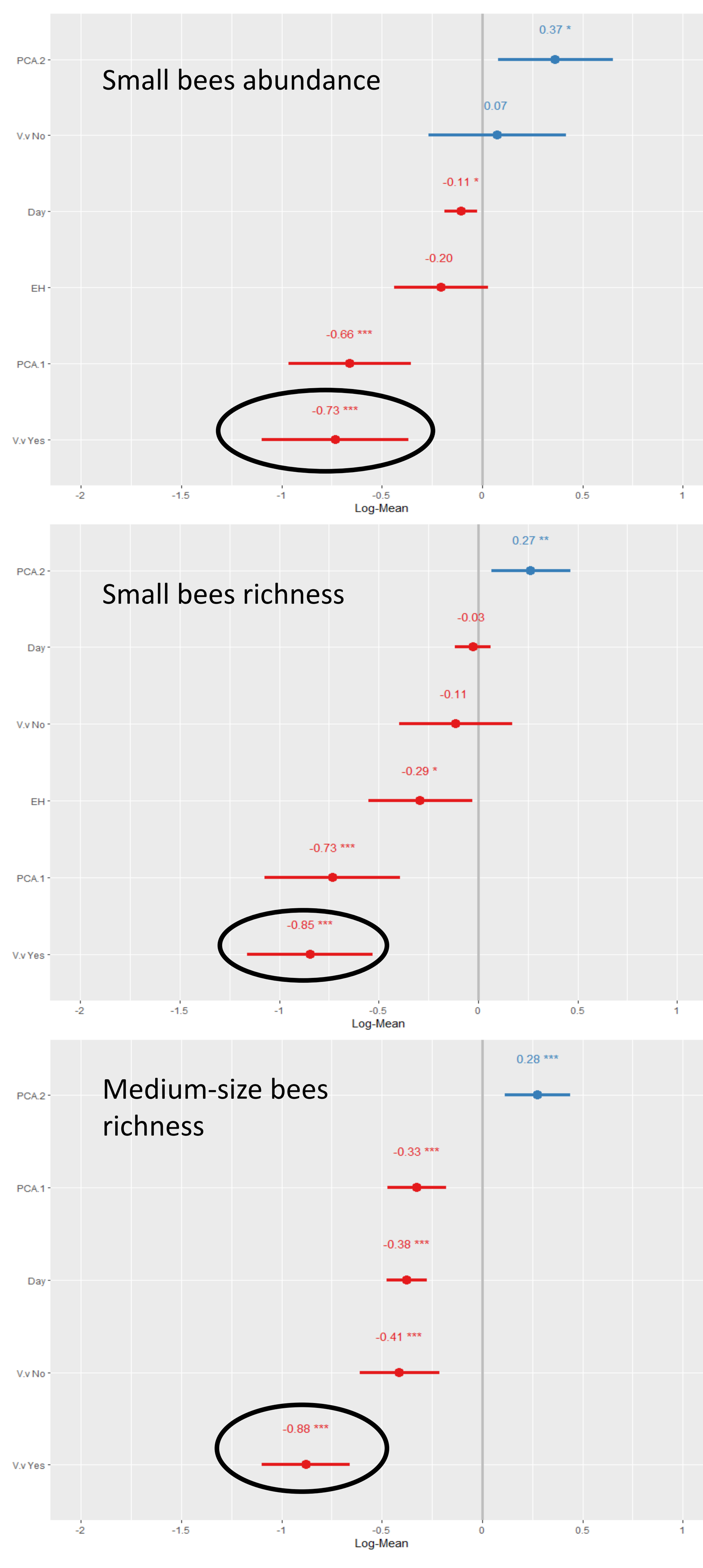
Andrenidae
Andrena (Agandrena) *asperrima* (Pérez, 1895)
Andrena (Charitandrena) *hattorfiana* (Fabricius, 1775)
Andrena (Chlorandrena) *nigroolivacea* (Dours, 1873)
Andrena (Chrysandrena) *fulvago* (Christ, 1791)
Andrena (Euandrena) *vulpecula* (Kriechbaumer, 1873)
Andrena (Hoplandrena) *rosae* (Panzer, 1801)
Andrena (Agandrena) *asperrima* (Pérez, 1895)
Andrena (Charitandrena) *hattorfiana* (Fabricius, 1775)
Andrena (Chlorandrena) *taraxaci* (Giraud, 1861)
Andrena (Plastandrena) *bimaculata* (Panzer, 1789)
Andrena (Proxiandrena) *proxima* (Kirby, 1802)
Panurgus (Panurgus) *dentipes* (Latreille, 1811)

Halictidae
Halictus (Monilapis) *simplex* [Halictus] (Blüthgen, 1923)
Halictus (Seladonia) *seladonius* (Fabricius, 1794)
Lasioglossum (Evylaeus) *malachurum* (Kirby, 1802)
Lasioglossum (Evylaeus) *punctatissimum* (Schenck, 1853)
Lasioglossum (Evylaeus) *puncticolle* (Morawitz, 1872)
Lasioglossum (Lasioglossum) *discum* (Smith, 1853)
Lasioglossum (Lasioglossum) *xanthopus* (Kirby, 1802)
Lasioglossum (Lasioglossum) *lativentre* (Schenck, 1853)

Megachilidae
Chelostoma (Foveosmia) *distinctum* (Stoeckhert, 1929)
Megachile (Callomegachile) *sculpturalis* (Smith 1853)
Stelis (Stelis) *breviuscula* (Nylander, 1848)

Apidae
Ceratina dentiventris (Gerstaecker, 1869)
Eucera nigrescens (Pérez, 1879)





GLMs significant output for abundance and species richness of wild bees of small and medium sizes (the black circles highlight the negative effect due to V. velutina upon wild bee)

Conclusions:

These preliminary analyses highlight that the presence of *V. velutina* could negatively affect small and medium sizes wild bee species. In particular, wild bees with a later flying period (from July to November) are more susceptible to *V. velutina* predation since the overlapping with the maximum hornet colony development and population size.

Realized with the financial contribution of the LIFE Programme of the European Commission (LIFE14 NAT/IT/001128 STOPVESPA)