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Special Section: The new Checklist of the Italian Fauna

The new Checklist of the Italian Fauna: Cicindelidae and Carabidae

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SUMMARY

An updated version of the 'Checklist of the Italian Fauna' for the families Cicindelidae and Carabidae (Insecta: Coleoptera) is presented here. The list reflects the state of art of taxonomic and chorological knowledge of Italian species in December 2024. The new checklist records 1688 taxa (specific + subspecific rank) of Cicindelidae and Carabidae, corresponding to 1442 species. The distribution of taxa in four macro-regions (N, S, Si, Sa) as well as in all Italian administrative regions is reported too. The number of endemic species is relevant (453), corresponding to 31.4% of recorded taxa. Compared to the previous Checklist by Vigna Taglianti, published in 2005, the number of Cicindelid and Carabid species recorded from the Italian political territory has increased from 1313 to 1442. The main changes concern the subfamilies Scaritinae and Trechinae, with numerous additions of new hypogean taxa, all endemic to Italian territory. Explanatory notes are provided for the adopted taxonomic approach. The full data set is attached to this paper as supplementary file, while a simplified version is freely accessible from the LifeWatch Italy Data Portal (https://dataportal.lifewatchitaly.eu/data) where it is expected to be regularly updated.

INTRODUCTION

In 1993, the first checklist of Italian Carabidae, a family of Coleoptera among the most studied and best known in our country, was published in the editorial series 'Checklist delle specie della fauna d'Italia' edited by the Ministry of the Environment (Scientific Committee for the fauna of Italy). Its author was Augusto Vigna Taglianti (1993), who first tried to arrange all the species known at the time in a modern taxonomic system, while at the same time providing information on their distribution in the country. This was not the first attempt to compile a complete catalogue of the species known within the Italian political borders with relative chorological indications, as it was preceeded by the contributions of Porta (1923), accompanied by dichotomous keys, of Luigioni (1929), extended also to other families of Coleoptera. But above all it was the catalogue of Magistretti (1965), with relative Supplement by the same author (1968), which represented a precise point of reference for the generations of carabidologists of those times, but which soon began to show signs of obsolescence in particular with regard to the supraspecific taxonomic categories. Even the checklist of Vigna Taglianti (1993) was, within a decade, considered outdated by its own author, who committed himself to compiling a new updated checklist of the Italian Carabidae within the project 'Fauna Europaea' (Vigna Taglianti 2004). On the basis of this work of taxonomic updating and insertion of newly described species, the following year Vigna Taglianti (2005a) published, in the Appendix of the APAT volume 'I Coleotteri Carabidi per la valutazione ambientale e la conservazione della biodiversità', a new checklist of the Italian species with the indication of their respective chorotypes and their distribution in our country. Compared to the 1993 list, the known species went from 1245 (+45 doubtful) to 1313 (+27 doubtful).

Published in the same years, even if not responding to the purpose of a checklist, it is worth mentioning the important contribution of Casale et al. (2006), unfortunately concerning only the species of some, albeit important, genera of Carabidae, for which a huge number of unpublished chorological reports were provided on a cartographic basis.

Also noteworthy are the two subsequent volumes by Pesarini & Monzini (2010, 2011), complete with drawings and dichotomous keys for the identification of all the species of the Italian fauna and, very recently, the checklist by Casale et al. (2021), made available online through the LifeWatch Italy Data Portal, so as to make possible, at least in theory, continuous and timely updates of the list provided. On this occasion, the distribution of all the species in the Italian political regions was also provided (as far as known up to that time). In the meantime, the reported species had risen to over 1400, and others are still being described.

For this reason, it is considered useful to provide in this article a further update on the Italian Carabidae fauna, which takes into account the latest taxonomic orientations, the most recently reported species and the new chorological data acquired.

MATERIAL AND METHODS

Study area

The new checklist of the Italian Fauna (Bologna et al. 2022) follows the subdivision of Italy in four macro-regions (Fig. 1), also used in the previous version of the checklist (Vigna Taglianti, 2005): 'N' (North) is the sum of eight administrative regions of Northern Italy (listed from north to south and from west to east: Aosta Valley, Piedmont, Lombardy, Trentino-Alto Adige, Veneto, Friuli-Venezia Giulia, Liguria, Emilia-Romagna); 'S' (South) includes the remaining ten regions of Central and Southern Italy (Tuscany, Umbria, Marche, Lazio, Abruzzo, Molise, Campania, Basilicata, Apulia, Calabria). The occurrences in the insular administrative regions of Sicily ('Si') and Sardinia ('Sa') are provided separately. Moreover, this first version of the new checklist

of Cicindelidae and Carabidae provides the occurrence (as far as it is known at present) of species in all the administrative regions of Italy. The regions include the administratively belonging minor islands.

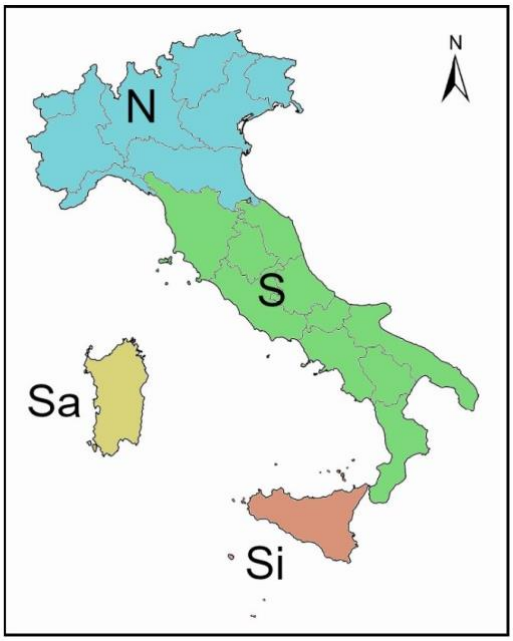

Figure 1. Study area: The Italian territory is divided into four sub-regions following the general framework of the project for a new Checklist of the Italian Fauna: N (Northern Italy: Aosta Valley, Piedmont, Lombardy, Trentino-Alto Adige, Veneto, Friuli-Venezia Giulia, Liguria, Emilia-Romagna); S (Central and Southern Italy: Tuscany, Umbria, Marche, Lazio, Abruzzo, Molise, Campania, Basilicata, Apulia, Calabria); Si (Sicily); Sa (Sardinia).

Literature data

This update is based on data published and verified distribution records until December 2024. Distribution records or nomenclatural changes were verified directly by examining and evaluating the information within each paper or source.

Data set organization

The data set is available as a simplified version in the on-line version from the LifeWatch website. In the Supplementary file (Supplementary Table S1) of this paper, 27 out of the 62 columns that are available for all animal groups are reported.

The first column is dedicated to the systematic classification of each species, from family rank to genus/subgenus, species and subspecies, including the authorship of the last two and the most common synonyms, some of which are still in use. The following six columns report the chorology of the species, its eventual status as endemic (E), and the presence in the four macro-regions. The final twenty columns report the presence of each species/subspecies (as far as it is known) in the administrative regions of Italy. To this purpose, not only published data were used (which would have illustrated a very incomplete distribution), but also data from museal and private collections and records from FEI (Forum degli Entomologi Italiani, online at http://www.entomologiitaliani.net), provided they are verified by the authors.

Data set information

Object name: Checklist of the Italian Fauna: Cicindelidae and Carabidae.

Characters encoding: Unicode (UTF-8).

Data sets citations: Casale A., Allegro G., Magrini P., Benelli A., 2021. Insecta Coleoptera Carabidae. In: Bologna M.A., Zapparoli M., Oliverio M., Minelli A., Bonato L., Cianferoni F., Stoch F. (eds.), Checklist of the Italian fauna. Version 1.0. Last update: 2021-03-31.

Format name: xml, Extensible Markup Language, for the online version at LifeWatch Italy.

Format version: 1.0

Distribution: https://dataportal.lifewatchitaly.eu/view/urn%3Auuid%3Ac1f2ab37-61e4-48e9-b3a9-15bdbf002f9d

Date of creation: November 2nd, 2020.

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Metadata language: English.

Metadata managers: Marco Bologna, Lucio Bonato, Fabio Cianferoni, Alessandro Minelli, Marco Oliverio, Fabio Stoch, Marzio Zapparoli & LifeWatch Italy.

Management details

Project title: The new Checklist of the Italian Fauna: Cicindelidae and Carabidae.

Database managers: Attilio Carapezza, Fabio Cianferoni, Franco Faraci; Marco Bologna, Lucio Bonato, Alessandro Minelli, Marco Oliverio, Fabio Stoch, Marzio Zapparoli & LifeWatch Italy.

Temporal coverage: Anything published until Dicember 2024.

Record basis: Published records in the scientific literature (distribution data implemented by author's records from collections and online web-sites).

Funding grants: No funding was specifically available for the project on Cicindelidae and Carabidae.

Geographic information

General description: The dataset includes records from Italy within its internationally recognized political borders.

Geographic units: The geographical units within Italy refer to two macro-regions and two major islands, as well as to all administrative regions as indicated in Material and methods.

Bounding box: All areas falling under Italian administration from 35° 25' to 47° 06' N and from 6° 35' to 19° 20' E (WGS84 reference system) were included.

Sampling design: We used only published data as far as systematics are concerned. Distribution data derive from published data as well as from museal and private collections and from FEI (Forum degli Entomologi Italiani, online at http://www.entomologiitaliani.net), provided they are verified by the authors.

Biogeographic region: Within the Palaearctic realm, according to the definitions of the European Environmental Agency (2017), the dataset covers three European biogeographical regions: Alpine, Continental, and Mediterranean.

Countries: Italy.

Quality control for geographic data: We checked that the published localities matched the geographical units used for the checklist at the level of administrative regions.

Literature records

General description: Only published records are included.

Literature list: The papers that provided nomenclatural changes, distribution novelties or exclusions to the previous checklists are (papers exclusively devoted to descriptions of new taxa are here not considered): Allegro (2019, 2021a, 2021b, 2023), Allegro & Biscaccianti (2024), Allegro *et* al. (2022), Bisio (1995, 2002, 2007), Bruschi (2013), Casale *et* al. (2022, 2023), Casale & Magrini (2013a, 2013b), Degiovanni (2022), Degiovanni & Magrini (2016, 2019, 2020), Degiovanni & Pavesi (2017), Delunas & Cillo (2018), Deuve (2004), Fancello et al. (2021), Giachino et al. (2024), Ledoux & Roux (2005), Leo et al. (2005), Magrini (2008, 2010, 2014a, 2014b, 2017, 2020), Magrini & Baviera (2011), Magrini & Benelli (2015), Magrini & Casale (2015, 2023), Magrini & Degiovanni (2006, 2012, 2013), Magrini & Fancello (2007, 2019), Magrini et al. (2006, 2013, 2015, 2018, 2019, 2020, 2024), Magrini & Grottolo (2017), Magrini & Landi (2017), Magrini & Onnis (2018), Magrini & Vigna Taglianti (2006), Mazzei *et al*. (2019), Monguzzi (2011), Monguzzi & Trezzi (2005), Muscarella & Pavesi (2016), Neri (2016), Neri & Magrini (2011), Neri et al. (2012), Rapuzzi & Sparacio (2012),

Sciaky & Magrini (2020), Vailati (2017), Vigna Taglianti & Magrini (2008), Wiesner (2020), Wrase (2009), Wrase & Magrini (2012), Zanella (2016, 2017, 2018).

Quality control for literature data: Only original references were considered, excluding papers reporting previously published data.

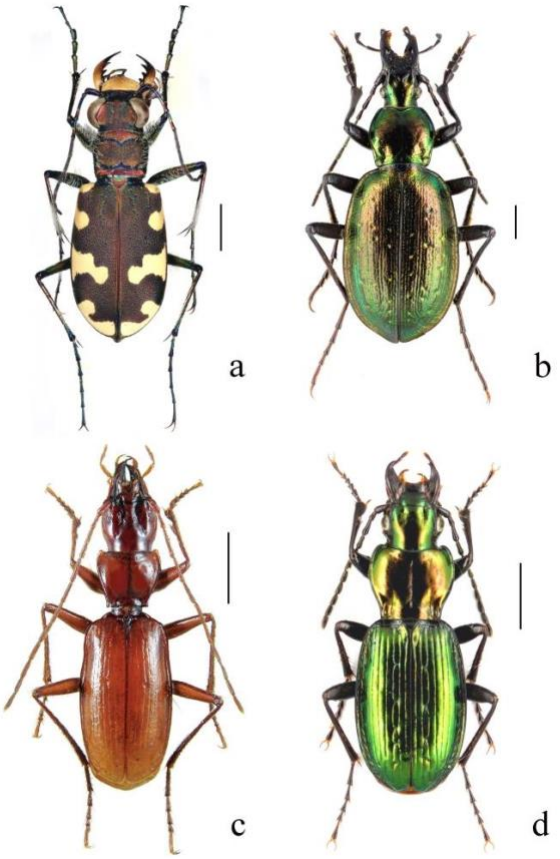

Figure 2. Examples of Italian endemic Cicindelidae and Carabidae: a) *Cicindela majalis* Mandl, 1935 (Cicindelidae); b) *Carabus cychroides* Baudi di Selve, 1860 (Carabidae, Carabinae); c) *Allegrettia pavani* C. Bari & R. Rossi, 1965 (Carabidae, Trechinae); d) *Pterostichus auratus* Heer, 1837 (Carabidae, Pterostichinae). Scale bars: 2.0 mm. Photos: (a, c) Anichtchenko et al. (eds.) 2007-2024, Carabidae of the World (Carabidae.org); (b, d) Ortwin Bleich, Coleoptera Europaea (Eurocarabidae.de).

Taxonomic information

General description: Only records reporting species or subspecies were included, disregarding records identified only at higher levels like genus, family, etc.

Taxonomic coverage: class Insecta, order Coleoptera, families Cicindelidae and Carabidae (Fig. 2).

Taxonomic rank: Only Family and Subfamily, species and subspecies are reported in this paper; the dataset reports higher taxa for each species, including Phylum, Class, Order, Family and Subfamily, Genus and Subgenus.

Taxon specialists: Achille Casale, Gianni Allegro, Paolo Magrini, Alessio Benelli.

Nomenclature: The nomenclature followed the Catalogue of Lorenz (2005, 2024).

Taxonomic remarks: This checklist mainly follows the previous one by Vigna Taglianti (2005a), introducing the numerous taxonomic and chorological updates occurred in the last 15 years. Species that were included in the previous checklists and are now considered not present in Italy, are excluded from the dataset. The most common synonyms of each taxon are also cited, in particular the recent ones, as they are still used in various contributions and catalogs.

In broad terms, the taxonomic approach was conformed to the following criteria:

1. Cicindelidae

The taxonomic approach given by Wiesner (2020) in his new checklist of world Cicindelidae is followed, in which species are not arranged into subfamilies, but only into tribes and subtribes. Several species previously considered dubious are confirmed for our fauna and some synonymies are clarified.

2. Carabidae Subfam. Carabinae

The genera *Calosoma* and *Cychrus* have not undergone any particular changes over time, apart from some discussions regarding the specific validity of *C. auropunctatum* compared to *C. maderae* (see Bruschi 2013). In the present list, pending further investigation, the two taxa are still maintained as distinct species.

The treatment of the genus *Carabus*, which includes several endemic species of the Italian fauna, here broadly follows the one

proposed by Casale et al. (1982), with some important modifications (changes of subgenera) proposed by Deuve (2004).

It should also be noted that numerous "weak subspecies" ("natio" or "morphae" in the sense of Breuning) have not been cited or accepted, partly already cited by Deuve, 2004, or recently proposed by Cavazzuti & Ghiretti (2020), Rapuzzi et al. (2022), Rapuzzi & Sparacio (2015) and Deuve (2023), which can be assimilated, in our opinion, to more or less differentiated but not geographically defined local populations.

3. Carabidae Subfam. Nebriinae

The treatment of the genus *Nebria* has been modified in accordance with the monographic work by Ledoux & Roux (2005), which treats the genus as a monophyletic unit assimilable to a single genus. This approach seems to be confirmed by molecular phylogenetic data currently being developed (Kavanaugh in litteris). Therefore, all taxa treated as distinct genera in the above-mentioned checklist by Vigna Taglianti (2005) are here considered at the level of subgenus of *Nebria*, with the exclusion of *Eurynebria*.

4. Carabidae Subfam. Scaritinae

It is worth highlighting the great increase in taxa within Clivinini Reicheiina, with the discovery and description of numerous species of *Typhloreicheia*, all endemic to Italy and many to the islands of Sardinia and Sicily (see Casale 2009), and the institution of two new genera for two of them (see Magrini et al. 2019).

5. Carabidae Subfam. Trechinae

Within the tribe Trechini, a significant increase in new hypogean species, all endemic to Italy, is recorded in the genera *Duvalius*, *Boldoriella*, *Allegrettia* and *Orotrechus*, with few shifts in specific or subspecific status. We also report the description of a new phylogenetically isolated genus (*Cimbrodytes*) from the Venetian Prealps (Piva 2021).

The genus *Trechus* has been treated in accordance with the recent contribution by Degiovanni & Magrini (2019). On the other hand, the division into genera and subgenera proposed by Donabauer (2019) is not accepted, based on molecular phylogenetic data that in our opinion are not correctly interpreted.

As regards the nomenclature of the Bembidiini Bembidiina (Bembidion sensu lato Auctorum), the checklist of the recent contribution by Neri et al. (2011) with subsequent updates (Neri et al. 2013) was considered as a basis.

6. Carabidae Subfam. Pterostichinae

Within this subfamily, apart from some recent synonymies (see Degiovanni & Pavesi 2017), re-evaluation of species previously considered as synonyms (see Allegro 2021) and addition of new to Italy or unpublished species (see Magrini et al. 2013; Monzini 2016), the most significant changes concern the nomenclature of very well-known species of the genus *Abax* (see Zanella 2016, 2017).

7. Carabidae Subfam. Platyninae

The only significant changes concern the genera *Platynus*, within which several species have been distinguished on a morphometric basis (Roggero et al. 2023), and *Platyderus*, with the Italian species revised by Magrini & Casale (2023) and descriptions of two new taxa.

8. Carabidae Subfam. Harpalinae

A new species of the genus *Amblystomus* (Wrase & Magrini 2012) has been described from Sardinia. Moreover, some taxonomic adjustments within the genus *Harpalus* (see Kataev 2013, Zanella 2023) are reported.

9. Carabidae Subfam. Lebiinae

It is worth mentioning the discovery of a new species in the south-western Alps (Allegro et al. 2015) and the confirmation of *Lebia nigricollis*, a very rare species endemic of Sardinia, as a valid species (Casale et al. 2021).

10. Carabidae Subfam. Dryptinae

The only significant change concerns the record in Sardinia of a species new to Italy (Degiovanni & Rattu 2021).

Quality control for taxonomic data: Taxonomic data were checked and updated to include revision of names, synonyms, delimitation of genera and higher taxa.

RESULTS

According to the adopted systematic arrangement, the new checklist records, at specific + subspecific rank, 1688 taxa of Cicindelidae and Carabidae, corresponding to 1442 species. Carabidae are arranged in 27 subfamilies. The distribution of taxa and of endemic species in the supra-generic ranks is summarized in Table 1. The complete list of the taxa (species + subspecies) of Cicindelidae and Carabidae recorded from the Italian political territory, with their systematic classification from family rank to genus/subgenus, including the authorship and the most common synonyms, and with the chorology of the species, their eventual status as endemic (E), the presence in the four macro-regions and the presence in the administrative regions of Italy is reported in Supplementary Table S1.

Table 1. Number of Italian taxa (species + subspecies / species) within Cicindelidae and within the different Subfamilies of Carabidae, as well as number of endemic Italian species within Subfamilies, with relative frequency within their own Subfamily and on total endemic species.

Family	Subfamily	species + subspecies n.	species n.	endemic species n.	Endemic in Subfamily %	Endemic on total %
Cicindelidae		31	18	1	5.56	0.22
Carabidae	Rhysodinae	3	3	0	0.00	0.00
Carabidae	Paussinae	1	1	0	0.00	0.00
Carabidae	Carabinae	101	68	9	13.24	1.98
Carabidae	Nebriinae	80	66	16	24.24	3.52
Carabidae	Omophroninae	2	2	0	0.00	0.00
Carabidae	Elaphrinae	6	6	0	0.00	0.00
Carabidae	Loricerinae	1	1	0	0.00	0.00
Carabidae	Siagoninae	1	1	0	0.00	0.00
Carabidae	Scaritinae	152	142	98	69.01	21.59
Carabidae	Apotominae	3	3	0	0.00	0.00
Carabidae	Broscinae	6	5	2	40.00	0.44
Carabidae	Psydrinae	1	1	0	0.00	0.00
Carabidae	Trechinae	586	475	241	50.74	53.08
Carabidae	Patrobinae	4	3	1	33.33	0.22
Carabidae	Perigoninae	1	1	0	0.00	0.00
Carabidae	Platyninae	118	111	25	22.52	5.51
Carabidae	Pterostichinae	246	206	46	22.33	10.13
Carabidae	Harpalinae	187	182	3	1.65	0.66
Carabidae	Licininae	16	16	2	12.50	0.44
Carabidae	Panagaeinae	2	2	0	0.00	0.00
Carabidae	Chlaeniinae	17	17	1	5.88	0.22
Carabidae	Oodinae	2	2	0	0.00	0.00
Carabidae	Odacanthinae	1	1	0	0.00	0.00
Carabidae	Cyclosominae	4	3	0	0.00	0.00
Carabidae	Lebiinae	87	78	7	8.97	1.54
Carabidae	Dryptinae	11	10	1	10.00	0.22
Carabidae	Brachininae	18	18	1	5.56	0.22
		1688	1442	454	31.50	100.00

The total number of taxa (species + subspecies) in each of the four macro-regions is the following: N 1152, S 791, Si 449, Sa 407. The distribution of taxa in each administrative region is detailed in Figure 3. Four large regions from the Northern Country (Piedmont, Lombardy, Veneto and Friuli Venezia Giulia) are the richest in taxa. Molise is only apparently very poor of species due to scarcity of available data.

A Cluster Analysis was perfomed, according to the Bray-Curtis Method, based on tha data of presence/absence of species/subspecies in each administrative region, to evaluate their faunistic similarities. The resulting dendrogram is reported in Figure 4. Three main clusters including the regions showing major faunistic similarities can be observed: the cluster of the islands of Sicily and Sardinia, the cluster of the northern regions and the cluster of the central-southern regions (Molise very likely forms a separate group just on account of scarcity of available data). The highest similarities occur between some geographically neighboring regions such as Toscana and Emilia-Romagna, Calabria and Basilicata, Veneto and Friuli Venezia Giulia.

The distribution of the corotypes of the Italian species of Cicidelidae and Carabidae is illustrated in Figure 5. The broadly distributed species are predominant for 50% (Holarctic + European); Mediterranean species account for 17%; Afrotropical species are very poorly represented.

The presence of endemic species is quite relevant: a total of 454 species is currently considered endemic to the Italian territory, corresponding to 31.5% of recorded species. The overwhelming majority of endemic species belongs to the subfamilies Trechinae and Scaritinae, respectively accounting for 53.1% and 21.6% of all endemic species; they also account for 50.7% and 69.0% of total number of species within their respective subfamilies (Tab. 1). Alpine+Apenninic corotypes account for 74%, Sardinian+Sicilian for the remaining 26%. The distribution of the endemic species is detailed in Figure 6.

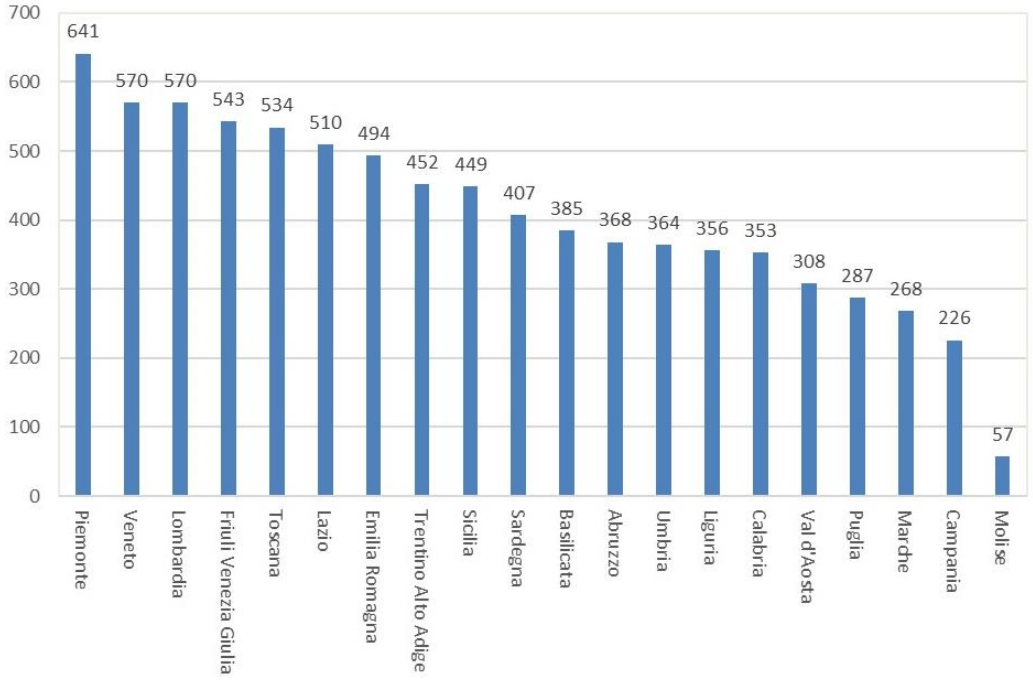

Figure 3. Distribution of taxa (number of species + subspecies) of Cicindelidae and Carabidae in the Italian administrative regions.

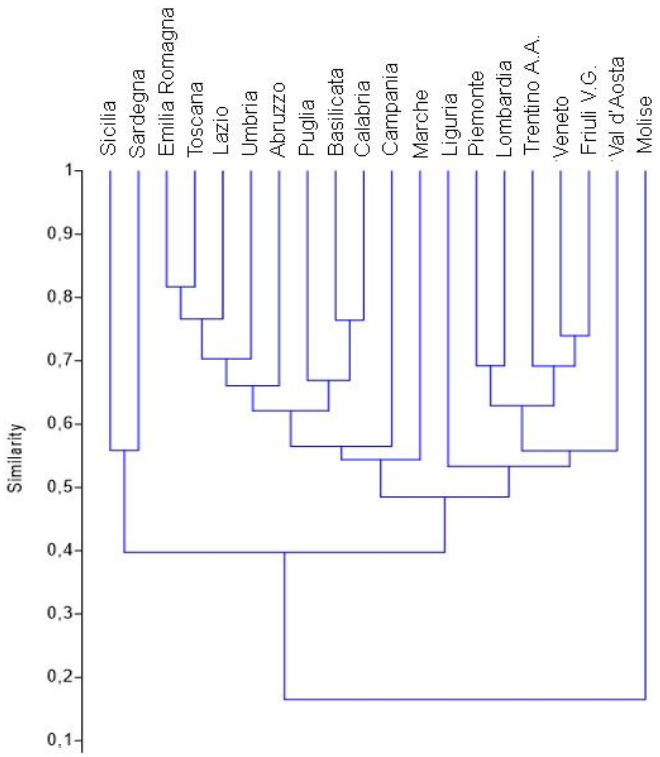

Figure 4. Dendrogram of faunistic similarities of the Italian administrative regions (Cluster Analysis according to the Bray-Curtis Method) based on tha data of presence/absence of spe-cies + subspecies of Cicindelidae and Carabidae.

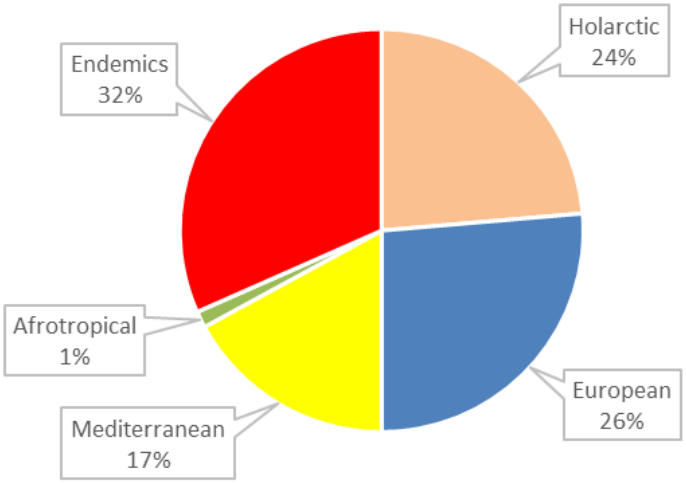

Figure 5. Distribution of the corotypes of the Italian species of Cicindelidae and Carabidae.

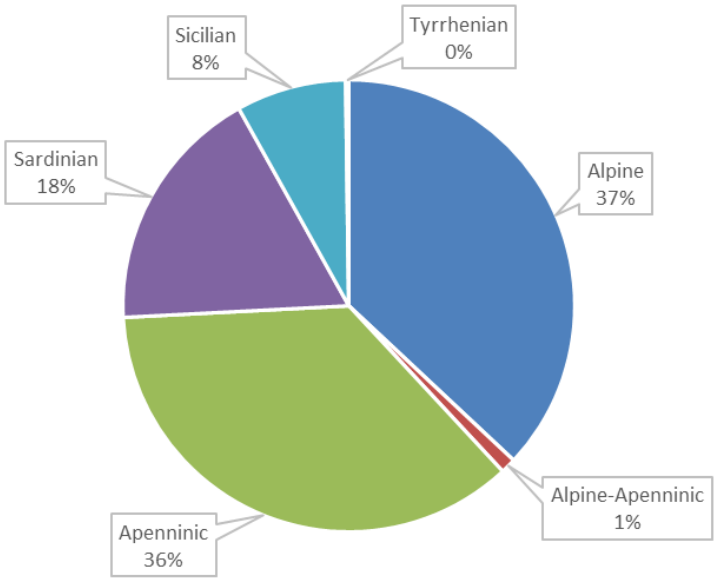

Figure 6. Distribution of the endemic corotypes of the Italian species of Cicindelidae and Carabidae.

In Italy 4 species with subcosmopolitan diffusion were probably introduced following human activities (*Polyderis brevicornis*, *Trechicus nigriceps*, *Somotrichus elevatus*, *Plochionus pallens*).

On March 2025, *Carabus cychroides* was added to the Red List of threatened species of the International Union for Conservation of Nature (IUCN) in the Endangered category (risk of extinction). *Carabus olympiae* is cited in Direttiva 'Habitat' (92/43/CEE) as animal species of Community interest, requiring a strict protection (Attachments II and IV); it is also protected by the Bern Convention on the Conservation of European Wildlife and Natural Habitats.A few species are protected at local level by regional laws (L.R.): e.g., *Carabus olympiae* by L.R. 2 novembre 1982, n. 32, of Piemonte Region; *Carabus morbillosus* and *Carabus clatratus* by L.R. 06.04.2000, n. 56, of Toscana Region; *Carabus italicus* and *Carabus cavernosus* by L.R. 7 settembre 1993, n. 50, of Abruzzo Region; and some other more.

DISCUSSION

Compared to the last published checklist (Vigna Taglianti 2005a), the number of Cicindelid and Carabid species recorded from the Italian political territory has increased from 1313 to 1442, mainly due to the numerous newly discovered species mostly in the Subfamilies Trechinae and Scaritinae. Further descriptions of new species are expected to be published in a near future.

No significant changes in the composition of Carabid Italian fauna can be attributed, at present, to global warming, but the species with restricted distribution areas, the species living at high altitude as well as the sensitive ones with narrow environmental tolerances (stenoecious species) can be considered as threatened of local extinction by the climate change in progress (cfr. Casale & Busato 2007, Gobbi 2020).

Italian Cicindelidae and Carabidae account for about 50% of total species number recorded from Europe (Vigna Taglianti, 2005b), thus confirming the important role of Italy as biodiversity hotspot in the European and Mediterranean areas.

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