



Research Article

Mammals of Italy: an annotated checklist

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Abstract

Checklists represent a basic tool for conservation and management of regional faunas. However, our knowledge on species composition in a territory changes over time due to species movements across borders, extinctions, introductions, as well as to new taxonomic evidence. We aimed to provide the most updated data on native and non-native species of mammals occurring, or that used to occur until recently, on the Italian political territory and seas. The checklist only includes species whose taxonomic status was explicitly agreed in the most recent peer-reviewed literature and based on the most updated taxonomic approaches. For each species, we provided the following information: scientific and common name, global and Italian range, relevant information for management and conservation (e.g. whether it is endemic, allochthonous, or listed in international regulations and red list assessments), as well as remarks on taxonomy and distribution. This new check list of Italian mammal fauna includes nine marine and 114 terrestrial species, belonging to seven orders (Erinaceomorpha, Soricomorpha, Chiroptera, Carnivora, Cetartiodactyla, Rodentia, Lagomorpha), and 28 families. Vespertilionidae represents the richest family (n=27 species), followed by Cricetidae (n=12) and Soricidae (n=11). The list includes 15–16 allochthonous species. Considering the relative small size of the country, Italy is confirmed as a hotspot of mammal diversity in Europe, hosting the highest species richness in relation to the total area.

Introduction

Checklists represent a basic tool for conservation and management of regional faunas, as they are used to implement regional red lists and atlases, and to prioritize management and conservation strategies (Tenquist and Charleston, 2001; Kéry et al., 2010; Bencatel et al., 2018; Gippoliti and Groves, 2018). The unique position of the Italian peninsula, lying in the middle of the Mediterranean Sea and set between the Balkan and the Iberian peninsulas, led to a biogeographic combination

of faunal assemblages, including many elements from the neighboring bioregions and endemic taxa (Feliner, 2011). Moreover, the wide latitudinal and altitudinal ranges, the high numbers of islands and islets, and the ancient and complex human colonization history (Palombo and Mussi, 2006) produced a high diversity of natural habitats and human-modified landscapes, from coastal dunes to high Alpine and Apennine mountains. Such environmental diversification is pivotal in promoting and maintaining one of the most biodiverse animal communities among European countries (Blasi et al., 2007), including a rich mammalian assemblage (Gippoliti and Amori, 2002). Checklists of Italian mammals have been published at regular intervals since 1990s (Amori et al., 1993, 1997, 1999; Angelici et al., 2009a; Carpaneto and Vigna Taglianti, 2009; Gippoliti, 2013), while detailed information on species occurrence has been provided in four volumes of the book series "Fauna d'Italia" (Italian fauna) (Boitani et al., 2003; Amori et al., 2008; Lanza, 2012; Cagnolaro et al., 2015). However, checklists deserve regular updating, due to species extinctions and expansion, introduction of alien species, as well as to new taxonomic evidence and phylogenetic rela-

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tionships among populations and taxa (subspecies upgrading or species downgrading) (Mignone et al., 2001; Lapini et al., 2018; Yusefi et al., 2019). Given the relevance of Italian mammal fauna both in terms of numbers and uniqueness of species, we aimed to provide the most updated data on native and non-native species of mammals occurring on the Italian political territory and seas.

Methods and criteria

The checklist includes all native and non-native species of mammals known to regularly occur on the Italian political territory and seas. For native species we also include recently extinct species that used to regularly occur in Italy. Feral populations of domestic taxa are not considered in this list. As an example these include goats inhabiting several minor islands, Asinara donkeys, and Giara horses (Kugler and Broxham, 2014). We consider all species that meet one of the following conditions: documented reproduction in nature during the previous five years for terrestrial species, and constant presence in the Italian seas in the previous 20 years for marine species (Cagnolaro et al., 2015). More specifically, for marine mammals (formerly included in Cetacea and now in the Cetartiodactyla) we consider species that occur regularly in the Italian seas according to the biogeographical sectors adopted by SIBM (Società Italiana di Biologia Marina — Italian Society of Marine Biology). Terrestrial species occurring occasionally in the Italian territory, and marine species occurring irregularly, rarely, or accidentally in the Italian seas, but regularly in the Mediterranean Sea (cf. Cagnolaro et al., 2015) are reported in a separate paragraph.

Given the inherent complexity of species concepts (Zachos, 2016), and the difficulties of applying a unique concept to all animal clades, the checklist includes all acknowledged taxa whose proposed taxonomy has been accepted through the peer-reviewed literature based on the most updated taxonomic approaches, such as integrative taxonomy (Hebert et al., 2003; Fujita et al., 2012). Specifically, whenever data are available we adopted species taxonomy based on the following criteria: (1) presence of heterozygous genetic markers delimiting areas of recombination that identify populations with or without gene flow (biological species concept, Flot et al., 2010); (2) presence of supported taxonomic units that match the expectations of differential evolutionary, population genetics, and phylogenetic processes within and between species (Fujisawa and Barraclough, 2013; Zhang et al., 2013); (3) use of Bayesian models to understand genealogical processes to identify species (Yang and Rannala, 2014); (4) presence of chromosomal differences, which may be directly involved in the reproductive isolation between populations (meiotic aberrations in hybrids or recombination suppression associated to chromosomal heterozygosity; Baker and Bradley, 2006; Pavlova and Searle, 2018). For instance, some of these criteria allowed researchers to recently confirm the species rank of clearly divergent taxa like the Calabrian black squirrel *Sciurus meridionalis* (Wauters et al., 2017) and Calabrian forest dormouse *Dryomys aspromontis* (Bisconti et al., 2018), or unveil new cryptic species from complex systems like *Myotis nattereri* (Çoraman et al., 2019) and *Muscardinus avellanarius* (Mouton et al., 2017).

For each species, we provide the following information: scientific and common names, both in English and Italian, type locality, brief description of global and Italian ranges, and remarks on taxonomy and distribution. We here list the criteria that are adopted for each provided piece of information.

Nomenclature. We use the most updated and widely agreed taxonomical nomenclature. As an example, based on O’Leary (2001), we adopt Cetartiodactyla as the name of the order including the former Cetacea and Artiodactyla. In case of controversial taxonomic names the most conservative option is adopted (i.e. as provided by Boitani et al., 2003; Amori et al., 2008; Lanza, 2012; Cagnolaro et al., 2015). As common English names we adopt those provided in the IUCN red list (www.iucnredlist.org) or Wilson and Reeder (2005). For Italian names we refer to Amori et al. (1999); Boitani et al. (2003); Amori et al. (2008); Lanza (2012); Cagnolaro et al. (2015).

Geography. Following Amori and Castiglia (2018) we report whether native taxa are endemic (ranges completely included within

the Italian borders), or near-endemic (only a small portion of the range falling outside the Italian border). For non-native species (allochthonous) we indicate whether they were introduced respectively before or after 1500 A.D. (ancient and recent introductions, respectively). This threshold is mentioned only for the purpose of the Italian legislation (Decreto Ministero Ambiente, 19 January 2015), which indicates different management options for species introduced before or after 1500 CE. However, we are aware that this benchmark has no biogeographical nor conservational meaning. For allochthonous taxa we report the native global range and the invaded range in Italy. World distribution is mainly based on Wilson and Reeder (2005); Wilson and Mittermeier (2009, 2011, 2014, 2018); Wilson et al. (2016, 2017), and IUCN red list (iucnredlist.org), unless a more recent update is available (e.g. Sciberas et al., 2012). Italian ranges are assigned based on the Italian fauna book series (“Fauna d’Italia”) (Boitani et al., 2003; Amori et al., 2008; Lanza, 2012; Cagnolaro et al., 2015), unless more recent updates are available (e.g. Lapini et al., 2014, 2015; Dondini et al., 2014; Notarbartolo di Sciara et al., 2016).

Finally, we provide supplementary material with the list of species and details on European and international regulations (CITES, Habitats Directive 92/43/CE and EU Regulation 1143/2014), and extinction risk at both country and global level (Red List status based respectively on Rondinini et al., 2013 and iucnredlist.org).

ERINACEOMORPHA Gregory, 1910

ERINACEIDAE G. Fischer, 1814

Erinaceus europaeus Linnaeus, 1758

English common name: Western European hedgehog

Italian common name: Riccio europeo

Type locality: S. Gothland Island, Sweden

Distribution

World: Europe, from the British Isles and the Iberian Peninsula, westwards through much of Western to Central Europe. It is present on the Azores and a number of Mediterranean islands.

Italy: Continental Italy, Sicily, Sardinia, and other small islands.

Remarks: The Sicilian population was described by Barrett-Hamilton (1900) as an endemic subspecies, *E. europaeus consolei* Barrett-Hamilton, 1900, but Wettstein (1942) cited the same taxon also for Calabria, and showed genetic differences from peninsular clades, with some connection with the Iberian populations (Santucci et al., 1998; Seddon et al., 2001). Further investigations both at the genetic and morphological level are needed to clarify the taxonomic status of the Sicilian populations.

Erinaceus roumanicus Barrett-Hamilton, 1900

English common name: Northern white-breasted hedgehog

Italian common name: Riccio orientale

Type locality: Gageni, Prahova, Romania

Distribution

World: Central and Eastern Europe, from Slovenia to Balkan countries, Greece, Russia, Ukraine, Northern Caucasus, and the island of Crete.

Italy: North-Eastern Italy (Trentino-Alto Adige and Friuli-Venezia Giulia).

SORICOMORPHA Gregory, 1910

SORICIDAE G. Fischer, 1814

Crocidura leucodon (Hermann, 1780)

English common name: Bicolored shrew

Italian common name: Crocidura ventrebianco

Type locality: near Strasbourg, Bas Rhyn, France

Distribution

World: From Europe to Russia, Caucasus and South-Western Asia, Lesbos Island (Aegean Sea). Absent from the Iberian Peninsula and Southern France.

Italy: Continental Italy.

Crocidura pachyura (Küster, 1835)

English common name: Mediterranean shrew

Italian common name: Crocidura mediterranea

Type locality: Cagliari, Sardinia, Italy

Distribution

World: North-Eastern Africa and Italy.

Italy: Sardinia and Pantelleria islands.

Remarks: Based on morphological analyses *Sorex pachyurus* Küster, 1835 is to be referred to *Crocidura* (contoli et al., 2004; Turni et al., 2007). Therefore, the name *C. pachyura* has priority over *C. ichnusae* Festa, 1912. A mtDNA based phylogeography analysis suggested that the Sardinian population should be attributed to *C. pachyura*, together with populations from Eastern Algeria, Tunisia, Ibiza and Pantelleria islands (Cosson et al., 2005).

Crocidura sicula Miller, 1900

English common name: Sicilian shrew

Italian common name: Crocidura di Sicilia

Type locality: Palermo, Sicily, Italy

Distribution

World: Sicily and Maltese archipelago.

Italy: Sicily and surrounding small islands (Egadi: Marettimo, Favignana, and Levanzo; Ustica).

Remarks: Sicilian near-endemic. A melanic population is found in the isle of Ustica (Sarà et al., 1997).

Crocidura suaveolens (Pallas, 1811)

English common name: Lesser shrew

Italian common name: Crocidura minore

Type locality: near Sevastopol, Khersones, Crimea, Russia

Distribution

World: From Spain to Russia.

Italy: Continental Italy, Elba Island, and some other small islands.

Remarks: Recent karyotype and DNA data suggested *C. suaveolens* represents a species complex Burgin and He (2018). According to these authors in Western and Central Europe occurs *C. gueldenstaedtii* (Pallas, 1811), and in Italy there should be *C. gueldenstaedtii mimula* Miller 1901. However, more investigations are needed to clarify the taxonomy of European and Italian populations (cf. Gippoliti, 2013).

Neomys fodiens (Pennant, 1771)

English common name: Eurasian water shrew

Italian common name: Toporagno acquatico

Type locality: Berlin, Germany

Distribution

World: From Europe to Russia and China.

Italy: Italian peninsula.

Remarks: Genetically, the Calabrian population is allied to the Pyrenean population and distinct from all other European populations (Castiglia et al., 2007). More investigations are needed to clarify the systematic status of the Calabrian population.

Neomys milleri Mottaz, 1907

English common name: Miller's water shrew

Italian common name: Toporagno acquatico di Miller

Type locality: Chesières, Alpes Vaudoises, Switzerland

Distribution

World: Europe (excluding the Iberian Peninsula) and South-Western Asia.

Italy: Continental Italy.

Remarks: Molecular phylogenetics by Igea et al. (2015) suggested that the species *Neomys anomalus* Cabrera, 1907 is restricted to the Iberian Peninsula, whereas *N. milleri* occurs in the rest of the range.

Sorex alpinus Schinz, 1837

English common name: Alpine shrew

Italian common name: Toporagno alpino

Type locality: St. Gotthard Pass, Uri Canton, Switzerland

Distribution

World: Disjunct range in various mountain regions of Central Europe.

Italy: Northern Italy (Alps).

Sorex antinorii Bonaparte, 1840

English common name: Valais shrew

Italian common name: Toporagno del Vallese

Type locality: not given; restricted to Northern Italy, lake Lugano, Porlezza by Lehmann (1963)

Distribution

World: South-Eastern France, Southern Switzerland, and Italy.

Italy: Italian peninsula.

Remarks: Italian near-endemic.

Sorex minutus Linnaeus, 1766

English common name: Eurasian pygmy shrew

Italian common name: Toporagno nano

Type locality: Barnaul, Western Siberia, Russia

Distribution

World: Continental Europe, European Russia and Siberia. The northernmost limit of its range extends beyond the Arctic Circle.

Italy: Italian peninsula.

Remarks: The peninsular populations appear genetically and morphologically different from the Central European ones. Furthermore, the southernmost population (*S. m. lucanius* Miller, 1909) is morphologically distinct for the shape of the lower jaw (Bilton et al., 1998; Mascheretti et al., 2003; Vega et al., 2010). More investigations are thus needed to assess the status of this taxon.

Sorex samniticus Altobello, 1926

English common name: Apennine shrew

Italian common name: Toporagno appenninico

Type locality: Campobasso province, Molise, Italy

Distribution

World: Italy.

Italy: Italian peninsula.

Remarks: Italian endemic.

Suncus etruscus (Savi, 1822)

English common name: Pygmy white-toothed shrew

Italian common name: Mustiolo

Type locality: Pisa, Tuscany, Italy

Distribution

World: South-Western Europe and Northern Africa; from South-Western Asia to China including India and Sri Lanka.

Italy: Italian peninsula, Sicily, Sardinia, Elba, and other small islands.

TALPIDAE Gray, 1835

Talpa caeca Savi, 1822

English common name: Blind mole

Italian common name: Talpa cieca

Type locality: Apennines near Pisa, Tuscany, Italy

Distribution

World: Southern Europe (Balkans, Greece, Italy).

Italy: Continental Italy.

Remarks: The Italian populations belong to the endemic nominal subspecies *T. c. caeca*, showing chromosomal differences in autosomal fundamental number (Nfa) respect to the Balkan subspecies *T. c. herzegoviniensis* Bolkay, 1925 (respectively Nfa=66 and Nfa=64). The two subspecies occur in disjunct ranges, with a gap between North-Eastern Italy and Slovenia. The estimated time of divergence of these two lineages were estimated to be close to the maximum limit for intraspecific divergence (Colangelo et al., 2010; Bannikova et al., 2015). More investigations, both at the genetic and morphological level, are needed to assess the taxonomic status of the two taxa (Amori et al., 2008).

Talpa europaea Linnaeus, 1758

English common name: Common mole

Italian common name: Talpa europea

Type locality: Engelholm, Kristianstad, Sweden

Distribution

World: Temperate Europe, from Britain and France eastwards through much of continental Europe to the rivers Ob and Irtysh Rivers (Asian Russia).

Italy: Northern and Central Italy.

Remarks: The Italian population showed a marked genetic and morphological divergence from Central European populations, likely due to isolation during glacial periods (Loy and Corti, 1996; Feuda et al., 2015; Bannikova et al., 2015).

Talpa romana Thomas, 1902

English common name: Roman mole

Italian common name: Talpa romana

Type locality: Ostia, near Rome, Latium, Italy

Distribution

World: Italy.

Italy: Southern and Central Italy.

Remarks: Italian endemic. In addition, biochemical and molecular analyses evidenced a clear distinction of the Calabrian populations from the others (Canestrelli et al., 2010).

CHIROPTERA Blumenbach, 1779

MINIOPTERIDAE Dobson, 1875

Miniopterus schreibersii (Kuhl, 1817)

English common name: Common bent-wing bat

Italian common name: Miniottero

Type locality: Kolumbacs Cave (=Kulmbazer Cave =Columbazar Cave), near Coronini, Banat, Mountains of Banat, Romania

Distribution

World: From Southern Europe to India, China and Japan; also present in Africa.

Italy: Continental Italy, Sicily, Sardinia, and other small islands.

MOLOSSIDAE Gervais, 1856

Tadarida teniotis (Rafinesque, 1814)

English common name: European free-tailed bat

Italian common name: Molosso di Cestoni

Type locality: Sicily, Italy

Distribution

World: Palaearctic distribution, with the South-Eastern portion of the range extending into the Indomalayan region. Widely distributed throughout the Mediterranean basin, including the Mediterranean islands and archipelagos.

Italy: Continental Italy, Sicily, Sardinia, and other small islands.

RHINOLOPHIDAE Gray, 1825

Rhinolophus euryale Blasius, 1853

English common name: Mediterranean horseshoe bat

Italian common name: Rinolofo euriale

Type locality: Milan, Lombardy, Italy

Distribution

World: Northern Africa, Europe, South-Western Asia, Iraq.

Italy: Continental Italy, Sicily, Sardinia, and Montecristo island.

Rhinolophus ferrumequinum (Schreber, 1774)

English common name: Greater horseshoe bat

Italian common name: Rinolofo maggiore

Type locality: Bourgogne, France

Distribution

World: Palaearctic.

Italy: Continental Italy, Sicily, Sardinia, and other small islands.

Rhinolophus hipposideros (Bechstein, 1799)

English common name: Lesser horseshoe bat

Italian common name: Rinolofo minore

Type locality: France

Distribution

World: Europe, Mediterranean basin, Central Asia (Kashmir).

Italy: Continental Italy, Sicily, Sardinia and some small islands.

Rhinolophus mehelyi Matschie, 1901

English common name: Mehely's horseshoe bat

Italian common name: Rinolofo di Mehely

Type locality: Bucharest, Romania

Distribution

World: Mediterranean basin, East to Iran, with northernmost records in North-Western France.

Italy: Sardinia, Sicily, and Apulia.

Remarks: Recently observed in Southern Italy (one record from Apulia) after many years without any record (Dondini et al., 2014).

VESPERTILIONIDAE Gray, 1821

Barbastella barbastellus (Schreber, 1774)

English common name: Barbastelle bat

Italian common name: Barbastello

Type locality: Bourgogne, France

Distribution

World: Central and Southern Europe, Caucasus, Anatolia, Morocco, and Canary Islands.

Italy: Continental Italy, Sicily, Sardinia, and Capri island.

Eptesicus nilssonii (Keyserling and Blasius, 1839)

English common name: Northern bat

Italian common name: Serotino di Nilsson

Type locality: Sweden

Distribution

World: From Central-Eastern Europe to China and Eastern Russia; North up to Norway.

Italy: Northern Italy.

Remarks: Known for the Alps and Prealps (Lapini et al., 2015).

Eptesicus serotinus (Schreber, 1774)

English common name: Serotine

Italian common name: Serotino comune

Type locality: France

Distribution

World: Europe to South-Western Asia and China.

Italy: Continental Italy, Sicily, Sardinia, and some small islands.

Hypsugo savii (Bonaparte, 1837)

English common name: Savi's pipistrelle

Italian common name: Pipistrello di Savi

Type locality: Pisa, Tuscany, Italy

Distribution

World: From Southern Europe to Northern Africa and South-Western Asia.

Italy: Continental Italy, Sicily, Sardinia, and other small islands.

Remarks: Some populations from Northern Africa, the Canary Islands, Sicily, Sardinia, and Montecristo possibly belong to the cryptic taxon *H. darwini* Toemes, 1859 (Veith et al., 2011; Dondini et al., 2016).

Myotis alcaethoe von Helversen and Heller, 2001

English common name: Alcaethoe whiskered bat

Italian common name: Vespertilio di Alcaethoe

Type locality: Over Fournikos Potamos stream, 39°5' N 21°49' E, near the village of Kleistos, Nomos Evritanias, Greece

Distribution

World: Endemic to Central and Southern Europe.

Italy: Based on evidence so far available (Galimberti et al., 2012), the species is probably present in the entire country, possibly rarer than the whiskered bat *Myotis mystacinus*.

Remarks: This taxon is one of the sibling species belonging to the "*M. mystacinus*" complex, along with *M. mystacinus sensu stricto* and *M. brandtii* (von Helversen et al., 2001). Morphological identification of these taxa may be difficult, so that a fully confident discrimination warrants molecular analysis. For this reason, the distribution currently known for Italy is at best, incomplete.

Myotis bechsteinii (Kuhl, 1817)

English common name: Bechstein's bat

Italian common name: Vespertilio di Bechstein

Type locality: Hanau, Hessen, Germany

Distribution

World: Europe, with the exception of the Scandinavian Peninsula.

Italy: Continental Italy and Sicily.

Myotis blythii (Tomes, 1857)

English common name: Lesser mouse-eared bat

Italian common name: Vespertilio minore

Type locality: Nasirabad, Rajasthan, India

Distribution

World: Southern Europe, Caucasus, South-Western Asia, India, and China.

Italy: Continental Italy.

Myotis brandtii (Eversmann, 1845)

English common name: Brandt's bat

Italian common name: Vespertilio di Brandt

Type locality: Foothills of the Ural Mountains. Spasskoie, Bolshoi-ik River, S. Ural, Orenburgsk. Obl., Russia

Distribution

World: Central and Eastern Europe, East to China and Japan.

Italy: Difficult to tell apart from the other cryptic species (*M. mystacinus*, *M. alcaethoe*) of the "*M. mystacinus* complex". As a consequence, the range in the country may be underestimated. Possibly present in the whole Italian peninsula, but confirmed records are scattered.

Remarks: This taxon forms a cryptic species complex with *M. alcaethoe* and *M. mystacinus*, (von Helversen et al., 2001), whose reliable discrimination requires molecular investigations.

***Myotis capaccinii* (Bonaparte, 1827)**

English common name: Long-fingered bat

Italian common name: Vespertilio di Capaccini

Type locality: Sicily, Italy

Distribution

World: Mediterranean basin, Southern Europe and South-Western Asia.

Italy: Continental Italy, Sicily, and Sardinia.

***Myotis crypticus* (Juste, Ruedi, Puechmaille, Salicini, Ibáñez, 2018)**

English common name: Cryptic bat

Italian common name: not available

Type locality: Cueva Serratico, El Rasillo, Spain

Distribution

World: Spain, France, and Italy.

Italy: Continental Italy.

Remarks: Recently described based on molecular and morphological evidence (Juste et al., 2018), and formerly identified as “*Myotis* sp. A” within the *Myotis nattereri* complex (Salicini et al., 2011). The populations from Southern Italy and Sicily may represent a separate species (formerly known as subclade “*Myotis* sp. C”) (Çoraman et al., 2019).

***Myotis daubentonii* (Kuhl, 1817)**

English common name: Daubenton’s bat

Italian common name: Vespertilio di Daubenton

Type locality: Hanau, Hessen, Germany

Distribution

World: Europe (with the exception of Northern Scandinavia), Central Asia, East to China and Japan.

Italy: Continental Italy, Sicily, and Sardinia.

***Myotis emarginatus* (E. Geoffroy, 1806)**

English common name: Geoffroy’s bat

Italian common name: Vespertilio smarginato

Type locality: Charlemont, Givet, Ardennes, France

Distribution

World: Europe, North-Western Africa, East to South-Western Asia.

Italy: Continental Italy, Sicily, Sardinia, and Elba Island.

***Myotis myotis* (Borkhausen, 1797)**

English common name: Greater mouse-eared bat

Italian common name: Vespertilio maggiore

Type locality: Turingia, Germany

Distribution

World: Europe, with the exception of the Scandinavian Peninsula. East to Anatolia and South-Western Asia.

Italy: Continental Italy, Sicily, Sardinia, Lampedusa, Capri, and Elba islands.

***Myotis mystacinus* (Kuhl, 1817)**

English common name: Whiskered bat

Italian common name: Vespertilio mustacchino

Type locality: Germany

Distribution

World: Europe, East to Central Asia and China.

Italy: Continental Italy, Sicily, and Sardinia.

Remarks: This taxon forms a cryptic species complex with *M. alcaethoe* and *M. brandtii*, (von Helversen et al., 2001) whose reliable discrimination requires molecular investigations.

***Myotis punicus* Felten, Spitzenberger and Storch, 1977**

English common name: Maghreb mouse-eared bat

Italian common name: Vespertilio magrebino

Type locality: El Haouaria Cave, Cap Bon, Tunisia

Distribution

World: Mediterranean basin.

Italy: Sardinia and Sicily.

***Nyctalus lasiopterus* (Schreber, 1774)**

English common name: Giant noctule

Italian common name: Nottola gigante

Type locality: Northern Italy, Pisa (uncertain)

Distribution

World: From Western Europe to Kazakhstan, also present in Cyprus, Malta, and Balearic Islands.

Italy: Presumably Continental Italy, but records are rare and scattered.

Remarks: Occurrence in Sicily was only recorded with few uncertain records up to 1990 (Sarà, 1998).

***Nyctalus leisleri* (Kuhl, 1817)**

English common name: Leisler’s bat

Italian common name: Nottola di Leisler

Type locality: Hanau, Hessen, Germany

Distribution

World: Europe, Northern Africa, East to the Urals and Iran.

Italy: Continental Italy, Sardinia, Elba and Capri islands.

***Nyctalus noctula* (Schreber, 1774)**

English common name: Common noctule

Italian common name: Nottola comune

Type locality: France

Distribution

World: Europe, East to South-Eastern Asia and China.

Italy: Continental Italy.

***Pipistrellus kuhlii* (Kuhl, 1817)**

English common name: Kuhl’s pipistrelle

Italian common name: Pipistrello albolimbato

Type locality: Trieste, Friuli-Venezia Giulia, Italy

Distribution

World: Europe, East to the Southern Carpathians and Western Russia.

Italy: Continental Italy, Sicily, Sardinia, and other small islands, usually restricted to lower altitudes.

Remarks: Elevational limits are moving upwards, probably in response to warming temperatures. Accordingly, the species is exhibiting a rapid range expansion (Ancillotto et al., 2016), and latitudinal and altitudinal limits are likely to keep changing.

***Pipistrellus nathusii* (Keyserling and Blasius, 1839)**

English common name: Nathusius’ pipistrelle

Italian common name: Pipistrello di Nathusius

Type locality: Berlin, Germany

Distribution

World: Europe, Transcaucasia, and South-Western Asia.

Italy: Central Italy.

Remarks: Known as wintering in Northern and Central Italy. Recent records highlighted the presence of breeding or non-migratory populations in Tuscany, Latium, and Umbria (Ancillotto and Russo, 2015). Both morphology and echolocation calls resemble those of *P. kuhlii*, which may have caused misidentifications and underestimation of the species’ occurrence.

***Pipistrellus pipistrellus* (Schreber, 1774)**

English common name: Common pipistrelle

Italian common name: Pipistrello nano

Type locality: France

Distribution

World: Europe, Mediterranean basin, East to the Caucasus and Volga river. Discontinuously recorded in Central and Eastern Asia.

Italy: Continental Italy, Sicily, Sardinia and other small islands.

Remarks: Morphologically very similar to *P. pygmaeus*. Due to the recent confirmed separation of the two species (Jones and Barratt, 1999), historical records may refer to either species.

***Pipistrellus pygmaeus* (Leach, 1825)**

English common name: Soprano pipistrelle

Italian common name: Pipistrello pigmeo

Type locality: Dartmoor, Devonshire, England

Distribution

World: Europe to Western Russia.

Italy: Continental Italy, Sicily, and Sardinia, but records are scattered across the range.

Remarks: Morphologically very similar to *P. pipistrellus*. Due to the recent confirmed separation of the two species (Jones and Barratt, 1999), historical records may refer to either species.

CHIROPTERA Blumenbach, 1770 (continued)

VESPERTILIONIDAE Gray, 1821 (continued)

Plecotus auritus (Linnaeus, 1758)

English common name: Brown long-eared bat

Italian common name: Orecchione bruno

Type locality: Sweden

Distribution

World: Europe.

Italy: Northern and Central Italy, Sardinia, and Sicily.

Remarks: Recent records for Sicily are reported by Fulco et al. (2015).

Plecotus austriacus (J.B. Fischer, 1829)

English common name: Gray long-eared bat

Italian common name: Orecchione grigio

Type locality: Vienna, Austria

Distribution

World: Europe.

Italy: Continental Italy, Sicily, Sardinia, and Elba Island.

Plecotus macrobullaris Kuzyakin, 1965

English common name: Mountain long-eared bat

Italian common name: Orecchione alpino

Type locality: Ordzhonikidze (now Vladikavkaz), Northern Ossetia, Caucasian Russia

Distribution

World: Europe, Central and Eastern Caucasus, South-Western Asia.

Italy: Alps.

Plecotus sardus Mucedda, Kiefer, Pidinchedda and Veith, 2002

English common name: Sardinian long-eared bat

Italian common name: Orecchione sardo

Type locality: Lanaitto's Valley, in a cave, Oliena District, Nuoro Province, Sardinia, Italy (40°15'29" N, 9°29'13" E, 150 m a.s.l.)

Distribution

World: Italian endemic restricted to Sardinia.

Italy: Central-Eastern Sardinia (few localities).

Remarks: Sardinian endemic. Its morphological resemblance with other sympatric *Plecotus* species is discussed in Mucedda et al. (2002).

Vespertilio murinus Linnaeus, 1758

English common name: Particoloured bat

Italian common name: Serotino bicolore

Type locality: Uppsala, Central Sweden

Distribution

World: Central-Northern Europe East to China, including Central Asia North to Himalaya.

Italy: Northern Italy and Tuscany.

Remarks: Reproduction only ascertained in Veneto (Lapini et al., 2017). Recently recorded for Tuscany, perhaps as vagrant (Dondini and Vergari, 2015; Lapini et al., 2015).

CARNIVORA Bowdich, 1821

CANIDAE Fischer, 1817

Canis aureus (Linnaeus, 1758)

English common name: Golden jackal

Italian common name: Sciacallo dorato

Type locality: "oriente", restricted to Bennà Mrs., Laristan, South Persia (Iran) by Thomas (1911)

Distribution

World: Europe, Caucasus, Western Asia up to China.

Italy: North-Eastern Italy (Trentino-Alto Adige, Veneto, and Friuli-Venezia Giulia), following range expansion from Slovenia. Recent observations also occurred in Lombardy (province of Bergamo) and Emilia Romagna (province of Modena).

Remarks: First occurrence in Italy recorded in 1984, first record of reproduction in 1985 (Lapini et al., 2011, 2018).

Canis lupus (Linnaeus, 1758)

English common name: Grey wolf

Italian common name: Lupo

Type locality: "Europae sylvis, etjam frigidioribus", restricted to "Sweden" by Thomas (1911)

Distribution

World: North America, Canada and Eurasia.

Italy: Continental Italy.

Remarks: The species is in an expansion phase after the strong decline in the '70 of the XX century (Zimen and Boitani, 1975; Genovesi, 2002). The first

recent records in the Alps date to 1992 (Mercantour National Park, Poulle et al., 1997). Recent contact and admixture with Balkan individuals occurred in North-Eastern Italy (Fabbri et al., 2014). It went extinct in Sicily in the middle of XX century (Boitani et al., 2003; Angelici and Rossi, 2018). Hybridization with the domestic dog was ascertained in Central and Southern Italy (Galaverni et al., 2017).

Vulpes vulpes (Linnaeus, 1758)

English common name: Red fox

Italian common name: Volpe comune

Type locality: "Europa, Asia, Africa, antra fodiens", restricted to "Sweden (Upsala)" by (Thomas, 1911)

Distribution

World: Northern hemisphere from the Arctic Circle to North America, Europe, North Africa, the Asiatic steppes, India, and Japan.

Italy: Continental Italy, Sicily, and Sardinia.

FELIDAE Fischer de Waldheim, 1817

Felis silvestris Schreber, 1777

English common name: European wild cat

Italian common name: Gatto selvatico europeo

Type locality: Not given; Fixed by Haltenorth (1953) as "vielleicht Nordfrankreich". Listed by Pocock (1951) as "Germany"

Distribution

World: Europe, Africa, South-Western and Central Asia, India, China, and Mongolia.

Italy: Continental Italy, Sicily, and Sardinia.

Remarks: The populations from Sardinia formerly ascribed to *F. s. lybica* probably stemmed from feral domestic cats in Neolithic times (Boitani et al., 2003; Gippoliti and Amori, 2006; Macdonald et al., 2010; Mattucci et al., 2013). Recent taxonomic revision separated *F. silvestris* (Europe to the Caucasus) and *F. lybica* (Africa and Central Asia), and ascribed the Sardinian population to the latter (Kitchener et al., 2017). The small populations occurring in Liguria and in the Eastern Alps are related to expansion from France and Slovenia, respectively (Boitani et al., 2003; Lapini, 2006b). Occasional hybridization with domestic cat is detected across the Italian range (Oliveira et al., 2015).

Lynx lynx (Linnaeus, 1758)

English common name: Eurasian lynx

Italian common name: Lince euroasiatica

Type locality: "Europae sylvis et desertis", restricted by Thomas (1911) to "Wennersborg", S. Sweden

Distribution

World: Eurasia.

Italy: Western (Val d'Aosta, Val d'Ossola) and Eastern (Carso, Adamello-Brenta, Prealpi Giulie, Val Venosta) Alps.

Remarks: Extinct in Italy the early XX century. The current occurrences stem from expanding reintroduced populations in Switzerland and Slovenia. First new records in 1982 (Boitani et al., 2003).

MUSTELIDAE Fischer, 1817

Lutra lutra (Linnaeus, 1758)

English common name: Eurasian otter

Italian common name: Lontra euroasiatica

Type locality: "Europae aquis dulcibus, fluvii, flagnis, piscinis", restricted to "Upsala" (Sweden) by Thomas (1911)

Distribution

World: Eurasia and Northern Africa.

Italy: Southern and Central Italy (Campania, Abruzzo, Molise, Basilicata, Apulia, and Calabria). Newly established in the Eastern Alps (Alto Adige and Friuli-Venezia Giulia) following range expansion from Austria and Slovenia. A formerly captive population crossbred with the Asian *L. l. barang* is established in the Ticino river.

Remarks: Recovering after strong decline in the '70 of the XX century (Prigioni et al., 2009; Loy et al., 2010; Panzacchi et al., 2011; Loy et al., 2015). New records in North-Eastern Italy since 2011 (Lapini and bonesi, 2011; Lapini et al., 2014; Pavanello et al., 2015).

Martes foina (Erxleben, 1777)

English common name: Stone marten or Beech marten

Italian common name: Faina

Type locality: "Europa inque Persia" listed to Germany by Miller (1912)

Distribution

World: Europe and Asia up to Myanmar.

Italy: Continental Italy.

Martes martes* (Linnaeus, 1758)*English common name:** Pine marten**Italian common name:** Martora**Type locality:** “*Sylvvis antiquus*”, restricted to “Upsala” (Sweden) by Thomas (1911)**Distribution****World:** Central and Eastern Europe, South-Western Asia, Caucasus, Asian Russia (Western Siberia).**Italy:** Continental Italy, Sardinia, Sicily, and Elba island.***Meles meles* (Linnaeus, 1758)****English common name:** European badger**Italian common name:** Tasso**Type locality:** “*Europa inter rimas rupium et lapidum*”, restricted to “Upsala” (Sweden) by Thomas (1911)**Distribution****World:** Eurasia.**Italy:** Continental Italy.***Mustela erminea* (Linnaeus, 1758)****English common name:** Stoat**Italian common name:** Ermellino**Type locality:** “*Europa et Asia frigidior; hyeme praefertim in alpinis regionibus nivea*”, restricted to “Upsala” (Sweden) by Thomas (1911)**Distribution****World:** Holarctic.**Italy:** Northern Italy (Alps).***Mustela nivalis* (Linnaeus, 1758)****English common name:** Least weasel**Italian common name:** Donnola**Type locality:** province of Vesterbotten, Sweden**Distribution****World:** Holarctic.**Italy:** Continental Italy, Sicily, and Sardinia.**Remarks:** No taxonomically relevant divergence of the large sized Sardinian animals (*M. n. boccamela* Bechstein, 1800) was confirmed by recent molecular data (Lebarbenchon et al., 2010).***Mustela putorius* (Linnaeus, 1758)****English common name:** European polecat**Italian common name:** Puzzola europea**Type locality:** “*Inter Europae rupes et lapidus acervos*” restricted to “Scania”, Southern Sweden by Thomas (1911)**Distribution****World:** Europe.**Italy:** Continental Italy.**Remarks:** According to Kurose et al. (2008) the domestic ferret is a separate species (*Mustela furo*), closer to *M. eversmanni* than to *M. putorius*.***Neovison vison* (Schreber, 1777)****English common name:** American mink**Italian common name:** Visone americano**Type locality:** “*Man findet das Vison in Canada und Pensilvanien*”. Larivière (1999) listed type locality as “Eastern Canada”**Distribution****World:** Native to North America.**Italy:** Northern and Central Italy, Sardinia.**Remarks:** Allochthonous. Imported in Italy for fur farming in the 1950s. The first records of escaped animals occurred in the 1970s (Lapini, 1991). Recorded in Abruzzo, Emilia Romagna, Friuli-Venezia Giulia, Latium, Molise, Sardinia, Veneto (Angelici et al., 2000; Boitani et al., 2003; Bartolommei et al., 2013; Jordan et al., 2017). Feral populations seem to be better adapted to Northern Italian water bodies (Bon, 2017).**PHOCIDAE Gray, 1821*****Monachus monachus* (Hermann, 1799)****English common name:** Mediterranean monk seal**Italian common name:** Foca monaca mediterranea**Type locality:** “*Dalmation Sea at Ossero*”, Croatia**Distribution****World:** Fragmented records in Western Mediterranean (Cyprus, Greece and Turkey), Mauritania, Madeira.**Italy:** Accidentally in Central and Southern Tyrrhenian around Sardinia and surrounding small islands, and in Northern Adriatic Sea.**Remarks:** Once abundant throughout the Mediterranean, Black Sea, off Atlantic coasts of North-Western Africa and Macaronesia, this species suffered dra-

matic declines in the last century. Viable populations no longer occur in Italy (Boitani et al., 2003; Karamanlidis et al., 2016; Gippoliti, 2017).

PROCYONIDAE Gray, 1825***Procyon lotor* (Linnaeus, 1758)****English common name:** Northern raccoon**Italian common name:** Procione or Orsetto lavatore**Type locality:** “*Americae maritimis*”, restricted to “Pennsylvania” by Thomas (1911)**Distribution****World:** Native to Northern and Central America.**Italy:** Established in Northern Italy (Lombardy) and Tuscany (Province of Arezzo). Sporadic records in Abruzzo, Latium, Emilia Romagna, Piedmont, Liguria, Veneto, and Valle d’Aosta.**Remarks:** Allochthonous. Escaped from captivity. Feral populations first recorded in 2004 in Lombardy, and in 2013 in Tuscany (Canova and Rossi, 2008; Mori et al., 2015; Bon, 2017; Boscherini et al., 2019).**URSIDAE Fischer de Waldheim, 1817*****Ursus arctos* (Linnaeus, 1758)****English common name:** Brown bear**Italian common name:** Orso bruno**Type locality:** “*Sylvvis Europae frigidis*”, restricted to Northern Sweden by Thomas (1911)**Distribution****World:** North America, Eurasia.**Italy:** Central Apennines (Abruzzo, Latium, and Molise, with sporadic occurrence in Marche and Umbria) and the Alps (Adamello-Brenta National Park, restocking from Slovenian population in 1999–2002; Tarvisian, Belluno Dolomites, Carnic Alps colonized in 1991 following reintroduction and range expansion from Slovenia).**Remarks:** Almost extinct in the Alps in the ‘60 of the XX century (Perco, 1991). Recent morphological studies claimed the high distinctiveness of the Central Apennine population, named *U. a. marsicanus* Altobello, 1921 (Loy et al., 2008; Colangelo et al., 2012a; Meloro et al., 2018), which survives with about 50 individuals (Ciucci et al., 2015, 2017). Genomic evidence suggests that this population remained isolated around 1500 years ago (Benazzo et al., 2017).**VIVERRIDAE Gray, 1821*****Genetta genetta* (Linnaeus, 1758)****English common name:** Common genet**Italian common name:** Genetta comune**Type locality:** “*orientis juxta rivos*”, restricted to “*orientis juxta rivos, Hispania*” by the same descriptor (Linnaeus, 1766). Listed by Thomas (1911) as “Spain” and further restricted the type locality to “El Pardo, cerca de Madrid” by Cabrera (1914)**Distribution****World:** Africa, introduced in early times to Spain (Delibes et al., 2017) and expanded to Portugal, France, and Italy.**Italy:** The first record in North-Western Italy dates to 1967 (likely an individual escaped from captivity), followed by natural range expansion from France. Occasional records in Veneto and Emilia Romagna.**Remarks:** Allochthonous. Recent evidence strongly supports that the species was translocated by Muslims into Europe in the eighth century CE (Delibes et al., 2017). The current occurrence in Italy is confirmed by Gaubert et al. (2008); Mignone et al. (2001); Deliber and Gaubert (2013); Papeş et al. (2015); Bon (2017).**CETARTIODACTYLA Montgelard, Catzeflis and Douzery, 1997****BALAEOPTERIDAE Gray, 1864*****Balaenoptera physalus* (Linnaeus, 1758)****English common name:** Fin whale**Italian common name:** Balenottera comune**Type locality:** “*Habitat in Oceano Europaeo*”, then restricted by some authors to the “*Norwegian Sea, near Svalbard, and the Spitsbergen Islands*” (Thomas, 1911)**Distribution****World:** All oceans, arctic to tropical waters.**Italy:** Italian Seas: Ligurian Sea, Corsica and Sardinia seas. Frequent but less abundant in the Tyrrhenian, Ionian and Sicilian Channel; rare in the Adriatic.**Remarks:** Recent studies confirmed the hypothesis of genetic exchange between the Atlantic and Mediterranean populations, supported by observations in the Strait of Gibraltar (Gauffier et al., 2018). Records in Adriatic are reported by Notarbartolo di Sciarra et al. (2016).

CETARTIODACTYLA Montgelard, Catzeflis and

Douzery, 1997 (continued)

BOVIDAE Gray, 1821

***Ammotragus lervia* (Pallas, 1777)**

English common name: Barbary sheep or Aoudad

Italian common name: Ammotrago

Type locality: Oran, Algeria “Africae borealori propria” restricted to Department of Oran, Algeria (Harper, 1940)

Distribution

World: Northern and Western Africa (Morocco, Chad, Niger, Sudan, Mali).

Italy: Northern Italy.

Remarks: Allochthonous. Animals in the wild were reported in Piedmont, Lombardy, and Liguria. The first introduction in Lombardy dates back to 1993, but the population seems to have been eradicated (Mori et al., 2017a). A small reproductive population exists in Liguria, recorded since 2009 (Mori et al., 2017a).

***Capra ibex* Linnaeus, 1758**

English common name: Alpine Ibex

Italian common name: Stambecco delle Alpi

Type locality: “Habitat in Wallesiae praeruptis inaccessis”; identified as Valais, Switzerland, by Thomas (1911)

Distribution

World: Alps (Italy, France, Austria, Germany, Switzerland, Slovenia), and Rila mountains (Bulgaria).

Italy: Northern Italy (Alps).

Remarks: Fragmented range in the Alps. Mostly derived reintroduced populations having their ancestry in the Gran Paradiso population, whose genetic diversity has been lost for past overhunting (Stüwe and Nievergelt, 1991; Dupré et al., 2001).

***Ovis aries* Linnaeus, 1758**

English common name: European mouflon

Italian common name: Muflone europeo

Type locality: “Habitat in siccis apricis calidis”; identified as Sweden by Thomas (1911); domesticated stock

Distribution

World: South-Western Asia.

Italy: Continental Italy, Sardinia, Elba, and other minor islands.

Remarks: Allochthonous, introduced to Sardinia and Corsica during the Neolithic, recently elsewhere. The former classification as *O. orientalis musimon* (reported in Rezaei et al., 2010) was replaced by *O. gmelini musimon*, since *O. orientalis* was considered synonymous of the Asiatic mouflon *O. gmelini* (resolution of the 5th International Symposium on Mouflon: Hadjisterkotis, 2016). Nonetheless, some molecular studies suggested that the European mouflon stemmed from the domestic lineage, thus supporting its inclusion in the species *Ovis aries* (Hiendleder et al., 2002; Sanna et al., 2015). Regardless of its taxonomic position, a conservation value is accrued to the historical Corsican and Sardinian populations, because they still retain a relevant portion of the original genetic diversity currently lost or depleted in the Asian wild relatives.

***Rupicapra pyrenaica* Bonaparte, 1845**

English common name: Southern chamois or Isard

Italian common name: Camoscio appenninico

Type locality: “Mont. Pyren.”, (Pyrenees)

Distribution

World: Spain, France, Andorra, and Italy.

Italy: Central Italy (Apennines).

Remarks: Italian population ascribed to the endemic subspecies *R. p. ornata*. All present populations derive from a single surviving population in the Abruzzo, Latium, and Molise National Park. In the past decade, molecular studies confirmed high levels of mitochondrial and nuclear differentiation from the Iberian chamois (*R. p. pyrenaica*), but also detected similarities with *R. rupicapra cartusiana* in the Western Alps (Crestanello et al., 2009; Rodríguez et al., 2010). Though some authors (Groves and Grubb, 2011) proposed the elevation to species rank (*R. ornata*), in the absence of a clear definition of species delimitation in this genus, the current classification *R. p. ornata* is here retained.

***Rupicapra rupicapra* (Linnaeus, 1758)**

English common name: Alpine chamois or Northern chamois

Italian common name: Camoscio alpino

Type locality: “Habitat in alpiibus Helveticis summis inaccessis”, Switzerland

Distribution

World: From the Alps to the Caucasus.

Italy: Northern Italy (Alps and Karst).

Remarks: Recent occurrences recorded in the provinces of Trieste and Gorizia (Lapini et al., 2014).

CERVIDAE Goldfuss, 1820

***Capreolus capreolus* (Linnaeus, 1758)**

English common name: European roe deer

Italian common name: Capriolo

Type locality: “Habitat in Europa, Asia”, identified as Sweden by Thomas (1911)

Distribution

World: Europe and South-Western Asia.

Italy: Continental Italy.

Remarks: The endemic subspecies *C. capreolus italicus* survives in isolated populations of Southern Italy (Gargano and Orsomarso mountains, and Castelporziano Estate, near Rome). Other remnant populations of Central Italy (Maremma) hybridized with introduced non-native roe deer (Mucci et al., 2012; Biosa et al., 2015).

***Cervus elaphus* Linnaeus, 1758**

English common name: Red deer

Italian common name: Cervo or Cervo nobile

Type locality: “Habitat in Europa, Asia”, identified as Southern Sweden by Thomas (1911)

Distribution

World: Europe, part of Northern Africa, South-Western Asia.

Italy: Continental Italy and Sardinia.

Remarks: The Mesola red deer probably represents the only native population of mainland Italy, recently recognized as an endemic subspecies (*C. e. italicus* Zachos et al., 2014). The other endemic subspecies, the Tyrrhenian red deer (*C. e. corsicanus* Erxleben, 1777) of Sardinia and Corsica was shown to derive from an extinct lineage formerly inhabiting continental Italy (Doan et al., 2017), likely introduced to Sardinia during the human colonization of the island (Vigne, 1992).

***Dama dama* (Linnaeus, 1758)**

English common name: Fallow deer

Italian common name: Daino

Type locality: “Habitat in Europa”; identified as “Habitat in vivariis Regis et Magnatum” (Thomas, 1911)

Distribution

World: Native to Turkey.

Italy: Continental Italy, Sicily, and Sardinia.

Remarks: Ancient introduction. Likely introduced by the Phoenicians (1000 BCE) along the coasts of the Mediterranean, and repeatedly in recent times (Boitani et al., 2003; Masseti et al., 1997).

DELPHINIDAE Gray, 1821

***Delphinus delphis* Linnaeus, 1758**

English common name: Short-beaked common dolphin

Italian common name: Delfino comune

Type locality: “Habitat in Oceano Europaeo”, then restricted by some authors to the “North East Atlantic”

Distribution

World: Circumglobal. All temperate and tropical waters, probably not in the Indian Ocean.

Italy: Italian Seas: Waters around Sardinia, off Ischia, in the Strait of Sicily. Sporadic strandings/sightings in the Tyrrhenian and Adriatic seas.

***Globicephala melas* (Traill, 1809)**

English common name: Long-finned pilot whale

Italian common name: Globicefalo

Type locality: “in Scapay Bay, in Pomona, one of the Orkneys” Scotland, UK

Distribution

World: Temperate and subpolar zones: Antarctic Ocean; Southern Indian and Pacific Oceans; Atlantic Ocean. Historical distribution in North-Western Pacific off Japan.

Italy: Italian Seas: Once common in the Ligurian and Sardinian Sea, its density decreased in the last decades. Rare in the Tyrrhenian Sea. Occasional strandings are reported for the coasts of the Ionian Sea.

***Grampus griseus* (G. Cuvier, 1812)**

English common name: Risso’s dolphin

Italian common name: Grampò

Type locality: “envoyé de Brest”, Finistère, France

Distribution

World: All oceans, in temperate to tropical deep waters of the conti-

mental slope and outer shelf.

Italy: Italian Seas: Ligurian-Corso-Provençal basin. Seasonal occurrence in the Southern Tyrrhenian Sea off Ischia, island of Ustica, the Aeolian islands, and the Adriatic Sea.

***Stenella coeruleoalba* (Meyen, 1833)**

English common name: Striped dolphin

Italian common name: *Stenella striata*

Type locality: “South Atlantic Ocean near Rio de la Plata, off coast of Argentina and Uruguay”

Distribution

World: Cosmopolitan in cold-temperate to tropical waters between 50° N and 40° S.

Italy: Italian Seas: Common in all Italian seas.

***Tursiops truncatus* (Montagu, 1821)**

English common name: Common bottlenose dolphin

Italian common name: Tursiope

Type locality: “an der öslichen Küste von Südamerika; wir karpun-irten ihn in der Gegend des Rio de la Plata” (=South Atlantic Ocean near Rio de la Plata, off coast of Argentina and Uruguay)

Distribution

World: Cosmopolitan in temperate to tropical waters, mostly between 45° N and 45° S except in Northern Europe and Southern New Zealand.

Italy: Italian Seas: Common in all Italian seas.

PHYSETERIDAE Gray, 1821

***Physeter macrocephalus* Linnaeus, 1758**

English common name: Sperm whale

Italian common name: Capodoglio

Type locality: “Habitat in Oceano Europaeo” [“Habitat in Oceano Septentrionali”, restricted for neotype of *P. catodon* designated by Husson and Holthuis (1974) to “Middelplaat (Wester-schelde) Netherlands”]

Distribution

World: Worldwide. Antarctic and cold-temperate waters (Northern hemisphere) to tropical waters except Red Sea.

Italy: Italian Seas: Ligurian, Tyrrhenian and Ionian Seas, and in parts of the Aegean Sea. Rare in the Strait of Sicily, and vagrant in the Adriatic Sea.

Remarks: Despite being vagrant, several strandings were recorded in the Adriatic Sea coasts even in recent years (Bearzi et al., 2011; Mazzariol et al., 2011, 2018).

SUIDAE Gray, 1821

***Sus scrofa* (Linnaeus, 1758)**

English common name: Wild boar

Italian common name: Cinghiale

Type locality: “Habitat in Europa australiore”; shown to be Germany, from where wild boar had been introduced to Sweden, Oeland (Thomas, 1911)

Distribution

World: Native to Eurasia and Northern Africa.

Italy: Continental Italy, Sicily, Sardinia, Elba, and other small islands.

Remarks: Genetic peculiarities observed in the Sardinian and Central-Southern Italian populations support their subspecific differentiation (respectively *S. s. meridionalis* and *S. s. majori* Scandura et al., 2008; Iacolina et al., 2016). Hybridization with domestic pigs and imported foreign stocks strongly puzzles the genetic structure of the Italian populations (Scandura et al., 2011).

ZIPHIIDAE Gray, 1865

***Ziphius cavirostris* G. Cuvier, 1823**

English common name: Cuvier’s beaked whale

Italian common name: Zifio

Type locality: “dans le département des Bouches-du-Rhône, entre le village de Fos et l’embouchure du Galéon, près du canal qui réunit l’étang de l’Estomac à la mer” [in the department of Bouches-du-Rhône, between the village of Fos and the mouth of the Galéon (or Channel Galéjon), near the channel that links the pond of the Estomac to the sea], Gulf of Lion, France

Distribution

World: All oceans, in cold-temperate to tropical waters, in offshore waters.

Italy: Italian Seas: Ligurian, Tyrrhenian and Ionian Seas.

Remarks: During the past five decades several atypical mass strandings occurred in the Mediterranean, causing the death of at least 100 animals. Stranding was related to naval exercises using mid-frequency active sonars (Podestà et al., 2016).

RODENTIA Bowdich, 1821

CRICETIDAE Fischer, 1817

***Arvicola amphibius* (Linnaeus, 1758)**

English common name: Water vole

Italian common name: *Arvicola d’acqua*

Type locality: England

Distribution

World: Europe and South-Western Asia.

Italy: Italy: North-Eastern Italy.

Remarks: The presence of this species was reported by Lapini and Paolucci (1994) from localities of north-eastern Italy, but ascribed to *A. terrestris scher-man* (Shaw, 1801), now considered as *A. amphibius* (Kryštufek et al., 2015). However, further investigations are necessary to fully understand the distribution range of this taxon and the possible contact zone with *A. italicus*.

***Arvicola italicus* Savi, 1839**

English common name: Italian water vole

Italian common name: *Arvicola d’acqua italiana*

Type locality: near Pisa, Tuscany, Italy

Distribution

World: Italy.

Italy: Continental Italy.

Remarks: Likely an Italian near-endemic. Molecular genetic study indicated that the Italian lineage is divergent from other European populations (Castiglia et al., 2016). Further investigations will allow to identify distribution limits of this species in the northern Italy.

***Chionomys nivalis* (Martins, 1842)**

English common name: European snow vole

Italian common name: *Arvicola delle nevi*

Type locality: Faulhorn, Berner Oberland, Switzerland

Distribution

World: Mountains of Central-Southern Europe, Turkey, Caucasus, South-Western Asia and Turkmenistan.

Italy: Continental Italy (Alps and Northern-Central Apennines).

Remarks: The southern boundary of the species range has recently been revised by excluding Calabria (Nappi and Aloise, 2015).

***Microtus arvalis* (Pallas, 1778)**

English common name: Common vole

Italian common name: *Arvicola campestre*

Type locality: Pushkin-town, Leningrad Oblast, Russia (as restricted by neotype selection by Malygin and Yatsenko, 1986; formerly as “Germany”)

Distribution

World: From Europe to Russia and China.

Italy: Northern Italy.

***Microtus brachycercus* (von Lehmann, 1961)**

English common name: Calabrian pine vole

Italian common name: *Arvicola bruzia*

Type locality: Camigliatello Silano, Calabria, Italy

Distribution

World: Italy.

Italy: Southern and Central Italy.

Remarks: Italian endemic.

***Microtus levernedii* (Crespon, 1844)**

English common name: Mediterranean field vole

Italian common name: *Arvicola di Leverned*

Type locality: Marshes between St. Gilles and Aigues-Mortes, Gard, France

Distribution

World: Iberian Peninsula, France, Switzerland, Austria, Italy, Slovenia, and Hungary.

Italy: Northern Italy.

Remarks: Recent studies on systematic relationships and evolutionary history of the genus *Microtus* revealed that the populations from France, Switzerland, and Italy belong to a distinct species from *Microtus agrestis*, and re-evaluated the species *levernedii* (Jaarola and Searle, 2004; Hellborg et al., 2005; Paupério et al., 2012).

RODENTIA Bodwich, 1821 (continued)

CRICETIDAE Fischer, 1817 (continued)

***Microtus liechtensteini* (Wettstein, 1927)**

English common name: Liechtenstein's pine vole

Italian common name: Arvicola del Liechtestein

Type locality: Summit of Mali Rajinac, 1699 m, Velebit Mountains, North-Western segment of the Dinaric Alps, Croatia

Distribution

World: Italy, Austria, Slovenia, Croatia, Serbia, and Bosnia and Herzegovina.

Italy: North-Eastern Italy (Friuli-Venezia Giulia, Veneto, and Trentino-Alto Adige up to the river Adige).

***Microtus multiplex* (Fatio, 1905)**

English common name: Alpine pine vole

Italian common name: Arvicola di Fatio

Type locality: near Lugano, Ticino Canton, Switzerland

Distribution

World: France, Switzerland, Italy.

Italy: North-Western Italy, including the Northern Apennines, West to the Adige river.

Remarks: The species is replaced by *M. liechtensteini* East to the Adige river. Occurrences in the Central Apennines need to be confirmed (Nappi et al., 2012; Nappi, 2014).

***Microtus nebrodensis* (Minà-Palumbo, 1868)**

English common name: Sicilian pine vole

Italian common name: Arvicola dei Nebrodi

Type locality: Le Madonie, Sicily, Italy

Distribution

World: Italy.

Italy: Sicily.

Remarks: Endemic to Sicily. The subspecies *Microtus savii nebrodensis* from Sicily was recently elevated to species rank based on both morphological and molecular evidence (Bezerra et al., 2016).

***Microtus savii* (de Selys Longchamps, 1838)**

English common name: Savi's pine vole

Italian common name: Arvicola di Savi

Type locality: near Pisa, Tuscany, Italy

Distribution

World: Italy, and, marginally, Switzerland and France.

Italy: Northern (except Friuli-Venezia Giulia) and Central Italy.

Remarks: Italian near-endemic. A single record for Elba island (Vesmanis and Hutterer, 1980) has not been so far confirmed (contoli et al., 1988). Its absence in Friuli-Venezia Giulia was ascertained by Lapini et al. (1996).

***Microtus subterraneus* (de Selys Longchamps, 1836)**

English common name: Common pine vole

Italian common name: Arvicola sotterranea

Type locality: Waremme, Liege, Belgium

Distribution

World: From Europe to Russia.

Italy: North-Eastern Italy.

***Myodes glareolus* (Schreber, 1780)**

English common name: Bank vole

Italian common name: Arvicola rossastra

Type locality: Lolland isle, Denmark

Distribution

World: From Europe to Central Asia.

Italy: Continental Italy.

Remarks: The taxonomy of the genus *Myodes* in Calabria is still unclear. Two taxa were described from this region: *M. hallucalis* Thomas, 1906 from the Aspromonte massif, in the Southern tip of the peninsula, and *M. curcio* von Lehmann, 1961 from the Northern Sila Massif. Recent molecular genetic studies suggested that the taxon is structured in four clades in Italy, and revealed a considerable genetic distance between the Calabrian and the other Italian populations (Colangelo et al., 2012b; Chiocchio et al., 2019), compatible with an inter-specific divergence. Hence, further genetic and morphological investigations are needed to assess the taxonomic status of this population, which could represent a separate species. Kryštufek et al. (2019) reconsidered *Clethrionomys* as the proper genus for the species.

GLIRIDAE Muirhead, 1819

***Dryomys aspromontis* von Lehmann, 1964**

English common name: Calabrian forest dormouse

Italian common name: Driomio bruzio or Driomio della Calabria

Type locality: Gambarie d'Aspromonte, Calabria, Italy

Distribution

World: Southern Italy.

Italy: Southern Italy (Calabria).

Remarks: Endemic to Calabria. A deeply divergent evolutionary lineage restricted to extreme Southern Italy, previously described as *D. nitedula aspromontis*, has been recently ascribed to a distinct species (Bisconti et al., 2018).

***Dryomys nitedula* (Pallas, 1778)**

English common name: Forest dormouse

Italian common name: Driomio

Type locality: lower Volga River, Russia

Distribution

World: Europe, South-Western and Central Asia.

Italy: North-Eastern Italy (Alps).

***Eliomys quercinus* (Linnaeus, 1766)**

English common name: Garden dormouse

Italian common name: Quercino

Type locality: Germany

Distribution

World: Europe, from Portugal to the Urals (Russia), including numerous Mediterranean islands.

Italy: Continental Italy, Sicily, Sardinia, Lipari.

Remarks: Further genetic and morphological insights are needed to clarify the taxonomic position of the various chromosomal races (Gornung et al., 2010). Occurrence in Capri needs further confirmation (Nappi et al., 2007).

***Glis glis* (Linnaeus, 1766)**

English common name: Edible dormouse

Italian common name: Ghiro

Type locality: Carniola, Slovenia

Distribution

World: Europe and through Northern Turkey to the Caucasus, Northern Iran and Turkmenistan.

Italy: Continental Italy, Sicily, Sardinia, Elba, and Salina islands.

Remarks: Recent microsatellite investigations supported the differentiation of the species in three main haplogroups (Sicilian, Southern Italian, and European) (Hürner et al., 2010; Michaux et al., 2019). Thus, more detailed investigations are needed to assess the taxonomic status of these lineages. Occurrence in Capraia (Amori et al., 2015) and Capri (Nappi et al., 2007) islands need further confirmation.

***Muscardinus avellanarius* (Linnaeus, 1758) s.l.**

English common name: Hazel dormouse

Italian common name: Moscardino

Type locality: Sweden

Distribution

World: Europe, Russia, Ukraine, and Turkey. In continental Europe it is absent from Iberia, South-Western France, Northern Fennoscandia, and Southern Russia. Island populations occur in Southern Britain, Corfù, and Sicily.

Italy: Continental Italy, North-Eastern Sicily.

Remarks: Biochemical (Filippucci and Kotzakis, 1995) molecular (Mouton et al., 2012, 2017) and morphological (Amori et al., 2008) evidence suggests that the genus *Muscardinus* is present in Italy with two highly differentiated taxa. However, more detailed investigations are needed to assess their taxonomic status.

HYSTRICIDAE G. Fischer, 1817

***Hystrix cristata* Linnaeus, 1758**

English common name: Crested porcupine

Italian common name: Istrice

Type locality: "Asia", restricted to near Rome, Latium, Italy by Thomas (1911)

Distribution

World: Northern and Central Africa, Italy.

Italy: Continental Italy, Sicily, introduced to Sardinia and Elba island, where a few individuals have been recently released.

Remarks: Possibly introduced in ancient times to Continental Italy and Sicily. Recently introduced to Sardinia and Elba islands (Angelici et al., 2009b; Vecchio et al., 2018). Recent studies questioned the native origin in Italy, supporting its introduction in historical times (Trucchi and Sbordoni, 2009; Masseti et al., 2010; Mori et al., 2013; Trucchi et al., 2016). Oldest holocene fossil remains likely date back to 560–720 CE (Masseti et al., 2010), whereas fossil and sub-fossil findings might indicate a possible autochthony (Amori and Angelici, 1992). The species is showing a remarkable range expansion (Amori and Angelici, 1992; Angelici and Amori, 1999; Mori et al., 2018a), and latitudinal and altitudinal limits might continue to change over time.

MURIDAE Illiger, 1811***Apodemus agrarius* (Pallas, 1771)****English common name:** Striped wood mouse**Italian common name:** Topo selvatico dorso striato**Type locality:** Ulianovsk (formerly Simbirsk) middle Volga River, Ulianovsk Obl., Russia**Distribution****World:** Disjunct range in the Palaearctic and Indomalayan regions.**Italy:** North-Eastern Italy; isolated populations in Lombardy.***Apodemus alpicola* Heinrich, 1952****English common name:** Alpine wood mouse**Italian common name:** Topo selvatico alpino**Type locality:** Allgäu, Osterachtal, South Germany**Distribution****World:** Alps (Italy, Switzerland, Austria, Germany, France, Liechtenstein).**Italy:** Northern Italy (Alps).***Apodemus flavicollis* (Melchior, 1834)****English common name:** Yellow-necked wood mouse**Italian common name:** Topo selvatico dal collo giallo**Type locality:** Sieland island, Denmark**Distribution****World:** From Great Britain across much of continental Europe to the Urals (Russian Federation). It also occurs through Turkey East to Western Armenia, the Zagros Mountains of Iran and South to Syria, Lebanon, and Israel. It is present in some Eastern Mediterranean islands.**Italy:** Continental Italy.***Apodemus sylvaticus* (Linnaeus, 1758)****English common name:** Wood mouse**Italian common name:** Topo selvatico**Type locality:** Uppsala, Sweden (neotype designated by Zagorodnyuk, 1993)**Distribution****World:** From the Iberian Peninsula to Russia. In Northern Africa from Morocco to Tunisia.**Italy:** Continental Italy, Sicily, Sardinia, Elba, and other small islands.**Remarks:** The Sicilian population appears genetically highly differentiated (Michaux et al., 2003), claiming for a taxonomic revision of this taxon.***Micromys minutus* (Pallas, 1771)****English common name:** Harvest mouse**Italian common name:** Topolino delle risaie**Type locality:** Simbirsk (now Ulianovsk), Ulianovsk. Obl. middle Volga River, Russia**Distribution****World:** Palaearctic and Indomalayan regions, from Spain and Great Britain through Europe, Eastern Fennoscandia, and Russia to Northern Mongolia, China, the Korean peninsula, North-Eastern India, Myanmar, Vietnam, Japan, and Taiwan.**Italy:** Northern Italy, and isolated populations in Tuscany and Umbria.**Remarks:** Records from Latium, Campania, and Calabria need further confirmation (Amori et al., 2008).***Mus domesticus* Schwarz and Schwarz, 1943****English common name:** House mouse**Italian common name:** Topolino domestico**Type locality:** Dublin, Ireland**Distribution****World:** Native to South-Eastern Asia.**Italy:** Continental Italy, Sicily, Sardinia, Elba, and many other small islands.**Remarks:** Ancient introduction. Several chromosomal races have been reported in Italy for this species (Amori et al., 2008). According to Cucchi et al. (2005) its occurrence in Italy is recorded since the Bronze Age (2500–1000 BCE).***Rattus norvegicus* (Berkenhout, 1769)****English common name:** Brown rat**Italian common name:** Ratto delle chiaviche or Surmolotto**Type locality:** Great Britain**Distribution****World:** Native to Siberia and Manchuria.**Italy:** Continental Italy, Sicily, Sardinia, Elba and a few other small islands.**Remarks:** Allochthonous. Present in Europe at least from the XVI century (von Dirk, 1976). The time of colonization of Italy is not known, but it could have established in the country at least from 1700s (Mitchell-Jones et al., 1999).***Rattus rattus* (Linnaeus, 1758)****English common name:** Black rat**Italian common name:** Ratto nero**Type locality:** Uppsala, Uppsala country, Sweden**Distribution****World:** Native to Eastern Asia.**Italy:** Continental Italy, Sicily, Sardinia, Elba, and many other small islands.**Remarks:** Ancient introduction. Fossil findings in Central Italy date back to the Iron Age (about 1000 years BCE) (Kotsakis and Ruschioni, 1984). Older records from Sardinia (2500 BCE) are unconfirmed (Ruffino and Vidal, 2010). Genetic data evidenced an unexpected low diversity compatible with a single introduction event (Colangelo et al., 2015).**MYOCASTORIDAE Ameghino, 1904*****Myocastor coypus* (Molina, 1782)****English common name:** Coypu**Italian common name:** Nutria**Type locality:** Rio Maipo, Santiago Prov., Chile**Distribution****World:** Native to Brazil, Paraguay, Uruguay, Bolivia, Argentina, and Chile.**Italy:** Continental Italy, Sicily, and Sardinia.**Remarks:** Allochthonous. The species was imported in Italy for fur-farmings in 1928 (Amori et al., 2008). The first populations in the wild are known since the 1960s (Toschi, 1965).**SCIURIDAE Fischer de Waldheim, 1817*****Callosciurus erythraeus* (Pallas, 1779)****English common name:** Pallas's squirrel**Italian common name:** Scoiattolo di Pallas**Type locality:** not given; restricted to Assam, India by Bonhote (1901); further restricted to the Garo Hills of Assam by Moore and Tate (1965)**Distribution****World:** India, China, South-Eastern Asia.**Italy:** Varese province, Lombardy, Northern Italy.**Remarks:** Allochthonous. Introduced before 2007 (Mazzamuto et al., 2017).***Callosciurus finlaysonii* (Horsfield, 1832)****English common name:** Finlayson's squirrel**Italian common name:** Scoiattolo di Finlayson or Scoiattolo variabile**Type locality:** "the Island called Sichang, in the Gulf of Siam", Koh Si Chang (Gulf of Thailand)**Distribution****World:** South-Eastern Asia.**Italy:** Northern and Southern Italy.**Remarks:** Allochthonous. Introduced in Piedmont (Acqui Terme, Alessandria) and Basilicata (Maratea) in the 1980s (Martinoli et al., 2010; Bertolino and Lurz, 2013). It is localized in Piedmont and widespread in Campania, Basilicata, and Calabria.***Eutamias sibiricus* (Laxmann, 1769)****English common name:** Siberian chipmunk**Italian common name:** Tamia siberiano**Type locality:** "Vicinity of Barnaul", Altaisk Krai, Russia**Distribution****World:** From Russia to Japan.**Italy:** Northern and Central Italy.**Remarks:** Allochthonous. Released in Veneto, Latium, and Marche. It currently occurs in Rome (Villa Ada and Villa Pamphili) and in the city of Valeggio sul Mincio (Province of Verona, Veneto) (Benassi and Bertolino, 2011; Mori et al., 2018a). Some individuals still occur in the Piave valley (Belluno). Sporadic occurrences but not established populations have been reported in many other regions (Piedmont, Liguria, Marche, Tuscany, Lombardy, Trentino-Alto Adige, Friuli-Venezia Giulia, and Campania).***Marmota marmota* (Linnaeus, 1758)****English common name:** Alpine marmot**Italian common name:** Marmotta**Type locality:** "in Alpibus Helveticis" restricted to Swiss Alps (Switzerland) by Thomas (1911)**Distribution****World:** Alps, Tatra, and Carpathians Mts..**Italy:** Northern Italy.**Remarks:** Introduced to the Northern Apennines, between Tuscany and Emilia Romagna (Ferri et al., 1988; Sala et al., 1993).

RODENTIA Bodwich, 1821 (continued)

SCIURIDAE Fischer de Waldheim, 1817 (continued)

Sciurus carolinensis Gmelin, 1788

English common name: Eastern grey squirrel

Italian common name: Scoiattolo grigio

Type locality: “Carolina”, USA

Distribution

World: USA and Canada.

Italy: Northern and Central Italy.

Remarks: Allochthonous. Introduced in Italy several times since 1948. It is now widespread in Piedmont and Lombardy, more localized in Veneto, and only few records are reported for Tuscany; nearly eradicated in Liguria and Umbria (Martinoli et al., 2010; Mori et al., 2016).

Sciurus meridionalis Lucifero, 1907

English common name: Calabrian black squirrel

Italian common name: Scoiattolo meridionale

Type locality: “la regione calabrese degli Appennini, e soprattutto quella parte che vien detta Sila”, restricted by lectotype selection to Potilia Policastro (now Petilia Policastro), locality Cerigliana (Sila massif), Crotone province, Calabria, Lat. 39°7'39.97" N; Lon. 16°41'26.27" E, 1552 m a.s.l. Italy by Wauters et al. (2017)

Distribution

World: Italy.

Italy: Southern Italy (Calabria and Basilicata).

Remarks: Endemic to Southern Italy. The former subspecies *S. vulgaris meridionalis* was elevated to species rank (Wauters et al., 2017).

Sciurus vulgaris Linnaeus, 1758

English common name: Eurasian red squirrel

Italian common name: Scoiattolo comune

Type locality: “in Europae arboribus”. Restricted by Thomas (1911) to Uppsala, Sweden

Distribution

World: Europe and Asia.

Italy: Continental Italy, excluding the extreme southern regions (Basilicata, Calabria, and Apulia).

LAGOMORPHA Brandt, 1855

LEPORIDAE Fischer, 1817

Lepus capensis Linnaeus, 1758

English common name: Cape hare

Italian common name: Lepre sarda

Type locality: “ad Cap. b. Spei”, Cape of Good Hope (South Africa)

Distribution

World: Africa and Western Asia (natural range), Sardinia in Italy (introduced).

Italy: Sardinia and surrounding islands.

Remarks: Archaeological, genetic and morphological data assessed the ancient introduction to Sardinia from Northern Africa, at some point between the Bronze and Iron Ages (Scandura et al., 2007; Canu et al., 2012). As Northern African hares might belong to a separate species (*Lepus mediterraneus* Wagner, 1841, see Palacios, 1998), the species name could not be considered valid anymore. However, as the phylogeography of the African and Eurasian hares is still unclear, we keep the current name.

Lepus corsicanus de Winton, 1898

English common name: Apennine hare or Italian hare

Italian common name: Lepre appenninica or Lepre italiana

Type locality: “Bastia,” Corsica, France

Distribution

World: Italy and France (Corsica).

Italy: Southern and Central Italy, Sicily, and Elba island.

Remarks: Italian endemic. The Corsican population was introduced in historical times (Vigne, 1992). Recently introduced to Elba island (Scarselli et al., 2016). Classified as a separate taxon after Palacios (1996) and Pierpaoli et al. (1999). Some later studies highlighted its phylogenetic affinity with the broom hare *L. castroviejoi* hypothesizing conspecificity (Angelici and Luiselli, 2007; Alves et al., 2008). Hybridization with *L. europaeus* may occur (Pietri et al., 2011), despite it has never been detected in Italy (Mengoni et al., 2015).

Lepus europaeus Pallas, 1778

English common name: European hare

Italian common name: Lepre europea

Type locality: not given; restricted from Trouessart (1910) to Poland and later by Ognev (1940) to South-Western Poland

Distribution

World: From Northern Spain East to Siberia, and South to the North-

ern portion of South-Western Asia. Introduced in the United Kingdom and Southern Scandinavia.

Italy: Continental Italy and Pianosa island.

Remarks: It may locally hybridize with *L. timidus*, and occasionally with *L. corsicanus* (Thulin et al., 2006; Pietri et al., 2011). Its gene pool consists of a mix of native and exotic lineages, due to translocations and introductions for hunting purposes (Mengoni et al., 2018). However, a pure *L. e. meridiei* Hilzheimer, 1906 [*nomen nudum*] ancient population still survives in the protected island of Pianosa, where it was brought from the peninsula in past centuries (Mengoni et al., 2018).

Lepus timidus Linnaeus, 1758

English common name: Mountain hare

Italian common name: Lepre variabile

Type locality: “in Europa” (Uppsala, Sweden)

Distribution

World: Alps and from Scandinavia to Russia and Japan.

Italy: Northern Italy (Alps).

Remarks: It may locally hybridize with *L. europaeus* (Thulin et al., 2006).

Oryctolagus cuniculus (Linnaeus, 1758)

English common name: Wild rabbit

Italian common name: Coniglio selvatico

Type locality: “in Europa australis” (=Germany; Ellerman and Morrison-Scott, 1951)

Distribution

World: Native to the Iberian Peninsula and Northern Africa. Introduced in all continents with the exception of Asia and Antarctica.

Italy: Continental Italy, Sicily, Sardinia, and other small islands.

Remarks: Ancient introduction. Historical evidence of the presence on the islands of Nisida and Capri in the II Century CE (Amori et al., 2008).

Sylvilagus floridanus (J.A. Allen, 1890)

English common name: Eastern cottontail

Italian common name: Silvilago or Minilepre

Type locality: “Sebastian River, Brevard Co” (Florida, USA)

Distribution

World: Native to USA, Canada, Central America, Venezuela, and Colombia.

Italy: Northern and Central Italy.

Remarks: Allochthonous. First recorded in Piedmont in 1966. It is widespread in Piedmont and Lombardy; smaller populations occur in Liguria, Veneto, Emilia-Romagna, Abruzzi, Tuscany, Latium, and Umbria (Niethammer and Angelici, 2003; Amori et al., 2008; Bertolino et al., 2011; Dori et al., 2018).

Irregular species from Italian territory and seas

VESPERTILIONIDAE Gray, 1821

Plecotus kolombatovici Đulić, 1980

English common name: Balkan long-eared bat

Italian common name: Orecchione balcanico

Type locality: Korčula, Croatia

Distribution

World: Eastern Mediterranean, along the coast between Turkey, Greece, and the Balkans.

Italy: one ascertained record from Tuscany.

Remarks: The recent description and similarity to other species from the same genus make this species difficult to detect. Thus further investigations will provide a clearer picture of the taxon's distribution in the Italian peninsula and islands. Apart from previous, unconfirmed records (Spitzenberger et al., 2001; Lanza, 2012), the first Italian specimen, identified through a molecular approach, was recently reported for Tuscany (Ancillotto et al., 2019).

CANIDAE Fischer, 1817

Nyctereutes procyonoides (Gray, 1834)

English common name: Raccoon dog

Italian common name: Cane procione

Type locality: Unknown, restricted to “vicinity of Canton, China” by G.M. Allen (1938)

Distribution

World: Native range covers Indochina, Eastern China, Korea, South Eastern Russia, and Japan.

Italy: North-Eastern Italy (Veneto, Trentino, and Friuli-Venezia Giulia), following range expansion from introductions in Eastern Europe.

Remarks: Allochthonous. Introduced and widespread in Northern, Central and Eastern Europe; still spreading towards West and South at a rate of 40 km per year (Kauhala and Kowalczyk, 2011). Recorded occasionally in North Eastern Italy since 1989, following range expansion from Eastern Europe (Amori and Lapini, 1987; Lapini, 2006a; Kauhala and Kowalczyk, 2011; Bon, 2017).

CERVIDAE Goldfuss, 1820***Cervus nippon*** Temminck, 1838Sika
English common name: argl**Italian common name:** Cervo sika**Type locality:** "Les isles du domain du Japan; restricted to Japan, Kyushu, Nagasaki" (Groves and Smeenk, 1978)**Distribution****World:** China, Korea, Japan, Russia, Taiwan, and Vietnam.**Italy:** Northern Italy.**Remarks:** Allochthonous. Occurs in small non-reproductive groups in Northern Italy, escaped or released from farms. Evidence of hybridization with red deer (Smith et al., 2018).**BALAENIDAE** Gray, 1821***Eubalaena glacialis*** (P.L.S. Müller, 1776)**English common name:** North Atlantic Right whale**Italian common name:** Balena franca nordatlantica**Type locality:** not specified by Müller, however, according to Hershkovitz (1966) (not Eschricht and Reinhardt, 1861) the type locality is to be identified with "vicinity of North Cape (Nord Kapp in Danish), Finnmark, Norway" derived from name "Nord-Kaper" of Norwegian whalers. Note that Müller did not describe the species, but cited other authors, among others, E. von Aphelen (1768), who, for the species, reports as coming also from "Norway, Iceland and Greenland". So, this should be considered the correct type locality**Distribution****World:** North Atlantic Ocean.**Italy:** Italian Seas: Once common (Rodrigues et al., 2018) but now very rare in the Mediterranean Sea.**Remarks:** Only two documented records are known for the Mediterranean Sea (Cagnolaro et al., 2015). The only certain record for Italy is the catch of a young female in the Gulf of Taranto in 1877, described by Capellini as *Balaena tarantina* Capellini, 1877, which holotype is in the Zoological Museum of Naples University (Maio and De Stasio, 2014). The sighting of a specimen in May 1991 near the island of S. Antioco in Sardinia was not verified (Notarbartolo di Sciarra, 1996). Other historical records are doubtful.**BALAENOPTERIDAE** Gray, 1864***Balaenoptera acutorostrata*** Lacépède, 1804**English common name:** Common minke whale**Italian common name:** Balenottera minore**Type locality:** "Pris aux environs de la rade de Cherbourg" (taken nearby the harbour of Cherbourg), Manche, Normandy, France**Distribution****World:** All oceans and virtually at all latitudes, from 65°S to 80°N. Rare in tropical waters.**Italy:** Italian Seas: Occasionally reported in the Mediterranean Sea.**Remarks:** Historical survey from 1771 to 2016 revealed 62 records from the Mediterranean Sea and 15 records from the Italian seas. The evidence of calves, less than four meters long, documented during the last 40 years (particularly to the Ligurian and Tyrrhenian Seas) supports the hypothesis that the Mediterranean Sea may be or might have been a potential calving or nursery ground. However, molecular data from individuals occurring in the Mediterranean Sea evidenced that they belong to North Atlantic populations (Maio et al., 2016a).***Megaptera novaeangliae*** (Borowski, 1781)**English common name:** Humpback whale**Italian common name:** Megattera**Type locality:** "de la nouvelle Angleterre" (=Coast of New England), USA**Distribution****World:** Worldwide: cold-temperate to tropical waters.**Italy:** Italian Seas: Occurrences are extremely rare in the Italian Seas: only one catch and nine sightings of a single specimen are reported, the last one from the Gulf of Naples in March 2019.**Remarks:** Since 1885, 26 records (18 sightings of which four with two individuals, three strandings, and five by-caught individuals) have been reported from different locations across the Mediterranean Sea (Cagnolaro et al., 2015; Maio et al., 2016b, 2019).**DELPHINIDAE** Gray, 1821***Orcinus orca*** (Linnaeus, 1758)**English common name:** Killer whale**Italian common name:** Orca**Type locality:** "Habitat in Oceano Europaeo" North-East Atlantic**Distribution****World:** Cosmopolitan: all seas and oceans.**Italy:** Italian Seas: Occasional in the Italian Seas.**Remarks:** Regular in the Strait of Gibraltar (Notarbartolo di Sciarra et al., 2016). Since 1870 to 2010, ten documented records have been reported from different locations across the Italian Seas (Cagnolaro et al., 2015). The skull of a specimen captured in March 1898 near the island of Asinara (Sardinia), preserved in

the Museum of Natural History of Florence University, is the only known specimen from the Italian seas. However, the locality on the original label could be doubtful (Cagnolaro et al., 2014). The two skulls described by Giglioli in 1880 from Palermo are misidentifications (Cagnolaro et al., 2014).

Pseudorca crassidens (Owen, 1846)**English common name:** False killer whale**Italian common name:** Pseudorca**Type locality:** "In the great fen of Lincolnshire beneath the turf, in the neighborhood of the ancient town of Stamford" (subfossil), England, UK**Distribution****World:** Circumtropical to warm temperate.**Italy:** Italian Seas: Occurrences are extremely rare in the Italian Seas.**Remarks:** A total 43 records have been reported from different locations across the Mediterranean Sea since 1787 Cagnolaro et al. (2015). Among these, only 14 were from Italian Seas (three sighting, seven strandings, and four catches of various specimens) (Stanzani and Piermarocchi, 1992; Cagnolaro et al., 2015). The Museum of Natural History of Florence University contains the lectotype of *Pseudorca mediterranea* Giglioli, 1882 (a skull from Palermo, Sicily, May 1868) (Cagnolaro et al., 2014).***Steno bredanensis*** (G. Cuvier in Lesson, 1828)**English common name:** Rough-toothed dolphin**Italian common name:** Steno**Type locality:** Paimpol, Brittany, France**Distribution****World:** Worldwide, circum-global between 40°N and 35°S: warm-temperate to tropical waters.**Italy:** Italian Seas: Occurrences are rare in the Italian Seas.**Remarks:** Considered a "visitor species" until 2006, it is now considered a regular species in the Eastern Mediterranean Sea, but retaining the status of visitor in the Western basin (Notarbartolo di Sciarra et al., 2016). Only three records are known in the Italian Seas (one museum specimen, one sighting of 160 individuals, and one mass stranding of six animals) (Cagnolaro et al., 2015).**KOGIIDAE** Gill, 1871***Kogia sima*** (Owen, 1866)**English common name:** Dwarf sperm whale**Italian common name:** Cogia di Owen**Type locality:** "taken at Waltair" [=Visakhapatnam, State of Andhra Pradesh (=ex Madras British Colonial Presidency) India]**Distribution****World:** Worldwide: warm-temperate to tropical waters of all oceans, occasionally strands in cold-temperate areas. There is no evidence of migrations.**Italy:** Italian Seas: Extremely rare for the entire Mediterranean basin.**Remarks:** Only three records are available for the Mediterranean: a specimen found dead and partly buried on 20th May 1988 at Foce Chiarone (Province of Grosseto); an individual stranded alive and then died at Eraclea Minoa (Province of Agrigento, Western Sicily), on 8th September 2002 and a dead female found stranded at Trentova Bay near Agropoli (Salerno Province, Campania, Southern Italy) on 4th February 2017 (Cagnolaro et al., 2015; Maio et al., 2017).**ZIPHIIDAE** Gray, 1865***Mesoplodon bidens*** (Sowerby, 1804)**English common name:** Sowerby's beaked whale**Italian common name:** Mesoplodonte di Sowerby**Type locality:** "stranded on the estate of James Brodie, Esq. F.L.S., in the county of Elgin" Elginshire, Scotland, UK**Distribution****World:** Temperate waters of the North Atlantic Sea (Eastern and Western), including North Sea and Baltic Sea. Considered rare in Canadian waters.**Italy:** Italian Seas: Occurrence in the Mediterranean Sea is accidental.**Remarks:** The species occurrence is documented by a stranding at iles de Lérins (Cannes, France) on 15 August 1996 and two sightings offshore Eastern Corsica, in the Montecristo Trough area on 9 August 2010, and offshore north-eastern Sardinia, in the Caprera Canyon area on 17 June 2012 (Cagnolaro et al., 2015; Bittau et al., 2018).***Mesoplodon europaeus*** (Gervais, 1855)**English common name:** Gervais' beaked whale**Italian common name:** Mesoplodonte di Gervais**Type locality:** "qui provient d'un individu harponné dans la Manche" English Channel.**Distribution****World:** Warm-temperate to tropical waters of the Western North Atlantic Sea.**Italy:** Italian Seas: Occurrence in the Mediterranean Sea is occasional.**Remarks:** It is considered a "vagrant species" in the Mediterranean Sea (Podestà et al., 2006; Cagnolaro et al., 2015). Only one record of a specimen stranded at Castiglioncello (Livorno, Tuscany) in 2001.

Table 1 – Summary of the number of species for each order and family, including details on their origin, and number of species included in international regulations and in extinction risk main categories (national and global scale).

Order	Family	Endemic or near-endemic	Allocthonous	Habitats Directive 92/43/CE			CITES		Endangered (VU-EN-CR) in Red List		n. species in the family	
				Annex II	Annex IV	Annex V	Annex I	Annex II	Italian ¹	Global ²		
Erinaceomorpha (2 spp)	Erinaceidae										2	
Soricomorpha (14 spp)	Soricidae	3			1						11	
	Talpidae	1									3	
Chiroptera (33 spp)	Miniopteridae			1	1			1	1		1	
	Molossidae				1						1	
Carnivora (17 spp)	Rinolophidae			4	4				4	1	4	
	Vespertilionidae	1		6	27				11	2	27	
	Canidae			1	1	1		1	1		3	
	Felidae			1	2			2			2	
	Mustelidae		1	1	1	2	1		1		8	
	Phocidae			1 ^h	1		1				1	1
	Procyonidae			1 ^r								1
Cetartiodactyla (17 spp)	Ursidae	1 ^s		1 ^h	1			1	1		1	
	Viverridae		1			1					1	
	Balenopteridae				1		1		1	1	1	
	Bovidae	1 ^s	2	1 ^h	1	2	1	1	1		5	
	Cervidae	2 ^s	1	1 ^{hs}	1 ^s				1 ^s		3	
	Delphinidae			1	5			5	1		5	
	Physeteridae				1		1		1	1	1	
Rodentia (34 spp)	Suidae										1	
	Ziphiidae				1			1			1	
	Cricetidae	4									12	
	Gliridae	1			3 ³				1	1	5	
	Hystricidae		1 ⁴								1	
	Muridae		3								8	
Lagomorpha (6 spp)	Myocastoridae		1 ^r								1	
	Sciuridae	1	4(2 ^r)								7	
	Leporidae	1	1			1			1	1	6	
		TOTAL	13	15/16	19	54	7	4	11	25	8	123
			(+4 spp)	(4 r)	(5 h)							
		%	10.5	12.2/13	15.4	43.9	5.6	3.2	9.0	20.3	6.5	
				(4 h)								

¹ Rondinini et al. (2013)

² IUCN Global Red List 2018

³ 1 as *Dryomys nitedula*

⁴ Sardinia, Elba, Insubria and W Liguria

^s as subspecies

^h priority species, Annex II Habitats Directive 92/43/CE

^r EU regulation 1143/2014

Species waiting for confirmation of their occurrence in the Italian territory

The occurrence of Gaisler's long-eared bat *Plecotus gaisleri* Benda, Kiefer, Hanák and Veith, 2004 reported by Lanza (2012) for the Italian territory has not been yet considered in this checklist, as its occurrence is not supported by scientific literature, and standing its exclusion from the European checklist (Eurobats, 2018).

After the formal description of several cryptic taxa within the *Myotis nattereri* species complex, the Italian populations are now classified as *M. crypticus* (see above). However, the occurrence of *M. nattereri* (Kuhl, 1817) *s.l.* in the Italian territory is still unclear, as northeastern populations may still belong to this taxon (Çoraman et al., 2019).

Karyologic studies indicate the presence of the Ulm race of the Common shrew *Sorex araneus* Linnaeus, 1758 in the Carnic Alps and Karavanke mountains (Kral et al., 1979; Zima et al., 2003). Preliminary analyses of skulls of

common shrews *s.l.* from the Italian mountains (Friuli-Venezia Giulia and Veneto Regions) indicate a closer morphology to *S. araneus* than to *S. antinorii*, particularly in the shape of the mandibles. Such evidence suggests that *S. araneus* might occur in Veneto and Friuli-Venezia Giulia (Dorigo et al., 2016; Lapini and Cassol, 2017). Further genetic data are needed to confirm this hypothesis.

Recent records of the European beaver *Castor fiber* in Friuli-Venezia Giulia suggest that this species is expanding from Austria and will likely establish in Northern Italy in the short medium term (Pontarini et al., 2019). The species is listed in Annexes II and IV of Habitat Directive EC/92/43.

Recent records of the Muskrat *Ondatra zibethicus* in Friuli-Venezia Giulia (Lapini and Scaravelli, 1993) suggest that this species is expanding from north-western Slovenia and will likely establish in north-eastern Italy in the medium term (Lapini et al., 1996). Muskrats were introduced in Prague at the beginning of XX century and are now expanding in various European countries (Skyriené and Paulauska, 2012).

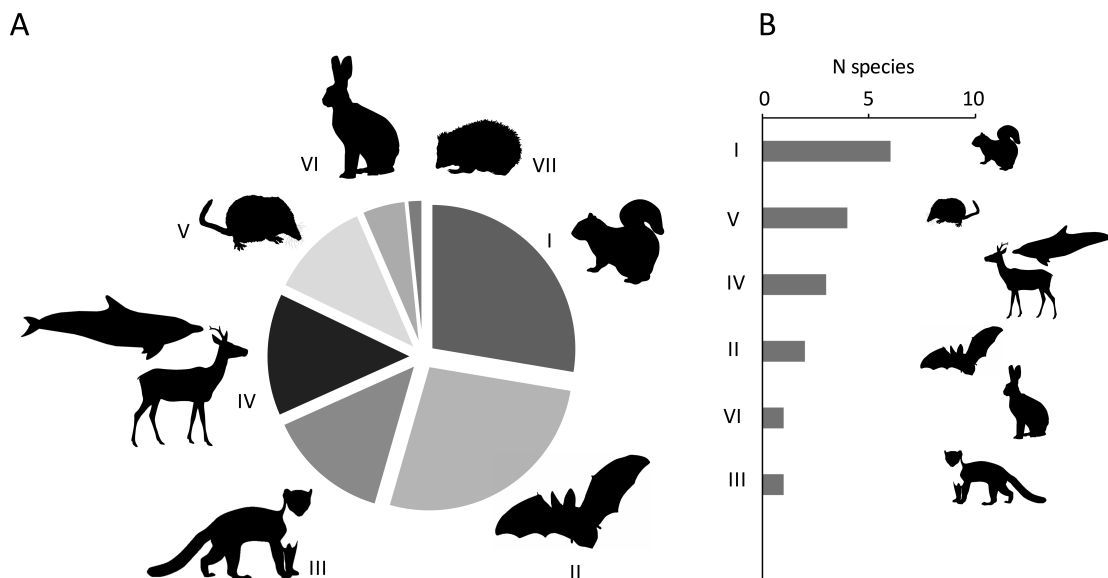


Figure 1 – Species richness and uniqueness of Italian mammals. A) percentage of species within each taxonomic order (total number of species: $n=123$); B) number of endemic taxa (including subspecies; $n=17$) within each taxonomic order (if present); each order is represented by an illustrative example. I: Rodents (*Sciurus vulgaris*); II: Chiroptera (*Plecotus auritus*); III: Carnivora (*Martes foina*); IV: Cetartiodactyla (*Stenella coeruleoalba* and *Capreolus capreolus*); V: Soricomorpha (*Sorex antinorii*); VI: Lagomorpha (*Lepus corsicanus*); VII: Erinaceomorpha (*Erinaceus europaeus*). Images from PhyloPic (www.phylopic.org), available under public domain (*Sorex* by Becky Barnes; *Plecotus* by Yan Wong; *Capreolus* by Steven Traver) or licensed under the Attribution-ShareAlike 3.0 Unported license (<https://creativecommons.org/licenses/by-sa/3.0/>; *Erinaceus* by Claus Rebler; *Stenella* by Chris Huh; *Lepus*, *Martes* and *Sciurus* by Anthony Caravaggi).

The Greater white-toothed shrew *Crocifura russula* and the Algerian mouse *Mus spretus* occurs in the French Alps (Mitchell-Jones et al., 1999). However, specific investigations are needed to assess their occurrence in the Italian territory.

The allochthonous Indian crested porcupine *Hystrix indica* Kerr, 1792 was recently recorded in Marche (province of Macerata, Mori et al., 2017b). This species may produce fertile offspring with the crested porcupine (Mori et al., 2017b). Thus further investigations are required to assess any evidence of reproduction.

Discussion

The Italian mammal fauna includes nine marine (including monk seal) and 114 terrestrial species (including allochthonous species), out of 36 and 219 respectively occurring in Europe (Temple and Terry, 2007). The main differences with previous checklists (Amori et al., 1993, 1997, 1999; Angelici et al., 2009a; Carpaneto and Vigna Taglianti, 2009; Gippoliti, 2013) refer to: new introductions of allochthonous species (e.g. *Callosciurus erythraeus*), taxonomic revisions revealing the existence of new endemic species (*Sciurus meridionalis*, *Dryomys aspromontis*, and *Myotis crypticus*), and the lack of recent confirmed records of previously reported taxa. However, given the number of species currently reported as irregular from the Italian territory and seas, and the need of taxonomic revision for some taxa, the number of Italian mammal species might grow in the next future.

Mammals occurring in Italy belong to seven orders (Erinaceomorpha, Soricomorpha, Chiroptera, Carnivora, Cetartiodactyla, Rodentia, Lagomorpha), and 28 families (Tab. 1). Vespertilionidae represents the richest family ($n=27$ species), followed by Cricetidae ($n=12$) and Soricidae ($n=11$) (Fig. 1, Tab. 1, and Supplementary Material).

Considering the relatively small size of the country (ca 2.97% of European territory), Italy stands out as a European hotspot of mammal diversity, hosting 48.23% of the species occurring in Europe (Temple and Terry, 2007), and the highest species richness in relation to the country area among the Mediterranean countries (Fig. 2) (Temple and Cuttelod, 2009). These outcomes strengthen the role of Italy as a Mediterranean biodiversity hotspot (Blasi et al., 2007).

Thirteen species and four subspecies are endemic or near-endemic to Italy, corresponding to 10.5% of its mammal fauna (Tab. 1 and Supplementary Material). Again, this percentage is among the highest for Mediterranean countries, after Spain (22%, Temple and Cuttelod, 2009) and France (14%, Temple and Cuttelod, 2009). Moreover, the number of endemic taxa is expected to further increase in the next future following current investigations in hotspot areas like the Calabria region (Vega et al., 2010), or upon clarification of the specific status of cryptic taxa (e.g. southern populations of *Myotis crypticus*, Çoraman et al., 2019).

Seven species are globally endangered (2 EN, 5 VU, Tab. 1), and 25 species are endangered in the national red list (2 CR, 13 EN, 11 VU, Tab. 1) (Rondinini et al., 2013). One in 15 mammal species (6.5%) is globally threatened in Italy, compared to one in six species in Europe (15%). However, the number of threatened species might increase in the next future, as little information is avail-

able for some rare taxa, or no evaluation has been made so far (Rondinini et al., 2013).

Also, the Italian mammal fauna includes from 15 to 16 allochthonous species (12.2–13%, pending the crested porcupine as either native or alien), four of which are considered invasive alien species of union concern (EU regulation 1143/2014) — over a total of eleven — i.e. the coypu *Myocastor coypu*, the Northern raccoon *Procyon lotor*, and three squirrels (the grey squirrel *Sciurus carolinensis*, the Pallas's squirrel *Callosciurus erythraeus*, and the Siberian chipmunk *Eutamias sibiricus*). For these species all member states must put in place a surveillance system and take rapid eradication measures, or take con-

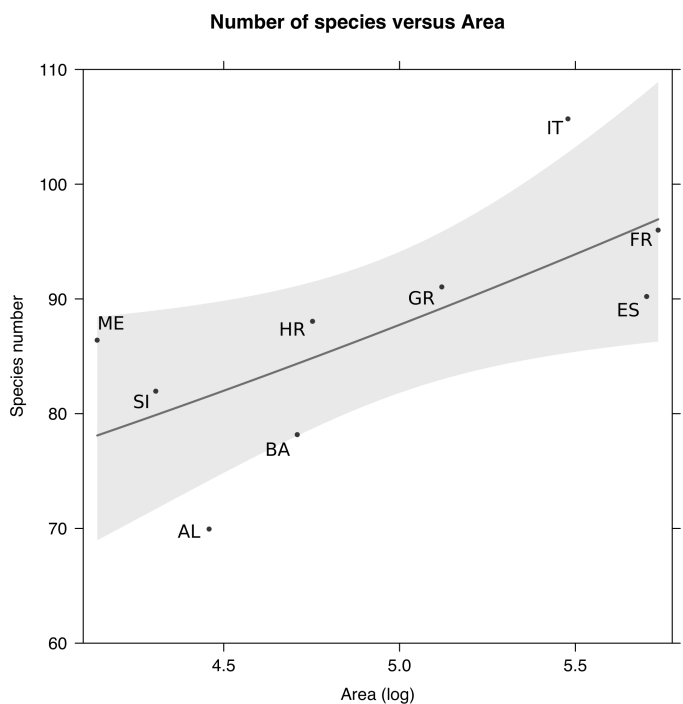


Figure 2 – Number of species occurring in European Mediterranean countries according to Temple and Cuttelod (2009), plotted as a function of the country surface (in km^2 , log transformed) (Switzerland, Macedonia, Serbia, Bulgaria, Portugal, Malta, and Cyprus excluded). Regression line is shown in gray, shaded area shows 95% confidence interval ($R^2=0.48$). ISO 3166 codes for countries are as follows: AL: Albania, BA: Bosnia and Herzegovina, ES: Spain, FR: France, GR: Greece, HR: Croatia, IT: Italy, ME: Montenegro, SI: Slovenia.

certed management actions so that they do not spread any further (Genovesi et al., 2015).

Overall, this checklist highlights the urgency of updating the Annexes of Habitat Directive 92/43/CE (hereafter HD) and the related obligations following Art. 17. In fact, despite *Capra aegagrus* is considered a priority species by EU, included in both annex II and IV, it is not a native species to Italy (Rondinini et al., 2013). It is thus mandatory to amend HD by excluding this taxon from annexes and further evaluations according to HD Art. 17. Also, endemic species showing restricted ranges in South-Central Italy (*Lepus corsicanus*, *Sciurus meridionalis*, *Dryomys aspromontis*, *Talpa romana*) or islands (*Microtus nebrodensis*) urgently need assessment and their eventual inclusion in the HD annexes. ☞

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Supplemental information

Additional Supplemental Information may be found in the online version of this article:

Table S1 List of mammal species occurring in Italy and details on international regulations and red list assessment at both national and global scale.