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Four hundred years of studying and collecting African mammals: a review of Italian contributions to African mammalogy

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Abstract. The present contribution presents a synthesis of more than 400 years of collecting and studying African mammals by Italian researchers. The former colonies in Libya and the Horn of Africa (Eritrea and Italian Somalia) are excluded as Italian research in those areas is relatively well-known. The review highlights how Italian researchers, explorers, and collectors contributed to early knowledge of African mammal biodiversity in several countries, notably Egypt and Uganda, although this contribution is frequently overlooked today. It is suggested that the absence of a centralised national museum dedicated to what we now term 'biodiversity' has contributed to a suboptimal use of these valuable collections.

Key words: collections, museums, Uganda, Egypt, Democratic Republic of Congo

Introduction

The Italian Peninsula's complicated and fragmented political history produced a wealth of scientific institutions from North to South. The situation before national unification, achieved in 1861 (Rome was added in 1870 with the fall of the Pope's political power), had long-term effects on the country, which still lacks a national repository for natural history collections. This situation continues to have a negative, though frequently overlooked, impact on biodiversity research (cf. Andreone et al. 2022). The vicissitudes of zoological research in each major research centre often did not allow a synthesis and review of zoological research, including those concerning African zoology. In this situation, foreign colleagues may have difficulties recognising the significance of important collections or expeditions, such as that of Carlo Fornasini to

Mozambique between 1831 and 1859. Furthermore, the fact that Italy was later a colonial power in Libya, Eritrea, Somalia, and, for a few years, Ethiopia led to the establishment of important and well-known collections from these regions (Carpaneto & Gippoliti 1994, Maretti et al. 2013, Gippoliti 2020), and it seems that Italian scientific collections and research elsewhere in Africa (e.g. Egypt, Sudan, Uganda etc.) have been underestimated (i.e. Osborn & Helmy 1980, Delany 2012). However, considering the valuable contribution of several Italian explorers to early geographic discoveries along the Nile (i.e. Giovanni Miani, who died in 1872 in what is now the Democratic Republic of Congo), the presence of significant natural history collections is unsurprising. Additionally, Italian museums received specimens from abroad that may be of greater scientific or historical value than generally believed. Hopefully, this overview will prove useful to experts of specific



taxa/regions and broaden the appreciation for Italian museums in the context of biodiversity conservation (cfr. Gippoliti 2005).

Material and Methods

An extensive literature review among Italian zoological journals was performed. When available, particular attention was paid to critical catalogues and historical reviews of single natural history museums. The results are discussed on a single city/museum basis, from north to south Italy, although additional museums can be found in some cities. Valuable African mammal specimens can also be found in other public and private collections, but their history remains to be investigated.

Turin

The Zoological Museum of Turin University (whose collections are located in the Museo Regionale di Scienze Naturali in Turin) received specimens collected in Egypt by Giuseppe Donati (1717-1762), professor of botany at Turin, including some bats (*Taphazois perforatus*, *Asellia tridens*) well before their formal description (Geoffroy Saint-Hilaire 1818). A strong connection with Egypt was later established through Bernardino Drovetti (1776-1852) and his crucial role in that country as several living animals reached the Savoia Menageries and were often studied by zoologists of the University (Marro 1950). Prof. Giuseppe Gené (1800-1847) described the female of *Capra nubiana* (Gené 1834a) and established that the Barbary sheep *Ammotragus lervia* was more related to the genus *Capra* than to *Ovis* (Gené 1834b). In 1839, a small number of mammals was received by Luigi Regis, a former collaborator of Bonelli at Turin and at the time 'Conservatore del Museo Zoologico Egiziano' (curator of the Egyptian Zoological Museum). Franco Andrea Bonelli (1784-1830) described the mounting of a hippopotamus skin from the Cape of Good Hope acquired at London (Bonelli 1825). In Italy, at the time, only Florence and Pavia had very old mounted skins of this species, quite certainly from two specimens captured in 1600 in Damietta (Nile Delta) by physician Federico Zerenghi (Zerenghi 1603). Bonelli transformed the Turin Museum into an active, internationally recognised institution that received African mammals from several collectors, dealers, and museums. He recognised some of these as new species, but their description remained unpublished in the manuscript catalogue of the Turin Zoological Museum. An example is *Zorilla mauritanica* from Tripoli (Libya) which he considered different from the Cape of Good Hope species and must be considered

an early synonym of *Ictonyx libyca* (Hemprich & Ehrenberg, 1832).

A little-known chapter concerns capturing live Sudanese animals for the Savoia Royal Menageries. In 1864, Leopoldo Ori (1830-1869) was asked to capture wild animals for the Italian king Vittorio Emanuele II. In 1867, a considerable consignment of live animals, including nine giraffes, eight elephants and many other mammals and birds, was embarked from Alexandria to Italy (Visconti 1986). These included at least one *Hippotragus equinus bakeri*, which was unique to Europe and described by the Secretary of the Zoological Society of London after a visit to Turin (Sclater 1868). A short paper on the anatomy of an African elephant which died in Turin was published by Lorenzo Camerano (Camerano 1881). Specimens from southern Sudan were received from some of the first European explorers of Equatorial Africa, such as Alexandre Vaudey (1818-1854) and Antoine Brun-Rollet (1810-1855), who also served as Piedmont consuls in Khartoum. Other mammals from Sudan were received by Orazio Antinori, who also sent one *Phataginus temminckii* taken by Carlo Piaggia (1827-1882) at Kedareff, thus confirming the former presence of the species in Sennar (cf. Yalden et al. 1996: 113). Around 1900, Camillo Lessona, son of Michele, the museum director between 1867 and 1894, sent materials from Wadi Halfa (Sudan at the border with Egypt), including a *Gazella dorcas isabella*.

Luigi Amedeo di Savoia (1873-1929), Duca degli Abruzzi, led an expedition to Ruwenzori (Uganda) in 1906. Significant mammalogical contributions – ignored by Delany (2012) – include papers by Lorenzo Camerano (Camerano 1906, 1909a, b, c, d, e), who also described a mountain leopard subspecies, *Panthera pardus ruwenzorii*, and Enrico Festa (Festa 1907, 1909a, b) who described the bat *Nyctinomys aloysii-sabaudiae*, now *Tadarida aloysiisabaudiae* (Lanza & Harrisson 1963).

Missionary Luigi (Luis David) Jalla (1860-1943) sent materials from the Upper Zambesi region (Borotseland), located in what is now Zambia. In his study on plains zebras, Camerano (Camerano 1902) reported two specimens of *Equus burchelli zambiensis* donated by Jalla and dedicated a subspecies of *E. burchelli* from Southern Ethiopia to him.

Similarly to several of the most ancient museums in Italy, Turin received or acquired several African mammals in its early years. In particular, Turin obtained a male quagga *Equus quagga* from Leadbeater



in 1823. This specimen was discussed by Camerano (Camerano 1908), who designated it the type specimen of *E. quagga troussarti* (a phenotype represented by the Turin and one Paris specimen). Although subspecies are not generally accepted nowadays, it is somewhat remarkable that a taxon characterised by low genetic variability, such as the extinct quagga (Leonard et al. 2005), showed remarkable phenotypical differentiation evidenced by the few museum specimens available. The Turin skull was studied by Augusto Azzaroli (1921-2015) (Azzaroli 1966a, Azzaroli & Stanyon 1991), who was convinced that *E. quagga* and *E. burchelli* represented two distinct species.

Entomologist Achille Griffini published a monograph on zebras (Griffini 1913) and a paper discussing two taxa described a few years earlier: *Equus annectens* Rothschild, 1906, and *E. burchelli pococki* Brasil et Pennetier, 1909 (Griffini 1912).

Several mammals were received, but not studied, from Katanga (Congo DRC), possibly the results of collecting by the veterinarian Ettore Bovone (cfr. Chiovenda 1922).

Milan

Ferdinando Sordelli (1839-1916) reported that the first evidence of the genus *Spalax* in North Africa was provided by the expedition of Giuseppe Hainan (1828-1883) in Cyrenaica, well before it became an Italian colony (Sordelli 1899). However, Emilio Cornalia's contribution (Cornalia 1882) went unnoticed, and John Anderson discovered *Spalax* again in Lower Egypt (Anderson 1892).

Bats collected in Northern Kenya by Saverio Patrizi, who joined the Lamberto Toncker and Raimondo Franchetti expedition, were examined, and de Beaux described two taxa (de Beaux 1923). Regrettably, the holotype of *Petalia thebaica aurantica* was lost during the bombing of Milan in 1943, while the type of *Scotoecus artinii* is still extant (Cagnolaro 1976). A paratype of *S. artinii* is located in Genoa (MSNG 45844) (G. Doria, pers. comm., 2019).

Aurelio Rossi's (1898-1942) mammal collection in the Congo was studied by de Beaux (de Beaux 1925), who described the subspecies *Arvicanthis abyssinicus rossii*. The skull of a rare Nile white rhinoceros *Ceratotherium cottoni* collected by Rossi was later studied due to a dental anomaly (Vialli 1955).

After its almost complete destruction during World War II, the ungulate collection was rebuilt and

subsequently catalogued (Oriani & Castiglioni 2003). Important specimens include a Nigerian klipspringer, cf. *Oreotragus porteousi*, some dama gazelles *Nanger dama ruficollis* and scimitar-horned oryx *Oryx dammah* from Chad, and an incomplete skull of a giant sable antelope *Hippotragus variani*.

Pavia

The old and prestigious Museo di Storia Naturale of Pavia University reached prominence under the direction of Lazzaro Spallanzani (1729-1799). The museum grew from a 1771 donation by the Empress Maria Theresa of a collection assembled in Vienna. By her order, one of the hippopotamus mounted skins originally collected in 1600 by Zerenghi was moved in 1783 from Mantua to Pavia, where it is still on display (Rovati et al. 2007).

In 1830-1831, Giuseppe Acerbi (1773-1846), then Austrian consul to that country, donated a rich collection of Egyptian animals to the museum (Anonymous 1831). In 1835, he sent another equally important Egyptian collection to the museum of Padua University, which included one *Sus scrofa* and one *Gazella dorcas* (Catullo 1836).

Paolo Panceri (1833-1877) published a fascinating account of the anatomy of a giraffe whose skeleton and mounted skin were later deposited at the Museum of Anatomia Comparata of Pavia University (Panceri 1858).

Edoardo Zavattari (1883-1972) is well known for his biological and medical research in Libya and Eastern Africa (Latella 2012, Crucitti & Gippoliti 2021). He also travelled extensively in West Africa, collecting specimens that were studied by some of his collaborators (Citterio 1929, 1932, Storti 1929).

Parma

Luigi Pigorini donated a small zoological collection from the Congo made by Mr Giuseppe Corona to the Zoological Museum of Parma University. Alberto Del Prato (Del Prato 1893) studied it. He reported a few mammals from Banana (Lower Congo), including the skin of a *Felis neglecta* (Gray, 1838), a synonym of *Profelis aurata* (Temminck, 1827).

Between November and December 1907, the Zoological Museum received the Piola Collection, a small but interesting collection from the then Congo Free State – more precisely, from the region of the high River Ubangi. It included two mounted skins of male and female okapis. This fact seems noteworthy



as sexual differences (i.e. the lack of ossicones in females) had hitherto not been firmly established. However, the two specimens were not reported in the scientific literature (cfr. Lankester 1910, Gippoliti 2022).

Venice

Giampaolo Rallo reported that a substantial African 'big game' collection was donated in 1939 by Count Giuseppe De Reale (1877-1937) to the Museum of Natural History in Venice (Rallo 1999). Although specimens were often not correctly labelled (a common problem with this kind of collection), archive research showed that Count De Reale made 12 hunting trips in Africa between 1898 and 1929. He visited not only Tripolitania, Eritrea, and Ethiopia but also Egypt, Sudan, Tanzania, Kenya, Uganda, Belgian and French Congo, the Central African Republic, Chad, Tunisia, and the French Sahara. Some specimens of known origin, such as the skull of a male *Loxodonta cyclotis* taken in the region of Bangui, may have scientific relevance. Specimens belonging to the genus *Alcelaphus* were included in a recent taxonomic paper (Gippoliti 2023).

Another more recent 'big game' collection is located in Bassano del Grappa, near Vicenza. The Renato Luca Collection includes numerous African bovids and other large mammals and deserves to be better catalogued so that the scientific community can take advantage of it.

Genoa

The Genoa civic Natural History Museum, founded by Marquis Giacomo Doria (1840-1913) and some Italian naturalists in 1867, played a critical role in the discovery of the chimpanzee in East Africa. The first volume of the Genoa journal, *Annali del Museo civico di Storia naturale*, included a paper by Arturo Issel that reviewed the history of two ape specimens that reached Egypt and were the first evidence of chimpanzees *Pan troglodytes* in north-east Africa (Issel 1870). One of these specimens was later sent to Genoa and was studied by Giglioli, together with a skull of a young chimpanzee obtained by the physician Lamberto Ori while serving in Sudan, and subsequently sent to the Florence Anthropological Museum. Giglioli investigated what was then known about chimpanzee geographic variability, and although the materials were clearly insufficient, he described in the *Annali*, the eastern chimpanzee as *P. troglodytes schweinfurthi* (Giglioli 1872). Interestingly, two more specimens from Monbuttu reached Genoa in 1872. They are a legacy of the last expedition of

Giuseppe Miani (1810-1872) in the discovery of the source of the Nile and possibly the first substantial evidence of chimpanzees in current Uganda.

Collections in Tunisia were completed by Abdul Kerim in 1873, Orazio Antinori (1811-1882) in 1875, and Giacomo Doria from 1881-1882. Genoan materials were discussed by Fernand Lataste (Lataste 1887).

Leonardo Fea (1852-1903) is well-known for his Asian zoological collections but from 1897 to 1903 he was in West-Central Africa, more precisely in Cape Verde (1897-1898), Portuguese Guinea (Guinea-Bissau) (1898-1900), São Tomé (1900-1901), Príncipe (1901), Bioko (1901-1902), Annobón (1902), Cameroon (1902) and Gabon (1903). After having returned to Italy in March 1903, he died due to a tropical disease on 27 April 1903 in Turin, his native city (Poggi 2017). Although suffering from health problems, Fea dedicated much time to collecting mammals. With the help of natives, he secured several specimens, especially from Bioko (*Piliocolobus pennanti*, *Colobus satanas*, *Poiana richardsoni*, *Cephalophus ogilbyi*). Regrettably, the mammalogical samples of his last collecting expedition were never systematically reported, except for bats, a taxonomic group of which Giacomo Doria was particularly fond. Knud Andersen (Andersen 1906, 1907) discussed some of these specimens, including the second recorded *Rhinolophus alcyone* Temminck collected at Victoria, Cameroon, and a *Hipposideros caffer centralis* from Vivi (Belgian Congo) collected by Giacomo Bove (Andersen 1906). Egyptian materials from Genoa were also studied (Andersen 1906).

The Genoa Museum also received some Congolese specimens from Marquis Saverio Patrizi's hunting trip in Belgian Congo in 1926-1927 (Patrizi 2005) and some West-African materials from Heinrich Dohrn (Heinrich Wolfgang Ludwig Dohrn 1838-1913, brother of the founder of the Stazione Zoologica in Naples, Anton Dohrn) including the skull of a *Cephalophus niger* from Liberia.

An important Ugandan collection was received between 1908 and 1910 by British-Italian physician Enrico Bayon (1876-1952); later described by Oscar de Beaux in a series of papers (de Beaux 1921, 1922, 1924a, 1926) but ignored by Delany (Delany 2012). The Italian zoologist also used this collection as a basis for his taxonomic review of *Potamochoerus* (de Beaux 1924b). Incidentally, Delany cites Emin Pasha's main mammal collections from the Equatorial Province as the beginning of Ugandan mammalogy (Delany



2012). However, it is well known that the most prominent collector was the Italian Giuseppe Casati (1838-1902) (Casati 1891, Ackery 2002). In particular, Casati (Casati 1891: 153) recalled the acquisition of a young specimen of an arboreal hyrax whose skin was later sent to Emin Pasha and would be later described as *Dendrohyrax emini* Thomas, 1887. Therefore, the words of Thomas (Thomas 1888), “When the cares and anxieties of a person in the position of a responsible governor of a large and turbulent African province are considered, it seems wonderful that Emin should have been able to make any collections at all, and still more should have made such a collection as the present, nearly every specimen of which has been carefully labelled in his own handwriting (Fig. 2), with the date, sex, and exact locality, particulars which add enormously to its scientific value”, should more properly be dedicated to Casati.

In 1914, Enrico Bayon sent a few mammal specimens from Robben Island (Cape of Good Hope, South Africa). They were later studied by de Beaux (de Beaux 1921), who established the new taxon *Chrysochloris bayoni*.

Before World War II, specimens of large mammals were received from Angola and Mozambique, including a skull of the threatened giant sable antelope *Hippotragus variani* and a lowland nyala *Tragelaphus angasi* from Sofala – Mozambique (Arbocco 1965, Menchinelli 1970). In 1997, Ermanno Civalleri donated a collection of about 70 hunting trophies of African bovids (G. Doria, pers. comm., 2024).

Bologna

Camillo Ranzani (1775-1841) published a paper on a reddish spotted hyena, *Crocuta crocuta*, seen in a travelling menagerie and later secured for the Zoological Museum (Ranzani 1823).

Antonio Alessandrini (1786-1861), director of the Museum of Comparative Anatomy of Bologna University, described the skeleton of a young *P. troglodytes* (Alessandrini 1854). In a previous paper (Alessandrini 1829), he described the complete skeleton of a common hippopotamus received from Sennaar in 1826, thanks to Giovanni Bosari, a physician of Mehemet Ali. He also discussed the anatomy of a male *Neotragus pygmaeus* received from Frank in 1844 (Alessandrini 1848).

Giovanni Giuseppe Bianconi (1809-1878) studied the materials collected by Bologna-born tradesman Carlo

Fornasini (?-1865) in Mozambique just after Wilhelm Peters had studied for the first time Mozambique mammals (Bianconi 1853, Bonfitto 1992). Among the reported species, there are the first galago of the genus *Otolemur* of known origin (cited as *Otolicnus crassicaudatus* Geoff.) and two unknown bat species that Bianconi temporarily referred to as the Asian *Pteropus marginatus* Cuv. and *Nyctinomus plicatus* Gray. In the same University, Luigi Calori described in detail the anatomy of *Pedetes capensis* of the same collection (Calori 1854).

Augusto Toschi (1906-1973) produced a detailed morphologic study (Toschi 1936) of the skulls of several African antelopes, mainly belonging to the Pizzardi collection. After the war, several antelope trophies from the Congo (DRC), including some interesting heads and skulls of bongos *Tragelaphus* cfr. *euryceros* were donated by a Mr Tassoni but were never studied.

Pisa

In 1828, Paolo Savi (1798-1871), the great director of the Zoological Museum of Pisa University, studied three living antelopes sent from Egypt to the Grand Duke of Tuscany. Recognising one as a new species, he called it *Antilope gibbosa* (Savi 1828), now a senior synonym of *Addax nasomaculatus* (de Blainville, 1816). A French-Tuscanian archaeological expedition to Upper Egypt, led by Egyptologists Jean-Francois Champollion and Ippolito Rosellini and including the naturalist Giuseppe Raddi (1770-1829), collected some vertebrates deposited at the Pisa Museum that have been studied quite recently (Farina & Vanni 2021) including a member of the African golden wolf complex cf. *Canis anthus* Cuvier, 1820. In 2017, the museum received a huge collection of large mammals (including 248 complete mounted skins) shot by the hunter Giorgio Barbero, including several from Africa. The entire mammal collection is being revised and catalogued (S. Farina, pers. comm., 2023).

Florence

The Museo di Storia Naturale in Florence, often called ‘La Specola’ for its astronomical observatory, was founded by the Grand Duke Pietro Leopoldo of Lorraine and opened to the public in 1775, one of the oldest public museums in the world (Barbagli & Violani 2010). It includes a mounted hippopotamus skin collected by Zerenghi in 1600 (Fig. 1).

The Zoological Museum received a few mammal duplicates from the Brazzà-Pecile Congo expedition (1883-1886) from naturalist Giacomo Brazzà (1859-



Fig. 1. The mounted skin of *Hippopotamus amphibius* held at the Zoological Section of the Museo di Storia Naturale of Florence University (photo Spartaco Gippoliti, 2009), one of two specimens collected by Zerenghi in Egypt in 1600.

1888), the brother of the Italian-born Pietro (Pierre) Brazzà, which recognised the territories north of the River Congo as a French protectorate (Gippoliti & Agnelli 2014).

Balducci (Balducci 1909) studied the skull of a giant forest hog of the genus *Hylochoerus* from the Ituri Forest – already discussed by Giglioli (Giglioli 1907) and assigned it to a new species, *H. gigliolii*, which is now regarded as a synonym of *H. meinertzhageni* Thomas, 1904.

The ‘big game’ collection of the Count of Turin (Vittorio Emanuele di Savoia-Aosta 1870-1946) has recently been described (Finotello & Agnelli 2015). The African section resulted from a big game expedition in 1908-1910 and contains several specimens of *Ceratotherium cottoni*, the now almost extinct Northern white rhinoceros. To our knowledge, these specimens have never been thoroughly investigated. On the other hand, the skull of a male *L. cyclotis* from Beni (Congo Democratic Republic) has been the prototype of the species for the studies of Augusto Azzaroli on the evolution of elephants (e.g. Azzaroli 1966b).

Before World War II, Commander Attilio Gatti led some expeditions to Central and Southern Africa in collaboration with anthropologists from Florence University. In 1930, during an ‘Italian Scientific Expedition’, an adult mountain gorilla, *Gorilla beringei graueri*, was shot by Gatti. Its remains are stored in the Anthropology and Zoology museums in Florence (Ducci et al. 2015). A photographic reportage of gorillas was subsequently compiled by Lady Delves Broughton and published in The New York Times, L’Illustrazione Italiana and Illustrated London News. Raymond Dart (1893-1988), the South African paleoanthropologist famous for the discovery in 1925 of *Australopithecus africanus*, was also among the members of the expedition. His notes on the expedition, including on gorillas, remain unpublished (Štrkalj & Tobias 2008). However, it is noteworthy that Dart supported the first scientific investigations on wild mountain gorillas after the war.

Rome

The Pontifical University (Archigymnasium) received in 1837 a small zoological collection from Egypt (or more precisely from Nubia) donated to Pope Gregory XVI by Clot-Bey (Antoine Barthelemy Clot 1793-1868), the personal physician of Mehemet Ali, viceroy of Egypt. Among the mammals were three *Galago senegalensis*, and one member of the genus *Gerbillus* was listed as *Dipus sagitta*. The skeleton of the common hippopotamus is still found at the Museo di Anatomia Comparata of La Sapienza University. The skull of this specimen has been included in palaeontological studies that highlighted how it resembles the taxon *H. antiquus* (Caloi et al. 1980, Cuscani Politi 1980).

Although Rome became the capital of the Kingdom of Italy in 1870, no important African collection was received by the Zoological Museum of the University of Rome. However, specimens were often donated by soldiers returning from the Congo Free State (Carruccio 1912). Interestingly, in early 1903, the museum received a skin and a complete skeleton of an *Okapia johnstoni* as a gift to the King of Italy that had undoubtedly been obtained from the King of Belgium (Gippoliti 2022). These okapis were the third and fourth specimens to reach a scientific institution. Among the others, it is notable a *Manis temmincki* collected by the well-known official and explorer Romolo Gessi (1831-1881) during his exploration of the shores of Lake Albert in what is today Uganda (1876) (Carruccio 1904). The famous Czech explorer Emil Holub sent several specimens from his South African missions to the Rome Zoological Museum,

including a *Procavia capensis* and warthogs (Carruccio 1895a, b).

The Museo Civico di Zoologia, created in 1932 and managed by the Giardino Zoologico until 1998, increased its mammal collection mostly with the remains of animals that died in the zoo other than the old university materials. These include a female bongo *Tragelaphus euryceros* from Ituri (Congo DR) captured by the already mentioned captain Attilio Gatti (Gippoliti et al. 2018), an okapi male received in 1956 from Congo DR and the skull of *L. cyclotis* acquired by Naples Zoo and originating from Gangala nabodio (Palombo et al. 2021). Other specimens were the direct result of a donation of Italian hunters or collectors, such as Aurelio Rossi, who sent three mounted lowland gorillas (while he sent other ape specimens to Leiden Museum) or Saverio Patrizi, who donated two red colobus *Piliocolobus oustaleti* from the River Uellé, Belgian Congo.

Naples

When the Zoological Museum of the Naples University was officially established in 1813, the Kingdom of Two Sicilies was ruled by Joachim Murat, who married the daughter of Napoleon Bonaparte. Therefore, the early bond between the Jardin des Plantes collections and those in Naples is unsurprising. Thanks to the

French hegemony in Natural Sciences at the time, this link can also be recognised in other Italian museums that belonged to the 'Kingdom of Italy' established by Napoleon (i.e. Turin, Pavia, Padua and Bologna). Although a detailed study is still lacking, the adopted nomenclature and origin of several Naples early specimens (*Cercopithecus delalandii*, *Aonyx delalandii*) – as reported by the director of the museum, Achille Costa (1823-1898) (Costa 1863) – provides strong evidence that several early specimens originated either from the Cape of Good Hope from a French source, possibly Jules Verraux, or directly from the Paris Museum. The same Verraux was possibly the source of some Algerian mammals bought by Costa in 1862. Their nomenclature and year of acquisition indicate these specimens belonged to the Loche collection and probably include a syntype of *Zorilla vaillanti* Loche, 1856, acquired in 1861. In the same year, Costa also acquired three mammals from Gabon (*Anomalurus beecrofti*, *Nandinia binotata* and *Otolincus peli* = *Galagoides demidovi*) that probably originated from M. Aubrey Lecomte, the collector who, since 1856, sent some specimens from the then little-known Gabon to the Paris National Museum of Natural History (Pucheran 1858).

Francesco Gasco (1842-1892) and Paolo Panceri of Naples University were in Egypt in 1873. Gasco



Fig. 2. A mounted specimen of *Cercopithecus ascanius atrinasus*, belonging to the historical collections of the Zoological Museum of Bologna University (photo Spartaco Gippoliti, 2023).



recorded the results of a second trip by Prof Panceri with Emilio Cornalia and Cristoforo Bellotti of the Milan Museum to Egypt along the Nile as far as the first cataract (Gasco 1876). They also published some observations on the effects of cobra venom on the Egyptian mongoose *Herpestes ichneumon* (Panceri & Gasco 1874). Most anatomical specimens were deposited in the Comparative Anatomy Museum in Naples, while others were dispersed among Italy's leading university zoological museums.

Angelo Senna (1866-1952), studying specimens of his collection and those of the Naples Zoological Museum, confirmed the existence of two distinct *Rhinopoma* species in Egypt (Senna 1906). He (Senna 1914) also studied a small collection of bats collected by Maurizio Piscicelli during an expedition in Southern-central Africa with Elena d'Orleans Duchess d'Aosta. Senna described *Rhinolophus bembanicus* from the shore of Lake Bangweulu, a synonym of *R. simulator* Andersen according to Koopman (1975), although it is unlikely anyone was able to study this specimen before his destruction during World War II.

The hunting trophy collection donated by Elena d'Orleans, Duchess of Aosta (1871-1951), remains in the National Library in Naples. This collection is the result of several hunting safaris through many African regions. A catalogue and first scientific revision yielded some notable findings (De Francesco et al. 2020), including the identification of two heads of a dark impala collected in the vicinity of the Ngaso Ngnjro, North Kenya. These two belong to the taxon from the same region *Aepycerus melampus rendilis*, described by the Swedish zoologist Einar Lönnberg (Lönnberg 1912). The peculiar colour was the main reason for Lönnberg's description, yet the issue was neglected and, to our knowledge, the true *rendilis* is today represented by three specimens in Stockholm, one in Washington and the two Naples heads.

Discussion

In recent decades, there has been an increased recognition of the scientific value of natural history collections (Cotterill 2016). Advances in molecular techniques through next-generation DNA sequencing now allow the extraction of valuable mitochondrial genomes from various types of natural history specimens, to the extent that the term 'museomics' is now widely used (Guschanski et al. 2013). Museomics-based research has yielded new insights into the evolutionary history of organisms. It has dramatically impacted our knowledge regarding the

Tree of Life, filling gaps in most of its branches and revealing unknown or controversial phylogenetic positions. However, it should be stressed that collections also allow the unique investigation of phenotypic traits critical to evaluating phylogenetic hypotheses in a framework of integrative taxonomy (Dayrat 2005). While African countries must build up their own system of natural history collections, it is also vital that the scientific value of African natural history collections abroad is fully recognised so that they can contribute to public awareness – nationally and internationally – and effectively make available their collections for research and biodiversity conservation (Gippoliti 2005).

This review highlights how the geographic scope of Italian mammalogical research and collecting was more substantial than commonly believed. Considering the two hippopotamus specimens that the surgeon Federico Zerenghi collected in the Nile Delta in 1600 (Zerenghi 1603), these collecting activities span more than 400 years. One of the fathers of modern natural sciences, the Bologna-born Ulisse Aldrovandi (1522-1605), not only collected specimens but also hired a number of artists to produce colour illustrations that were later published in black and white in his books. Among the colour plates still held at Bologna University feature not only Zerenghi's female hippopotamus but also detailed illustrations of other African species such as *Cephalophus callipygus* and *Cercopithecus diana* (Capanna & Gippoliti 2007).

A correlation between political and historical events often facilitates opportunities for scientific research. For example, the numerous collections from the former Belgian Congo (now DRC) resulted from a strong political bond between the Kingdoms of Italy and Belgium. This bond was also exemplified by the number of okapi specimens reaching Italy a few years after its discovery and, incidentally, by the fact that the first photo of a living okapi was taken by Lieutenant Antonio Millo Ribotti, who also procured a specimen for the Genoa Museum (Gippoliti 2022). Regrettably, the specimens stored in Italian museums have not always been adequately catalogued and studied. Small museums especially had – and still have – limited staff, and international specialists may be unaware of the presence of potentially important voucher specimens. As a case in point, among the historical collections of the Zoological Museum of Bologna University, a specimen is included belonging to *Cercopithecus ascanius atrinasus* Machado, 1965 (Fig. 2) that is still officially known from nine specimens stored in an Angolan museum. Regrettably, no data

about the origin of this voucher specimen is available, but it certainly reached Bologna long before the formal discovery of *atrinusus*. The episode highlights how little care has been devoted to the scientific cataloguing and management of even prestigious museum collections, possibly constraining knowledge of African biodiversity (Ferguson 2020, Angelici et al. 2021). Although digitalisation may improve the accessibility of small collections, it seems that creating a national hub for biodiversity research and collections is urgently needed to properly care

for existing collections and encourage taxonomic and historical research that is fundamental to future biodiversity research and conservation.

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Literature

- Ackery P.R. 2002: Emin Pasha's butterflies – a case for Casati? *Arch. Nat. Hist.* 29: 347–357.
- Alessandrini A. 1829: Descrizioni delle ossa componenti il teschio di un ippopotamo d'Egitto. *Annali di Scienze Naturali* 1: 17–45, 411–449.
- Alessandrini A. 1848: Osservazioni anatomiche sullo scheletro del *Moschus pygmeus* Linn. *Rc. Sess. Accad. Sci. Ist. Bologna* 1847–1848: 41–42.
- Alessandrini A. 1854: Annotazioni intorno allo scheletro di un giovane troglodite *Simia troglodites*. *Nuovi Ann. Scie. Nat.* 10: 5–19.
- Andersen K. 1906: On some new or little-known bats of the genus *Rhinolophus* in the collection of the Museo civico, Genoa. *Ann. Mus. Civ. Stor. Nat. Genova* 42: 173–195.
- Andersen K. 1907: Chiropteran notes. *Ann. Mus. Civ. Stor. Nat. Genova* 43: 5–45.
- Anderson G. 1892: Remarks on the occurrence of *Spalax typhlus* in Africa. *Proc. Zool. Soc.* 1892: 472–476.
- Andreone F., Boero F., Bologna M.A. et al. 2022: Reconnecting research and natural history museums in Italy and the need of a national collection biorepository. *ZooKeys* 1104: 55–68.
- Angelici F.M., Colangelo P. & Gippoliti S. 2021: Out of Europe: investigating *Hystrix cristata* (Rodentia: Hystricidae) skull morphometric geographic variability in Africa. *Biogeographia* 36: a001.
- Anonymous 1831: Notizia di alcuni doni fatti dal sig. consigliere cav. Acerbi, console generale di S.M.I.R.A. in Egitto in Museo di Storia Naturale dell'Imp. R. Università di Pavia. *Bibl. Ital.* 64: 38–44.
- Arbocco G. 1965: Il niala, rara antilope del Sud Africa. *Natura (Milan)* 56: 168–170.
- Azzaroli A. 1966a: Pleistocene and living horses of the Old World. *Palaeontogr. Ital.* 61: 1–15.
- Azzaroli A. 1966b: La valeur des caractères crâniens dans la classification des éléphants. *Eclogae Geol. Helv.* 59: 541–564.
- Azzaroli A. & Stanyon R. 1991: Specific identity and taxonomic position of the extinct Quagga. *Rend. Lincei Sci. Fis. Nat.* 2: 425–436.
- Balducci E. 1909: Di una nuova specie di *Hylochoerus*. *Pubblicazioni del Reale Istituto di Studi Superiori Pratici e di Perfezionamento in Firenze – Sezione si Scienze Fisiche e Naturali*.
- Barbagli F. & Violani C. 2010: Origin and development of the exotic bird collection in the Museo di Storia Naturale of Florence University. *J. Afrotrop. Zool. (Spec. Issue)*: 5–16.
- Bianconi J.J. 1853: Specimena Zoologica Mosambicana. Fasciculus VII. *Mem. R. Accad. Sci. Ist. Bologna* 5: 221–243.
- Bonelli A. 1825: Intorno all'ippopotamo di recente acquisto al Museo di Torino. *Mem. R. Accad. Sci. Torino* 29: 243–250.
- Bonfitto A. 1992: Guida alla 'Collezione Mozambicana' del Museo di Zoologia dell'Università di Bologna. *Natura e Montagna* 39: 33–42.
- Cagnolaro L. 1976: Catalogo dei Tipi del Museo civico di Storia Naturale di Milano. III. I tipi dei Mammiferi con un profilo storico sulla collezione mammalogica. *Atti Soc. Ital. Sci. Nat. Mus. Civ. Stor. Nat. Milano* 117: 85–108.
- Caloi L., Palombo M.R. & Petronio C. 1980: Resti cranici di *Hippopotamus antiquus* (=H. major) e *Hippopotamus amphibius* conservati nel Museo di Paleontologia dell'Università di Roma. *Geol. Rom.* 19: 91–119.
- Calori L. 1854: Sulla struttura dell'*Helamys caffer* F. Cuvier. *Mem. R. Accad. Sci. Ist. Bologna* 5: 245–313.
- Camerano L. 1881: Ein Beitrage zur Anatomie des *Loxodon africanus*. *Zool. Anz.* 4: 481–483.
- Camerano L. 1902: Materiali per lo studio delle zebre. *Atti R. Accad. Sci. Torino* 37: 612–624.
- Camerano L. 1906: *Felis pardus* subsp. *ruwenzorii* nota preventiva. *Boll. Mus. Zool. Anat. Comp. R. Univ. Torino* 21: 1–6.
- Camerano L. 1908: Il Quagga del Museo Zoologico di Torino. *Atti R. Accad. Sci. Torino* 43: 562–565.
- Camerano L. 1909a: Ricerche intorno al *Colobus occidentalis* Rochebr e ad altre specie affini. In: Roccati (ed.), Il Ruwenzori. Parte scientifica. Risultati delle osservazioni e studi compiuti sul materiale raccolto dalla spedizione, vol. I, Zoologia, Botanica. *Hoepli, Milano, Italy*: 1–66.
- Camerano L. 1909b: Osservazioni intorno al *Cercopithecus ascanias* Aud. subsp. *schmidti* Matsch. In: Roccati (ed.), Il Ruwenzori. Parte scientifica. Risultati delle osservazioni e studi compiuti sul materiale raccolto dalla spedizione, vol. I, Zoologia, Botanica. *Hoepli, Milano, Italy*: 67–73.
- Camerano L. 1909c: Osservazioni intorno al *Felis pardus* subsp. *ruwenzorii* Camer. In: Roccati (ed.), Il Ruwenzori. Parte scientifica. Risultati delle osservazioni e studi compiuti sul materiale raccolto dalla spedizione, vol. I, Zoologia, Botanica. *Hoepli, Milano, Italy*: 89–110.
- Camerano L. 1909d: Osservazioni intorno al *Buffalus caffer* sub. spec. *radcliffei* Oldf. Thomas. In: Roccati (ed.), Il Ruwenzori. Parte scientifica.



- Risultati delle osservazioni e studi compiuti sul materiale raccolto dalla spedizione, vol. I. Zoologia, Botanica. *Hoepli, Milano, Italy: 139–144.*
- Camerano L. 1909e: Osservazioni intorno all'*Equus quagga* sub. spec. *granti* Winton. In: Roccati (ed.), Il Ruwenzori. Parte scientifica. Risultati delle osservazioni e studi compiuti sul materiale raccolto dalla spedizione, vol. I, Zoologia, Botanica. *Hoepli, Milano, Italy: 145–154.*
- Capanna E. & Gippoliti S. 2007: I 'Quadrupedi Vivipari'. In: Alessandrini A. & Ceregato A. (eds.), Ulisse Aldrovandi. *Natura Picta. Editrice Compositori, Bologna, Italy: 83–87.*
- Carpaneto G.M. & Gippoliti S. 1994: Primates of the Harena Forest, Ethiopia. *Primate Conserv. 11: 12–15.*
- Carruccio A. 1895a: Notizie zoologiche sovra un *Phacocoerus aeliani* Rüppel maschio ed esame anatomico della testa ossea di tre esemplari della stessa specie. *Boll. Soc. Rom. Stud. Zool. 4: 192–226.*
- Carruccio A. 1895b: Osservazioni zoologiche sul *Pedetes caffer* con note anatomiche sul cranio neurale e facciale del medesimo. *Boll. Soc. Rom. Stud. Zool. 4: 265–277.*
- Carruccio A. 1904: Sull'*Okapia* donata da S.M. Il Re Vittorio Emanuele III (Prima Parte). *Boll. Soc. Zool. Ital. 4: 233–253.*
- Carruccio A. 1912: Sui *Leptocebus aterrimus* Oudemans introdotti nella collezione dei primati del Museo Zoologico Universitario. *Boll. Soc. Zool. Ital. 1: 244–250.*
- Casati G. 1891: Ten years in Ekuatoria and the return with Emin Pasha, vol. 1. *Randolph Clay, London and New York.*
- Catullo 1836: Relazione dei doni fatti dal consigliere cav. Giuseppe Acerbi, già console generale di S.M.I.R.A. in Egitto, al Gabinetto di storia naturale dell'Università di Padova. *Bibl. Ital. 83: 44–65.*
- Chioyenda E. 1922: Le piante raccolte dal dott. Ettore Bovone al Catanga nel 1918–21. *Nuovo G. Bot. Ital. 36: 360–371.*
- Citterio V. 1929: Cellule enterocromaffini e cellule di Paneth nell'intestino di *Cercocebus lunulatus*. *Monit. Zool. Ital. 40: 137–141.*
- Citterio V. 1932: Persistenza della sutura metopica in un cranio di gorilla. *Boll. Zool. 3: 133–136.*
- Cornalia E. 1882: Elenco delle raccolte portate dalla Cirenaica. In: Haimann G. (ed.), *Cirenaica. Giuseppe Civelli, Rome, Italy: 138–141.*
- Costa A. 1863: Mammalia in Museo Zoologico. *Annuario Mus. Zool. R. Univ. Napoli 3: 1–6.*
- Cotterill F.P.D. 2016: The tentelic thesis, interdisciplinarity, and earth system science: how natural history collections underpin geobiology. *Arch. Zool. Mus. Lomonosov Moscow State Univ. 54: 598–635.*
- Crucitti P. & Gippoliti S. 2021: Edoardo Zavattari (1883–1972). La sua opera scientifica a cinquanta anni dalla scomparsa. *Med. Secoli 33: 517–566.*
- Cusani Politi P. 1980: Qualche considerazione sulla valutazione sistematica dell'ippopotamo fossile maggiore (*Hippopotamus amphibius major* Cuvier). *Atti Accad. Fisiocrit. Siena Med. Fis. 12: 1–10.*
- Dayrat B. 2005: Towards integrative taxonomy. *Biol. J. Linn. Soc. 85: 407–415.*
- de Beaux O. 1921: Collezioni zoologiche fatte nell'Uganda dal Dott. E. Bayon. XVI – Mammiferi. Parte I. Ungulata. *Ann. Mus. Civ. Stor. Nat. 'Giacomo Doria' Genova 49: 219–234.*
- de Beaux O. 1922: Collezioni zoologiche fatte nell'Uganda dal Dott. E. Bayon. XVII – Mammiferi. Parte II. Chiroptera. *Ann. Mus. Civ. Stor. Nat. 'Giacomo Doria' Genova 49: 364–373.*
- de Beaux O. 1923: Di alcuni chiroterteri africani del Museo civico di Milano. *Atti Soc. Ital. Sci. Nat. Mus. Civ. Stor. Nat. Milano 62: 91–101.*
- de Beaux O. 1924a: Collezioni zoologiche fatte nell'Uganda dal Dott. E. Bayon. XVIII – Mammiferi. Parte III. Rodentia. *Ann. Mus. Civ. Stor. Nat. 'Giacomo Doria' Genova 51: 202–219.*
- de Beaux O. 1924b: Beitrag zur Kenntniss der gattung *Potamochoerus* Gray. *Zool. Jahrb. 47: 379–504.*
- de Beaux O. 1925: Su alcuni mammiferi del Congo belga raccolti dal dott. A. Rossi. *Atti Soc. Ital. Sci. Nat. Mus. Civ. Stor. Nat. Milano 64: 87–96.*
- de Beaux O. 1926: Collezioni zoologiche fatte nell'Uganda dal Dott. E. Bayon. XIX – Mammiferi. Parte IV. Appendix. *Ann. Mus. Civ. Stor. Nat. 'Giacomo Doria' Genova 52: 100–107.*
- De Francesco T., Adamo I., Duraccio S. & Gippoliti S. 2020: Catalogo annotato della raccolta zoologica di Elena d'Orléans, duchessa D'Aosta, presso la Biblioteca Nazionale di Napoli. *Boll. Mus. Civ. Stor. Nat. Verona 44: 29–60.*
- Del Prato A. 1893: Le raccolte zoologiche fatte nel Congo dal cav. Giuseppe Corona. *Battei, Parma, Italy: 3–14.*
- Delany M.J. 2012: Mammal studies in Uganda 1878–1980. *Arch. Nat. Hist. 39: 27–38.*
- Ducci L., Veracini C. & Agnelli P. 2015: Note su un esemplare di Gorilla di pianura orientale, *Gorilla beringei graueri* (Matschie, 1914) conservato al Museo di Storia Naturale dell'Università di Firenze. *Museol. Sci. Mem. 14: 157–162.*



- Farina S. & Vanni L. 2021: The Zoological specimens of the Franco-Tuscan expedition in the Natural History Museum of the University of Pisa. *Arch. Nat. Hist.* 48: 337–345.
- Ferguson A.W. 2020: On the role of (and threat to) natural history museums in mammal conservation: an African small mammal perspective. *J. Vert. Biol.* 69: 20028.
- Festa E. 1907: Spedizione al Ruwenzori di S.A.R. Luigi Amedeo di Savoia Duca degli Abruzzi. XI. *Nyctinomys aloysi-sabaudiae*, nov. spec. (diagnosi preventiva). *Boll. Mus. Zool. Anat. Comp. R. Univ. Torino* 22: 1–2.
- Festa E. 1909a: Chiroterteri ed Insettivori. In: Roccati (ed.), Il Ruwenzori. Parte scientifica. Risultati delle osservazioni e studi compiuti sul materiale raccolto dalla spedizione, vol. I, Zoologia, Botanica. *Hoepli, Milano, Italy*: 75–88.
- Festa E. 1909b: Rosicanti. In: Roccati (ed.), Il Ruwenzori. Parte scientifica. Risultati delle osservazioni e studi compiuti sul materiale raccolto dalla spedizione, vol. I, Zoologia, Botanica. *Hoepli, Milano, Italy*: 111–138.
- Finotello P. & Agnelli P. 2015: La collezione dei trofei di caccia di Vittorio Emanuele Duca di Savoia-Aosta, Conte di Torino, al Museo di Storia Naturale dell'Università degli Studi di Firenze. *Museol. Sci.* 9: 13–29.
- Gasco F. 1876: Viaggio in Egitto dei soci P. Panceri e F. Gasco nell'anno 1873-1874. *Trani, Naples, Italy*.
- Gené G. 1834a: Descrizione di una singolare varietà di pecora a coda adiposa e della femmina di becco selvatico dell'Alto Egitto (*Capra nubiana* F. Cuv.). *Mem. R. Accad. Sci. Torino* 37: 275–289.
- Gené G. 1834b: Considerazioni generali sulle pecore e sulle capre con alcune speciali riflessioni sul Muflone africano (*Ovis tragelaphus* Auct.). *Ann. Sci. Regno Lombardo-Veneto* 4: 144–147.
- Geoffroy Saint-Hilaire E. 1818: Description des mammifères qui se trouvent en Egypte. *Imprimerie Impériale, Paris, France*.
- Giglioli E.H. 1872: Studi craniologici sui Cimpanzé. *Ann. Mus. Civ. Stor. Nat. Genova* 3: 56–179.
- Giglioli E.H. 1907: The forest-pig of Central Africa. *Nature* 75: 414–415.
- Gippoliti S. 2005: Historical museology meets tropical biodiversity conservation. *Biodiv. Conserv.* 14: 3127–3134.
- Gippoliti S. 2020: Records of Ethiopian and Eritrean mammals in Italian literature and museums, with some taxonomic notes. *Biogeographia* 35: 17–32.
- Gippoliti S. 2022: Okapi, Italy and the heart of darkness. The political history behind early specimens of *Okapia johnstoni* (Sclater, 1901) in Italy. *Quad. Mus. Civ. Stor. Nat. Ferrara* 10: 65–67.
- Gippoliti S. 2023: Tora hartebeest *Alcelaphus tora* Gray, 1873 and allied forms in Italian museums, with taxonomic considerations. *Ann. Mus. Civ. Stor. Nat. 'Giacomo Doria' Genova* 116: 261–278.
- Gippoliti S. & Agnelli P. 2014: Primatological relics of the Mission Brazza-Pecile in Equatorial Africa at the Museo di Storia Naturale of Florence University, with taxonomic notes. *Rend. Fis. Acc. Lincei* 25: 195–199.
- Gippoliti S., Luptak P. & Groves C.P. 2018: Flagship but only locally. The strange history of Bongo *Tragelaphus eurycerus* taxonomy. *Gazella (Praha)* 44: 48–60.
- Griffini A. 1912: Intorno a due bonte-quagga del Museo di Tring. *Atti Soc. Ital. Sci. Nat. Mus. Civ. Stor. Nat. Milano* 51: 366–383.
- Griffini A. 1913: Le zebre – studio zoologico e popolare. *Manuale Hoepli, Milan, Italy*.
- Guschanski K., Krause J., Sawyer S. et al. 2013: Next-generation museomics disentangles one of the largest primate radiations. *Syst. Biol.* 62: 539–554.
- Issel A. 1870: Descrizione di una scimmia antropomorfa proveniente dall'Africa centrale. *Ann. Mus. Civ. Stor. Nat. Genova* 1: 366–383.
- Koopman K.F. 1975: Bats of the Sudan. *Bull. Am. Mus. Nat. Hist.* 154: 353–444.
- Lankester E.R. 1910: Monograph of the Okapi. *Trustees of the British Museum, London, UK*.
- Lanza B. & Harrison D.L. 1963: A new description of the type specimen of *Nyctinomus aloysii-sabaudiae* Festa, 1907. *Z. Säugetierkd.* 28: 102–107.
- Lataste F. 1887: Catalogue critique des Mammifères apélagiques sauvages de la Tunisie. Exploration scientifique de la Tunisie. *Imprimerie Nationale, Paris, France*.
- Latella L. 2012: Zoologi italiani in Libia nella prima metà del Novecento. *Natura (Milan)* 103: 143–158.
- Leonard J.A., Rohland N., Glaberman S. et al. 2005: A rapid loss of stripes: the evolutionary history of the extinct quagga. *Biol. Lett.* 1: 291–295.
- Lönnberg E. 1912: Mammals collected by the Swedish Zoological Expedition to British East Africa 1911. *Kongl. Svenska Vetensk.-Akad. Handl.* 48: 1–188.
- Maretti S., Razzetti E. & Chiozzi G. 2013: L'esplorazione zoologica in Africa. Le ricerche degli italiani. Atti della Giornata di Studio, 2 dicembre 2010, Pavia. *Natura (Milan)* 103: 1–232.
- Marro G. 1950: La fauna e la flora africana inviata in Europa da B. Drovetti dal 1805 al 1829. *Boll. Mus. Zool. Univ. Torino* 2: 559–572.
- Menchinelli R. 1970: Proboscidiati, Perissodattili e Artiodattili del Museo Civico di Storia Naturale

- di Genova. *Ann. Mus. Civ. Stor. Nat. 'Giacomo Doria' Genova* 78: 189–216.
- Oriani A. & Castiglioni R. 2003: Gli ungulati del Museo Civico di Storia Naturale di Milano: Perissodactyla ed Artiodactyla. *Natura (Milan)* 93: 3–128.
- Osborn D.J. & Helmy I. 1980: The contemporary land mammals of Egypt (including Sinai). *Fieldiana Zool.* 5: 1–579.
- Palombo M.R., Carlini R. & Gippoliti S. 2021: Critical inventory of *Loxodonta* and *Elephas* (Mammalia, Proboscidea) cranial remains in the collections of the Museo Civico di Zoologia of Rome (Italy). *Boll. Mus. Civ. Stor. Nat. Verona* 45: 17–60.
- Panceri P. 1858: Studj sull'anatomia della giraffa. *Atti R. Ist. Lomb. Sci. Lett. Arti* 1: 347–351.
- Panceri P. & Gasco F. 1874: Intorno alla resistenza che l'icneumone ed alcuni altri carnivori oppongono al veleno dei serpenti, coll'aggiunta di esperimenti dimostranti l'azione funesta del veleno della *Mygale olivacea*. *Rendic. R. Accad. Sci. Fis. Mat. Napoli* 1874: 102–109.
- Patrizi S. 2005: Congo 1926-1927. Diario di caccia. *Editoriale Olimpia, Firenze, Italy.*
- Poggi R. 2017: 150 years of scientific activity. Notes on the foundation and development of the Museo Civico di Storia Naturale 'Giacomo Doria' of Genoa (1867-2017). *Ann. Mus. Civ. Stor. Nat. 'Giacomo Doria' Genova* 109: 1–273.
- Pucheran J. 1858: Documents relatifs a la mammalogie du Gabon. *Arch. Mus. Nat. Hist. Paris* 10: 103–135.
- Rallo G. 1999: La raccolta africana del conte Giuseppe De Reali al Museo civico di Storia Naturale di Venezia. *Quad. Mus. Civ. Stor. Nat. Venezia* 5: 1–56.
- Ranzani C. 1823: Osservazioni intorno ad una iena di pelo fulvo-rosso con macchie nerastre. *Opusc. Sci.* 4: 300–302.
- Rovati C., Ghisoli C. & Violani C. 2007: Figli dell'aria. Le raccolte ornitologiche del Museo di storia naturale dell'Università di Pavia. *Skira, Milan, Italy.*
- Savi P. 1828: Sopra tre antilopi viventi una delle quali per anche non descritta (*Antilope gibbosa* Nob.). *Nuovo Giorn. Lett.* 38: 89–115.
- Sclater P.L. 1868: Notes on Baker's antelope (*Hippotragus bakeri*). *Proc. Zool. Soc.* 1868: 214–218.
- Senna A. 1906: Appunti chiropterologici. *Annuario Mus. Zool. R. Univ. Napoli* 2: 1–7.
- Senna A. 1914: I chiropteri raccolti da S.A.R. la Duchessa d'Aosta nella regione dei grandi laghi equatoriali africani. *Annuario Mus. Zool. R. Univ. Napoli* 4: 1–8.
- Sordelli F. 1899: Note su alcuni vertebrati del civico Museo di Milano. I. Sulla esistenza del genere *Spalax* nell' Africa settentrionale. *Atti Soc. Ital. Sci. Nat. Mus. Civ. Stor. Nat. Milano* 38: 357–361.
- Storti E. 1929: Contributo alla conoscenza degli organi ematopoietici delle scimmie. Ricerche su *Cercocebus lunulatus*. *Boll. Soc. Med.-Chir. Pavia* 43: 88–93.
- Štrkalj G. & Tobias P.V. 2008: Raymond Dart as a pioneering primatologist. *HOMO – J. Comp. Hum. Biol.* 59: 271–286.
- Thomas O. 1888: On a collection of mammals obtained by Emin Pasha in equatorial Africa, and presented to the Natural History Museum. *Proc. Zool. Soc.* 1888: 3–17.
- Toschi A. 1936: Ricerche sul cranio e sulla dentatura di alcune specie di antilopi africane. *Arch. Zool. Ital.* 23: 121–190.
- Vialli V. 1955: Su una anomalia nella dentatura di un rinoceronte africano. *Natura (Milano)* 46: 131–134.
- Visconti A. 1986: L'Africa degli scienziati e dei collezionisti, in Africa. Storie di viaggiatori italiani. *Electa, Milan, Italy.*
- Yalden D.W., Largen M.J., Kock D. & Hillman J.C. 1996: Catalogue of the mammals of Ethiopia and Eritrea. 7. Revised checklist, zoogeography and conservation. *Trop. Zool.* 9: 73–164.
- Zerenghi F. 1603: La vera descrizione dell'hippopotamo, animale anfibio, che nasce in Egitto. *Vitale, Naples, Italy.*