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The oldest herpetological collection in the world: the surviving amphibian and reptile specimens of the Museum of Ulisse Aldrovandi

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Abstract. The natural history collection of the Bolognese polymath, encyclopedist, and natural philosopher Ulisse Aldrovandi (1522-1605) is regarded as the first museum in the modern sense of the term. It was intended as a resource for scholarship and a microcosm of the natural world, not simply a cabinet of curiosities. In addition to physical specimens, Aldrovandi's zoological material included a large series of paintings of animals (*Tavole di Animali*) that were integral to the collection.

Following Aldrovandi's death, his collection was maintained by the terms of his will, but by the 19th century relatively little remained. We examined surviving herpetological components of the collection, comprising 19 specimens of ten species, as well as the corresponding paintings and

associated archival material in the Museum of Palazzo Poggi, Museo di Zoologia, and Biblioteca Universitaria Bolognese in Bologna, Italy. Although the antiquity of some of these dried preparations is in question, many are documented in the *Tavole di Animalia* and/or are mentioned in 17th century lists of the museum, verifying them as the oldest museum specimens of amphibians and reptiles in the world. Exotic species are best represented, including two specimens of *Uromastix aegyptia* and several boid snakes – the first New World reptiles to be displayed in Europe. However, the *Tavole di Animalia* suggest that the original collection was dominated by Italian taxa and that greater effort may have been made to conserve the more spectacular specimens. The Aldrovandi collection provides a tangible link to the dawn of modern herpetology in Renaissance Italy.

Keywords: *Bufo bufo*, history of herpetology, natural history cabinets, specimen preservation, *Uromastix aegyptia*.

We dedicate this paper about the herpetological collections of a man of the Renaissance, Ulisse Aldrovandi, to Prof. Benedetto Lanza, a Renaissance man of the modern age.

Introduction

The accumulation of collections of natural history specimens, including those of a herpetological nature, began during the Renaissance as members of the nobility and educated society established curiosity cabinets or, in some cases, museums with specific instructional purposes. By the 17th century these natural history cabinets flowered across Europe as the expansion of global trade and travel provided ever more subjects for collection and study (MacGregor, 2007). These were the precursors of modern museum collections, but the link is more historical and philosophical than material, as most such cabinets did not survive the vagaries of the centuries. Nearly all 16th and 17th century collections, including those of Francesco Calzolari (1521-1600; Ceruti and Chiocco,

1622), Ferrante Imperato (1550-1625; Imperato, 1599), Basilius Besler (1561-1629; Besler, 1616, 1622, 1642), and Ole Worm (1588-1654; Worm, 1655; Schepelern, 1987, 1990) survive only in the form of published catalogues and iconic images. Biological material in all of these collections was dried, as it was not until the late 17th century that William Croune (1633-1684) and Robert Boyle (1627-1691) began experiments involving the alcohol preservation of organic specimens (Croune, 1662 in Birch, 1756; Boyle, 1663 in Birch, 1756; Boyle, 1666). Even in much later collections, dried preparations rarely survived through the centuries. For example, none of the dry injected anatomical mounts in the famous anatomical collection of Frederik Ruysch (1638-1731) sold to Peter the Great in 1717 (Luyendijk-Elshout, 1994; Driessen-van het Reve, 2006) appear to be extant. Of herpetological collections, even most of the early fluid-preserved preparations have not survived. Amphibian and reptile specimens from the large and important collections of Levinus Vincent (1658-1727), James Petiver (1663-1718), Theodor Jakob Klein (1685-1759), and Hans Sloane (1660-1753) are all believed to have been lost or destroyed. Among the earliest surviving herpetological specimens are small collections in Germany in the Franckesche Stiftungen in Halle (Altner, 1984) and in the Museum Waldenburg – Naturalienkabinett und Heimatmuseum (Beyrich, 1994; Budig, Zenker and Stadlander, 1999) – both probably predating 1730, and parts of the Swedish Museum of Natural History (with collections dating from 1739). In addition, remnants of the second collection of Albertus Seba (1665-1736), the greatest collector of his age, also exist – scattered across a number of European museums, having been dispersed through auctions (Boeseman, 1970; Juriev, 1981; Thireau, Sprackland and Sprackland, 1998; Bauer, 2002; Bauer and Günther, 2013). Of Seba's first collection, sold to Peter the Great in 1716 (Engel, 1937; Driessen-van het Reve, 2006) only a stuffed anaconda (*Eunectes murinus*) and perhaps a few other dry preparations are still extant (Juriev, 1981). Of the very few surviving natural history cabinets from the Renaissance, herpetological specimens have been signaled as surviving in only from the 17th century collection of Manfredo Settala (1600-1680) (Aimi, De Michele and Morandotti, 1984;

Barbagli, 2010) and the 16th century collection of the great Bolognese polymath Ulisse Aldrovandi (1522-1605; fig. 1) (Tega, 2001).

Aldrovandi's life has been summarized by many authors (e.g. Aldrovandi, 1907; Adler, 2007; Tugnoli Pàttaro, 2007). He attended the universities of Padua, Pisa and Bologna and studied a diverse curriculum, including law, humanities, mathematics, and medicine, but was influenced by Luca Ghini to make the natural sciences his special area of study. Through his noble family connections he was able to arrange for an academic chair at the University of Bologna. This chair of "Philosophiae Naturalis de Fossilibus, Plantis, et Animalibus", which he held from 1561 to 1600, was the first professorship of natural history at any university. Much has been written about Aldrovandi and his contributions to geology, botany and zoology (Tommasini and Tagliaferri, 2001; Vai and Cavazza, 2003 and references therein; Alessandrini and Ceregato, 2007 and references therein), and to his methods of study and organization (Olmi, 1976, 2001; Tugnoli Pàttaro, 1977, 1981, 2001). He was a champion of direct observation and claimed to write about only those things that he had observed and touched himself – although his approach was also encyclopedic and in reality he also drew heavily from classical authors. Aldrovandi's museum differed from the typical natural history cabinets of the 16th and later centuries, as it was not intended as a curiosity, but as a microcosm of nature, to be viewed and used by students and learned men in the pursuit of knowledge. It was, according to Aldrovandi's will, established in 1547 (Vai, 2003), although other sources place its origin to Aldrovandi's trip to Rome in 1549 (Scappini and Torricelli, 1993; Sarti, 2003). The collection was immense for its day. Ten years before his death it contained 18 000 items (Sarti, 2003). In addition to the physical specimens in his collection, obtained through his own travels and purchases across Italy, as well as the donations of his students and correspondents, Aldrovandi pioneered the approach of meticulously and accurately illustrating specimens as part of the process of objectively describing them (Alessandrini and Ceregato, 2007; Delfino and Ceregato, 2008). Such illustrations could record features from life that would be lost in the eventual museum specimen or could document specimens that could not be obtained for

Aldrovandi's collection or that could not be preserved at all due to limitations of the technology of the time. The paintings also served to disseminate knowledge, making the collection more readily accessible to those who could not visit his museum in person (Olmi, 2001). Indeed drawings were often exchanged between Aldrovandi and his scientific correspondents (Olmi, 1977). Ultimately, as the ravages of time and circumstance took their toll on Aldrovandi's collection, the paintings had the added benefit of preserving for posterity a record of this greatest of Renaissance natural history museums.

Amazingly, despite its great antiquity, Aldrovandi's collection, almost uniquely among those of the Renaissance, has survived (in part) to the 21st century. Today Aldrovandi's once vast zoological collection is represented by a variety of dried specimens and an extensive collection of contemporary paintings of natural objects (Alessandrini and Ceregato, 2007). Aldrovandi's will, drawn up in 1603, is the ultimate source for the survival of his collection. In it, he donated to the Bolognese Senate his collection and library as well as funds to support and administer it and to publish the numerous manuscripts that he had prepared but not published in his lifetime. The will obligated the city to maintain the collection intact in Bologna and to prevent its sale or deterioration, making it available as a public institution for scientific study. At least initially his wishes were scrupulously attended to by those who had known and worked with him. However, the focus of the museum and the personal investment of its curators declined as the decades passed (Battistini, 2003).

During his lifetime, Aldrovandi's collections were housed in his residence, the Casa del Vivaro, today in Via de' Pepoli (fig. 2). In 1617 the museum was moved into six rooms built by the senate to accommodate it in the Palazzo Pubblico (fig. 3), today the Palazzo d'Accursio (Frati, 1907; Scappini and Torricelli, 1993). In 1749 Aldrovandi's collection was moved to the Palazzo Poggi which had already housed several important museums that had been donated to the Bologna Istituto delle Scienze, which was based there (Vai, 2003). The collections were catalogued by Giuseppe Monti, director of the Museum of the Istituto, but after Monti's death in

1760 material was lost or destroyed or became intermixed with that in the other collections already resident in the Palazzo Poggi (Fрати, 1907; Sarti, 1988; Vai, 2003). Additional loss occurred when the collection was transferred to Paris in the wake of the Napoleonic invasion and subsequently when the Istituto delle Scienze was merged into the University of Bologna (Battistini, 2003). Further insult was suffered when Aldrovandi's collection was moved from the Palazzo Poggi to the Palazzo Malvezzi in the middle of the 19th century (Bianconi, 1852) and then divided among the Botanical, Zoological, and Geological Museum's of the University. After years of decline and neglect, Aldrovandi's material was identified and consolidated, chiefly through the actions of Giovanni Capellini (1833-1922), rector of the University for much of the latter portion of the 19th century. He transferred many specimens, as well as the wood block plates used to print the illustrations in Aldrovandi's books, back to the Palazzo Poggi.

Aldrovandi's herpetological works, *De Quadrupedibus Digitatis Viviparis Libri Tres, et de Quadrupedibus Digitatis Oviparis Libri Duo* (1637) and *Serpentum, et Draconum Historiae Libri Duo* (1639), were published posthumously, both edited by Bartolomeo Ambrosini, a former student and then curator of Aldrovandi's Museum. These were richly illustrated using xylography. The original pear-wood blocks, 3454 of which are extant in the Palazzo Poggi today (fig. 4), were engraved by Cristoforo Coriolano (born Christophorus Lederlein) and his son Gian Battista Coriolano following the drawings of Cornelius Schwindt which were, in turn, based on original paintings executed by Schwindt himself, Jacopo Ligozzi, Giovanni Neri, and other artists (Olimi, 2007; Delfino and Ceregato, 2008).

Despite the attention paid by modern authors to other disciplines in Aldrovandi's work, herpetology has been relatively little discussed, and only the herpetological paintings (Delfino, 2007; Delfino and Ceregato, 2008) and xylography (Caprotti, 1980) of Aldrovandi have received explicit consideration. Some of Aldrovandi's herpetological paintings have been reproduced by Simili (2001), Tega (2001), Antonino (2004), Baucon (2008), and Delfino and

Ceregato (2008), among others, but the greatest number (21) have been reproduced by Alessandrini and Ceregato (2007), and all the original tempera paintings (ca. 3000, including 47 depicting 75 individual amphibians or reptiles) have been digitized and are available on the internet (www.filosofia.unibo.it/aldrovandi/). Delfino (2007) and Delfino and Ceregato (2008) identified at least 34 herpetological species among Aldrovandi's paintings, and the latter provided identifications to the species or generic level for 28 of these, comprising five amphibians and 23 reptiles, the majority of them Italian. The original paintings are distributed across volumes IV, V, and VII of volumes of *Tavole di Animali*, currently housed in the Biblioteca Universitaria Bolognese. Although Aldrovandi's paintings of amphibians and reptiles are thus now well characterized, the physical specimens that have survived from this, the oldest museum have not been formally reviewed, although several specimens have been figured by Tega (2001). We here present the first explicit consideration of the surviving herpetological specimens from Aldrovandi's collection, present in Bologna today.

Materials and methods

In 2009 the authors jointly visited the collections of the Museo Ulisse Aldrovandi in the Palazzo Poggi and the Museo di Zoologia in order to examine the surviving Aldrovandi herpetological specimens as well as the Biblioteca Universitaria Bolognese to consult the paintings in *Tavole di Animali* and to search through archival material for possibly relevant records of the herpetological collection in Aldrovandi's time. In the museums we were permitted to closely examine and photograph specimens and in the library we had free access to the many volumes of original notes, lists and manuscripts, some in Aldrovandi's own handwriting. Our search through the library material was facilitated by the catalogue of Aldrovandi manuscripts compiled by Frati (1907), now also accessible online. Manuscripts are referenced by the manuscript number assigned by Frati (1907), followed by the original library manuscript designation. In the manuscripts individual

leaves, not pages, are numbered and are here referenced by leaf number and either “r.” for recto or “v.” for verso.

Results

Manuscripts

Several manuscripts in the Biblioteca Universitaria Bolognese are of herpetological note. For example Ms. 16 [Aula III-B-30]: *Adnotationes de serpentibus* [Notes on snakes] (fig. 5) and Ms. 21 [Aula III-B-31], Vol. IV. *Serpentium partus. Anatomica consideration* [Anatomical considerations on snakes] both include portions in Aldrovandi’s own hand and were used by Bartolomeo Ambrosini in the preparation of *Serpentum et Draconum Historiæ Libri Duo*.

Ms. 123 [Aula III-B-142], Vol. II: *Ulyssis Aldrovandi. Index dracologiae* [Index to material on dragons] is related to the same work, but was written after Aldrovandi’s death, probably as the book was being prepared. Ms. 118 [Aula III-B-142]: *Index rerum naturalium a Cornelio Svinto hactens in tabulis delineatarum* is a list of subjects, including herpetological ones, drawn on the plates for the volumes of Aldrovandi’s *Historia Naturalis* by Cornelius Schwindt.

Three manuscripts are of greater relevance for determining what herpetological specimens were in Aldrovandi’s collection. Ms. 26 [Aula III-B-31]: *Index alphabeticus rex omnium naturalium in Museo appensarum, incipiendo a trabe prima prope armarium primum* is a list of the contents of the museum during its early decades at the Palazzo Pubblico, compiled apparently no later than 1633 (Frati, 1907). Herpetological material is also listed in Ms. 76 [Aula III-B-52], III (leaves 32-86): *Index descriptionum rerum omnium naturalium, quae in ultimis libri observationum continentur* and MS 115 [Aula III-B-142]: *Catalogus animalium et plantarum, quae depictae sunt et in tabulis designatae atque incisae/Catalogus animalium a nemine unquam depictorum* which are, respectively, lists of specimens that were and were not figured in the *Tavole di Animali* and engraved for printing in the published works of Aldrovandi. No lists in Aldrovandi’s hand, or dating

from before the transfer of the museum to the Palazzo Pubblico appear to exist, thus there is no record of the total herpetological content of Aldrovandi's museum during its heyday in the late 16th century.

Specimens

Seventeen herpetological specimens are present in the Aldrovandi Museum in the Palazzo Poggi (PP). An additional two specimens attributable to Aldrovandi are in the Museo di Zoologia (MZ). In most cases the authenticity of the specimens as belonging to the original Aldrovandi collection is either confirmed by corresponding paintings in the *Tavole di Animali* or strongly supported by the style and apparent age of the preparations, although in some cases the evidence is only circumstantial. Presumably these specimens had all originally been identified as components of the museum by Capellini prior to the tercentenary of Aldrovandi's death. All labeling and mounts/display cases associated with specimens are no older than the 19th century. Amphibia: Anura *Bufo bufo* (Linnaeus, 1758): 2 specimens (PP).

Both specimens have been artificially modified, but their relatively large size, position and configuration of the parotoid gland, and overall morphology nonetheless permit species level identification. One specimen is labeled as "*Bufo caudatus sine dentibus*" (fig. 6A) and bears an artificial tail apparently fashioned from the skin of the same species and the other is designated as "*Bufo caudatus & dentatus*" (fig. 6B) and, in addition to having such a tail, also bears a set of mammalian teeth. The former specimen exhibits damage to each hand and foot, apparently from having been attached to a board with nails in the past. The latter specimen is missing both hands and portions of the forearms. These distinctive specimens were depicted in the *Tavole di Animali* T.VII, c.30-31 and were figured in Aldrovandi (1637) on pages 612 and 611, respectively. *Bufo caudatus* is also noted in Ms. 76:41v. Aldrovandi (1637) readily acknowledged that these specimens were faked, but nonetheless considered them as valuable to his collection.

Reptilia: Testudines

Chelonia mydas (Linnaeus, 1758): 2 specimens (PP). This species is represented by two large carapaces (fig. 7) probably corresponding to the “due case grandi di testudine marina” listed in a 17th century catalogue of the collection (Scappini and Torricelli, 1993). There are no paintings of this species in the *Tavole di Animali*, but Linnaeus (1758) in his description of the species cited the figure on page 714 of *De Quadrupedibus* (Aldrovandi, 1637). As such, the model for the illustration, from Aldrovandi’s Museum, is a syntype of this species (see Wahlgren in Delfino and Ceregato, 2008), along with others depicted in various other sources cited by Linnaeus. References to a specimen from the Gyllenberg collection in the Uppsala University Zoological Museum as a holotype (e.g. Lönnberg, 1896; Cogger, Cameron and Cogger, 1983), are incorrect. However, the figure cited by Linnaeus, corresponding to *Tavole di Animali* T.IV, c.68, clearly exhibits five lateral scutes on the carapace and is thus actually referable to *Caretta caretta*. The composite nature of the type series of *Chelonia mydas* was discussed by Wallin (1985), who documented that Linnaeus’s own specimens represented both *Chelonia mydas* and *Caretta caretta*. It is unlikely that either of the two extant Aldrovandi specimens of *Caretta caretta* (see below) could be a syntype of *Chelonia mydas* as the figured specimen does not have the broad carapace typical of juveniles. However, the painting and corresponding xylographic print are highly stylized and no such specific comparisons are possible.

Caretta caretta (Linnaeus, 1758): 2 specimens (1 PP, 1 MZ). Both specimens are juveniles represented by broad cordiform carapaces. That in the Palazzo Poggi is represented by the carapace only (fig. 7) and that in the Museo di Zoologia includes a carapace (specimen number 101583) and a skull (101582). Both specimens bear labels reading “*Chelonia Caretta junior* (pars dorsalis testae)”; that in the Palazzo Poggi also indicates “Habitat in Mare Mediterraneo”. Two images in the *Tavole di Animali* (T.IV, c.68, 69) appear to represent this species. As noted above, plate 68 (the dorsal view of the turtle) was reproduced in *De Quadrupedibus* (Aldrovandi, 1637) on page 714 and the ventral view, plate 69, corresponds to the image on page 715. In addition, the Museo di Zoologia skull, not represented in the *Tavole*

di Animali, was also produced by xylography on page 713 of Aldrovandi (1637). This figure shows the same asymmetric configuration of the frontal-prefrontal suture that characterizes skull MZ 101582. The “*Testudinis marina cortex et fragmentum*” listed in Ms. 76:76r. probably refers to this skull and associated carapace (fig. 8).

Reptilia: Crocodylia

Crocodylus niloticus Laurenti, 1768: 2 specimens (PP). These specimens are currently mounted on a wall of the Aldrovandi Museum exhibition room (fig. 9). The smaller measures approximately 2 m in total length and the larger 3 m. The only crocodylian represented in the *Tavole di Animali* (T.IV, c.39), is a juvenile *C. niloticus* which is clearly too young to be either of the extant specimens. Ms. 26 lists several crocodiles and crocodile eggs in the Museum, and Linnaeus (1758) cited Aldrovandi (1637: 677) in his description of *Lacerta crocodiles* (= *Caiman crocodilus*), but this is a text description, not a figure. A catalogue of the collection from 1742 notes “un grande cocodrillo del Nilo” and “un altro piu piccolo” as among the wall-mounted preparations then present (Scappini and Torricelli, 1993), but it is impossible to determine when these specimens may have entered the collection or if they are the ones now in the Palazzo Poggi.

Reptilia: Squamata

Uromastix aegyptia (Forsskål, 1775): 1 specimen (PP), 1 specimen (MZ). The Museo di Zoologia specimen (fig. 10A) bears a paper label glued to the flank of the specimen reads “*Uromastix spinipes*, Habitat in Africa” and has a modern tag tied to the front left leg. The specimen is missing the right foot and its skin is split or torn at the neck and near the tailbase. The specimen in the Palazzo Poggi (fig. 11) is on a stand marked “*Cordylus sive Uromastix*, De Quadr. 664” and also bears a paper label on the flank. *Uromastix* is represented in the *Tavole di Animali* by two paintings, T.IV, c.129 and T.V, c.37 (fig. 10B). The latter image, labeled “*Cordylos Uromastix Caudiverbera*”, served as the basis for the illustration on page 664 of Aldrovandi (1637) and appears to depict the

specimen now in the Museo di Zoologia. The other painting, which is much more detailed and accurate, depicts the specimen now in the Palazzo Poggi. Both specimens exhibit the scattered tubercular flank scales that distinguish *U. aegyptia* from similar congeners and the label name, *U. spinipes* Daudin, is a synonym (fide Wilms and Böhme, 2000). Along with the faked tailed toad specimens, the two *Uromastyx* have the most unambiguous claim to belong to the original 16th century collections. In addition to matching the *Tavole* noted above, mention of “*Lacertus indicus*” appears in Ms. 26:24v. and later, in another list of the collection (Scappini and Torricelli, 1993), “due lacerte indiane grand una delle quali si chiama chaudiverbera” are noted. This is consistent with the text on T.IV, c.129: “Cordylus Aristotelis, seu Cordulus. Caudiverbera. Uromastex, vel Uromastix. Phathages Indicus Aeliani”. (?) *Draco volans* Linnaeus, 1758: 3 specimens (PP). All three specimens are mounted in a single wood and glass box (fig. 11) that bears a 19th century label identifying them as “*Draco Daudinii* Bibr. H. in Insula Iava”. *Draco daudinii* is currently regarded as a junior subjective synonym (in part) of *D. volans*. The specimens are in poor condition and critical features of life color are lacking, but the observable pattern and the presence of six, rather than five patagial ribs is consistent with *D. volans* (see Das, 2010). No species of *Draco* is represented in the *Tavole di Animali* nor in *De Serpentibus* (Aldrovandi, 1639). This absence, along with the fact that European trade connections to the Indoaustralian Archipelago in the late 16th century were not yet well established, suggest that these specimens may significantly postdate Aldrovandi’s original collection. It is likely that any *Draco* transported back to Europe before the period of activity of the Dutch East India Company (Vereenigde Oost-Indische Compagnie, founded 1602) would have come from peninsular Malaysia, where the Portuguese had established a base by the time of Aldrovandi’s birth. However, the Palazzo Poggi specimens do not appear to be conspecific with any of the *Draco* of that region (Grismer, 2011). *Chamaeleo chamaeleon* (Linnaeus, 1758): specimen (PP). This very emaciated specimen is displayed perching on a stick in a wood and glass box (fig. 11) and is labeled as “*Chamaeleon cinereus* De Quadr. 670”. The citation to Aldrovandi’s (1637) plate 670 in the description of Linnaeus means that the

illustrated specimen should be regarded as one of the syntypes of this species (see Wahlgren in Delfino and Ceregato, 2008) contra Klaver and Böhme (1997), who note as syntypes only the two Stockholm types reported by Andersson (1900). The xylographic image is based on *Tavole di Animali* T.VII, c.112, but whether this is, in turn, based on the extant Palazzo Poggi specimen is unclear. The painting is not particularly accurate or detailed, but does clearly show an emaciated specimen with its mouth agape. However, the position of the limbs and tail are very different from the extant specimen. Chameleons are mentioned in several 17th century manuscripts relating to the collection, but it is not possible to determine if any such references pertain to the Palazzo Poggi specimen. *Scincus scincus* (Linnaeus, 1758): 2 specimens (PP). Each specimen is in its own glass jar atop a wooden platform (fig. 11). The jar labels bear the epithet “*Scincus officinalis*”, whereas those of the stands read “*Scincus officinarum*. De Quadr. 647”. Both specimens have broken tails and are quite faded, although the larger specimen retains hints of the dorsal barring common in the species (Arnold and Leviton, 1977). These correspond well to the two *Scincus* figured on T.VII, c.109 of *Tavole di Animali*, one of which is barred and the other a more unicolored golden, and there is a mention of “*Scincos*” in Ms. 26:48r.

Boa constrictor Linnaeus, 1758: 2 specimens (PP). Two specimens, each approximately 2.5-3 m in total length are mounted on the upper wall of the Aldrovandi exhibition room in the Palazzo Poggi. Both are dark and their patterns are difficult to discern. However, we were able to confirm that these are *B. constrictor* by using digital image modification to bring out the pattern in the skin, which is typical for this species. In both cases the head is missing and has been replaced by a carved wooden replica that is confluent with the skin (fig. 12). As boid skin may be stretched quite significantly, the actual size of the animals in life cannot be ascertained. Among the herpetological specimens in Aldrovandi’s collection these and the single anaconda (see below) are the only specimens to originate from the New World. ? *Eunectes murinus* (Linnaeus, 1758): 1 specimen (PP). A large stuffed snake approximately 5 m in length is suspended high on the wall of the exhibition room. It has a strikingly carved wooden head (fig. 12), like the *Boa* specimens, but its

pattern is even less discernible. However, the large size of the specimen (even if artificially stretched), as well as its large scale size is consistent with an anaconda. Although it is not possible to determine with any asurity the species, it is most likely that this is *E. murinus*, as the distribution of this species encompasses the region of South America that is likely to have been accessible to European travelers in the late 16th century. This may be the model for the image of the *Serpens Americanus* on p. 308 in Aldrovandi (1639), as the junction between the head and skin seems well indicated and the large carved head scales and lack of clear color pattern are consistent. There is no extant painting of this image in the *Tavole di Animali*. The catalogue of the collection from 1742, the year in which the move from the Palazzo Pubblico to the Palazzo Poggi was first decided, notes “serpenti vari seccati” among the wall-mounted preparations (Scappini and Torricelli, 1993), but it is not possible to confirm that these correspond to the three specimens of boids now in the Palazzo Poggi.

Discussion

The treasures of Aldrovandi’s Museum have undergone great attrition over the last four centuries. Of approximately 10 000 geological and paleontological specimens extant at the time of Aldrovandi’s death, only about 2000 appear to have survived until Monti’s time and a mere 200 specimens remain today in the Museum of Palazzo Poggi (Ceregato and Scarponi, 2000; Sarti, 2003; Ceregato, 2007). A similar loss over time, although starting from a more modest diversity of specimens, must have occurred to bring the surviving herpetological collections down to only 19 specimens. We do not have an accurate picture of the scope of the original herpetological holdings of the collection, as no complete listing of these items appears to exist in the manuscript holdings of the Biblioteca Universitaria Bolognese. However, based on the extant *Tavole di Animali*, at least 34 species and more than twice as many individual specimens were represented (Delfino, 2007; Delfino and Ceregato, 2008), assuming that the majority of images depict holdings of Aldrovandi’s own collection. Manuscript data (Mss. 26, 76, 115; Scappini and Torricelli, 1993) reveal that a

variety of unfigured specimens were also present when the collection was at the Palazzo Pubblico, although the generalized and vernacular names used in such lists precludes identification beyond the coarsest level (turtle, snake, lizard, etc.). If we are correct in assuming that most of the extant specimens are truly from Aldrovandi's time, these also demonstrate that the *Tavole* alone underestimate the former wealth of the collections, as several taxa, including *Draco* and *Chelonia mydas*, are not illustrated.

Of the surviving specimens, it is not surprising to find the large marine turtle carapaces, which are robust and resistant to insect damage. The persistence of the crocodiles on the one hand is facilitated by their thick, osteoderm reinforced skin and robust skulls, but conversely their size alone would have made them vulnerable to damage during transport in the many moves the collection underwent. Although we were not able to examine these wallmounted specimens closely during our visit to the Palazzo Poggi, they appear to be in especially good condition and the artificial eyes in the mounts appear too "modern" suggesting that these animals are either not original to the collection, or were renovated since the time of Capellini.

The survival of the three large snake specimens is also quite amazing, given their susceptibility to damage by pests and their large and unwieldy dimensions. However, the appearance of the skin and the carved heads of these snakes is consistent with their antiquity. The two boas and one anaconda are the only herpetological specimens of NewWorld origin among the extant Aldrovandi material. Aldrovandi's museum contained the first natural products of the Americas to be displayed in Europe (Laurencich Minelli, 1992; Boldreghini, 2007) and thus these snakes are of great significance in the history of herpetological discovery and study.

The large *Uromastyx aegyptia* as well as the faked toads were distinctive enough that they served as showpieces in the collection and were more scrupulously cared for than other specimens, although all four of the specimens show significant damage. It is likely that less spectacular herpetological specimens would have been discarded as they deteriorated, as this was a common practice in museum collections until well into the 19th century (Select Committee, 1836; Dobson, 1956;

Wallin, 1985), accounting, in part, for the absence of the numerous additional snakes, lizards, frogs, and salamanders that are figured in the *Tavole di Animali* or noted in the various 17th century lists of the collection.

As noted above, the *Draco* specimens in the Palazzo Poggi, which are certainly the most fragile of the herpetological material, may well be later additions to the collection during the 17th or 18th centuries.

The two species in Aldrovandi's collection that are represented by the most well documented material are *Uromastix aegyptia* and *Bufo bufo*. It is quite remarkable that *Uromastix*, despite being large and well-figured by Aldrovandi (1637), was missed by Linnaeus (1758) and remained undescribed for a full 138 years. Although other specimens must certainly have reached Europe in the interim, there seems to be no evidence of any between the two in Bologna, obtained probably no later than Aldrovandi's retirement in 1600, and specimens postdating the species' formal description by Forsskål (1775) based on Hasselquist (1757) (see Adler, 2012). The specimens of *Bufo* were not included by Delfino (2007) and Delfino and Ceregato (2008) in their lists of species in the *Tavole*, both because the associated specimens are modified by unnatural additions and could be considered chimeric preparations, and because the paintings alone do not allow an unambiguous allocation of the toads to species.

The addition of *Bufo bufo* to the list of species represented reinforces that the majority of herpetological specimens that were in the original collection were native to Italy, however, this is not true of the surviving material which, if all are assumed to be authentic to the period, includes two American taxa, four Egyptian/North African (counting the chameleon as African), one east Asian, and only three European species, assuming the sea turtles to have been collected from the Mediterranean. This may be coincidence, but is suggestive that the more exotic taxa were more highly valued and cared for after Aldrovandi's death and the movement of the collection.

Examination of Aldrovandi's herpetological collection today gives little sense of its original extent or its intended value as a pedagogic resource. Indeed, the surviving tailed toads, one with mammalian

teeth, might falsely give the impression that the collection was, like so many that followed, primarily a cabinet of curiosities. However, the *Tavole di Animalia*, as well as the manuscript lists of the collection's content and, of course, Aldrovandi's published works, provide a glimpse into Europe's first attempt to catalogue, summarize, and interpret the diversity of the natural world. Within this context, the amphibian and reptile specimens that survive in Bologna constitute a tenuous but tangible link to the birth of modern herpetology in Renaissance Italy.

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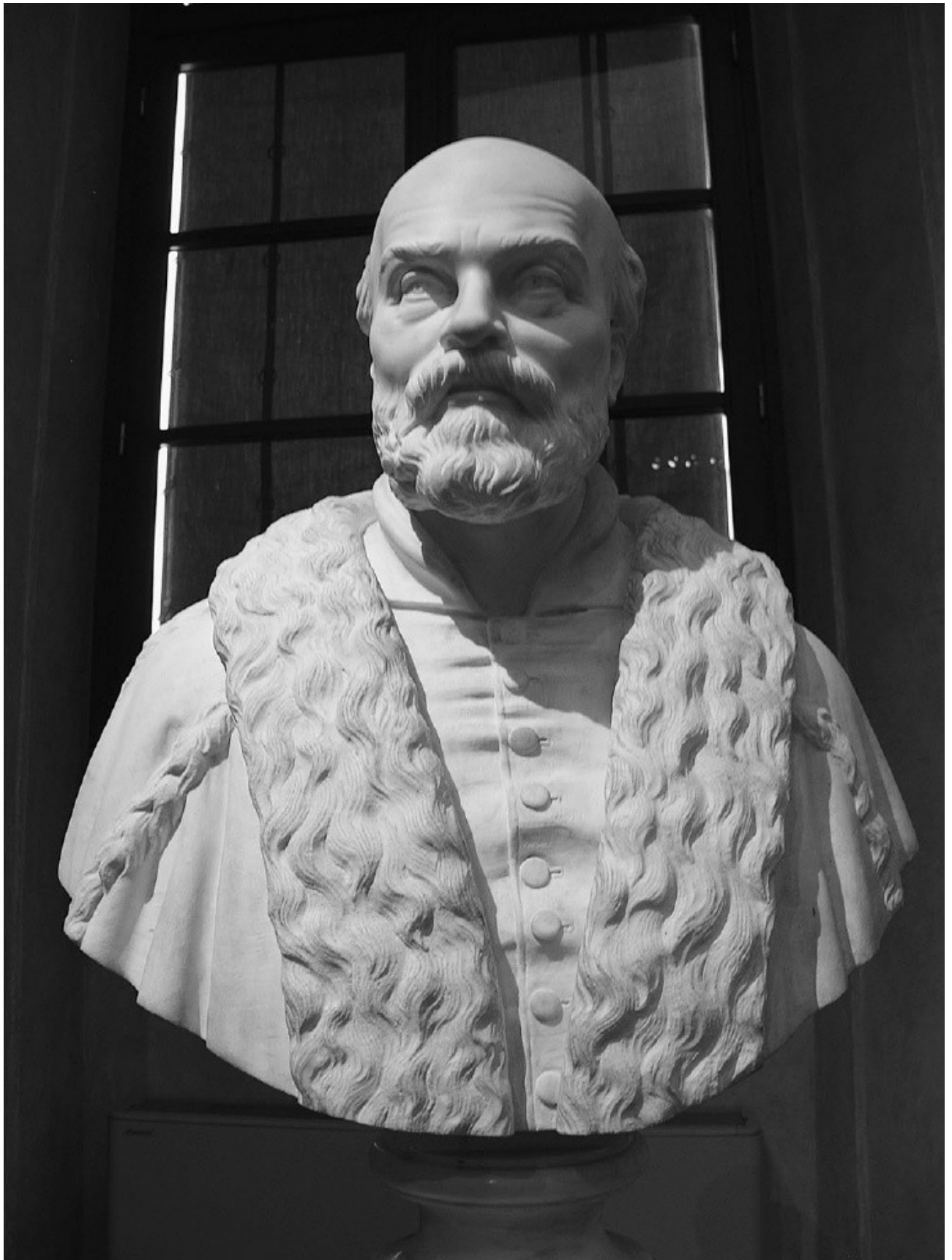


Figure 1. Marble bust of Ulisse Aldrovandi (1522-1605) commissioned by Giovanni Capellini for the tercentennial of Aldrovandi's death and on display in the Palazzo Poggi, Bologna.



Figure 2. Commemorative plaque on the Casa del Vivaro, Ulisse Aldrovandi's familial home and location of his museum during his lifetime, Via de' Pepoli, Bologna.



Figure 3. The Palazzo Pubblico, now Palazzo d'Accursio, Bologna, the site of Aldrovandi's collection from 1617 to 1749.

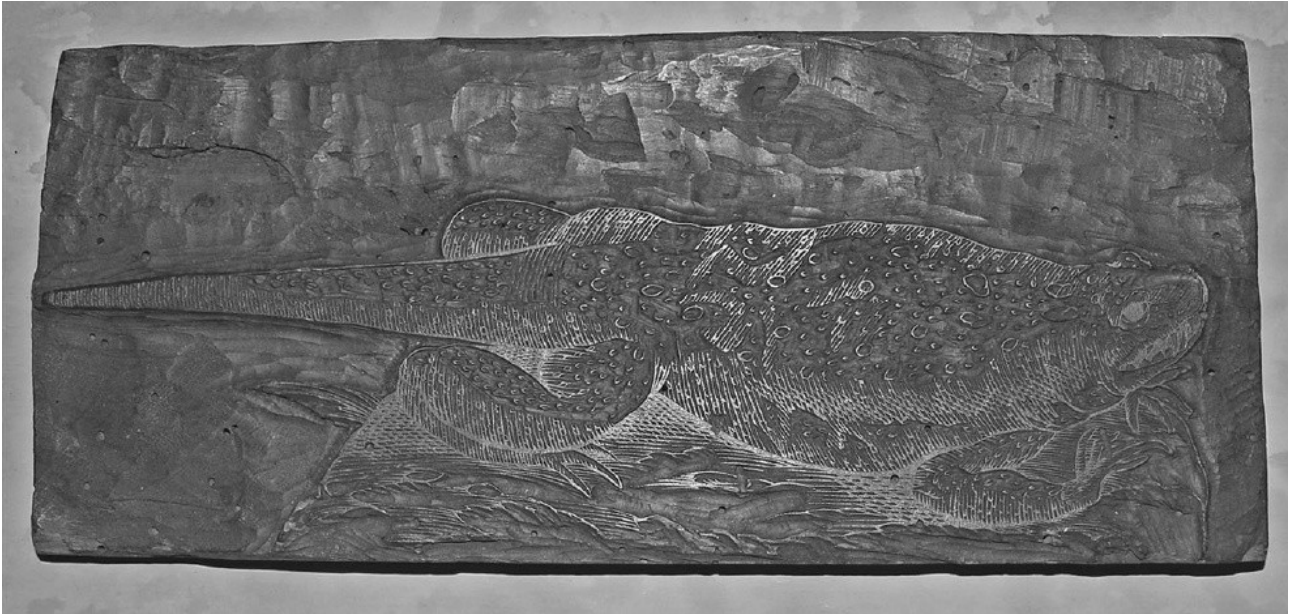


Figure 4. Pear-wood xylographic block depicting *Bufo caudatus*, & *dentatus fictus à circulatoribus*.

This image was based on *Tavole di Animali* T.VII, c.31 and was used to print the image on page 611 of Aldrovandi's (1637) book dealing with quadrupeds.

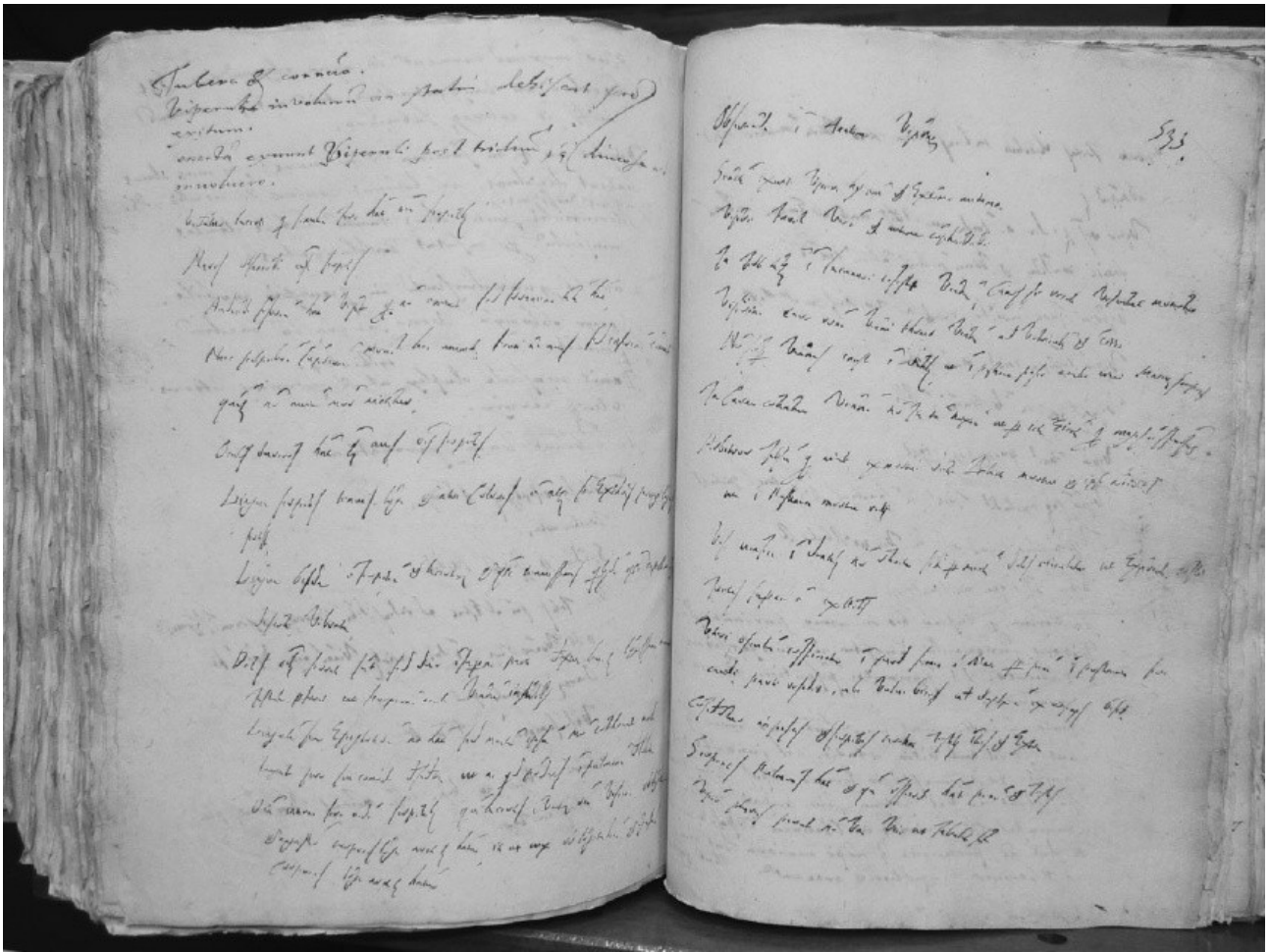


Figure 5. Ms. 16 [Aula III-B-30]: *Adnotationes de serpentibus* [Notes on snakes], Biblioteca Universitaria Bolognese, a manuscript in Aldrovandi's own hand later used in the compilation of his posthumous book on snakes and dragons (Aldrovandi, 1639).



Figure 6. Faked specimens of common toad, *Bufo bufo*, from Aldrovandi's collection, Museum of Palazzo Poggi. (A) *Bufo caudatus sine dentibus*, and (B) *Bufo caudatus & dentatus*, depicted on *Tavole di Animali* T.VII, c.31 and on page 611 of Aldrovandi, 1637.



Figure 7. Display cabinet in the Aldrovandi collection in Museum of Palazzo Poggi containing two large carapaces of *Chelonia mydas* and a smaller carapace of *Caretta caretta*.

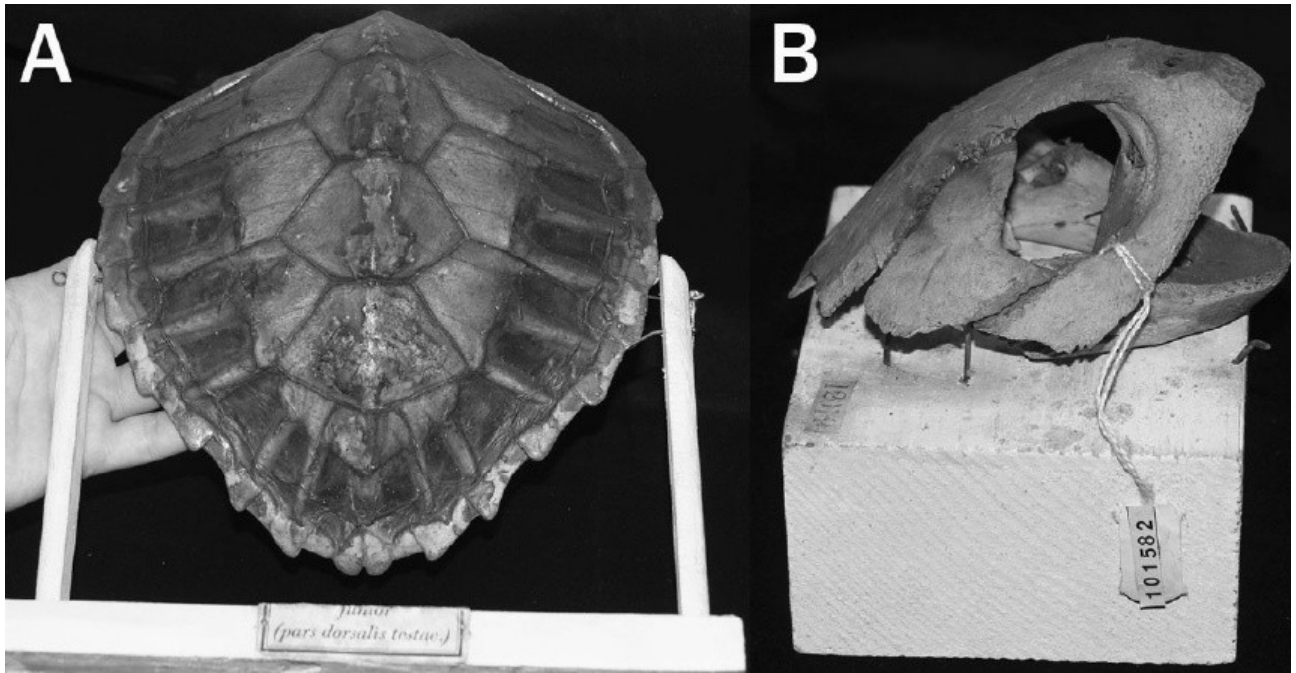


Figure 8. Juvenile *Caretta caretta* in the Museo di Zoologia, Bologna. (A) Carapace, and (B) skull.

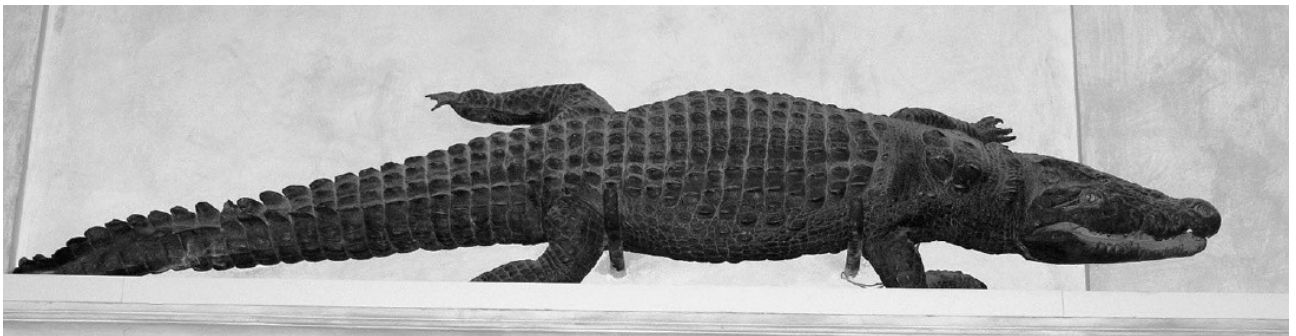


Figure 9. Smaller, wall-mounted specimen of *Crocodylus niloticus* in the Aldrovandi collection in Museum of Palazzo Poggi. Right limbs partly obscured by top of cabinets containing xylographic woodblocks used in Aldrovandi's publications.

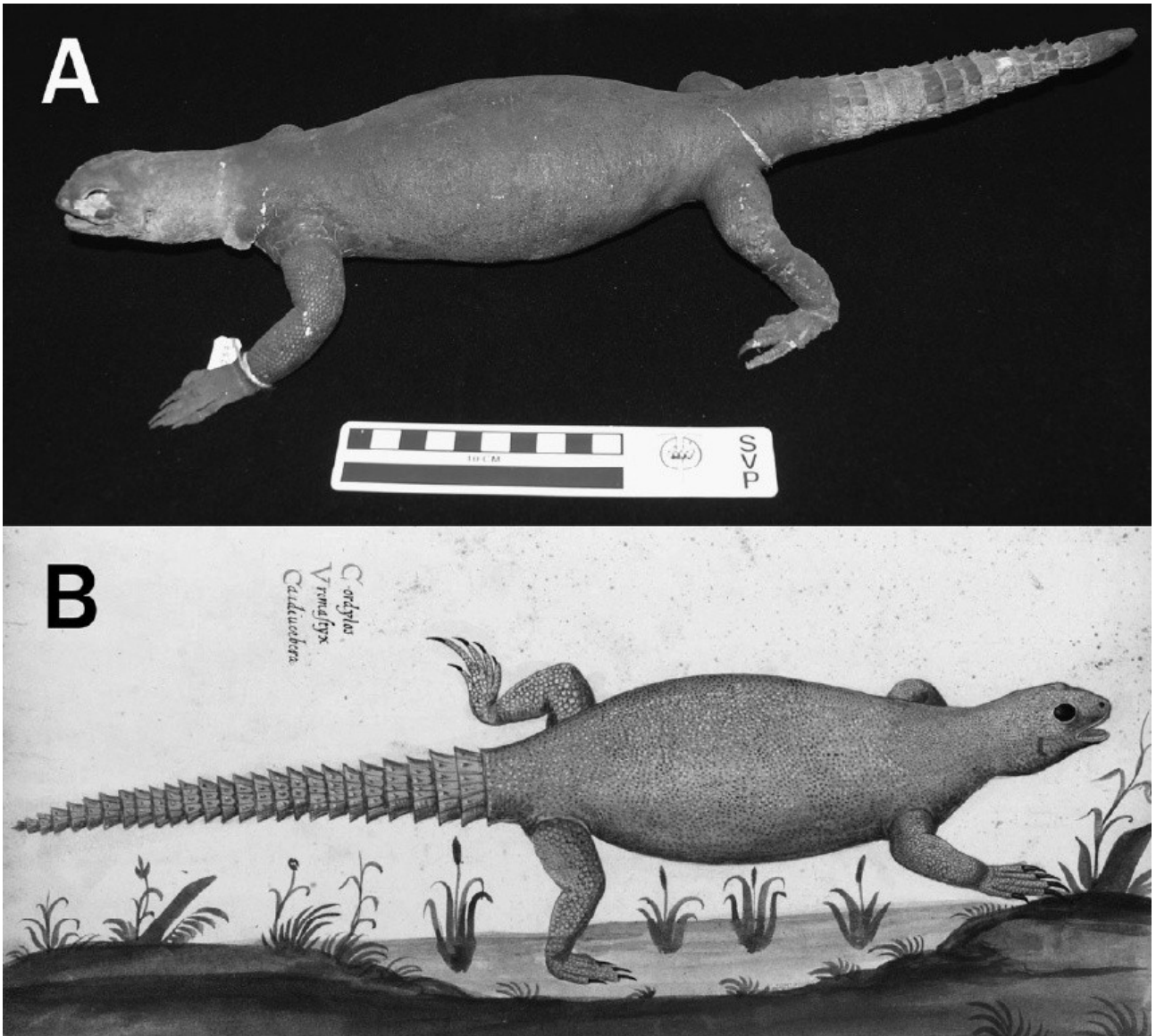


Figure 10. *Uromastix aegyptia*. (A) Specimen in the Museo di Zoologia, Bologna. (B) Painting of *Cordylus sive Uromastix* (*Uromastix aegyptia*) as represented in the *Tavole di Animali T.V*, c.37; based on the extant specimen figured in (A).



Figure 11. Aldrovandi lizard specimens in the Museum of Palazzo Poggi: *Draco (?) volans*, *Chamaeleo chamaeleon*, *Scincus scincus* (in cylindrical jars), and *Uromastyx aegyptia*.

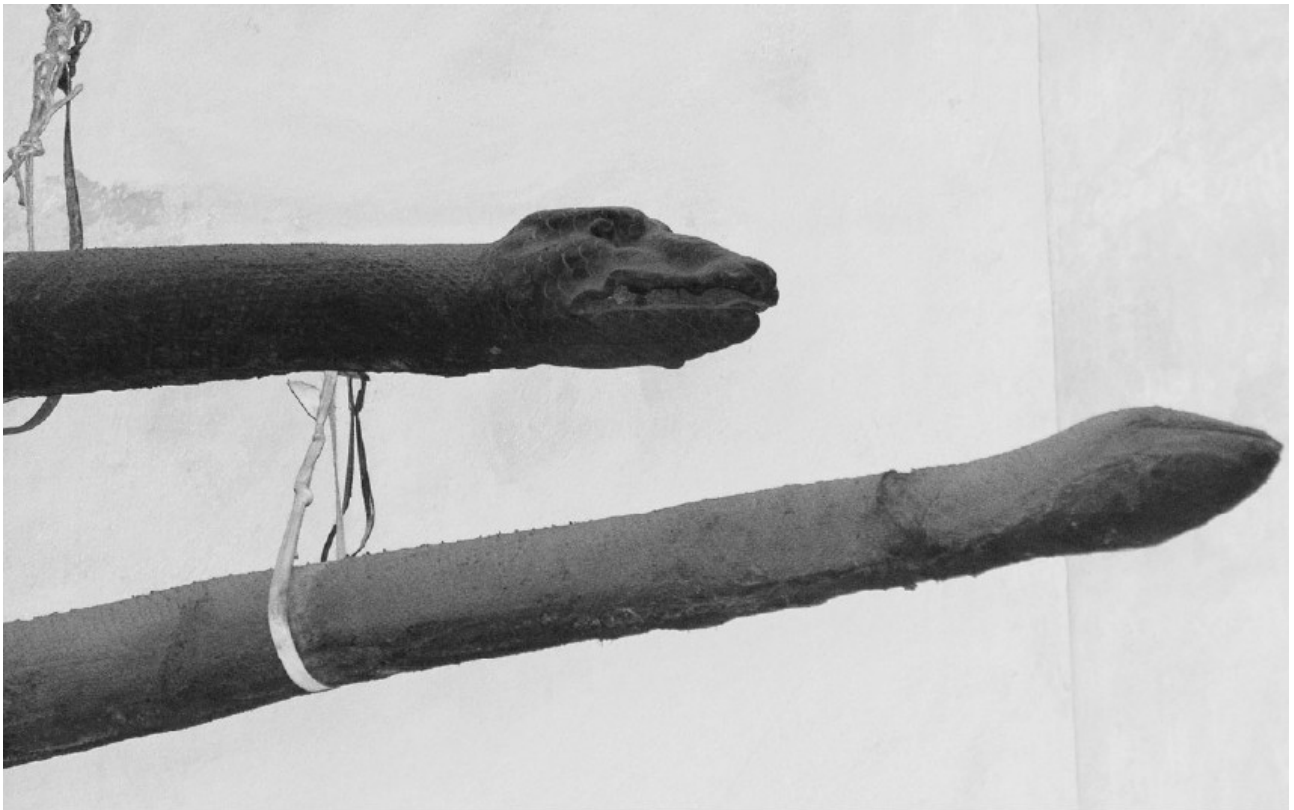


Figure 12. Anterior portions of wall-mounted specimens of (?) *Eunectes murinus* (above) and *Boa constrictor* (below) in the Aldrovandi collection of the Museum of Palazzo Poggi showing the carved wooden heads typical of dry preparations of snakes of the Renaissance period.