

## Chapter 35

# HAMBURG: Back to the Future: The *Centrum für Naturkunde* on Its Way Toward Reestablishing a Natural History Museum in Hamburg

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**Abstract** Comprising today approximately ten million specimens, Hamburg’s zoological collection at the newly established *Centrum für Naturkunde* (CeNak) goes back to the *Naturhistorisches Museum*, founded in 1843. It includes several historical collections that originate from the initiative and interest in natural history of civilians, merchandisers, traders, and owners of seagoing vessels. Only in 1891 that these collections were adequately stored and put on display in a then most innovative museum building in the city’s center that soon became one of the largest and most important natural history museums, second only to that in Berlin; it was also the one of its kind with most visitors for five decades. The museum and parts of its dry collections—mostly in entomology, malacology and mammalogy, and those in the exhibition—were destroyed during the “Operation Gomorrha” bombing of Hamburg and the subsequent “Feuersturm” in the morning of 30 July 1943, with the ruins being knocked down in 1951. Other parts, essentially the large alcohol collections and those of birds, have been stored elsewhere during WWII. Since then only provisionally housed the museum and its staff became part of the Universität Hamburg in 1969 and moved into a new building in the early to mid-1970s at its current location. As part of a growing mass university, these collections were long neglected and without substantial means to accomplish this goals, with a small display room opening on 2000 qm in 1984 only. With the founding of the CeNak in 2014 plans are underway for establishing again a modern natural history museum in Hamburg.

**Keywords** Naturhistorisches Museum 1891 • Allied bombing 1943 • Zoological Museum 1969 • CeNak 2014 • Integrated biodiversity research • Evolutionary systematics

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### 35.1 Year of Foundation and Age of Parts of the Collection

The *Naturhistorisches Museum Hamburg*, or Museum of Natural History (here called NatHistMus), was created when on 17 May 1843 the founding contract was signed by the Hamburg senate and the *Naturwissenschaftlicher Verein*. Itself established in 1837 only, this Hamburg association of natural science agreed on the fusion of its own collection with that of the *Johanneum*, a distinguished academic gymnasium since 1613 (with its roots going back to 1529). Both already possessed considerable collections, going back to the seventeenth century and accumulated through donations and acquisitions, such as, e.g., the curiosity cabinet of the Peter Friedrich Röding in 1849 or the impressive beetle collection of Johannes Amsinck in 1833.

Evidently, individual objects in these collections go back as far as 1684; such as, for example, CeNak's emblematic skull of a female narwhale (*Monodon monoceros*). As the only object that survived the bombing of the Hamburg NatHistMus in July 1943 when the building was destroyed, it mirrors the rich history and fate of its collections. Aptly called "Lisa"—from da Vinci's famous and equally unique painting in the Louvre—this narwhale skull exhibits two long projecting tusks (instead of none, as usual in females, or only one as in males).

In contrast to many other collections started as "Wunderkammer", or curiosity cabinets of regional kings and other dignitaries, the Hamburg collections originated from the initiative and interest in natural history of some of its civilians, merchandisers, traders, and owners of seagoing vessels. Well known among them was, at his time, Peter Friedrich Röding (1767–1846). Being the owner of a private art and natural history museum, he was once declared by the famous German writer Heinrich Heine in the 1820's as one of the seven "Merkwürdigkeiten," or curiosities, of Hamburg that any visitor must have seen (Heine 1887). Through an entry in his travel notebook, we know of another famous writer and poet, Adelbert von Chamisso, who in 1815 visited the Museum Röding in Hamburg. Being on his way to Copenhagen to join a Russian expedition around the world, Chamisso saw in Röding's collection, among other curiosities, also the female narwhale skull with the two tusks then already famous (see Glaubrecht and Bein 2017).

The NatHistMus had been run by the so-called *Museumskommission*, a coalition of natural history association of men and state representatives who operated the museum as a committee of volunteers, each in charge of one taxonomic area within the collection, ruling under a *Kollegialverfassung* (which was substituted only with the appointment of the first director five decades later). Thus, as Nyhart (2009: 207) noted rightly, like so much else in Hamburg's cultural life, the museum was a public–private enterprise. However, over the years, it became increasingly obvious that this arrangement was not promoting the overall interests of the museum. Its collections were long time provisionally housed at the *Johanneum*, a school for higher education, located

in the nineteenth century in the St. Johannis-Kloster, a former monastery at the Rathausmarkt near the inner part of the city center's Lake Alster which later became the site of Hamburg's impressive town hall. For most of that century, international trade was the main source of material, resulting in many objects for the NatHistMus that also profited enormously from the sale of the Museum Godeffroy. This private museum, actually one of the largest ever, was founded in 1861 by Johan Cesar VI Godeffroy, who asked his captains, contractors, and traders to collect in particular in the South Sea and Eastern Australia. After the Museum Godeffroy was forced to close after bankruptcy, all zoological objects were sold and given in 1886 to the NatHistMus (see Kranz 2005; Scheps 2005).

As the museum's first professional and full-time paid scientific worker and curator, Johann Georg Pfeffer (1854–1931) was employed in 1880 and the second curator came in 1883, Johann Wilhelm Michaelsen (1860–1837). Its first full-time director from 1882 to 1889 was Heinrich Alexander Pagenstecher (1825–1889), a formerly retired zoology professor and director of the Zoological Institute from Heidelberg. In particular, instrumental in establishing the museum as an institution, however, was Hamburg's seven-time mayor Gustav Heinrich Kirchenpauer (1808–1887). Although a lawyer and journalist by profession, one of Kirchenpauer's avocations was natural history, in particular the taxonomy of marine invertebrates which he first studied in the River Elbe estuary. He described and named eight genera and 77 species of hydroids (of which about half of the species are still recognized as valid), and one new genus and 26 new species-group taxa of bryozoans, later working on a global scale. Unfortunately, most of Kirchenpauer's collection, among them many types, was destroyed in Hamburg during WWII (Calder and Brinckmann-Voss 2011).

Opened on 17 September 1891, after nearly a decade of planning and constructing, the NatHistMus moved to its own building, designed in Italian renaissance style by the architects Manfred Semper and Carl Philipp Krutisch, with 100 m in length, 36 m width, and 32 m height and with open galleries surrounding the major hall (see Figs. 35.1 and 35.2). It was located near Hamburg's later main train station, where it formed part of a museum assemblage together with the Hamburg *Kunsthalle* and the *Museum für Kunst und Gewerbe*. The new museum was inaugurated by the new director since 1889, Karl Matthias Kraepelin (1848–1915), who had become professor at the *Johanneum* two years earlier (after teaching there since 1878). Being a "local talent," Kraepelin was not only recognized for his commitment to reform science education in schools (see Nyhart 2009) but also a distinguished naturalist specialized in the study of scorpions, centipedes, and spiders. He in the subsequent two decades made this museum an internationally renowned research institution. In this context, he explicitly named, next to geographical distribution, zoological systematics as the main task ("die wissenschaftliche Hauptaufgabe") of this museum. Kraepelin was extremely successful in building up the museum's global collections through private donations and in context with the colonial movement. Kraepelin (1899: 10–11; 1901: 132) reported that from 1891 to 1899, within less than a decade, the museum holdings



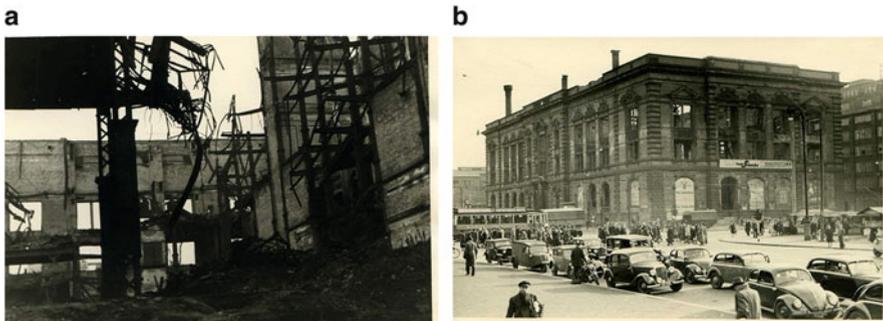
**Fig. 35.1** The *Naturhistorisches Museum*, or Museum of Natural History, in Hamburg designed in Italian renaissance style opened in 1891 (CeNak Archive)



**Fig. 35.2** The main exhibition hall of the *Naturhistorisches Museum Hamburg*, with large whale skeletons on display until the 1940's (CeNak Archive)

have been nearly doubled, with an increase of about 15.000 catalogue numbers or c. 60.000 specimens per year. At the same time, the NatHistMus, promoting the modern dual arrangement of separating research collections from exhibitions, was visited by an average of 140.000 people per year. Kraepelin was among those museum scientists who saw it as their role to present evolution to a broad public through the new public exhibits and to conduct research related to the history of life (Nyhart 2009: 26). We need to remember that at that time the Hamburg NatHistMus was, together with the one in Berlin, the leading German research museum, presenting a newly biologized picture of nature and of zoological research, with its holdings being an archive containing the records of natural history and with systematics playing an important role (see Nyhart 2009: 239–240).

In 1914, when also the museum's name changed into *Zoologisches Museum*, the zoologist Hans Lohmann (1863–1934) followed as director, serving until 1933. Lohmann, who had an expertise in polar plankton research, also became the first professor of zoology at the newly founded University of Hamburg in 1919 (to which the museum, however, did not belong until 1969). In 1934 Berthold Klatt (1885–1958) followed as forth director. The NatHistMus was destroyed during the Allied bombing of Hamburg in the early morning of 30 July 1943 (“operation Gomorrha”), only 3 months after the celebration of its centenary (Fig. 35.3). Significant parts of its scientific collections, in particular the alcohol-preserved collections, were removed earlier and stored outside the museum building or even Hamburg, together with some parts of the dry collections, in particular those of birds. Noteworthy, the alcohol collections were not removed for their enormous scientific value or as cultural heritage but to protect Hamburg's citizens from the risk of burning (Hallermann 2007: 22). An estimated fifth of these wet collections have fallen prey to the post-wartime black market. In contrast to today's



**Fig. 35.3** The ruins of the *Naturhistorisches Museum Hamburg*, (a) destroyed by the bombing of the city's center on 30 July 1943 and (b) shortly before its final removal in 1951 (CeNak Archive)

use of methylated ethanol, the preserving spirit then could be redistilled. This fate of the museum's collection became part of the postwar literature thanks to the famous German writer Siegfried Lenz (1964). While only the iconic narwhale skull with the double tusks was rescued due to a curious event, many other rare objects on display were destroyed in the exhibition hall, among them the most impressive skeletons and partial casts of some larger whales (Fig. 35.2) and even the very rare skeleton of the extinct Steller's sea cow (then called *Rhytina gigas*; see Mohr 1950).

After the destruction of its building, those parts of the NatHistMus collections that have been rescued were provisionally deposited in the Botanical State Institute in Hamburg's city center; in 1953 they moved to a former bunker near today's university campus. With the end of the war, those parts of the collection that have been deposited in the eastern German state of Saxony came under the ruling of the Soviet military administration and returned from there in the late 1950's. Only after many frustrating years Curt Kosswig (1903–1982), who was director from 1955 to 1969, managed to negotiate the building of a new facility for both a museum and the zoological institute (that had once been part of the NatHistMus). Until then having being an independent research institute of the state of Hamburg (*Staatsinstitut*), the natural history collections and its staff were formally integrated into the university in 1969, and then renamed as Zoological Institute and Zoological Museum Hamburg (ZIM). It moved, 1972–1976, into a new building on its current location (see Fig. 35.4). In 1984 a small exhibition, presented on 2,000 qm, was opened. However, without professional staff for exhibitions and education being employed, museum scientists were long left alone with running this exhibit which has not seen much improvement since then (see below).



**Fig. 35.4** The Zoological Museum Hamburg as part of the newly founded *Centrum für Naturkunde* (CeNak) in its university building from the early 1970's (CeNak Archive)

Larger collections in particular for the entomological and malacological departments were taken over from the natural history section of the nearby *Museum Altona* when it was dissolved in 1979. Also, the rich fish collection of the Hamburg *Institut für Seefischerei* (ISH) of the *Bundesforschungsanstalt für Fischerei* (BFAFi) was taken over in 1993 (see under the respective collections).

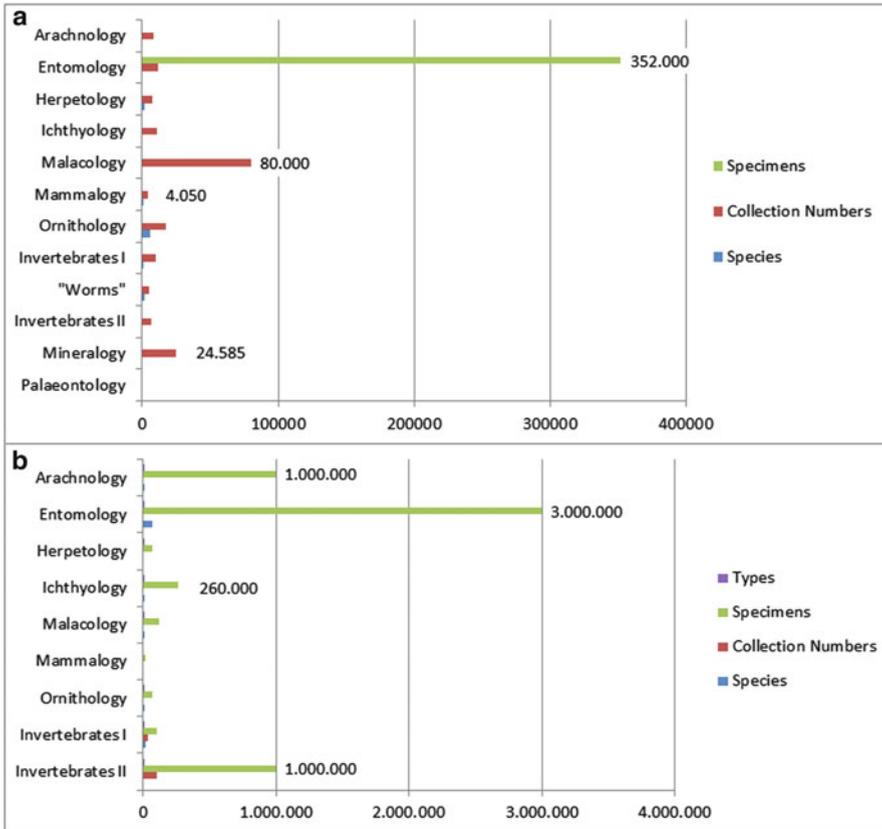
Despite continuous efforts by Hamburg's museum zoologists and the curators of the constituent collections organized in the *Verbund der Naturwissenschaftlichen Sammlungen Hamburgs* (VNSH; see Brandt et al. 2010) that long in vain tried to convince university and federal state authorities of the need for and the establishment of a new natural history museum at a more prominent site, the respective commitment of Hamburg state officials was lacking. Even worse, in 2005 the *Behörde für Wissenschaft und Gesundheit* of the Freie und Hansestadt Hamburg (i.e., the Free and Hanseatic City) intended, after ill-advised ideas on the digitalization of its inventories, to close down the zoological collections. This approach, fortunately, not only resulted in strong media echo in German newspapers but ultimately also in a rather successful—as it turned out—evaluation by the German *Wissenschaftsrat*. In 2009 this board recommended several steps for the improvement of the museum's situation, asking the senate of the city of Hamburg to take action within three years.

Finally, after decades of unsuccessful attempts to improve the situation of the natural history collections, in October 2014 the *Centrum für Naturkunde* (CeNak), or Center of Natural History, was founded by the Universität Hamburg. Albeit virtual to date, the three collections of the Geological-Paleontological Museum, the Mineralogical Museum, and the Zoological Museum (ZMH) now again form an essentially autonomous research institution independent of the faculty, directly answering only to the presidency of the Universität Hamburg (for details on the new structure, see below).

With the exception of these latest developments, the history of the NatHistMus Hamburg has been described in many details in particular by Weidner (1969, 1967, 1993), based on former accounts by Kraepelin (1899, 1901) and in particular by Panning (1955, 1956, 1957, 1958), Ladiges et al. (1968), Hoerschelmann et al. (1993), and Kraus (1994). Additionally, in providing the historical context, many aspects can also be found in Köstering (2003) and Nyhart (2009). Currently, Köstering (in prep.) is writing the first profound history of the NatHistMus and the zoological collections in Hamburg, covering the period from the year of its foundation in 1843 to the late 1970's.

## 35.2 Number of Species and/or Specimens, Focal Points

Within the newly founded CeNak, the Zoological Museum Hamburg (ZMH) is the largest of its three museums, comprising approximately ten million specimens housed in nine research collections with taxa from the entire animal kingdom. Together with the objects on show in its permanent exhibition, it renders the CeNak



**Fig. 35.5** Number of specimens and catalogued entries, respectively, (a) in the former *Naturhistorisches Museum* around 1900 and (b) as currently estimated for the zoological collections of the *Centrum für Naturkunde*

one of the most important scientific research museums in Germany, despite its losses during WWII (see Fig. 35.5). Certain parts of its collections, as will be detailed here, are among the most important of its kind at a national as well as international scale, in particular those of the same invertebrate groups such as, for example, the Oligochaeta and Polychaeta, the Crustacea, the Acari and Arachnida, as well as the Tunicata, the fishes, and ungulates. When compared with other museums, the number of zoological specimens alone makes the ZMH the fourth or fifth largest, after Frankfurt, Berlin, and Munich, in its size comparable to the museum in Stuttgart and larger than that in Bonn.

However, as it holds true for other natural history collections, figures about zoological inventories are tentative at best. To date, no reliable attempt has been made within Germany (e.g., among those collections represented by the DNSF), not to speak of any international approach (e.g., within the CETAF facilities), to consistently assemble figures on collection size in a comparative fashion. Thus,

each museum presents more or less reliable estimates independently. However, these are hardly comparable, as the factual basis for the counts are seldom or not at all mentioned (not to speak of being evaluated). For the Hamburg collections, our estimates are given here as they are retrievable from former reports, in particular from a guidebook for the Zoological Museum (Brandt et al. 2008). Although viewed against a preliminary evaluation of existing data bases, these estimates for the ZMH should be considered as approximate only and thus taken with considerable care, as in all other cases.

### 35.3 Arachnology: Arthropod Collections

approx. 1 mio. specimens, 8.800 species—3.200 types known (of 2.000 primary types)

This scientific collection, for most of its time closely associated with the department of Entomology in the ZMH (see below), houses a total of 860.000 preserved specimens, not counting the rich Acari collection. It includes arachnids and other arthropods, such as in particular the Pararthropoda, Chelicerata, and Myriapoda. A most numerous and important collection is that of the Acari, with c. 3.600 species represented. Catalogue entries are present for a total of 55.000 specimens, of which 18.000 are stored in ethanol and 37.000 are microscopic slides. Of particular historical interest, for example, is a rich collection of Australian spiders, collected by Amalie Dietrich for the Museum Godeffroy in 1862–1872 in Queensland and worked up by L. Koch and E. von Keyserling, with an estimated more than 800 of the c. 2.000 araneae species. The collection is internationally renowned in particular for its material in Tardigrada, Arachnida, and heterostigmatic Acari, being consulted frequently by scientists for its many types as well as the historical material. In addition, rich in species numbers and important are the collections of diplopods (1.060 species) and scorpions (452 species).

The curatorial position was long held, from 1959 to 1992, by Gisela Rack, followed by Hieronymus Dastych, who retired in October 2012. For more details, see Dastych in Brandt et al. (2008: 50–51).

### 35.4 Entomology: Insect Collections

approx. >3 mio. specimens, 65.000 species—c. 10.000 types

Once one of the largest entomological collections in Germany, the Zoological Museum suffered greatly from the loss of essential parts of its collection in 1943 which was assumed to house in this department up to then about 1.5 mio. insects, with an estimated 10.000 types (Fig. 35.5). Parts of these historical collections, going back to the time of Hanseatic merchandisers with their interest in natural

history collections, were rescued, while important parts of the collection, such as of holometabolic insects with many types, were destroyed. Today, CeNak's entomological collection holds again up to at least 3 mio. specimens, with 1 mio. specimens pinned and in alcohol each, supplemented by well over 5.000 microscopic samples and 500 modeled objects, and about 10.000 types, with a focus in Acercaria (>4.000), Coleoptera (>3.100), and Lepidoptera (>1.500), rendering it one of the largest and most important among German museums.

The international significance of the collection is reflected by loan requests for some 5.000 specimens to around 20 different countries each year. Collected from all around the world, containing numerous unique specimens, the collection is subdivided into three sections: the scientific-systematic collection, scientific special collections (including insects that damage plants and textiles), and a comprehensive teaching collection. Only a very small fraction of its holdings are catalogued and/or digitalized, now using Specify, transferring data from scanned catalogue cards (65.000) to Excel sheets (50.000 entries), resulting in about 30.000 entries (as of 2015).

The collection is growing on average by 10.000 specimens per year and, thus, continues to document the biodiversity of insects, the largest class of animals on Earth. Edited by H. Strümpel and H. Dastych, the entomological department published its own journal "Entomologische Mitteilungen aus dem Zoologischen Museum Hamburg" for many years (with back issues being available online under <https://www.cenak.uni-hamburg.de/forschung/zoologie/entomologie/zeitschrift.html>); it will be continued within a relaunched journal *Evolutionary Systematics* published for the entire Zoological Museum in Hamburg, for which currently new plans are about to be implemented.

## 35.5 Herpetology: Reptilia and Amphibia

65.000 specimens—194 nominal types, with 333 type specimens registered

This department holds the fifth largest herpetological collection in Germany, with about 70 % reptiles and 30 % amphibians, stored essentially in 17.500 jars, supplemented by several hundred dried skeleton and skin specimens and 259 sets of serial histological sections. About half of the collection, with data from c. 33.000 individuals, are now digitized, using FileMaker Pro software (July 2015), among those are 190 types that are available online through GBIF; type catalogues have been published by Hallermann (1998, 2006). As the inventory catalogue was destroyed in 1943 during WWII, the holdings and data of the collections had to be restored from the information preserved on the original labels, which was started by H.-W. Koepcke (1914–2000); see Hallermann (2007, and references therein). The collections hold some important historical specimens, among them, e.g., reptiles collected by Maximilian Prince zu Wied-Neuwied (1782–1867) during his famous expedition to Brazil 1815–1817; described in 1825, these are among

the oldest preserved holdings in Germany. The ZMH also comprises the herpetological collections of Johann Gustav Fischer (1819–1889), the most distinguished Hamburg herpetologist at his time. He described 106 reptile and six amphibian taxa, of which only 34 and four, respectively, are still present at the ZMH, while the remainders were lost during WWII. For a more detailed account of the history of the museum's herpetology, see Hallermann (2007).

## 35.6 Ichthyology: Fish Collection

260.000 specimens, 70.000 series, 8.100 species—1.340 type series with 3.700 type specimens

The 260.000 specimens in this collection, comprising about 70.000 series, represent about 8.100 species from 60 orders and 378 families, which are about 25 % of all known fishes worldwide. Thiel et al. (2009) have given a detailed account on the development of the ZMH fish collection, based on the analysis of its data base. The foundation of the collection goes back to the NatHistMus in Hamburg, with initially low numbers, amounting, e.g., in 1850, only 110 lots, but increased markedly during the second half of the nineteenth century and surpassed the 4400 mark in 1900. Overall, about 6 % of the current collection stems from this period between 1851 and 1900. The first two decades of the twentieth century saw a relative rapid expansion of the collection, continuing to profit from expeditions exploring unknown habitats and territories. An estimated 14 % of the holdings, which are mostly (70 %) stored in alcohol, were destroyed during WWII. The most significant, rendering the ZMH collection now beyond doubt the largest of marine fish in Germany and also one of the largest worldwide, came in 1993 with the official takeover of 23.860 marine fish lots from the former *Institut für Seefischerei* Hamburg (ISH), after the collection had been transferred to the ZMH already in 1978; for a brief history of the ISH fish collection, designed and initiated by Gerhard Krefft (1912–1993), see Stehmann (1997). It resulted in an increase of 75 % of all actual catalogue lots stored now in the ZMH. Today these holdings are partly (ca. 65 %) digitalized, using our own Access database, with about 46.500 entries (as of 2015). These are also to be found via online data search such as FishBase ([www.fishbase.org](http://www.fishbase.org); [www.cenak.uni-hamburg.de/sammlungen/zoologie/ichthyologie.html](http://www.cenak.uni-hamburg.de/sammlungen/zoologie/ichthyologie.html)).

The collection maintains a worldwide coverage, containing about two thirds of all fish species, 70 % of all fish genera and 98 % of all fish families known to occur in the Atlantic Ocean, including the Antarctic sector, and has considerable series from the Indian Ocean and large numbers of lots originating from the Pacific Ocean and also from Europe, Asia, Africa, and North and South America. Actinopterygii and Elasmobranchii together comprise more than 93 % of the orders represented in the ZMH fish collection database. For more details, see Thiel et al. (2009).

The research of the ZMH Ichthyology Group today includes modern taxonomic and biogeographic approaches important in present global biodiversity research. One research focus is, next to biosystematics, of selected groups of teleosts and elasmobranchs, the study and modeling of ecology and distribution of diadromous fish, as well as ongoing surveys of the fish fauna in the North and Baltic Seas and their adjacent waters and, in particular, in the River Elbe [see Thiel et al. (2009), Thiel and Thiel (2015)]. It renders the ZMH fish collection as an indispensable tool among international reference centers dealing with biodiversity documentation and conservation of fishes.

### 35.7 Invertebrates I

>100.000 specimens, 31.000 catalogue entries, c. 20.000 species—c. 3.300 types

Within its diverse collection, about 23 groups of multicellular animals (Metazoa) are represented, with currently more than 31.000 catalogue entries (Fig. 35.6). There are three main parts of international rank. First, among the Oligochaeta, there are 4.200 catalogue entries, with 1.346 types, including the historical collection in particular of Hamburg's longtime curator and oligochaet specialist Wilhelm Michaelsen (1860–1937), who was working from 1887 to 1923. Thus, of the



**Fig. 35.6** A view of the collection Invertebrates I of the Centrum für Naturkunde (CeNak Archive)

c. 8.000 species of Oligochaeta known worldwide, 16% of all named taxa are represented by type material in the CeNak, i.e., every fifth oligochaet in the world is represented in Hamburg by its name-bearing specimens. Second, about 3.700 catalogue entries of Tunicata are present, with 1.343 entries for the Ascidia (with 309 types). Third, there are 1.538 series of Bryozoa with 54 types known. Other parts comprise Echinodermata with 3.900 series and 209 types, Cnidaria (3.260 lots, 156 types), Porifera (1.988 series, 215 types), Hirudinea (979 series, 35 types), and Chaetognatha with 700 series. More than 25.000 entries are currently digitally registered, using FileMaker Pro.

## 35.8 Invertebrates II

>1 mio. specimens, 100.000 catalogue numbers—11.000 types known

This collection essentially of crustaceans and marine bristle worms houses, with more than 100.000 catalogue numbers, the largest type collection in Germany. It holds 44.888 catalogue numbers for the Crustacea, among them also 6.458 types, and 27.693 catalogue numbers for the Polychaeta, with c. 4.363 types. More than 90% of the species in this collection are from marine habitats, with 70% of them coming from the southern hemisphere, in particular the South Polar Ocean. Using the database Sesam, type entries from former catalogue cards were digitalized. The collection comprises 368 families of the Crustacea (with c. 2.100 genera) and 48 families of the Polychaeta (with c. 1.350 genera), with Amphipoda (c. 250.000 specimens) and Isopoda (c. 170.000 specimens) being the most numerous parts within the malacostracan Crustacea, and the Copepoda (c. 260.000) and Ostracoda (25.000) among the “entomostracan” crustaceans. A systematic focus are several groups of Crustacea, among them, e.g., the Peracarida, the Decapoda, and the Copepoda, with a geographical focus on taxa from the Southern Ocean and various deep-sea basins. A special research interest of the current curator is the systematics and phylogeny as well as the documentation and analysis of the biodiversity and biogeography of Peracarida with focus on Isopoda.

## 35.9 Malacology: Mollusk Collection

120.000 series, 10.000 species—1.787 types

The CeNak Mollusk Collection includes primarily snails, mussels, and cephalopods from every continent and ocean on Earth. Once its collection numbered about 300.000 series, but the whole dry collection was lost as a result of the destruction of the Natural History Museum in 1943 (see Fig. 35.5). Of its more than 120.000 series, currently (as of 2015) more than three quarter (100.700) are digitalized, using Specify, comprising 100% of its wet and 80% of its dry collection, of which

more than 35 % are georeferenced. In addition there is a tissue collection for genetic studies with more than 5.700 samples.

The alcohol collection of the NatHistMus and the former collection of the *Museum Altona* formed the base of the recent collection, the latter including part of the collections of Otto Semper, with types, e.g., of Karl Theodor Menke and Ludwig Pfeiffer. The collection has especially increased in size by yields of research vessels (“Walther Herwig,” “Polarstern”) and the accession of private collections, in particular those of Rolf Brandt from Thailand collecting nonmarine mollusks, as well as Eberhard Claus, Peter Glöer, and Wolfgang Fauer. Focuses in the collection are land snails from southeastern Europe, Turkey, the Caucasus region, South America (Columbia, Peru), and eastern Africa (Uganda, Rwanda), freshwater mollusks from Thailand, and marine mollusks from the Antarctic and Patagonian regions. The cephalopod collection with about 3.250 series is the largest in Germany and among the largest worldwide.

Research focuses largely on species diversity, evolution and distribution patterns, as well as the phylogenetic relationships of land snails. A current project, for example, is investigating how environmental factors and historical processes have led to a high level of species diversity in the Caucasus.

## 35.10 Mammalogy: Mammal Collection

c. 20.000 specimens—number of types not known

The collection comprised about 10.000 skeletons and 3.000 skins, supplemented by 5.000 specimens stored in alcohol, rendering it one of the most important in Germany. In particular, this latter section of the collection is of importance as it comprises historical material, including organs and embryos, while the dry collection was completely destroyed in the former NatHistMus building in 1943 (Fig. 35.5). Using Specify about 16.000 specimens are digitalized, with next to all skins this comprises about 95 % of the skeletons, 80 % of the wet material, and 60 % of the histological sections. The focus of the collection is on hoofed animals, African primates, and marine mammals, with postwar collections of larger mammals, represented by skulls and mostly complete postcranial skeletons, and from taxa that are hardly retrievable today from their natural habitats. The collection comprises material derived from major expeditions to India and Angola as well as other parts of Africa in the 1950’s–1960’s, e.g., from Manfred Röhrs and Henriette Oboussier, with large and complete series of bovid material.

Most recently, in 2014, the CeNak took over from Günter Bräuer a most valuable and unique (paleo-)anthropological collection that has been assembled over the last four decades. With 250 casts of fossil hominids, it is certainly the largest of its kind in Germany. In addition, a collection of prehistorical anthropology and human osteology was donated, comprising 1500 specimens of medieval skeletons (in 650 boxes), most valuable for morphological-anatomical comparisons.

Research in the collection focuses on functional aspects of mammal teeth and their chewing, using three-dimensional data analyses of dental surface structures that enable the study of diet and life history of (even extinct) species and to reconstruct past and present environments including influences such as of climate change.

### **35.11 Ornithology: Bird Collection**

71.000 specimens, 3.500 species—c. 142 known types

The ornithology collection, for which once a catalogue was printed in 1898, suffered from substantial losses during WWII. It gained c. 9.000 specimens again since 1967 and has yet doubled since then. Today a total of 30.000 specimens of mounted or skinned birds are listed again in the catalogue, supplemented by 20.000 feather samples, 4.000 skeletons, and 2.000 alcohol samples, plus a total of 15.000 specimens in the egg collection. Of the species-rich collection, about 4.000 numbers (with about 25.000 individuals) have been digitalized and types included in the GBIF database. The curatorial position has not been available since 1997, with the collection being provisionally administered by the acting curator for herpetology.

### **35.12 Today's Conditions of Infrastructure (Staff, Rooms, Laboratories, Exhibitions, Financial Support, Perspectives)**

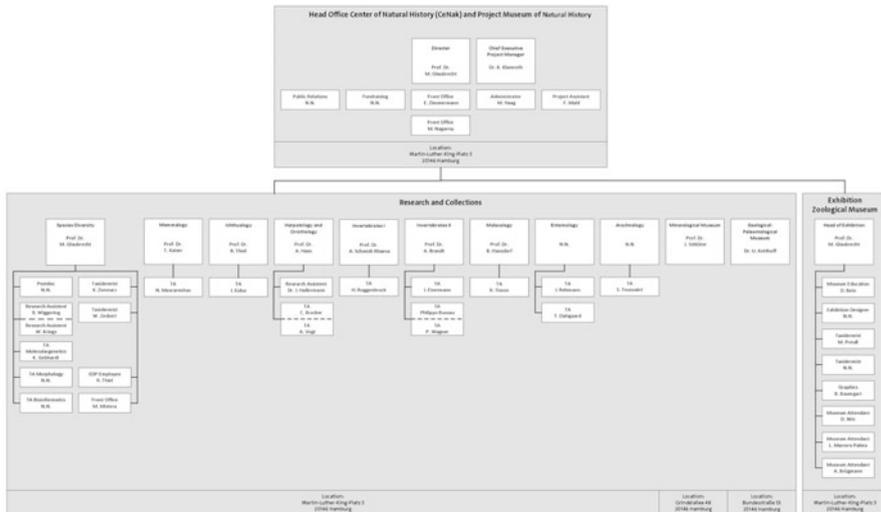
*Organizational Structure* CeNak's structure today is only to be understood from a historical perspective of our institution which seems to be quite unique among the larger natural history museums in Germany. Integrating its important collections into the Universität Hamburg in 1969, as part of the Zoological Institute and Zoological Museum (ZIM), resulted in the successive loss of the museum's autonomy, with transfer of virtually all decision making to the Faculty of Mathematics, Informatics and Natural Sciences (MIN), but was not necessarily based on better competence. This increasing and unhealthy dominance of university processes and interests, in concert with the rigorous decrease in financial support of building maintenance and collection-related staff members, has created a disastrous situation for the museum. After two major evaluations by external experts, among them most importantly by the German *Wissenschaftsrat*, an independent advisory board in scientific and research questions for the German government, this situation of the ZMH became at least public and most obvious.

Although the Hamburg Senate for more than the last decade remained indolent and inactive, the university in 2012 finally took over responsibility in paving the way for both the establishment of a new director and the foundation of the CeNak.

In this context, a new institutional concept was accepted and implemented in the course of the new appointment. The presidency of the Universität Hamburg decided in May 2014 to found the new Centrum für Naturkunde (CeNak), or Center of Natural History, followed by the inauguration of its new scientific director in October 2014. Effectively, the CeNak now is no longer part of the MIN Faculty, thus independent of other university administrative structures and only responsible to the president of the university. It integrates under its (to date only virtual) roof the three natural history collections of the former Zoological Museum, the Geological-Paleontological Museum, and the Mineralogical Museum, which, though, remain for the time being at their respective localities.

Within the CeNak, the ZMH comprises its former nine departments, each with its own collection and curator (the latter with the exception of ornithology): mammals, birds, reptiles and amphibians, fish, insects, spiders, mollusks, as well as the two invertebrate sections, viz., for Crustacea and Polychaeta, and all remaining, respectively (see Fig. 35.7). In addition, an exhibition on 2.000 qm is immensely popular as a place of learning for school children and university students alike (for more on the exhibition and didactic concept, see below).

*Personnel* The CeNak currently (as of August 2015) has a total of 99 employees of different status. Among them are 35 employees whose salaries are paid through the university budget, with 12 scientists altogether, i.e., professors and curators (of which ten are in the Zoological Museum), as well as two scientific qualification positions (associated with the newly established professorship for *Biodiversität der Tiere*). In addition, there are 21 employees in science-supporting services, such as



**Fig. 35.7** Organigramm, or composition of the positions and personal in the Centrum für Naturkunde Hamburg (CeNak)

collection maintenance, preparators, and other staff in administration, direction, and exhibition. Another total of 31 employees, essentially Ph.D. students and student assistants, are paid through third-party money, i.e., grants from founding bodies such as DFG, BMBF, DAAD, and others. In addition to these total of 66 employees, the CeNak has currently another 33 members, such as bachelor, master, and other students, professor emeriti, volunteers, and guest researchers.

A cooperation contract with the MIN faculty regulates the engagement of CeNak's scientists, professors as well as curators and others, in teaching activities at the Universität Hamburg. In mutual agreement between university, faculty, and CeNak's director, the teaching load was now reduced and fixed, in order to set free more of the working time of scientific staff members for museum and collection affairs.

*Rooms and Laboratories* Built in the early to mid-1970's, the ZMH facility at Martin-Luther-King-Platz has lacked careful maintenance for decades and is among those university buildings desperately in need for renovation or, alternatively, rebuilding on site or elsewhere. While planning toward this goal was long not visible, the spatial situation has been shown to be close to critical by the evaluation of the *Wissenschaftsrat* in December 2008. Major improvements, i.e., renovating the most necessary on site, were mutually agreed on in the course of the appointment of CeNak's director and are currently implemented, to be finalized in 2016. Plans are discussed to also improve the situation of the exhibition, but are not completely agreed on yet.

Nevertheless, in its museum building, the ZMH possesses currently a well-equipped central molecular lab and several morphology labs, including the scanning electron microscopy facility shared with the Zoological Institute. It is planned in the course of renovating parts of the Zoological Museum building to create central labs for molecular genetics and morphology. To run these, new staff is currently hired, with positions granted by the university for the next 5 years in the course of the inauguration of the new director.

The ZMH also have a *Präparatorium*, including workshops and maceration facility, with two preparators working full time for both the research collections and the exhibition. The CeNak continues to share other facilities, such as technical workshops and services, their library, and their lecture halls with the closely associated Zoological Institute in an adjacent part of the same building.

*Exhibition* Once among the most attractive and important of all zoological museums in Germany, and second only to the *Museum für Naturkunde* in Berlin, the public exhibition of the NatHistMus in Hamburg suffered greatly from the Allied air raid on 30 July 1943. It took nearly half a century, until 1984, when again the so-called Schausammlung opened its doors to the public (see Fig. 35.8). Unfortunately, this exhibition on only 2.000 qm is well hidden within the MIN campus at its current location. Being the only object once on display in the former NatHistMus that survived, the narwhale skull with two tusks, recently named "Lisa" now (see above), became the new icon. The current exhibition was created in the early 1980's and has not yet seen much of an improvement in terms of design



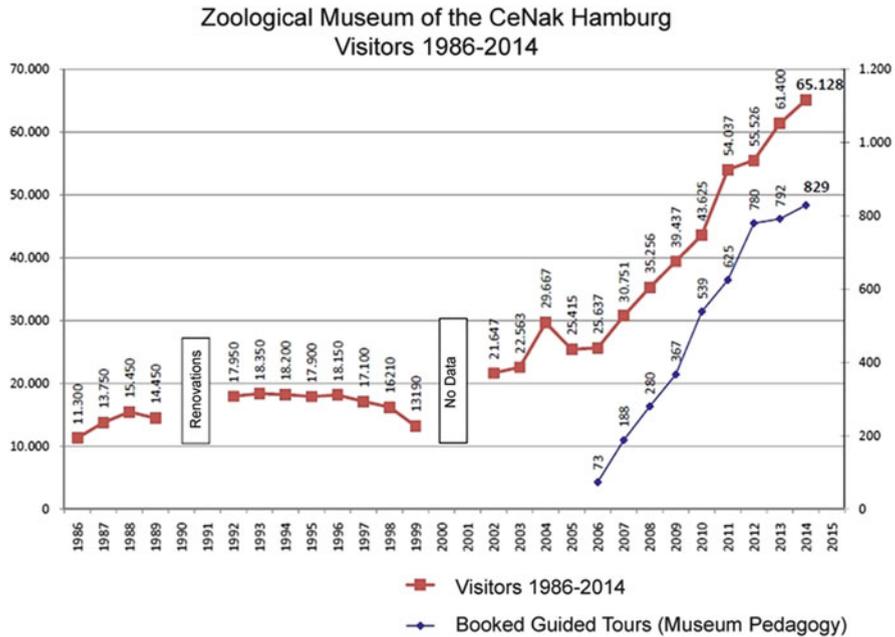
Fig. 35.8 View of the exhibition of the Centrum für Naturkunde Hamburg (CeNak)

and didactic concept. Its basic idea, essentially exhibited by larger vertebrates, was described in more detail in Brandt et al. (2008). Referring to it here in more detail will be superfluous, as with the new CeNak implemented, key positions within the newly established exhibition department will now be filled, and a new exhibition concept will be created and implemented in the near future.

Nevertheless, the exhibition continues to generate increasing numbers of visitors. With about 20.000 visitors per year in 2004 and 30.000 in 2007, it was even doubled in number until reaching 65.000 in 2014 (see Fig. 35.9). For a comparison with other museums in Hamburg, we note that the *Museum für Völkerkunde* counts 130.000 and the *Kunsthalle* 380.000 visitor per year, however, on much more space and with by far other means. The successful development in the ZMH's exhibit is undoubtedly the results of an extraordinary engagement of the museum didactic services, creating next to regular-guided tours and education in particular for school classes also smaller special exhibits and events.

*Financial Support* As a result of its new institutional structure, effective October 2014, the CeNak built over the course of the first year of existence its own administration, human resource planning, and financial budget, albeit in close association with the central university administration. At the moment, its budget is comparably low, with approximately around 3 mio Euro per year spent essentially on the salaries of CeNak's personal and for the most basic support of its collection, exhibition, and research.

*Perspectives* With the implementation of the CeNak, it is planned to (re-)establish a modern natural history museum in Hamburg, taking up after more than half a century the tradition of the former NatHistMus, in particular the most successful and prosperous of its phases when Karl Matthias Kraepelin developed its leading



**Fig. 35.9** The increase of visitors in the exhibition of the Zoological Museum of the Centrum für Naturkunde Hamburg (CeNak)

role in research, exhibition, and education (see above). Details of these plans are currently discussed and negotiated with the various partners in the university, the city state’s administration, and with private donors.

The vision and concept of an *Evolutioneum* as Hamburg’s new Natural History Museum for the twenty-first century has been developed by its current director in the course of his appointment. Pending on the political commitment of the Hamburg Senate for the implementation of a new master plan for his museum, including in particular a new building with a museum exhibition as showcase of its research, CeNak’s two declared aims are, first, to reestablish the museum as an excellent research institution taking up its former tradition and, second, to bridge the gap between academia and the general public.

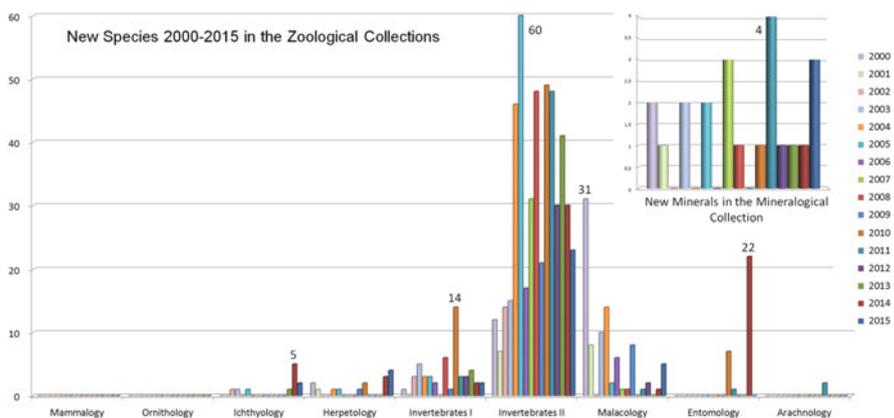
### 35.13 *Research: Examples of Today’s Research, Potencies*

The ZMH enjoys considerable national and international recognition in the scientific community for its achievements in collection-based research by its leading scientists and their broad expertise in organismal zoology. The ZMH has seen over the last decade a complete generation turnover in its leading scientific staff, with three research programs guiding new staff acquisition in the past, viz., (program I)

taxonomy and phylogeny, (program II) evolutionary biology, speciation processes and ecomorphology, and (program III) biogeography, monitoring, and modeling, and with new curators appointed for the departments of herpetology (2004), mammalogy (2005), ichthyology (2006), invertebrates I (2007), and entomology (2008). The later curatorial position became vacant again in 2010, but will be again filled, together with the one in arachnology (that became vacant in 2012), in the course of restructuring the CeNak. Consolidating the three museum collections and staff within the newly founded CeNak serves three key aims: (i) to preserve collections and assure their availability, (ii) to expand and develop the collections, and (iii) to make specimens available to both researchers and the public via exhibitions.

A review of the various research goals of CeNak's scientists, based on studies on terrestrial as well as aquatic taxa, with the two broader programs "Biological Earth System Science" and "Aquatic ecology," was given in detail by Brandt et al. (2008). In this context, next to traditional morphological studies, also modern microscopic methods, such as electron microscopy, confocal laser scanning microscopy, uCT and 3D reconstruction and visualization techniques as well as immunohistochemical and molecular genetic methods for populations-level as well as phylogenetic analyses, are applied. The ZMH staff members also contributed with expertise and collection material toward the success of joint programs, such as, e.g., "Census of Marine Life," "Tree of Life," "Deep Metazoan Phylogeny," "Biota" and "Diversitas," as well as "Clisap" (see Fig. 35.10).

The ZMH as part of the CeNak is integrated in the major national and international research and museum networks, including CETAF (Consortium of European Taxonomic Facilities), DNSF (Konsortium Deutsche Naturwissenschaftliche Forschungssammlungen), NORe (Museumsverbund der Nord- und Ostsee Region e.V.), and Deutscher Museumsbund. We agreed on a formally legalized



**Fig. 35.10** The number of new species described by scientists from the Zoological Museum of the Centrum für Naturkunde Hamburg within the past 15 years (CeNak)

cooperation granting joint research in taxonomic and systematic studies with the *Deutsches Zentrum für Marine Biodiversitätsforschung* (DZMB), founded in 2001 as external department of the Forschungsinstitut Senckenberg in Frankfurt (FIS) and administered through the Senckenberg facilities in Wilhelmshaven. Another legalized cooperation is established between the *Johann Heinrich von Thünen-Institut für Seefischerei* (vTI) in Hamburg, from which the ZMH has taken over a very rich fish collection in 1993. The vTI continues to transfer ichthyological specimens of its research activities.

In the context of restructuring the museum, also its own journal will be relaunched. The former “Mitteilungen aus dem Zoologischen Museum Hamburg” has a long tradition going back to 1883, when it was founded as “Jahresbericht über das Naturhistorische Museum zu Hamburg” and has been continuously been published until 2010 (see online under <https://www.cenak.uni-hamburg.de/uebercenak/journale.html>). Currently new plans are about to be implemented for a new open access journal *Evolutionary Systematics* to be published for the entire CeNak.

*Contributing Toward an Encyclopedia of Life* Within a period of the last 15 years, from 2000 to 2014, a total of 500 new taxa on the species level have been described by scientists at the CeNak (see Fig. 35.10), in addition to a total of 34 new minerals by CeNak’s mineralogist. Based on its research collections, the scientists in the CeNak will continue with museum-based zoological research in the field of taxonomy and systematics, evolution and ecology, as well as ecosystem function of aquatic and terrestrial taxa. The main focal research areas have been described by the individual scientists of the ZMH for their responsible departments and collections in Brandt et al. (2008). More recent updates are available online on CeNak’s website for the respective departments.

In the near future, an integrated biodiversity research program, along the lines of a vision on *Discovering biological diversity—its evolution and future*, will be developed for the CeNak in close association with its researchers. We will continue to combine a special focus on marine habitats, from the local River Elbe estuary to the polar regions, and on selected terrestrial to limnic taxa from various regions in the world, accentuating an evolutionary systematics perspective, i.e., combining taxonomy-based descriptive approaches in systematics, phylogeny, and biogeography with more causal and analytical approaches as described by Glaubrecht (2010). This research program will rest on three methodological bases, viz., morphology, molecular genetics (including genomics), and biogeographical and ecological modeling. This program will be supplemented by a biohistory agenda, looking into the life history of individual objects as well as taking into focus the historical development of collections and museums; for some examples of actual research, see the CeNak websites, for the theoretical reasoning in particular those under the department for “Biodiversität der Tiere.”

In this context, the implementation of a working program on the intelligent digitalization of our research collection (i.e., including all researchable metadata) will be crucial. We also plan to establish a third collection strategy, viz., in addition

to the dry and wet collection, to build a “cold archive” where extracted DNA and tissue samples will be stored for future molecular genetic research.

### **35.14 Promotion of Junior Staff**

Flexibility in terms of permanent or temporarily available positions to promote junior staff is quite limited in a German university institution nowadays. Next to two scientific qualification positions associated with the newly established department for “Biodiversität der Tiere,” currently a total of 31 employees are paid through third-party money. These are essentially Ph.D. students and student assistants, thus promoted as upcoming scientists, in addition to the supervision of bachelor and master students. CeNak has no formal postgraduate or Ph.D. promotion program on its own, but is part of those programs developed in responsibility of the faculty and/or Universität Hamburg.

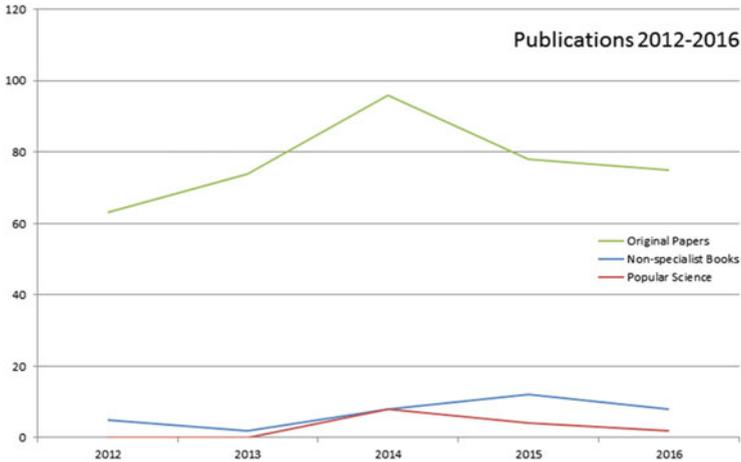
### **35.15 Publications: Written or Other Used New Media**

Over the last couple of years, the scientific staff of the CeNak, here counting 12 fully employed scientists and their staff (mainly assistants and Ph.D. students), wrote a total of about 100 original and peer-reviews scientific publications per year, including books and book chapters plus several popular science publications. For example, in 2014, these original publications numbered 96 plus 8 scientific books, i.e., in average 8.7 per then fully employed scientist (note that some staff positions of the CeNak were not filled yet at that time).

We found, in a web-based bibliographic search, that a collection material of the CeNak was mentioned, for example, from the entomology department in 96 publications within the last 8 years (2008–2015), thus resulting in about 12 publications per year where authors used and/or referred to material from the CeNak. We can assume that in other departments, in particular those holding the species-rich invertebrate taxa, would exhibit similar figures, adding up in about 100 publications per year mentioning CeNak material (Fig. 35.11).

### **35.16 Publications: Done by Lectures, Workshops, Meetings, and Expeditions**

The scientific staff is, as elsewhere, engaged in scientific lectures, workshops, and other meetings; however, we haven’t assembled a detailed listing of these activities.



**Fig. 35.11** The number of publications per year in the three museums of the *Centrum für Naturkunde* Hamburg (CeNak), for the period 2012–2014 with reference to those published to date for 2015

Scientists of the CeNak are regularly involved with major marine expeditions in an international context, for example, in expeditions of the research vessel “Sonne,” “Meteor,” and “Polarstern,” as well as others. These are mainly cruising in Antarctica, but also in the Middle Atlantic and the Pacific. More low-key, i.e., individually organized, terrestrial expeditions were regularly going to regions in Southeast Asia, e.g., Thailand and Indonesia, as well as Australia and Africa. Details on this can be found on the individual websites via CeNak’s homepage, as well as in the individual publications and reports of its scientists.

### 35.17 Didactic Conceptions of Exhibitions

Given the integration into the Universität Hamburg since 1969, a small exhibition was only opened in 1984. It was designed as “Schausammlung” or display room, i.e., presenting selected zoological objects of special interest, such as particularly larger mammals and birds, with the idea to allow an overview of this part of global biodiversity, ranging from marine whales to European ungulates. As research in the ZMH was essentially disconnected from its permanent exhibition, no special signature of these activities was visible and accessible to the visitor; also no particular object and their individual history have been presented. Substantial financial support and trained staff was long lacking. Only with the newly established CeNak it will be possible to make up for these deficiencies in the past.

Nevertheless, the display room is immensely popular as a place of learning for school children and university students alike. The education department offers a comprehensive range of tours and events (not only in the Zoological but also the other two museums exhibits). As can be shown for the Zoological Museum, the number of its visitors has constantly, and in the most recent years, rapidly increased, reaching its capacity with about 65.000 visitors per year in 2014 (see Fig. 35.9).

### **35.18 Cooperation with Schools**

As museums in general are most important locations for bridging the gap between science/research and society, the exhibition and educational display room of the ZMH provides an “außerschulischer Lernort” or external school room for educating pupils in natural sciences and biology, respectively. Accordingly, a large fraction of the increasing number of visitors in the ZMH exhibit is from schools and kindergarten. As the university also has special curricula for teachers, there is a close cooperation with the educational department established, making use of a special collection (with about 3.000 catalogued items and/or specimens in addition to those in the scientific research collections). In 2014 a total of 870 didactic programs have been offered and booked, with a third of the visits coming from classes of the Hamburg gymnasiums. There is a focus on evolutionary biology for which the exhibition staff with its two permanent positions and 16 freelance members is particularly trained.

### **35.19 Use of Social Media (Youtube, Facebook, Twitter, Instagram, and Local Platforms)**

Information on CeNak, its exhibitions, and events can be found online on its website as well as on Facebook via its homepage under <https://www.facebook.com/pages/Zoologisches-Museum-Hamburg/102096659875733?sk=timeline> (Fig. 35.12).



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