The invertebrate and large foraminifer fossils in the paleontological collection Georg Gasser (1857–1931)

→ Irene Tomelleri[1], Alexander Nützel[2,3,4], Baran Karapunar[2,3], Hans Hagdorn[5], Giuseppa Forte[1] & Evelyn Kustatscher[1]

[1] Museum on Nature South Tyrol, Bozen/Bolzano, Italy
[2] Department für Geo- und Umweltwissenschaften, Paläontologie und Geobiologie, Ludwig-Maximilians-Universität, München, Germany
[3] SNSB-Bayerische Staatssammlung für Paläontologie und Geobiologie, München, Germany
[4] GeoBio-Center, Ludwig-Maximilians-Universität München, München, Germany
[5] Muschelkalkmuseum Ingelfingen, Germany
E-mail: irenetomelleri@gmail.com; giusy.forte@naturmuseum.it; Evelyn.Kustatscher@naturmuseum.it; nuetzel@snsb.de; karapunar@snsb.de; encrinus@hagdorn-ingelfingen.de

ABSTRACT

The paleontological collection of Georg Gasser gives important insights in the fossiliferous sites of the 19th and 20th century, and the fossils collected and studied during that time interval. With about 90% the invertebrates represent the biggest part of the paleozoological specimens. All major groups are represented, although there is a clear predominance of molluscs reflecting Gasser's particular predilection for these animals. Although 45% of the finds suffer a lack of information on the labels. The collections give us nonetheless a picture of the main areas of provenance for the fossils and an hint on Gasser's compositional idea regarding the collection. A close connection between Gasser and the German-speaking areas in Europe as primary source of the specimens is evident, with only rare exotic exceptions represented by some localities in America, Africa or in the Atlantic Ocean. This work is based on a preliminary study, realized with the aim of promoting insights and favor the divulgation of the historical content of this paleontological heritage.

KEY WORDS

Austro-Hungarian Empire, German Empire, Dolomites, South Tyrol, Wunderkammer, historical collection

1. INTRODUCTION

The collection of Georg Gasser (1857–1931) is one of the most extensive collections of natural objects (minerals, fossils and zoological specimens) in Tirol. His mineralogical collection is well-known, whereas his paleontological collection has not been given much attention since the closure of his exhibition in 1931. Several relocations during the lifetime of Georg Gasser, but especially after his death, affected the preservation of the fossils and the quality of the labels. What survives of this collection (about 3,500 fossils) is stored in the Museum of Nature South Tyrol (NMS) in Bozen/Bolzano. The overarching number of fossils (92%) belongs to remains of all major animal groups excluding microfossils. Only approximately 8% are plant fossils. The biggest part of the paleozoological collection is assigned to the invertebrates (70%).
The aim of this paper is to give an overview of the invertebrates of the paleontological collection of Georg Gasser and to identify the distinctive characters of the collection in a historical context. This permits to evidence the stratigraphic and geographical distribution of the fossils also from a geopolitical perspective, since the collection gives insights in the scientific memory of the collecting areas during the 19th and early 20th centuries. Some of the areas sampled during those times may not be available anymore due to constructions and/or changes in the natural or human-based landscape.

2. MATERIALS AND METHODS

In the last two years, a research project of the Museum of Nature South Tyrol (see Kustatscher et al., this volume) has been carried out to quantify the heritage of the paleontological collection "Georg Gasser". The goal was conservation and enhancement of the collection returning it to the community, as was Gasser's original idea. This has been carried out by studying the historical documents of Georg Gasser (Wagensommer et al., this volume a, b; Wagensommer, this volume a, b) and by revising the paleontological collection (Kustatscher et al., this volume; Tomelleri et al., this volume a, b, c; Baucon et al, this volume). Unfortunately, the complicated pandemic situation linked to Covid-19, together with sometimes missing or incomplete labels, made a detailed systematic revision of the fossils very difficult. For this reason, the overview given here includes both historical names of Georg Gasser and modern revisions; an asterisk is indicated to express the names reported by Georg Gasser himself. An additional element present among the invertebrate collection is the fact that Georg Gasser glued various specimens onto glass supports, covering them sometimes with a glass lens. This hinders the study of the specimen from all sides and may make diagnostic characters not accessible (Fig. 1). This type of exhibition shows Gasser's didactic aim, who tried, for example, to express, through association of specimens, pointing on similarities or differences

FIG. 1: Example of display, adopted by Georg Gasser for the specimens of the collection. Scale bar=1 cm

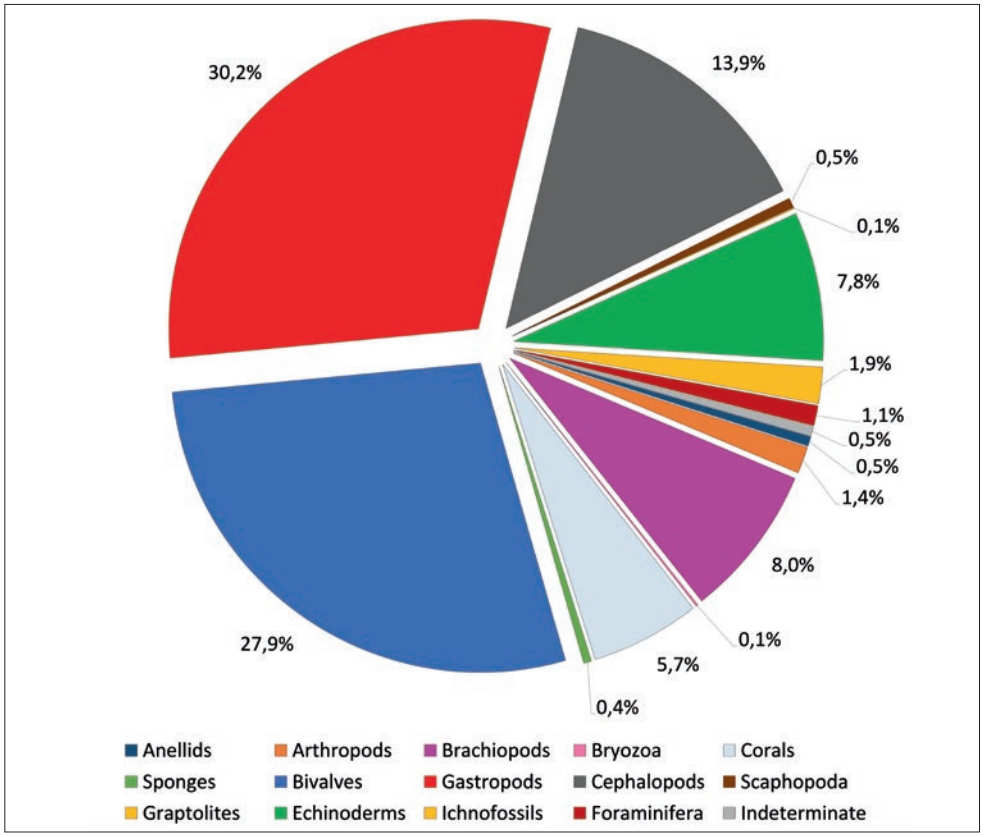

FIG. 2: Composition of Gasser's paleozoological collection, excluding the vertebrate groups. Typologies represented and their relative abundance.

within the same or distinct taxonomic groups or illustrating the occurrence of the same species in different localities. (Fig. 8F).

3. THE INVERTEBRATES AND MACROFORAMINIFERA OF THE COLLECTION – AN OVERVIEW

The paleozoological collection of Georg Gasser is composed of 3221 fossils (see also Wagensommer et al., this volume a, b), 86% of which are represented by invertebrates, 11% by vertebrates and the last 3% is divided between ichnofossils (1.6%; Baucon et al., this volume), protista (0.9%) and still unidentified specimens (0.5%). A preliminary revision of some groups such as vertebrates (Wagensommer et al., this volume c), cephalopods (Tomelleri et al. this volume c) and part of the molluscs (this paper) has been carried out, but a complete revision of the fossils is still pending.
Analysing the composition of the invertebrate fossil collection, it is possible to notice how Gasser tried to represent all the main groups, giving however more attention to molluscs, which represent 72% of the total amount of the invertebrates. The brachiopods and echinoderms represent each about 8% of the invertebrates, Anthozoa about 6%, arthropods 1.4% whereas the rest belongs to annelids, sponges, bryozoans and graptolites.

4. THE COMPOSITION OF THE COLLECTION

The major groups identified in the collections are as follows:

4.1 PROTISTA

The Protista in the collection are exclusively represented by large benthic foraminifers (30 specimens), most of which (18 specimens) come from the area of Monte Baldo and, the large part, specifically, from Sorne Valley, in the Brentonico Plateau (Fig. 9B). Near this village there are, in fact, outcrops of Eocene basaltic tuffs with carbonate intercalations whose fossil fauna was first indagated in 1931 by G. B. Dal Piaz (Socin, 1936). Some sporadic examples come from the well-known Nummulitic Limestone of Traunstein in Bavaria (Germany), while one sample report *Nummulites lucasana**, from the Oligocene of Bad Häring.

4.2 ANTHOZOA

The corals group is dominated by the presence of Hexacorallia forms (54 specimens) with a small representation of Rugosa (6 specimens) and Tabulata (4 specimens), although a high percentage of the corals (99 specimens) have no further taxonomic assignment; the group needs a revision (Figs. 3D, E, G).
The chronostratigraphic distribution of Rugosa-type corals spans between the Ordovician and Permian. In the collection, the order is registered only by six specimens, all assigned to one species, *Calceola sandalina* (Fig. 3B), a solitary coral, typical of the Devonian. It is a characteristic taxon of the Eifelian, a stage named after the Eifel region in Germany. The Hexacorallia-type corals are well represented in the collection with representatives of both Mesozoic and Cenozoic. The Mesozoic and Cenozoic corals are more abundant, coming from the Triassic of the Dolomites (Fig. 3D) or specifically from the Seiser Alm/Alpe di Siusi (South Tyrol, 9 specimens), the Cretaceous of Gosau/St. Gilgen (2 specimens, Fig. 3E), the Paleogene of Grignon (France, 3 specimens, Fig. 3F) and Monte Baldo (Italy, 2 specimens). In the Georg Gasser Collection the most representative species are identified as *Turbinolia crispa**, *Trochosmilia varians**, *Montlivaltia granulosa**, *Montlivaltia capitata**, *Montlivaltia crenata**, *Montlivaltia decipiens**, *Cyclolites macrostoma**, *Columnastrea striata**, *Astrocoenia reticulata**, *Calamophyllia fasciculata**, *Dendrophyllia* sp.*, *Caryophillia* sp.*.
"Halysites sp."* (Fig. 3A) and *Calamopora* sp.* (Fig. 3C) represent some exceptional representatives of Paleozoic Tabulata in the collection. The first is a typical fossil from the famous site of Louisville, Kentucky, well known for its Silurian Limestone and its fauna. The second is represented by three samples, from Zawidowice near Olesnica (Sadewitz, Oels).

4.3 ARTHROPODA

The arthropods in the Georg Gasser Collection (40 specimens) belong to three main groups, the trilobites (60%), the crustaceans (35%), and the insects (5%). The trilobites come mainly from the Paleozoic of Bohemia (13 specimens), an historical region corresponding to the current Czech Republic mostly. Well represented is the Barrandian area, where invertebrates were studied for more than 230 years (Fatka et al., 2015). The middle Cambrian is registered by some forms (*Conocoryphe sulzeri**, *Paradoxides* sp.) from Jince (Ginetz), one of the well-known deposits of Czech Republic, for the rescue of the oldest trilobites (Bruthansová et al., 2007). The Ordovician trilobites in the collection are from the Prague Basin, for example of Beroun, including *Phacops latifrons**, *Ellipsocephalus hoffi** (Fig. 4B), *Calymene declinata**, and *Asaphus socialis** (Fig. 4A). A single specimen, *Bronteus palifer**, following Gasser's attribution, derives from Kosoř.
The two specimens of insects in the collection come from the famous Upper Jurassic *Fossillagerstätte* of Solnhofen (Fig.4D), from which come also some samples belonging to Crustacean, particularly some decapod forms (Fig. 4C). A selection of Brachyura from Trento (4 specimens), together with a specimen from the Middle Oligocene of Itzehoe (Germany) (Fig. 4F) complete the collection of crustaceans including three small specimens of *Balanus* sp. One of these is from the Andona Valley, a well-known Pliocene fossiliferous site (vertebrates and invertebrates) of Piedmont.

4.4 BRACHIOPODA

The brachiopods in the collection derives exclusively from the Paleozoic and Mesozoic with two representatives of the Lingulata group (PZO 12605, 13110), several forms assigned to Rhynchonelliformea (137 specimens) and various undetermined forms (90 specimens). This group is, thus, also in need of a modern systematic revision.

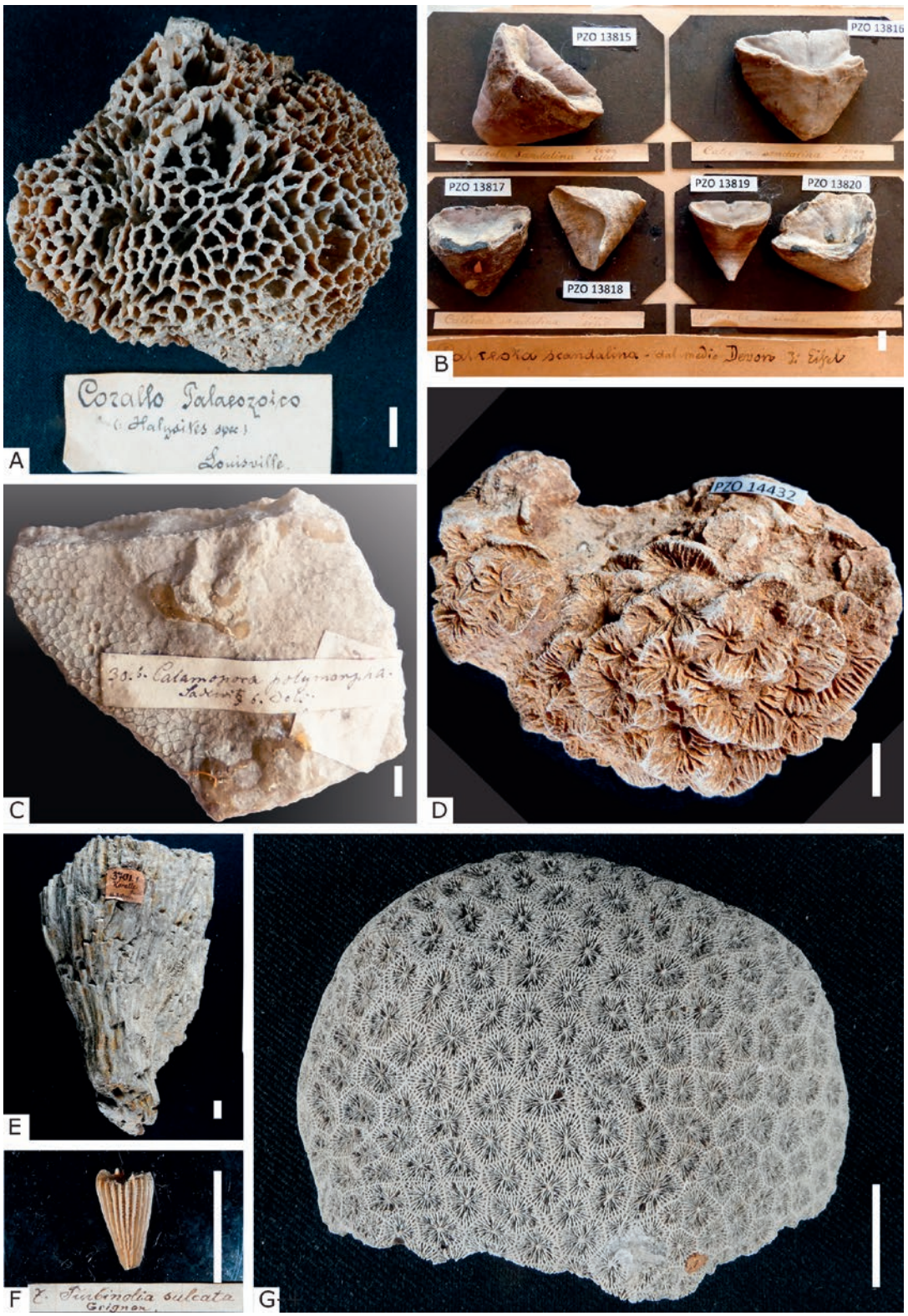

FIG. 3: Examples of corals in the Georg Gasser Collection. Scale bars = 1 cm. **A.** *Halysites* sp., Louisville, PZO 14390; **B.** *Calceola sandalina*, Eifel, PZO 13815-13820; **C.** *Calamopora polymorpha*, Zawidowice, PZO 14475; **D.** Not determined coral, Dolomites, PZO 14432; **E.** Not determined coral, St. Gilgen, PZO 13019; **F.** *Turbinolia sulcata**, Grignon, PZO 14486; **G.** Not determined coral, unknown locality, PZO 14426.

The Mesozoic is represented by 98 specimens, 16 of which from the Triassic, whereas 49 specimens are assigned to the Jurassic. The Jurassic specimens come mainly from Germany (12 specimens) and Austria (12 specimens), the Triassic ones from the Dolomites (Seiser Alm/Alpe di Siusi, Recoaro, Marmolada; 9 specimens). The Paleozoic representatives (63 specimens) are restricted to the Devonian (58 specimens). Two specimens from Lahošt have been identified in Gasser's collection as the Paleozoic species *Atrypa reticularis* and *Orthis elegantula*, but the attributions seem to be erroneous; more probable they come from Cretaceous outcrops present in the area. The most represented fossiliferous region is Eifel with 49 specimens of mainly *Spirifer* and *Retzia* fossils. Dernau (5 specimens) and Lahneck (2 specimens) document some additional localities of German brachiopods.

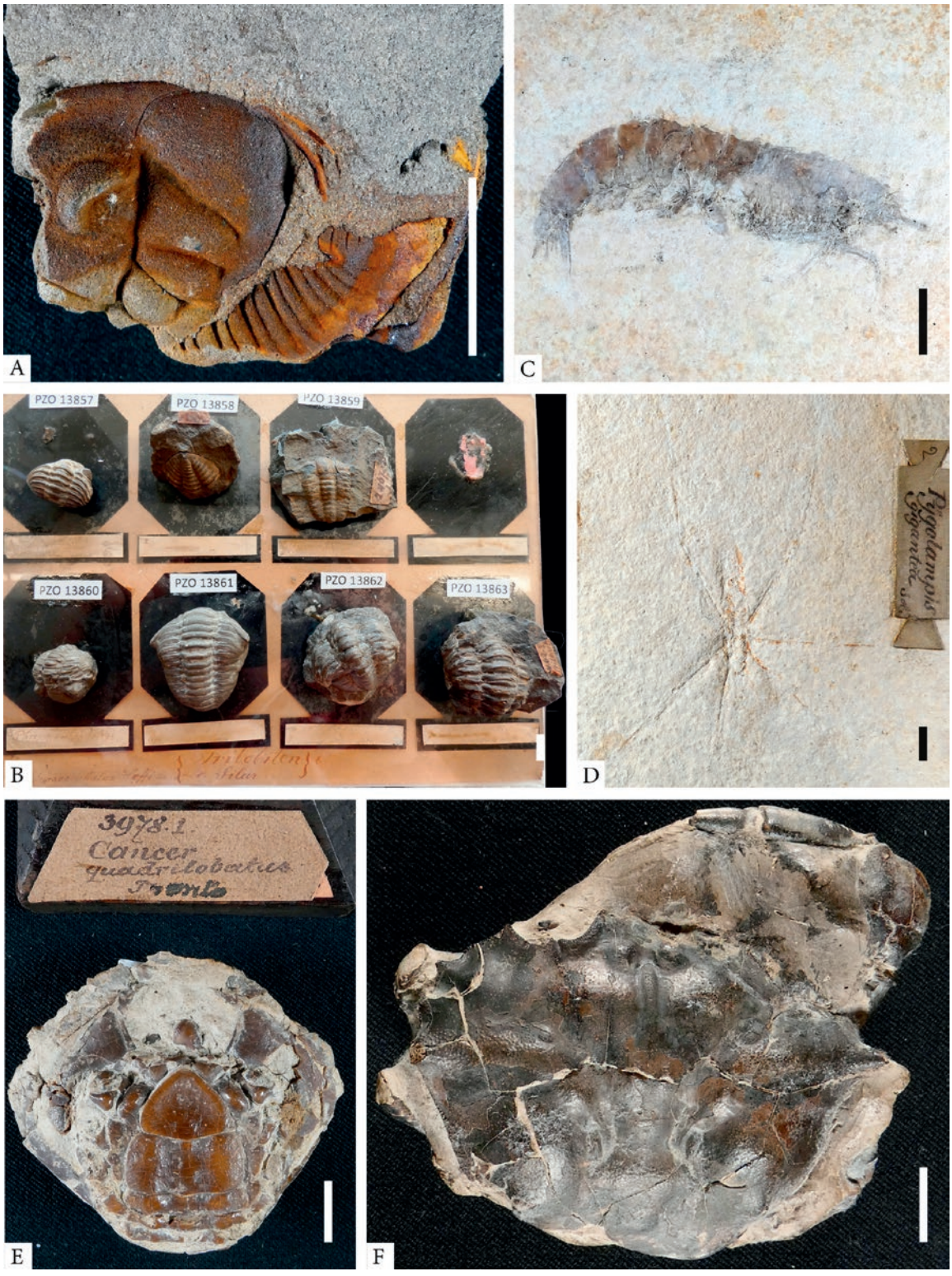

FIG. 4: Examples of arthropods in the Georg Gasser Collection. Scale bars = 1 cm. **A.** *Asaphus socialis**, Beroun, PZO 13850; **B.** Trilobites from different localities, (e.g., Beroun, Prague Basin), PZO 13857-13863; **C.** Crustacean decapod, Solnhofen, PZO 13652; **D.** *Pygolampis gigantea**, Solnhofen, PZO 13654; **E.** *Cancer quadrilobatus**, Trento, PZO 13853; **F.** Brachyura, Itzehoe, PZO 13731.

FIG. 5: Examples of brachiopods in the Georg Gasser Collection. Scale bars = 1 cm. **A.** *Streptorhynchus* sp.*, Eifel, PZO 14014; **B.** Spiriferidae, Zwillingsberg near Dernau, PZO 12456; **C.** Rhynchonellidae, Eifel?, PZO 12467; **D.** *Lacusonella lacunosa*, Waidring, PZO 12461; **E. 1-2** *"Terebratula" tychaviensis*, Štramberk, PZO 12546; **F.** *Terebratula corinata**, Laufenburg, PZO 13644.

4.5 ECHINODERMATA

The Echinodermata are represented in the Georg Gasser collection by the classes Stelleroidea (3 specimens), Crinoidea (91 specimens) and Echinoidea (130 specimens). To Stelleroidea belong three specimens of the famous ophiuroid *Geocoma carinata* from the Upper Jurassic of Solnhofen (Fig. 6C). Two crinoids also come from the same site: *Comaturella pennata* and *Saccocoma tenella*. Other Echinodermata of Upper Jurassic successions from Germany come from Muggendorf, Sigmaringen, Sontheim and generically from the area of Baden-Württemberg illustrating examples of some typical finds of this region, with species like *Millericrinus milleri*, *Plegiocidaris* sp. and generic fragments of crinoid columnals and echinoid spines.

Among the crinoids, the Mesozoic representatives derive mainly from the Triassic St Cassian Formation of the Dolomites (Seiser Alm/Alpe di Siusi, Enneberg/Marebbe, St. Kassian/San Cassiano, Pralongià). Other representatives come from the Muschelkalk of Rüdersdorf near Berlin and Schwäbisch Hall in Württemberg. Some of the genera present in the collection are: the Triassic *Chelocrinus, Encrinus, Zardinicrinus, Holocrinus, Isocrinus, and the Jurassic Liliocrinus, Pentacrinites, Seirocrinus* and *Comaturella.* The best preserved species from Germany are *Encrinus liliiformis, Holocrinus dubius, Pomatocrinus mespiliformis, and Saccocoma tenella* and from the Dolomites *Chelocrinus cassianus, "Isocrinus" propinquus* and *Zardinicrinus granulosus*. The remains of *Encrinus liliiformis* (Fig. 6B), are particularly abundant in Muschelkalk of Germany and this species was one of the first crinoids described in the scientific literature: Georgius Agricola, in his monograph De natura fossilium, named the columnals of *E. liliiformis* "*Trochites*" in 1546 (Hagdorn, 2011). The same term, that means "wheel stones" appears in two labels of the collection, associated to *Laevicyclus* sp., an ichnofossil wrongly interpreted as crinoid (see Baucon et al., this volume).

The Echinoidea are also very abundant and diverse in the collection. Some of the best preserved specimens belong to the genera *Cidaris, Clypeaster, Echinocorys, Echinolampas, Galerites, Plegiocidaris, Pseudocidaris, Rhabdocidaris, Schizaster* and *Scutella*. The most abundant and diverse assemblages of echinoids in the collection come from the Dolomites and Germany. From Germany derives, among others, the species *Echinocorys ovatus*, as well as several specimens of *Cidaris, Clypeaster, Galerites, Plegiocidaris* and *Rhabdocidaris* only assigned at genus level in open nomenclature. "*Cidaris" alata, "Cidaris" buchii, "Cidaris" dorsata* and "*Cidaris" roemeri* are identified from the Triassic of the Dolomites, taxa used for isolated spines that cannot be assigned to specific biological taxa.

The oldest examples are *Ctenocrinus* sp. from the German Devonian of the Eifel area. The youngest specimens come from the Miocene, in detail *Clypeaster* sp. from Osnabrück (Germany) (Fig. 6F), an unidentified echinoid from Fortaleza de la Mola, Mahon (Spain) and *Scutella* sp. from Rocca di Garda (Italy). In addition, the Cretaceous specimens come from the Italian outcrops of Ferrazze, near Verona and from Monte Baldo, from the Austrian fossiliferous sites of St. Gilgen and Grossbach (=Groisbach?), the German Rügen Island and the Danish localities Møn and Jütland.

4.6 MOLLUSCA

The molluscs are certainly the most represented in the collection. Abundant are bivalves (799), gastropods (866 specimens), and cephalopods (399 specimens) whereas the scaphopods are represented by only 14 specimens.

The two most abundant groups among the molluscs are those of the gastropods, which is not surprising considering Gasser's passion for extant gastropods and bivalves (see Gasser & Baumgarten, 2007). Among the gastropods, the main groups present are the Caenogastropoda (246 specimens), Pulmonata (54 specimens), Vetigastropoda (15 specimens), Heterobranchia (14 specimens), Orthogastropoda (14 specimens), Prosobranchia (10 specimens), and Opistobranchia (2 specimens). The oldest fossils come from the Carboniferous Bergkalk of Bleiberg, *Pecten hoernesianus**, the youngest specimen is a fossil of *Lymnaeus* sp., from the Pleistocene of Weimar (Germany), excluding the Holocene specimens attributed to *Helix* from Madeira (Portugal).

The bivalves are one of the most represented groups. A partial overview, in need of revision, include Autobranchia (98 specimens), Heterodonta (62 specimens), Palaeoheterodonta (11 specimens), Pteriomorphia (332 specimens), and Tindariidae (6 specimens). The Paleozoic forms come from the Silurian (mainly from Böhmen), and Permian (Germany). The dominant part comes from the Triassic of the Dolomites (Italy) or Germany but also the Jurassic of Germany is well represented. The youngest bivalve fossils are from the Miocene of France, Germany and Spain.

The cephalopods are represented by ammonoids (277 specimens), bactritoids (1 specimen), coleoids (94 specimens), nautiloids (11 specimens) and orthoceratoids (8 specimens). They will not be discussed here in detail since they are discussed in Tomelleri et al. (this volume c). A small number of Silurian orthoceratoids cephalopods from Bohemia and Germany represent some of the oldest fossils among the molluscs. The scaphopods are mostly from the Cenozoic of Austria, such as Bad Häring and Baden near Vienna, as well as from the Jurassic of Baden Würtemberg (Germany). One not well-defined specimen is labelled as coming from Seiser Alm/Alpe di Siusi (Dolomites).

The Triassic fossiliferous successions of the Dolomites are well represented among these fossils. This includes *Claraia* sp. and *Unionites* sp. and also specimens erroneously attributed to *Turbo* sp. (i.e., *Werfenella rectecostata*), typical of the Werfen Formation, with fossils originating from localities in Fassa Valley (e.g., Vigo, Soraga, Mazzin) and around Bozen/Bolzano (Weissenstein/Pietralba). Typical examples of *Daonella* sp. have been collected from the Wengen and Livinallongo formations. Particularly abundant are bivalves, gastropods and ammonoids in the St. Cassian Formation, whose provenance is particularly but not exclusively documented for the Seiser Alm/Alpe di Siusi area. From this lithostratigraphic unit come also ammonites that reflect the high diversity and variety of forms identifiable in the formation (*Arpadites ruppeli, Badiotites eryx, Cladiscites ungeri, Klipsteinia boetus, Nannites spurius, Trachyceras aon, Trachyceras basileus, Lecanites glaucus*). From the Seiser Alm/Alpe di Siusi area, gastropods and bivalves are also found from the so-called *Pachycardia Tuffe*. Substantial amount of mollusc collection come also from the Ladinian (Middle Triassic) Marmolada Limestone, which might yield yet undescribed gastropod species. The Carnian (Upper Triassic) "Raibl Formation" of Raibl (today Cave del Predil, Italy) is represented by a single gastropod

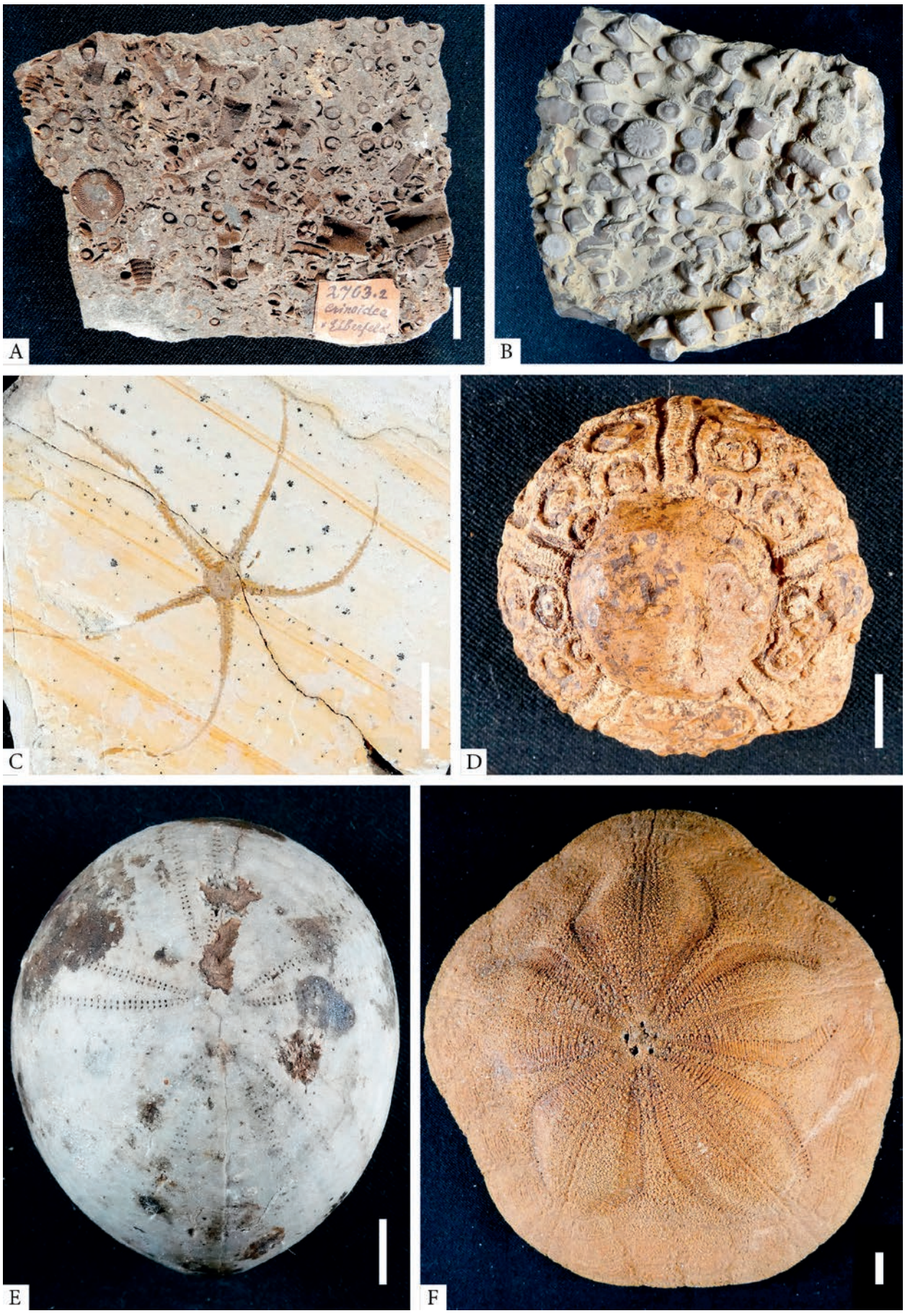

FIG. 6: Examples of echinoderms in the Georg Gasser Collection. Scale bars = 1 cm. **A.** Not determined crinoids, Elberfeld, PZO 14530; **B.** *Encrinus liliiformis**, Schwäbisch Hall, PZO 14199; **C.** *Geocoma carinata*, Solnhofen, PZO 14208; **D.** ?*Plegiocidaris*, Muggendorf, PZO 14206; **E.** *Echinocorys ovatus*, Rügen, PZO 14193; **F.** *Clypeaster* sp., Osnabrück, PZO 14182.

species *Tectospira multistriata* and a small number of bivalves (*Corbula rosthorni*, *Myophoria* sp., *Hoernesia* sp.?).
From abroad there are some fossils, although limited, especially from the Muschelkalk. Both the French locality Girmont and the German Friedrichshall are associated with a sample from "Striata-Kalk", with the characteristic specimen *Lima striata* (Zirkel, 1894). The Lower Muschelkalk "Wellendolomit" of Rohrdorf near Altensteig, instead is associated with a single specimen of *Hoernesia socialis*. The Jurassic is dominated mainly by cephalopods followed by bivalves and less frequently gastropods and rare scaphopods. In the Baden-Württemberg region the ammonites are dominant with a good variety of genera (24) and species (25). One of the most represented localities is Balingen (Germany), most Jurassic bivalves come from this area. Some *Aptychus* remains (*Laevaptychus* sp., *Coronaptychus* sp., *Lamellaptychus* sp.) come from the Upper Jurassic of Solnhofen and Nusplingen.
Megateuthis giganteus, *Passaloteuthis paxillosus* and *Salpingoteuthis* are examples of Coleoidea from Baden-Württemberg, whereas a specimen of *Hibolithes semihastatus* comes from the Prag Basin. Few specimens are present from the Jurassic of Italy such as *Discosphinctoides geron*, *Passendoferia birmensdorfense*, *Reineckeia kiliani* (Trento), *Macrophylloceras ptychostoma*, *Ptychophylloceras ptychoicum* (Rovereto), *Phylloceras* sp. (Garda Lake territory).
Most of the Cretaceous molluscs come from Rügen Island or the Austrian localities (e.g., St. Gilgen, St. Wolfgang). From Rügen come specimens of *Belemnitella mucronata*, *Gryphaea vesicularis**, *Spondylus aculeatus**, *Pecten mantellianus**. From the Gosau group Ampullina sp., *Caprina anguillari**, *Cyrena solitaria**, *Fimbria* sp.*, *Hippurites cornuvaccinum* (Fig. 7D 1–2), and *Nerinea* sp. (Fig. 8C) are present. *Inoceramus* sp., particularly common in the Upper Cretaceous Planerkalk, has been collected from Strehlen near Dresden, whereas *Inoceramus concentricus* and *Gaultyoceras* sp.? are typical of the Gault Formation.
To the Cretaceous "Quadersandstein" of Telnitz, in Czech Republic, belongs a sample of *Exogyra columba*, whereas other examples of bivalves from Czech Cretaceous basins come from Lahošť.
Cenozoic molluscs are mainly represented by bivalves and gastropods with rare examples of cephalopods (nautiloids), such as a specimen from the Oligocene (Rupelian) of Itzehoe (Germany) (Fig. 4F). Some unusual exotic examples derive from the African locality of Moçâmedes in Angola (Conidae, Fig. 8D, Veneridae: *Pitar* and *Senilia*) and from some unknown Cenozoic locality in

FIG. 7: Examples of bivalves in the Georg Gasser Collection. Scale bars = 1 cm. **A.** *Claraia clarai*, Soraga, PZO 13288; **B.** *Camptonectes auritus*, Balingen, PZO 13271; **C. 1-2** *Ostrea gigantea*, Dischingen, PZO 12425; **D. 1-2** *Hippurites cornuvaccinum*, Gosau, PZO 12403; **E.** *Spondylus spinosus**, Strehlen near Dresden, PZO 12372; **F.** *Arca noae**, Grund, PZO 14895.

FIG. 8: Examples of gastropods in the Georg Gasser Collection. Scale bars = 1 cm. **A.** *Dicosmos seisiensis*, Seiser Alm/Alpe di Siusi, PZO 12388; **B.** *Gyraulus sulcatus*, Steinheim am Albuch, PZO 12896; **C.** *Nerinea buchi*, Gosau?, PZO 13158; **D.** *Lithoconus* sp.?, Moçâmedes, PZO 13150; **E.** Examples of Cenozoic gastropod from different French localities, Grignon, Bordeaux, PZO 15176–15182; **F.** Several specimens of *Cerithium rubiginosum** from different Miocene localities, "Banat" and Bad Vöslau, PZO 15035–15052.

Sicilia, mostly bivalves (e.g., Pectinidae, *Anomia* sp.); the absence of a specific location doesn't make it possible to assign the chronostratigraphic age in higher resolution.
A good collection of bivalves and gastropods comes from three famous Cenozoic basins of Austria (Vienna Basin) (Fig. 8F), Germany (Mainz Basin) and France (Paris Basin), with the two best-documented locations of Grignon and Bordeaux (Fig. 8E). Some molluscs were collected from Bad Häring, Dischingen and Steinheim as well as from the Italian outcrops of Monte Brione, Val di Sorne and Strigno. Other locations are recorded by extremely small number of samples such as Liancourt (France), Osnabrück, Kressenberg (Germany), Würenlos (Switzerland), Mahon (Balearic Islands), Lăpugiu (Lapugy, Romania). A small selection of *Helix pomatia** from Taubach (near Weimar) is also part of the collection. This Quaternary site is particularly well-known for its fossil invertebrates and its travertine deposits, a sample of which probably occur in the collection, with the generic indication "Weimar".

4.7 PORIFERA

Thirteen specimens belong to the group of the sponges. Most specimens (7 specimens) come from the "Strata" at St. Kassian/San Cassiano in Gadertal/Val Badia. These are small specimens, object of surface picking, only identified at group level. Two isolated samples come from the Jurassic of Balingen (Germany) (Fig. 9C) and Baden close to Vienna (Austria).

4.8 OTHER INVERTEBRATES

A limited number of annelids (14 specimens), bryozoans (4 specimens) and graptolites (2 specimens) are also present in the collection. The annelids are represented by the calcareous tubes of the Serpulidae species *Rotularia spirulea*, an extinct polychaete, particularly common and abundant in the rocks of marine environment of the Eocene. Unfortunately, almost all the samples of Annelida group lack a specific geographic indication, except for two specimens coming respectively from Monte Baldo (Italy) and Bad Häring (Austria).
The rare examples of bryozoans in the collection also lack a label and thus, information of their geographic and chronostratigraphic origin are missing. The exception is given by a specimen attributed, in the Gasser Collection, to *Acanthocladia dubia** (Fig. 9A), from the Lopingian (upper Permian) of Poesnek (Germany). Remnants of the Zechstein Reef lie, in fact, around this locality, emerging with reliefs such as the local Altenburg Hill. During the nineteenth century, these outcrops have returned a rich and characteristic association of fossils that fed collections (Murchison, 1859; Ramsay, 1883).
Two specimens of Graptolithina, one of them from Glogow ("Glogau", Poland) (Fig. 9D), document this particular Paleozoic colonial organisms in the collection.

FIG. 9: Examples of other invertebrates and Protista in the Georg Gasser Collection. Scale bars = 1 cm. **A.** *Acanthocladia dubia*, Poesnek, PZO 13309; **B.** *Nummulites* sp.*, Sorne (Monte Baldo), PZO 12621; **C.** Not determined sponge, Balingen, PZO 14414; **D.** Graptolithina, Głogów, PZO 13315.

4.9 ICHNOFOSSILS

The ichnofossils (56 specimens) are generally of local origin, with only sporadic samples from abroad. Triassic specimens come mainly from Hafling/Avelengo, Eppan/Appiano, Seiser Alm/Alpe di Siusi and the Fassa Valley. More recent are the specimens from the Oligocene of Monte Brione. A rather common *Lumbricaria* sp.* comes from the Jurassic limestones of Solnhofen (Germany), *Chondrites intricatus** from Tirol (Austria), and a selection of coprolites and gastroliths from England (for more details see Baucon et al., this volume).
By collecting information from the labels associated with the samples, it has been possible to observe the ancient terms used in the past to define fossil traces, such as "Hieroglyphen" and some erroneous attributions, as in the case of *Chondrites* interpreted as algae fragments (for more details see Baucon et al., this volume).

5. CHRONOSTRATIGRAPHIC DISTRIBUTION OF THE SPECIMENS

The invertebrates in the collection of Georg Gasser does not continuously document Earth History. The findings are concentrated on particular geological intervals, evidencing that the collection is not constructed in a rigorous way to represent the evolution of the invertebrates through time and/or all the iconic taxa of the different time periods (Fig. 10, 11, 12).
Looking at the chronostratigraphic distribution of the specimens, the oldest are five trilobites from the Cambrian of the former Böhmen (Bohemia), today mostly Czech Republic. Mainly cephalopods (9 specimens) come from the Silurian of Bohemia. Less abundant are bivalves (4 specimens), brachiopods (2 specimens), arthropods, corals, echinoderms, graptolites and gastropods (1 specimen each). The Barrandian area, in the Bohemian massif, is well known to geologists as one of the classical regions for European Lower Palaeozoic, with its almost complete Cambrian-Middle Devonian sequence (Storch et al., 1993). It has returned a rich paleofauna mostly documented in the collection by trilobites and rare cephalopods.

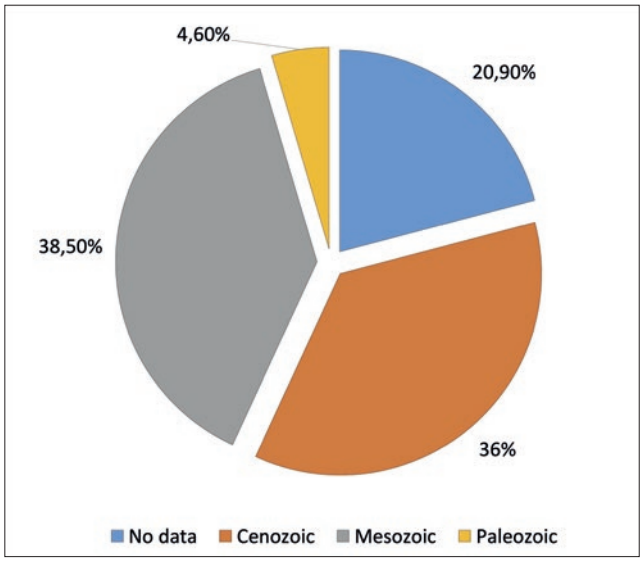

FIG. 10: Distribution of the specimens by age

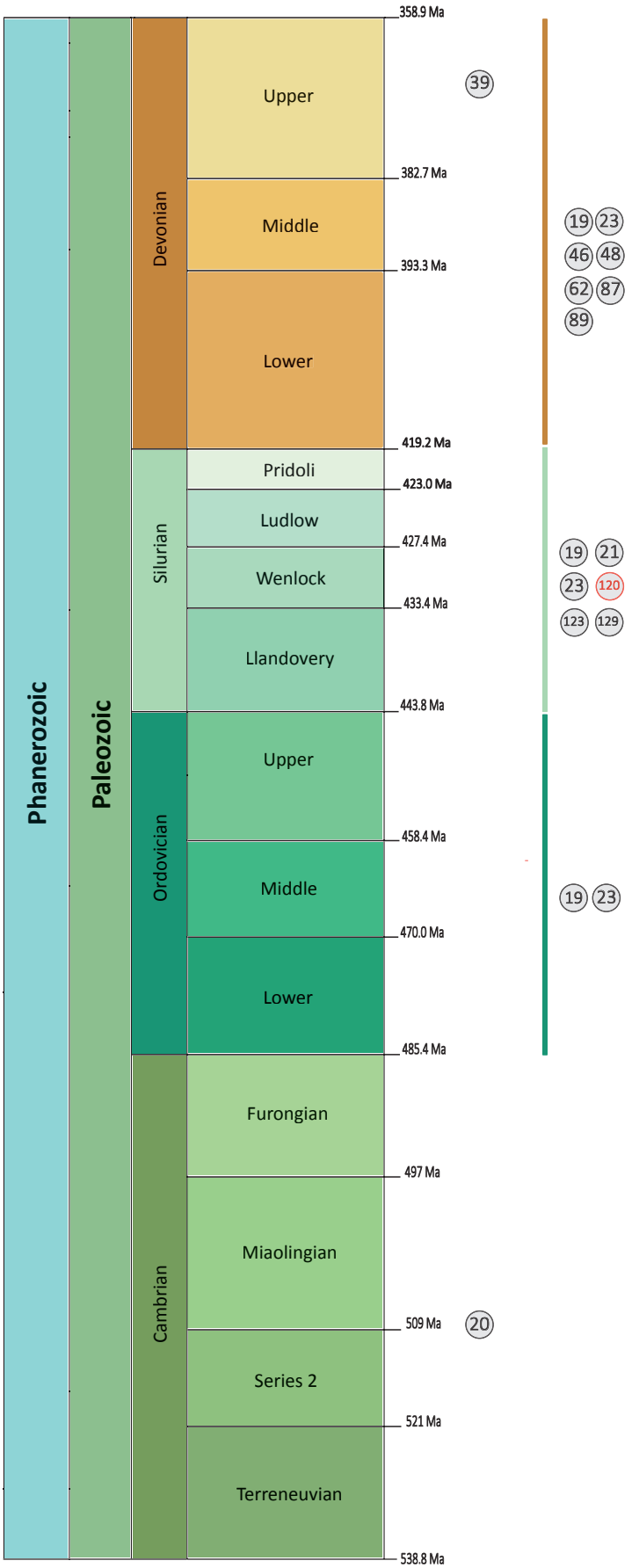

FIG. 11: Chronostratigraphic distribution of the specimens in the Georg Gasser's collection. The red encircled number refer to open attribution: 19. Beroun; 20. Jince; 21. Kosor; 23. Prag; 39. Beul, Eisborn; 46. Eifel; 48. Elberfeld; 62. Lahneck; 87. Weilburg; 89. Zwillingsberg, Dernau; 120. Glogow; 123. Zawidowice; 129. Louisville

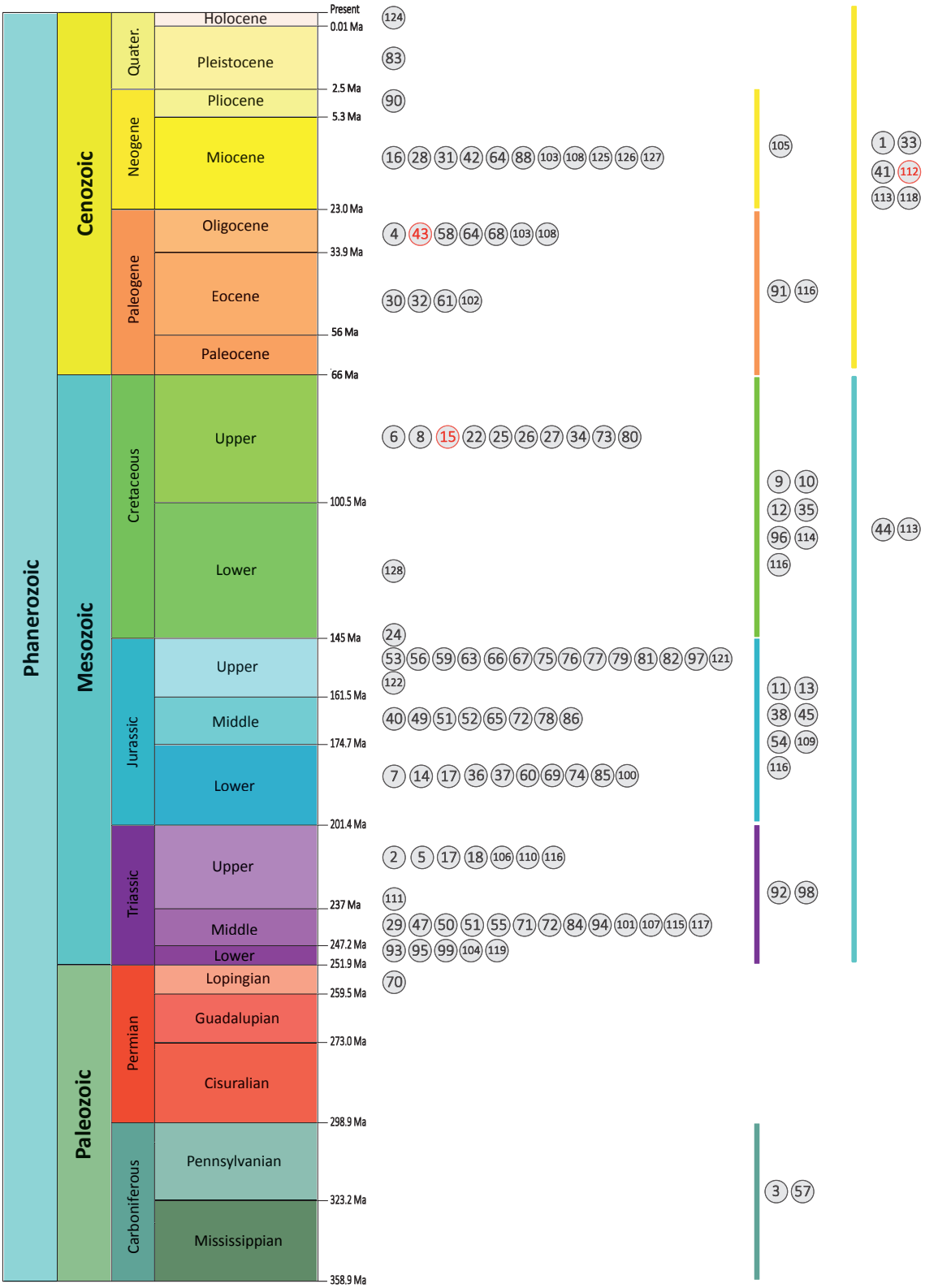

FIG. 12: Chronostratigraphic distribution of the specimens in the Georg Gasser's collection. The red encircled number refer to open attribution: 1. Moçâmedes; 2. Bad Aussee; 3. Bad Bleiberg; 4. Bad Häring; 5. Berganger; 6. Bregenz; 7. Breitenberg (Salzkammergut); 8. Gosau, Dittelbach, Sankt Gilgen & Sankt Wolfgang; 9. Grossbach (=Groisbach?); 10. Hallein; 11. Kitzberg near Vils, Vils near Reutte; 12. Kössen; 13. Salzburg; 14. Schafberg; 15. Untersberg; 16. Vienna Basin: Baden, Bad Vöslau, Gainfarn, Grund, Neudorf, Pötzleinsdorf, Steinbrunn, Turkenshanz, Vösslau, Wiesen; 17. Waidring; 18. Zirl; 22. Lahošť; 24. Štramberk; 25. Telnice; 26. Teplice ; 27. Boncavail; 28. Bordeaux; 29. Girmont; 30. Grignon; 31. La Mole; 32. Liancourt; 33. Paris Basin; 34. Møn; 35. Jütland; 36. Bad Boll; 37. Bad Hindelang; 38. Balingen; 40. Bopfingen; 41. Coburg; 42. Dischingen; 43. Doberg; 44. Ebenwald, Berlin; 45. "Ehingen"; 47. Eisenach; 49. Ettenheim; 50. Ettersberg; 51. Friedrichshall; 52. Göppingen:53. Gräfenberg;54. Hechingen; 55. Schwäbisch Hall; 56. "Heuberg"; 57. Hof; 58. Itzehoe; 59. Kelheim; 60. Kirchheim; 61. Kressenberg; 63. Laufenburg; 64. Mainz Basin: Flörsheim, Steinheim, Weisenau, Weinheim; 65. Mössingen; 66. Muggendorf; 67. Nusplingen; 68. Osnabrück; 69. Plieningen; 70. Pößneck; 71. Rohrdorf; 72. Rüdersdorf; 73. Rügen; 74. Schwabisch Gmünd; 75. Sigmaringen; 76. Solnhofen; 77. Sontheim an der Brenz; 78. Spaichingen; 79. Storzingen; 80. Strehlen; 81. Streitberg; 82. Stuifen (Schwaben); 83. Taubach; 84. Thuringian forest; 85. Vaihingen/Filder; 86. Wasseralfingen; 88. Zimmerholz; 90. Andona Valley; 91. Carzano near Telve; 92. Enneberg/Marebbe; 93. Eppan/Appiano sulla Strada del Vino; 94. Esino Lario; 95. Fassa Valley: Fassa, Mazzin, Soraga, Vigo; 96. Ferrazze, San Martino Buon Albergo; 97. Garda lake area; 98. Hafling/Avelengo; 99. Karerpass/Passo Carezza; 100. La Spezia; 101. Marmolada; 102. Monte Baldo – Sorne Valley; 103. Monte Brione; 104. Monzoni; 105. Parma Hills; 106. Raibl; 107. Recoaro; 108. Rocca di Garda; 109. Rovereto; 110. Sankt Kassian/San Cassiano including Pralongià; 111. Seiser Alm/Alpe di Siusi including Bad Ratzes; 112. Sicily; 113. Strigno; 114. Tesino; 115. Tiers/Tieres; 116. Trento; 117. Vajolet Valley; 118. Vicenza; 119. Weissenstein/ Pietralba; 121. Kamień Pomorski; 122. Wrzosowo; 124. Madeira; 125. Lăpugiu; 126. Menorca: "Fortaleza de La Mola" "La Mola" "Mahon"; 127. Würenlos; 128. Folkestone

The most represented Paleozoic time interval is the Devonian, with 68 invertebrates. Most are brachiopods (58 specimens), followed by corals (7 specimens), cephalopods (2 specimens) and bryozoans (1 specimen) from Eifel, Nassau and Zwillingsberg in Germany. The western part of the Rhenish Slate Mountain, named Eifel, is particularly famous for its Mid-Devonian marine fauna, testified in the collection especially by brachiopods. The Carboniferous is represented only by one specimen of coral from Hof (Germany), whereas the only Permian specimen is represented by a bryozoan from Germany (Pößneck).
The Mesozoic period starts with Lower–Middle Triassic fossils, principally from the Dolomites, with fossils coming from the Werfen, Wengen and St Cassian formations, as well as the Marmolada Limestone. Some specimens also record the Middle Triassic of the German Muschelkalk and the Upper Triassic of the Raibl Formation. The Jurassic specimens come mainly from the localities of Baden-Württemberg in southern Germany, a classic area for geological and paleontological research. Here the three Jurassic series, referring to lithology and its appearance in outcrop, were traditionally named "Schwarzer Jura", "Brauner Jura" and "Weisser Jura" roughly corresponding to the international admitted terms Lower, Middle and Upper Jurassic. Upper Cretaceous specimens derive from Chalk of Rügen Island in the North German Basin and some localities in the Danish Basin (e.g., Møn) together with samples from Strehlen, Teplice and Lahost sited in the Cretaceous Bohemian Basin that extends between Saxony, Bohemia and Moravia. Other interesting examples are associated to the type locality of Gault Formation in England and to Upper Cretaceous sediments of Gosau Group, in the vicinity of the type locality, in Northern Calcareous Alps.
Finally, for the Cenozoic, three main areas can be identified, Paris Basin, Vienna Basin and Mainz Basin. The Paris Basin is registered by the locality of Liancourt, but particularly, by the classic site of Grignon, studied for Lutetian stage. The Mainz Basin belongs to the North Upper Rhine Graben and includes Paleogene and Neogene layers whereas the Vienna Basin covers large parts of eastern Austria and it's Neogene in age, whose succession starts from the Lower Miocene to Pliocene.
In the national context, the Cenozoic finds examples especially in Trentino and Verona provinces, as for the fossils of Oligocene-Miocene successions of Monte Brione and Rocca di Garda, whereas rare exceptions come from other regions of Italy (Piedmont, Emilia Romagna, Sicily). It is interesting to highlight that a small selection of molluscs come from Angola, Madeira and few, isolated, samples from the United States.

6. GEOGRAPHIC DISTRIBUTION OF THE SPECIMENS

The collection is rather a geographical representation of some of the most important and/or available outcrops for invertebrate fossils during the lifetime of Georg Gasser (1857–1931). His preferential communication route with territories under the control of Austro-Hungarian Empire or affiliated to the German Empire (see Wagensommer et al., this volume a, b) is well visible in the collection. For this reason, localities in what today lays in Austria, Czech Republic, Germany, Romania, well represented. The presence of specimens from Angola and USA are exceptional (Figs. 13, 14).

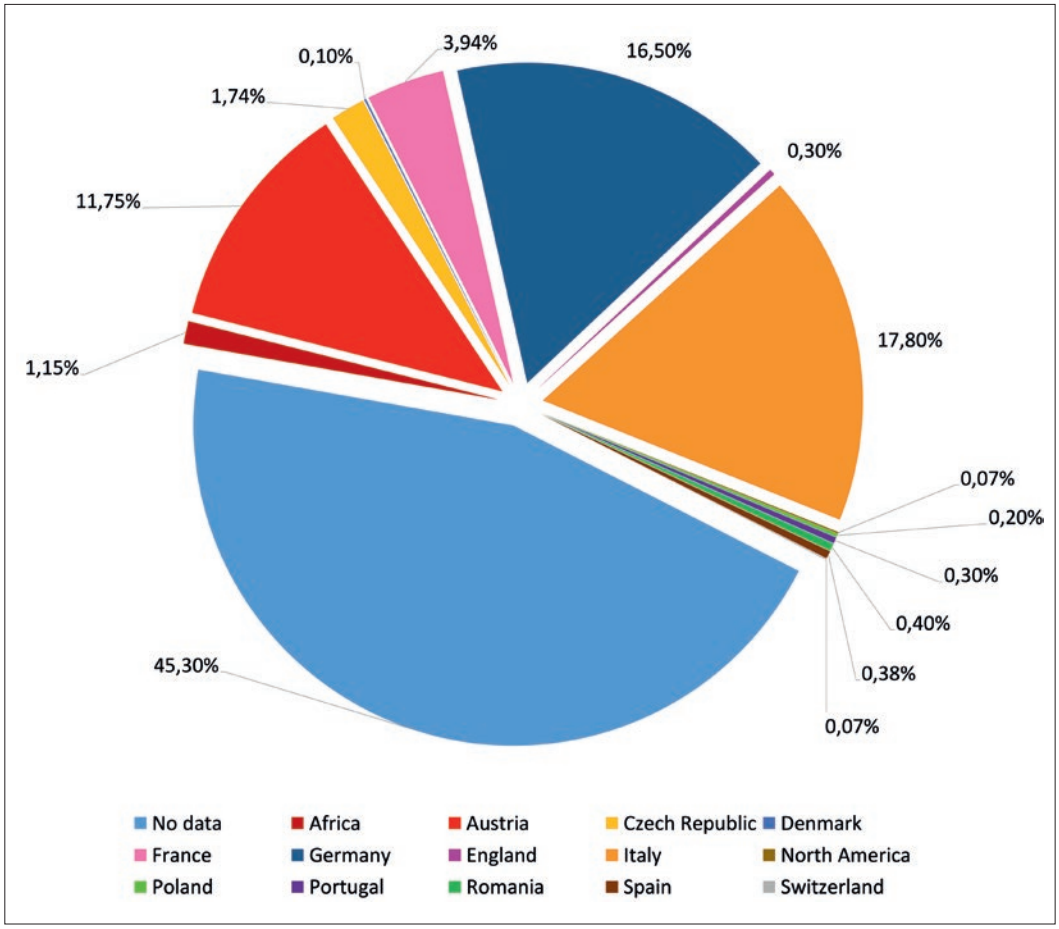

FIG. 13: Distribution of the specimens by country

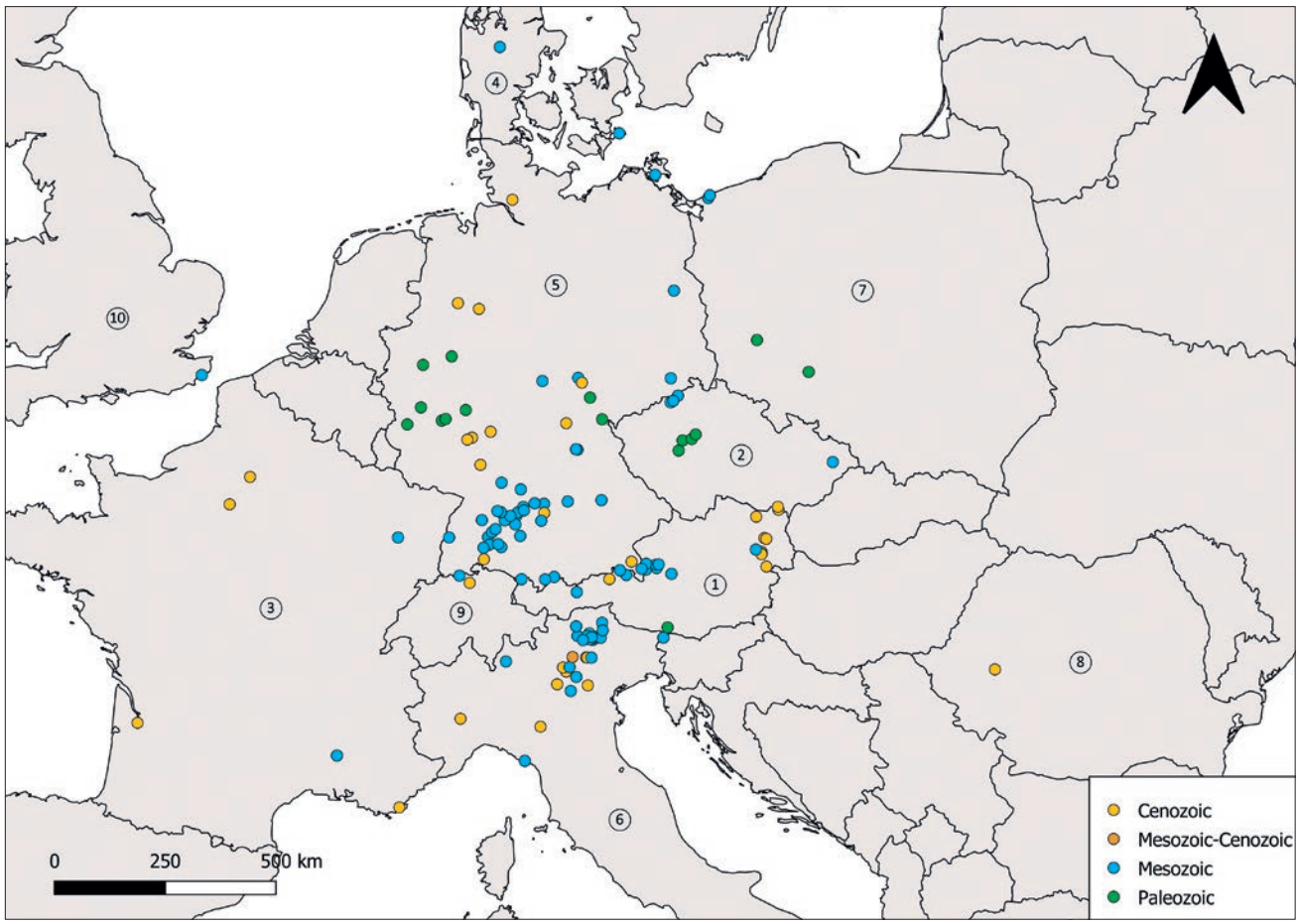

FIG. 14: Map of Europe with the localities from which come the specimens of the Georg Gasser paleozoological collection excluding vertebrates. **1. Austria:** Bad Aussee, Bad Bleiberg, Bad Häring, Bregenz, Breitenberg (Salzkammergut), Gosau, Dittelbach, Sankt Gilgen, Sankt Wolfgang, Grossbach (=Groisbach?), Hallein, Kitzberg near Vils (Vils near Reutte), Kössen; Salzburg (Schafberg, Untersberg), Vienna Basin (Baden, Bad Vöslau, Gainfarn, Grund, Neudorf, Pötzleinsdorf, Steinbrunn, Turkenshanz, Vösslau, Wiesen), Waidring, Zirl; **2. Czech Republic**: Beroun, Jince, Kienberg, Kosoř, Lahošť, Prag, Štramberk, Telnice, Teplice; **3. France**: Boncavail, Bordeaux, Girmont, Grignon, La Mole, Liancourt; **4. Denmark**: Møn, Jütland; **5. Germany:** Bad Boll, Bad Hindelang, Balingen, Beul, Eisborn, Bopfingen, Coburg, Dischingen, Doberg, "Ehingen", Eifel, Eisenach, Elberfeld, Ettenheim, Ettersburg near Weimar, Friedrichshall, Göppingen, Gräfenberg; Hechingen; Schwäbisch Hall, "Heuberg", Hof (Saale), Itzehoe, Kelheim, Kirchheim, Kressenberg, Lahneck, Laufenburg, Mainz Basin (Flörsheim, Steinheim, Weisenau, Weinheim), Mössingen, Muggendorf, Nusplingen, Osnabrück, Plieningen, Pößneck, Rohrdorf near Altensteig, Rüdersdorf near Berlin, Rügen, Schwabisch Gmünd, Sigmaringen, Solnhofen, Sontheim an der Brenz, Spaichingen, Storzingen, Strehlen, Streitberg, Stuifen (Schwaben), Taubach, Vaihingen/Filder, Wasseralfingen, Weilburg, Zimmerholz, Zwillingsberg near Dernau; **6. Italy**: Andona Valley, Carzano near Telve, Enneberg/Marebbe, Eppan/Appiano sulla Strada del Vino, Esino Lario, Fassa Valley: Fassa, Mazzin, Soraga, Vigo, Ferrazze-San Martino Buon Albergo, Garda Lake area, Hafling/Avelengo, Karerpass/Passo Carezza, La Spezia, Marmolada, Monte Baldo (Sorne Valley), Monte Brione, Monzoni, Parma Hills, Raibl, Recoaro, Rocca di Garda, Rovereto, Sankt Kassian/San Cassiano including Pralongià, Seiser Alm/Alpe di Siusi including Bad Ratzes, Strigno, Tesino, Tiers/Tieres, Trento, Vajolet Valley, Vicenza, Weissenstein/Pietralba; **7. Poland**: Głogów, Kamień Pomorski, Zawidowice, Oleśnica, Wrzosowo, **8. Romania**: Lăpugiu, **9. Switzerland**: Würenlos; **10. United Kingdom**: Folkestone. Not included in the map are Menorca, Madeira, Moçâmedes (Angola) and Louisville (USA)

An overview of the identified localities of provenance of the specimens is presented here, based on the information provided by the associated lables, integrated, where it was possible, by literature. The list is sorted by country and localities. Next to the modern name of the locality there is, eventually, in brackets, the reference to the historical name, indicated on the card. Unfortunately, due to the loss of tags, 45 % of specimens lack a specific source locality. In other cases, (about 5 %) the geographic indication is too generic, and it was not possible to narrow the position (e.g., Banat, Baden Württemberg, Balearic Island, Bohemia, Denmark, Dolomites, Jutland, North America, Pommern, South Tyrol).

Here we discuss the main fossiliferous localities that are mentioned in the collection, focusing in detail on those better represented or with common/characteristic taxa. The age, number of specimens as well as the genera and species present are indicated for each locality. Localities not yielding determinable fossils are left out. Also missing in the list are very vague indications of the origin of the specimens, such as those referred to geological or geographical areas, or those that do not have an identification at least at period level. Due to the high number of specimens, only for single samples are reported the database numbers. In the other cases, only the number of specimens and the most characteristic taxa are mentioned. Cephalopods and ichnofossils are reported in detail in other papers of this volume (see Baucon et al., this volume; Tomelleri et al., this volume c).

6.1 ANGOLA

Moçâmedes

Age: Cenozoic

Moçâmedes is sited in the Namibe Basin, formerly called the Mocâmedes basin, an elongate marginal depression located in southwest Angola and north Namibia (Gindre-Chanu et al., 2016). Cretaceous and Cenozoic rocks outcrop in the basin, separated from similar deposits of the Kwanza Basin by Precambrian rocks of the Luanda swell (Franks & Nairn, 1973). The

bulk of the coastal formation around Moçâmedes is made up by Eocene rocks covered by Miocene and younger marine sediments. Sections of this stratigraphical succession are exposed by fluvial action and along the cliff coast north and south of Moçâmedes (Beetz, 1934).
Collection Georg Gasser: 28 specimens, including corals (PZO 14397), bivalves (7 specimens, *Pitar* sp., *Senilia* sp.) gastropods (18 specimens, *Cerithium* sp.*, *Conus* sp.*, *Lithoconus* ?, Fig. 8D, *Murex* sp.*, *Turritella* sp.*, *Acteon* sp.*, *Helix* sp.*), indeterminate specimens (2 specimens)

6.2 AUSTRIA

Bad Aussee
Age: Carnian (Late Triassic)
The specimen comes from the red condensed limestones of the Hallstätter Kalk Formation (see Piller et al., 2004) in the Northern Calcareous Alps, most probably from the famous Feuerkogel. The Feuerkogel is one of the best-known localities worldwide for Upper Triassic ammonoids (Diener, 1921). For more details see Tomelleri et al. (this volume c).
Collection Georg Gasser: *Joannites cymbiformis* (PZO 12916)

Bad Bleiberg
Age: Carboniferous
The label indicates as source rock for the specimen the "Bergkalk". Koninck (1873) in his "Monographie des fossiles carboniferes de Bleiberg" described this species from Bleiberg.
Collection Georg Gasser: 1 specimen, *Pecten hoernesianus** (PZO 13348)

Bad Häring
Age: Early Oligocene
The calcareous marls of Bad Häring contain, among the others, a famous paleoflora (for more details see Tomelleri et al., this volume a) and a rich, historically well-known mollusc fauna (e.g., Dreger, 1892, 1904).
Collection Georg Gasser: 27 specimens, including bivalves (9 specimens, *Amusium* sp.*, *Arca* sp.*, *Crenella deshayesiana**, *Pecten guembeli**, *Ostrea* sp.*), gastropods (15 specimens, *Aporrhais haeringensis*, *Bulla lignaria**, *Cassis affinis**, *Voluta coronata**), scaphopods (PZO 14552, *Dentalium* sp.*), annelids (PZO 14554), foraminifers (PZO 13133, *Nummulites lucasana**)

Berganger
Age: Late Triassic
The label refers to the classic lithostratigraphic unit "Carditen Schichten".
Collection Georg Gasser: bivalve (PZO 13325)

Bregenz
Age: Late Cretaceous
The specimen from Bregenz most likely is referrable to the Helvetic Zone, which has prominent outcrops south of Bregenz (Janoschek & Matura, 1980). The Eocene Flysch of Vorarlberg are nowadays considered Late Cretaceous in age (Friebe, 2009, p. 9). For more details see Baucon et al. (this volume).
Collection Georg Gasser: *Chondrites intricatus* (PZO 13663)

Breitenberg (Salzkammergut)
Age: Hettangian-Sinemurian (Early Jurassic)
Red condensed, micritic limestones of the Kendlbach Formation of Early Jurassic age crop out in the well-known fossiliferous site of Breitenberg close to St. Wolfgang (Neumayr, 1879). An old quarry, now abandoned, yielded a rich ammonoid fauna (Blind, 1963; Suess & Mojsisovics, 1868; Meister & Böhm, 1993). For more details see Tomelleri et al. (this volume c).
Collection Georg Gasser: *Arinoceras* sp. (PZO 12323)

Gosau, Dittelbach, Sankt Gilgen & Sankt Wolfgang
Age: Late Cretaceous
These three localities lay very close together in the Northern Calcareous Alps. Here crop out the fossil-rich sediments of the Lower Gosau Group, which is Late Cretaceous in age.
Collection Georg Gasser**:** 14 specimens**; Gosau:** bivalve (PZO 13114, *Hippurites cornuvaccinum*, Fig. 7D 1-2); **St. Gilgen**: bivalves (4 specimens, *Caprina anguillari**, *Fimbria* sp.*), corals (2 specimens), crinoid (PZO 14929, *Pentacrinus* sp.*); **St. Wolfgang:** bivalves (3 specimens, including *Cyrena solitaria**, *Hippurites dilatatus**)
Remarks: three gastropods, including *Nerinea buchi** (Fig. 8C) could be attributed to Gosau locality

Grossbach (=Groisbach ?)
Age: Cretaceous
Collection Georg Gasser: echinoid (PZO 14250)

Hallein
Age: Cretaceous
Collection Georg Gasser: gastropod, *Nerinea* sp. (PZO 12404)

Kitzberg near Vils, Vils near Reutte
Age: Jurassic
Collection Georg Gasser: 12 specimens, brachiopods (*Terebratula* sp.*, *Terebratula pola**, *Rhynchonella* sp.)

Kössen
Age: Cretaceous
Kössen, located in Northern Calcareous Alps, attracted the scientific interest for its brachiopod-and bivalve rich-dark gray marl and limestone sequence that became the type-section for the so-called Kössen Formation (Főzy & Szente, 2014). In addition, this locality gave the name to Kössen Basin where Mesozoic sediments, from Triassic to Cretaceous, were deposited.
Collection Georg Gasser: gastropod, *Actaeonella* sp. (PZO 12549)

Salzburg
Age: Jurassic
Collection Georg Gasser: 2 specimens, brachiopod (PZO 13316), ammonoid (*Paraconiceras* sp.; PZO 12343)
Remarks: the ammonoid could be come from Breitenberg (see Tomelleri et al, this volume c)

Schafberg
Age: Early Jurassic
Located in the Northern Calcareous Alps, Schafberg, was studied by the earliest researchers in the 19th century interested in its rich fossil invertebrate fauna (Vörös et al., 2003).
Collection Georg Gasser: *Terebratula adnetica** (PZO 13236)

Untersberg
Age: Late Cretaceous?
In the area crop out the Gosau group, whose succession spans from Cretaceous to Eocene.
Collection Georg Gasser: coral (PZO 14430)

Vienna Basin: Baden, Bad Vöslau, Gainfarn (Gainfahren), Grund, Kienberg, Neudorf, Pötzleinsdorf, Steinbrunn, Turkenshanz, Vösslau, Wiesen
Age: Neogene
The Vienna Basin, situated in the Alpine-Carpathian junction, covers parts of three states: Czech Republic, Slovakia and Austria, which contains the main bulk. The localities in the collection are all well-known fossiliferous sites of this area, whose paleontological specimens were collected and studied since the first half of 19th century.
Collection Georg Gasser: 252 specimens, **Baden**: 11 specimens, gastropods (8 specimens, *Leptoconus dujardini*, Natica glaucinoides*, Cassis texta*, Fusus bilineatus*, Pleurotoma monilis**), scaphopods (3 specimens, *Dentalium elephantinum**); **Bad Voslau**: 11 specimens, gastropods (10 specimens, *Ceritium rubiginosum**, Fig. 8F, *Trochus patulus**), bivalve (PZO 12358, *Venus* sp.*); **Gainfarn**: 18 specimens, bivalves (5 specimens, *Cytherea multilamella**), gastropods (13 specimens, *Buccinum* sp.*); **Grund**: 73 specimens, bivalves (53 specimens, *Arca diluvia*, Arca noae**, Fig. 7F, *Venus glabrata*, Venus plicata*, Glycymeris polyodonta*, Ostrea cymbularis**), gastropods (19 specimens, *Ancillaria glandiformis*, Calyptraea muricata*, Cerithium bidentatum*, Fusus burdigalensis*, Melanopsis dufourii**), scaphopod (1 specimen); **Kienberg**: 13 specimens, bivalves (11 specimens, *Glycymeris* sp., *Chama* sp.*), gastropod (2 specimen, one of these: *Conus mercati**); **Neudorf**: 2 specimens, gastropods; **Pötzleinsdorf:** 12 specimens, bivalves (8 specimens, *Lucina columbella**), gastropods (4 specimens, including *Conus deperditus**); **Steinbrunn**: 46 specimens, bivalves (7 specimens, including *Venericardia partschii**), gastropods (39 specimens, *Conus ventricosus*, Cerithium scabrum*, Turritella archimedis*, Rostellaria pespelecani**); **Turkenshanz:** 2 specimens, bivalve (PZO 12543), gastropod (PZO 12543), **Vöslau**: 11 specimens, bivalve (*Venus* sp.*, PZO 12358), gastropod (10 specimens, *Cerithium sp., Trochus patulus**); **Wien**: 8 specimens, gastropods (8 specimens, *Conus* sp., *Turritella archimedis*, Trochus* sp.*); **Wiesen**: 45 specimens, bivalves (44 specimens, *Crassatella dissita*, Donax brocchii*, Mactra podolica*, Venus gregaria**), gastropod (PZO 15369, *Cerithium pictum**)
Remarks: the specimens could be attributed to the Miocene successions that fill the basin, and characterise the surroundings of the localities

Waidring
Age: Late Triassic–Early Jurassic, containing ammonites and brachiopods, overlay this unit (SIBLIK, 1993)
Hahn (1910) described the geology and paleontology of Steinplatte near Waidring: the sections that develops near Kammerkohrkogel begins with the Cardinia lumachelle sequence resting upon the Upper Triassic Dachstein Reef Limestone. The Variegated Cephalopod Limestone, containing ammonites and brachiopods, overlay this unit (Siblik, 1993).
Collection Georg Gasser: 20 specimens, brachiopods (12 specimens, including *Lacusonella lacunosa*, Fig. 5D, *Terebratula omologaster*, Terebratula peregrina**), corals (2 specimens, *Lithodendron* sp.*), ammonoids (6 specimens, see also Tomelleri et al., this volume c)
Remarks: 1 specimen, *Lacusonella lacunosa* is associated to a label that report as source rock "Raibler schicten". However, it seems more probable that it belongs to Lower Jurassic unit, whereas the two samples of *Lithodendron* sp. belong to Upper Triassic Dachstein Limestone, known also as *Lithodendron* Limestone (Suess, 1854).

Zirl
Age: Carnian (Late Triassic)
Near Zirl in Tyrol, in an old quarry crop out Wettersteinkalk, Wettersteindolomite and the "Raibl Schichten" (Brandner & Polenschinski, 1986). They are called, Zirler Formation or *Cardita* Schichten, respectively (Tollmann, 1976; Wöhrmann, 1889); the labels in the collection mention "Ob. *Cardita* Schichten". For more details see Tomelleri et al. (this volume a).
Collection Georg Gasser: bivalve (PZO 13656)

6.3 CZECH REPUBLIC

Beroun
Age: Ordovician–Devonian
Beroun, sited inside the Prag Basin, is studied for its fossil fauna. Particularly famous are the trilobites.
Collection Georg Gasser: 5 specimens, trilobites (*Phacops latifrons*, Asaphus socialis**, Fig.4A, *Calymene declinata*, Ellipsocephalus hoffi**, Fig. 4B)

Jince (Ginetz)
Age: Middle Cambrian
This locality, geologically sited in the Príbram-Jince Basin, part of Barrandian area, is one of the well-known deposits of Czech Republic for its oldest trilobites of the State (Bruthansová et al., 2007).
Collection Georg Gasser: 2 specimens, trilobites (*Conocoryphe sulzeri*, Paradoxides* sp.)

Kienberg
Age: Miocene
The Middle Miocene Kienberg locality is sited about 3.5 km east of Mikulov. It was known by the first researchers in the 19th century that collected, studied and recorded paleontological specimens in several works (Schultz, 2010).
Collection Georg Gasser: 13 specimens (see also "Vienna Basin")

Kosoř
Age: Silurian
Collection Georg Gasser: 3 specimens, trilobite (*Bronteus palifer**), nautiloid (*Endoceras annulatum,* see also Tomelleri et al., this volume c), bivalves (*Cardiola interrupta*, Paludina varicosa**)

Lahošť (Loosch)
Age: Late Cretaceous
Collection Georg Gasser: 7 specimens, bivalves (4 specimens, including *Spondylus spinosus**), brachiopods (2 specimens), gastropod (*Conotomaria* sp.)

Prag
Age: Ordovician–Devonian
Collection Georg Gasser: 4 specimens, cephalopods (2 specimens, including *Protophragmoceras* sp., *Michelinoceras michelini*, see also Tomelleri et al., this volume c), trilobites (2 specimens, including *Proteus ruperstes**)

Štramberk (Stramberg)
Age: Late Jurassic–Early Cretaceous
Štramberk is historically famous for its abundance of fossils. The Štramberk Limestone is exposed as carbonate megablocks, breccias and conglomerates at several quarries (i.e., Kotouč, Municipal, Horní Skalka and Castle Hill) near the town of Štramberk (Vašíček et al., 2017, 2018). The brachiopods in the collections could have been found in the area. Both species were described and illustrated by Suess (1858) in his "Die Brachiopoden der Stramberger Schichten". See also Tomelleri et al., this volume c.
Collection Georg Gasser: 6 specimens, ammonoids (*Ptychophylloceras ptychoicum*), brachiopods (5 specimens, "*Terebratula*" *tychaviensis*, Fig. 5E1-2, *Rhynchonella suessi**)

Telnice (Telnitz)
Age: Late Cretaceous
Collection Georg Gasser: bivalve, *Exogyra columba** (PZO 12927)
Remarks: The label associated to the specimen report "Quadersandstein" as source rock. The term Quadersandstein was introduced by German geologists for thick-bedded sandstones subject to fracture along vertical, rectangular joints into large blocks (*Quadern*). This term was historically applied to sandstones of Late Cretaceous age cropping out in northern Bohemia and in adjacent parts of Saxony and Silesia (Skocek & Valecka, 1983).

Teplice (Teplitz)
Age: Late Cretaceous
Teplice is geologically part of the Bohemian Cretaceous basin, whose fossil faunas are studied since the 19th century.
Collection Georg Gasser: 2 specimens, brachiopods (*Terebratula semiglobosa**, *Spondylus spinosus**)

6.4 FRANCE

Boncavail
Age: Late Cretaceous
The Boncavail hill is one of the famous fossiliferous deposits of the Cretaceous massif of Uchaux. Here the complex of yellow or brown limestone sandstones, alternating with more sandy areas, returned a rich paleofauna described originally by Hebert (1875) and later studied in more detail by Roman & Mazeran (1913) (Sornay, 1950).
Collection Georg Gasser: bivalve, *Trigonia scabra** (PZO 12603)

Bordeaux
Age: Miocene
One of the first descriptions of Miocene fossils from Bordeaux region appeared in the 17th when Pierre de L'Ancre (1622) described the sediments rich in shells that crop out on the hillside of Sainte-Croix-du-Mont, located 40 km southeast of Bordeaux, and wondered about the origin of the material. In 1761 Desmarest discussed the sediments of this region and was convinced of the marine origin of the fossils of northern Aquitaine (Godard, 2018).
Collection Georg Gasser: 9 specimens, bivalves (3 specimens, including *Chama lamellosa**), gastropods (6 specimens, including *Fissurella labiata**)

Girmont, near Epinal
Age: Middle Triassic
The tag associated to the sample indicates "Striatenkalk" [= "Striatakalk"] which is the informal name of a lithostratigraphic unit belonging to the Muschelkalk (Zirkel, 1894). The Striatakalk take its name from *Lima striata*, which is the characteristic fossil of the unit. Effectively, in the vicinity of Girmont there is a limestone massif, whose rocks belong to the Muschelkalk (Minoux et al., 1978).
Collection Georg Gasser: bivalve, *Lima striata*? (PZO 13233)

Grignon
Age: Eocene
Grignon in the Paris Basin is an exceptional site, famous for its mollusk fauna of Lutetian age. First reported by the naturalist Jacques-Tranquillain Féret in 1753, it was then described and made famous, by Lamarck in his "Mémoire sur les coquilles fossiles des environs de Paris" (Piguet-Ruinet, 2022).
Collection Georg Gasser: 92 specimens, including corals (3 specimens, *Oculina solanderi**, *Turbinolia crispa**, *Turbinolia sulcata**, Fig. 3F), bivalves (44 specimens, including *Chama calcarata**, *Chama sulcata**, *Corbula anatina**, *Corbula gallica**, *Corbula lamarckii**, *Crassatella grignonensis**, *Crassatella lamellosa**, *Crassatella trigonata**, *Arca biangula**), gastropods (45 specimens including *Bifrontia disjuncta**, *Bifrontia marginata**, *Bifrontia serrata**, *Conus deperditus**, *Hipponix* sp.*, *Keilostoma turricula**, *Melania cancellata**, *Melania inquinata**, *Melania lactea**, *Natica mutabilis**, *Niso terebellata**, *Oliva mitreola**, *Turritella abbreviata**, *Turritella multistriata**, *Voluta* sp.*, *Volvaria bulloides**, Fig. 8E)
Remarks: In Georg Gasse Collection the age of its specimens specimens is often erroneously indicated as Miocene.

La Mole
Age: Miocene
Collection Georg Gasser: 1 specimen, *Conus* sp.(PZO 13152)

Liancourt
Age: Eocene
Liancourt is geologically located in the Paris Basin.
Collection Georg Gasser: bivalve, *Pseudomiltha gigantea* (PZO 14538)

Paris Basin
Age: Cenozoic
The Paris Basin represents a classic study area, for its geology and fossiliferous content. Its sedimentary infill ranges from the Permian to the Miocene. The Cenozoic succession is localized in the area of the Île de France and surroundings.
Collection Georg Gasser: 4 specimens, gastropods (3 specimens, *Glossus* sp., *Turritella* sp.*, *Cerithium* sp.), bivalve (*Venericardia jouanetti**, PZO 12420)

6.5 DENMARK

Møn
Age: Late Cretaceous
The island of Møn, with its cliff made by White chalk is one of the representative Cretaceous localities of North European.
Collection Georg Gasser: echinoderm, *Galerites* sp. (PZO 14239)

Jütland
Age: Cretaceous
Collection Georg Gasser: echinoderm, *Echinocorys ovatus* (PZO 14198)

6.6 GERMANY

Bad Boll
Age: Early Jurassic
This locality is well-known for its Lower and Middle Jurassic outcrops and fossils (e.g., Quenstedt 1883–1885, 1886–1887). One of the specimens (*Harpoceras falcifer*) in Gasser's collection comes from the Posidonienschiefer, corresponding to the three ammonite zones *tenuicostatum*, but especially *falciferum* and *bifrons* Zone (Riefgraf et al., 1994; Hess, 1999a). See also Tomelleri et al. (this volume c).
Collection Georg Gasser: 2 specimens, *Harpoceras falcifer* (PZO 12240), *Salpingoteuthis* (PZO 12935)

Bad Hindelang
Age: Early Jurassic
A monograph about brachiopods from Hindelang, in the Northern Calcareous Alps, was realized by Böse (1893).
Collection Georg Gasser: 2 specimens, brachiopods (*Rhynchonella ascia**)

Balingen
Age: Jurassic
The Jurassic Balingen site in the Swabian Alb and its foreland. Fossil fauna from this area are frequent in many European collections. Quarry activities that interested the area, pushed paleontological discoveries and studies in the 19th century. The specimens come from the Lower and Upper Jurassic sequences of the area.
Collection Georg Gasser: 91 specimens, including bivalves (32 specimens, including *Plicatula spinosa**, *Camptonectes auritus*, Fig. 7B), ammonoids (56 specimens, see Tomelleri et al., this volume c), gastropod (PZO 15082), sponge (PZO 14414, Fig. 9C), coral (PZO 14447)

Beul, Eisborn
Age: Late Devonian
Less than one km northwest of Eisborn, the Beul hills present several outcrops with a good Frasnian–Fammenian transition (Girard et al., 2005; Helling & Becker, 2022).
Collection Georg Gasser: cephalopod, *Bactrites gracilis* (PZO 12890). For more details see Tomelleri et al. (this volume c).
Remarks: On the label associated to the specimen is indicated "Beul bei Bonn", probably a mistake in the report of the locality.

Bopfingen
Age: Middle Jurassic
Bopfingen is located in the northeastern Swabian Alb. The paleozoological fauna of the Middle Jurassic lithostratigraphic units are famous. Quenstedt (1886–1887), in his chapter on the lithofacies of the ammonites, cited, specifically, the Ipf, a mountain famous as celtic archeological site (Nipf – sic) near Bopfingen, as locality where it was possible to find also remains of *Belemnites giganteus*. For more details see Tomelleri et al. (this volume c).
Collection Georg Gasser: 4 specimens, cephalopods, *Megateuthis giganteus* (PZO 12524, 12525, 12955, 12956)

Coburg
Age: Cenozoic
Collection Georg Gasser: gastropod, *Lymnaeus pereger**(PZO 15014)

Dischingen
Age: Miocene
Dischingen is known for its Miocene marine invertebrates and continental molluscs that are stored in several museum collections (Salvador et al., 2018)
Collection Georg Gasser: 10 specimens, bivalves (*Pecten palmatus**, *Ostrea gigantea*, Fig. 7C 1–2)

Doberg
Age: Oligocene?
Doberg, near Bünde, is famous for its Oligocene-Miocene successions investigated since the 19th century. The specimen in the collection is common in the deposits of this locality. Doberg is particularly well known for its echinoid faunas.
Collection Georg Gasser: 1 specimen, *Terebratula grandis* (PZO 13645)
Remarks: The label associated to the specimen report erroneously the indication of "Weisser Jura".

Ebenwald, near Berlin
Age: Mesozoic
Collection Georg Gasser: 2 specimens, bivalves (including *Pleuromya* sp.*, PZO 13293)

"Ehingen"
Age: Jurassic
This fossiliferous site is located in the Swabian Jura, a chain of Jurassic highlands in Baden-Württemberg, whose lithostratigraphic sequence was first studied in detail by Quenstedt (1843) (Ziegler, 1977). For more details see Tomelleri et al. (this volume c).
Collection Georg Gasser: cephalopod (*Amauroceras* sp.; Late Jurassic), bivalve (*Grammatodon* sp., Early Jurassic)
Remarks: The genus *Amauroceras* comes from the Amaltheenton Formation and is Early Jurassic in age. This is not compatible with the locality Ehingen (comm. pers. Günter Schweigert). It could, thus be an error in attribution of the locality.

Eifel
Age: Devonian
The Eifel Mountains, on the western side of River Rhine, are the classical study area for Devonian rocks and their fossiliferous content, in particular, from the Middle Devonian type sections.
Collection Georg Gasser: 56 specimens, brachiopods (49 specimens, including *Retzia* sp.*, *Spirifer laevicosta**, *Streptorhynchus* sp.*, Fig. 5A,C), corals (7 specimens, including *Calceola sandalina**, Fig. 3B)

Eisenach
Age: Middle Triassic
One of the specimens in the collection (*Ceratites nodosus*, PZO 12919), is one of the most characteristic fossils of the informal unit "Striatakalk" of the lower part of Upper Muschelkalk (Eck, 1865).
Collection Georg Gasser: 1 specimen, cephalopod from the Anisian (*Ceratites nodosus*, see also Tomelleri et al., this volume c)

Elberfeld
Age: Devonian
Collection Georg Gasser: crinoid (PZO 14530, Fig. 6A)

Ettenheim
Age: Middle Jurassic
Collection Georg Gasser: bivalve, *Ostrea cristagalli** (PZO 13108)

Ettersberg, near Weimar
Age: Middle Triassic
The Ettersberg, in the Thüringian Basin, corresponds to an asymmetric arch-like fold that interests Muschelkalk layers.
Collection Georg Gasser: bivalves, *Gervilleia socialis**, *Myophoria* sp.* (PZO 13257)
Remarks: A brachiopod (PZO 12374) labelled "Weimar-Muschelkalk" could also come from the same source area.

Friedrichshall
Age: Triassic–Jurassic
Collection Georg Gasser: 1 specimen, Triassic bivalve (*Lima striata*)
Remarks: Another specimen "*Astarte pulla**" associated to the so-called Middle Jurassic "Kelloway sandstone" may be attributed to this locality, although the illegible writing on the label makes the attribution difficult and ambiguous

Göppingen:
Age: Middle Jurassic
Collection Georg Gasser: bivalve, *Pholadomya* sp. (PZO 13297)

Gräfenberg
Age: Late Jurassic
Gräfenberg is well-known for its well-preserved ammonites that were extracted from active quarries such as Endress and Deuerlein (e.g., Schairer & Schlampp, 2003). For more details see Tomelleri et al. (this volume c).
Collection Georg Gasser: 2 specimens, ammonoids.

Hechingen
Age: Jurassic
Collection Georg Gasser: sponge (PZO 15034)

Schwäbisch Hall
Age: Middle Triassic
The label refers to "Muschelkalk" as lithostratigraphic unit. Effectively *Encrinus liliiformis* is a common and well-known crinoid from the middle Triassic Muschelkalk of Europe.
Collection Georg Gasser: 2 specimens, crinoid (*Encrinus liliiformis**, Fig. 6B)

"Heuberg"
Age: Late Jurassic
For more details see Tomelleri et al. (this volume c).
Collection Georg Gasser: 5 specimens, ammonoids (*Ataxioceras polyplocum*, *Perisphinctes martelli*, *Phylloceras album*)

Hof (Saale)
Age: Carboniferous
The label associated to the specimen refer to the so-called "Bergkalk", a Carboniferous limestone that crops out in the area of Hof, whose Paleozoic rocks were preliminary investigated in the 19th century.
Collection Georg Gasser: 1 specimen, *Syringopora* sp.* (PZO 13670)

Itzehoe
Age: Rupelian (early Oligocene)
Haas (1889) enlisted molluscs from the "Rupelthon" (Rupelian) of Itzehoe in the Kiel (?) collection, describing also the nautiloid *Könenia alseni*. For more details see Tomelleri et al. (this volume c).
Collection Georg Gasser: 2 specimens, ammonoid, *Könenia alseni* (PZO 13838), crab (PZO 13731, Fig. 4F)

Kelheim
Age: Late Jurassic
Kelheim is one of the Lithographic Limestone outcrops of Bavaria, famous for the outstanding preservation of invertebrate and vertebrate fossils (e.g., Schwarz-Wings et al., 2011) Near Kelheim existed an important quarry for Plattenkalk, now abandoned (e.g., Crook, 1894; Kölbl-Ebert & Cooper, 2018). For more details see Tomelleri et al. (this volume c).
Collection Georg Gasser: ammonoid, *Ammonites** (PZO 12966)

Kirchheim
Age: Pliensbachian? (Early Jurassic)
Ammonites from Kirchheim unter Teck, were described in Quenstedt's (1883–1885) monograph about Lower Jurassic sites in Swabian Alb. For more details see Tomelleri et al. (this volume c).
Collection Georg Gasser: ammonoid, *Ammonites capricornus** (PZO 13374)

Kressenberg
Age: Eocene
Collection Georg Gasser: 2 specimens, gastropods, *Paludina carbonaria** (PZO 13210–13211)

Lahneck
Age: Devonian
The Rheinish Grauwacke from Lahneck is cited by Quenstedt (1871) in his work about fossils brachiopods of Germany.
Collection Georg Gasser: 3 specimens, brachiopods (2 specimens), crinoid (PZO 14528)

Laufenburg
Age: Late Jurassic
Collection Georg Gasser: 2 specimens, brachiopods (*Terebratula corinata**, Fig. 5F, *Terebratula subsella**)

Mainz Basin: Flörsheim, Steinheim, Weisenau, Weinheim
Age: Oligocene-Miocene
In the Mainz Basin crop out Paleogene–Neogene stratigraphic succession rich in invertebrates; they have been described since the 19th century (Grimm et al., 2001).
Collection Georg Gasser: 33 specimens, **Flörsheim:** 1 specimen, *Ostrea callifera*; **Steinheim**: 7 specimens, gastropods (*Valvata multiformis**, *Gyraulus sulcatus,* Fig. 8B, *Gyraulus trochiformis*); **Weisenau:** 3 specimens, gastropods (cf. *Tympanotonos* sp.); **Weinheim**: 22 specimens, bivalves (8 specimens, including *Isognomon sandbergeri*, *Unio* sp.*, *Glycymeris* sp.), gastropods (14 specimens, including *Cerithium* sp., *Clausilia* sp., *Valvata* sp.)

Mössingen
Age: Middle Jurassic
Mössingen in the foreland of the Swabian Alb is well-known in literature for its Jurassic successions and ammonite faunas. In particular, Quenstedt (1883–1885), in his monograph discussed the easy finds of *Leioceras opalinum* in the surroundings of Mössingen. For more details see Tomelleri et al. (this volume c).
Collection Georg Gasser: 3 specimens, *Leioceras opalinum* (PZO 12513–15)

Muggendorf
Age: Late Jurassic
Muggendorf is a village in Bavaria (Germany), and fossils from this locality are Late Jurassic, mostly faunal elements belonging to sponge reefs (Weisser Jura).
Collection Georg Gasser: echinid, ?*Plegiocidaris* sp. (PZO 14206, Fig. 6D)

Nusplingen
Age: Late Jurassic (Kimmeridgian)
Nusplingen, in the western Swabian Alb, is a famous fossil locality for the excavation of Lithographic Limestone and the exceptional preservation of its fossils, making it an important *Fossil-Lagerstätte*, like the younger Solnhofen site. The first fossils from the Nusplingen Lithographic Limestone were reported in the middle of the 19th century. In this area several excavation campaigns took place, at first for commercial purposes, then for scientific interests as far as it became a Protected Excavation Area in 1983 (e.g., Dietl & Schweigert, 2004; Schweigert & Roth, 2021).
Collection Georg Gasser: 4 specimens, cephalopods (*Coronaptychus* sp., *Laevaptychus* sp., *Lamellaptychus* sp., see Tomelleri et al., this volume c)

Osnabrück
Age: Oligocene
Osnabrück is particularly famous for its Upper Oligocene fauna from the so called "Osnabrücker Meeressand" studied by different palaeontologists since the 19th century (e.g., Dietrich, 2012).
Collection Georg Gasser: 2 specimens, echinoderms (*Clypeaster* sp., Fig. 6F)

Plieningen
Age: Early Jurassic
Collection Georg Gasser: bivalve, *Gryphaea* sp.* (PZO 13232)

Pößneck
Age: Late Permian
Remnants of the Zechstein Reef lie around Pößneck, emerging with reliefs such as the local Altenburg Hill. Known since the nineteenth century, these outcrops have returned a rich and characteristic association of fossils, feeding collections (Murchison, 1859; Ramsay, 1883).
Collection Georg Gasser: bryozoa, *Acanthocladia dubia** (PZO 13309, Fig. 9A)

Rohrdorf near Altensteig
Age: Middle Triassic
The label associated to the specimen report "Wellendolomit" as lithostratigraphic unit, the historical lower division of Muschelkalk (now formalized as Freudenstadt Formation).
Collection Georg Gasser: bivalve, *Hoernesia socialis* (PZO 12379)

Rüdersdorf near Berlin
Age: Middle Triassic–Middle Jurassic
Collection Georg Gasser: 3 specimens, crinoids (*Holocrinus dubius*, Encrinidae, *Serpianotiaris* sp.), gastropod (*Omphaloptycha* sp.?), bivalve (*Meleagrinella echinata*)
Remarks: Two specimens (crinoids and gastropod) are associated to Muschelkalk, whereas the label of the bivalve indicates Middle Jurassic.

Rügen
Age: Late Cretaceous (Maastrichtian)
The Isle of Rügen is one of the classic Upper Cretaceous outcrops in Europe. The white chalk cliffs and quarries have yielded numerous fossils studied by many German paleontologists, since the 19th century (e.g., Reich & Frenzel, 2002).
Collection Georg Gasser: 20 specimens, bivalves (5 specimens, *Pecten* sp.*, *Spondylus aculeatus**, *Gryphaea vesicularis**), echinoids (4 specimens, including *Echinocorys ovatus,* Fig. 6E, *Galerites sp.*), coleoids (11 specimens, see Tomelleri et al., this volume c)

Schwabisch Gmünd
Age: Early Jurassic
The Lower Jurassic foreland around Schwäbisch Gmünd has been known for a variety of fossil sites and the good preservation of samples. In the Gmünd area fossils can be found in different Lower Jurassic lithostratigraphic units. The so called Arietenkalk (Lower Sinemurian) stands out, both for the exceptional fauna and for historical reasons, since this limestone was object of quarry activity (Mayer, 2010).
Collection Georg Gasser: 2 specimens, bivalves (*Gryphaea arcuata*), ammonoid (see Tomelleri et al., this volume c)

Sigmaringen
Age: Late Jurassic
Collection Georg Gasser: 7 specimens, crinoids (*Encrinidae, Plegiocidaris* sp.)

Solnhofen
Age: Late Jurassic
The Plattenkalk of Solnhofen Fossil-Lagerstätte is famous for its rich paleofauna, collected over hundreds of years and exhibited in museums of natural history over the world. For more details see also Tomelleri et al. (this volume c).
Collection Georg Gasser: 15 specimens, arthropods (8 specimens, including *Eryma modestiformis**, *Eryon* sp.*, *Mecochirus* sp.*,

*Pygolampis gigantea**, Fig. 4C, D), echinoderms (4 specimens, including *Geocoma carinata*, Fig. 6C, *Comaturella pennata*, *Saccocoma tenella*) ammonoids (2 specimens), ichnofossil (PZO 12604)

Sontheim an der Brenz
Age: Late Jurassic
Collection Georg Gasser: 4 specimens, crinoids (*Liliocrinus* cf. *munsterianus, Millecrinus milleri, Pomatocrinus mespiliformis*)

Spaichingen
Age: Middle Jurassic
Collection Georg Gasser: 1 specimen, *Ostrea pectiniformis** (PZO 13216)

Storzingen
Age: Late Jurassic
The label associated report "Weisser Jura" as chronostratigraphic reference.
Collection Georg Gasser: 1 specimen, *Goniomya ornata** (PZO 13244)

Strehlen
Age: Late Cretaceous
Strehlen, near Dresden, is known for its Cretaceous outcrops and gives the name to the Strehlen Formation and the Strehlen Limestone in its lower part of the succession. The fossiliferous content was discussed, among the others, by Geinitz (1846).
Collection Georg Gasser: 9 specimens, bivalves (*Spondylus spinosus**, Fig. 7E, *Inoceramus brongniarti**)

Streitberg
Age: Late Jurassic
Locality in Bavaria (Franconian Alb).
Collection Georg Gasser: 3 specimens, brachiopods (*Rhynchonella lacunosa**)

Stuifen (Schwaben)
Age: Late Jurassic
Hill in front of the Swabian Alb.
Collection Georg Gasser: brachiopod, *Terebratula impressa** (PZO 13649)

Taubach
Age: Pleistocene
The site of Taubach is well known for its travertine deposits and the associated fossil flora and fauna (Pentecost, 2005).
Collection Georg Gasser:12 specimens, gastropods (*Helix* sp.*)
Remarks: Another sample in the collection (*Lymnaeus* sp.) report on the label the indication: "Kalktuff – Pleistozän"; it cannot be excluded that it refers to the same locality of provenance.

Thuringian Forest
Age: Middle Triassic
Collection Georg Gasser: crinoids (*Encrinites* sp.*) and bivalves (*Pecten* sp.*) (PZO 13218)
Remarks: The label indicate "Muschelkalk" as lithostratigraphic unit for the specimen. Effectively North and South of the Thuringian Forest Muschelkalk outcrops are present.

Vaihingen/Filder
Age: Early Jurassic
Well-preserved ammonites were extracted from various quarries surrounding Vaihingen, feeding numerous collections (Rainer et al., 2016; Scherzinger et al., 2020). The Sinemurian Arietenkalk is very rich in ammonites and other invertebrates (Scherzinger et al., 2020). For more details see Tomelleri et al. (this volume c).
Collection Georg Gasser: 5 specimens, cephalopods (*Ammonites bucklandi**, *Schlotheimia angulata*)
Remarks: The name concerns Vaihingen/Filder, not to be mixed with Vaihingen/Enz.

Wasseralfingen
Age: Middle Jurassic
Collection Georg Gasser: 1 specimen, *Pecten personatus** (PZO 12375)
Remarks: As reported on the label, the lithofacies associated to the specimen correspond to the so-called "Eisensandstein", a lithostratigraphic unit, whose outcrops are known around Wasseralfingen.

Weilburg
Age: Devonian
The Weilburg close to Nassau is characterized by outcrops of Middle Devonian volcanic rocks with minor reef limestones, Upper Devonian Adorf-Plattenkalk (thin-bedded limestone) and Kalkknotenschiefer (lime nodular slate) with basaltic intrusions, and Lower Carboniferous Alaunschiefer (black alum slate) (Moe, 2000). The Cephalopod fauna is Late Devonian in age. Sandberger (1855) described a specimen of "*Clymenia subnautilina*" from the Weilburg area. For more details see Tomelleri et al. (this volume c).
Georg Gasser's collection: cephalopod, *Clymenia undulata* (PZO 12519)

Zimmerholz
Age: Miocene
The label indicates "Meeresmolasse" as source rock which suggests the specimen could come from the so-called Miocene "Großkalk" cropping out in the area.
Collection Georg Gasser: bivalve, *Pecten palmatus** (PZO 12931)

Zwillingsberg near Dernau
Age: Devonian
Collection Georg Gasser: 5 specimens, brachiopods (Spiriferidae) (Fig. 5B)

6.7 ITALY

Andona Valley
Age: Pliocene
This valley near Asti is well known for the rich fossil fauna (vertebrates and invertebrates) already subject of study in the nineteenth century by several authors.
Collection Georg Gasser: arthropod, *Balanus sulcatus* (PZO 13609)

Carzano, near Telve
Age: Paleogene
Near Carzano are located outcrops of the Cenozoic succession of Valsugana, studied since the second half of the 19th century by various authors (Boschele et al., 2011). Recently, a more detailed geological and paleontological analysis was carried out, relating the various outcrops in the vicinity of Borgo Valsugana

and in the surrounding areas, including Carzano (Boschele et al., 2011; 2016a; 2017).
Collection Georg Gasser: 2 specimens, bivalve, echinoid

Enneberg/Marebbe
Age: Triassic
Collection Georg Gasser: 5 specimens, crinoids (*Encrinus liliiformis*)

Eppan/Appiano sulla Strada del Vino
Age: Early Triassic
Collection Georg Gasser: 3 specimens, bivalve (PZO 13255), ichnofossils (2 specimens, see Baucon et al., this volume)

Esino Lario
Age: Middle Triassic
Collection Georg Gasser: gastropod, *Omphaloptycha* sp. (PZO 12407)

Fassa Valley: Fassa, Mazzin, Soraga, Vigo
Age: Early Triassic
Along Fassa Valley it is possible to observe outcrops that spans from the Permian Bellerophon Formation to the Middle Triassic Schlern/Sciliar Dolomite. Specifically, the specimens in the collection, based on the lithological and paleontological content, can be all attributed to Lower Triassic Werfen Formation.
Collection Georg Gasser: 14 specimens, including bivalves (6 specimens, *Claraia clarai*, Fig. 7A, *Myacites fassaensis*), gastropods (3 specimens, "*Natica*" *gregaria*, "*Holopella*" *gracilior*), ichnofossils (5 specimens; see Baucon et al., this volume)

Ferrazze, San Martino Buon Albergo
Age: Cretaceous
Collection Georg Gasser: 5 specimens, echinoids (Schizasteridae?, Micrasteridae?)

Garda lake area
Age: Late Jurassic
Collection Georg Gasser: 3 specimens, ammonoids (*Ammonites*, *Phylloceras* sp.)

Hafling/Avelengo
Age: Triassic
Collection Georg Gasser: ichnofossil, *Planolites* sp. (PZO 13350). For more details see (Baucon et al., this volume)

Karerpass/Passo Carezza
Age: Early Triassic
Collection Georg Gasser: 2 specimens, bivalve (PZO 13212) and gastropod (*Bythinella* sp.*, PZO 12968)

La Spezia
Age: Early Jurassic
Collection Georg Gasser: bivalve (PZO 13327)

Marmolada
Age: Middle Triassic
The Marmolada is the only glacier of the Dolomites and is famous for its Marmolada Limestone that yielded invertebrates preserved also with original color, mostly gastropods.
Collection Georg Gasser: 29 specimens, gastropods (21 specimens, including *Moerkeia praefecta*, *Neritaria elliptica*, *Protonerita calcitica*, *Spirostylus linctus*, *Spirostylus subcolumnaris*) brachiopods (4 specimens), coral (*Lithodendron* sp., PZO 12459), bivalves (2 specimens, *Halobia* sp.), coleoid (*Aulacoceras*, PZO 13223)

Monte Baldo – Sorne Valley
Age: Eocene
Outcrops of Eocene basaltic tuffs, rich in fossil are exposed in the area.
Collection Georg Gasser: 32 specimens, foraminifers (18 specimens, *Nummulites* sp.*, Fig. 9B), corals (3 specimens), echinoid (2 specimen), gastropod (4 specimens, including *Terebellum* sp.), bivalve (3 specimens), briozoa (PZO 13332), polychete (*Serpula spirulaea*, PZO 13388)
Remarks: one more specimen of echinoid , referred to Monte Baldo, belong to the Cretaceous formations that crop out in the area

Monte Brione
Age: Oligocene–Miocene
Located, closed to Riva del Garda, Monte Brione presents an Oligocene-Miocene marine depositional succession, rich in fossil, particularly common are the Pectinidae. The fossils abundance of Monte Brione was already known in the 19th century, when the first researchers made their observation. Monte Brione, represent in fact a classic area for the stratigraphical study of Cenozoic in Southern Alps (Luciani, 1989).
Collection Georg Gasser: 39 specimens, bivalves (33 specimens, including *Pecten pseudobeudanti*), ichnofossils (5 specimens, see Baucon et al., this volume), gastropod (PZO 14541)

Monzoni
Age: Early Triassic
Monzoni is a mountain subgroup of the Marmolada. Here are exposed outcrops of the Werfen Formation, documented by the specimens of the collection.
Collection Georg Gasser: 3 specimens, bivalves (2 specimens, including *Pecten discites**, *Eumorphotis* sp.), gastropod (PZO 12946)

Parma Hills
Age: Neogene
Collection Georg Gasser: 4 specimens, bivalves (2 specimens, *Venus senilis**), gastropods (2 specimens, *Capulus ungaricus**)

Raibl
Age: Late Triassic (Carnian)
The Cave del Predil (formerly Raibl) area, near Tarvisio, was geologically studied since the 19th century and historically considered the type-area of the Carnian stage (De Zanche et al., 2000)
Collection Georg Gasser: 5 specimens, bivalves (4 specimens, *Corbula rosthorni*?, *Myophoria* sp., *Myophoria whatleyae**, *Hoernesia* sp.?), gastropod (*Tretospira multistriata*, PZO 12538)

Recoaro
Age: Middle Triassic
Near Recoaro, it is possible to observe several outcrops of different lithostratigraphic unit extending from the Metamorphic Basement to Middle Triassic dolomite. The specimen in the collection comes from the Recoaro Limestone, rich in brachiopods.
Collection Georg Gasser: brachiopod, Terebratulida (PZO 12462)

Rocca di Garda
Age: Oligocene–Miocene
Rocca di Garda is a rocky promontory, on the eastern bank of Lake Garda, built up by Oligocene and Miocene deposits. As for Monte Brione, the stratigraphic analyses and study of this area started in the 19th century.
Collection Georg Gasser: 3 specimens, echinoid (*Scutella* sp., PZO 14181), bivalve (2 specimens, including *Pecten* sp.)

Rovereto
Age: Jurassic
On the reliefs of the eastern edge of Etschtal/Val d'Adige, directly behind Rovereto, crop out successions from the Lower to Upper Jurassic. The specimens in the collection could be attributed to the unit of Rosso Ammonitico Veronese (Bajocian-Tithonian), a reddish limestone subject of mainly paleontological studies since the nineteenth century. For more details see Tomelleri et al. (this volume c).
Collection Georg Gasser: 2 specimens, ammonoids (*Ptychophylloceras ptychoicum*, *Macrophylloceras ptychostoma*)

Sankt Kassian/San Cassiano including Pralongià
Age: Carnian (Late Triassic)
Near the village of St. Kassian/San Cassiano, crops out the St Cassian Formation, famous for its highly diverse and exceptionally well-preserved fossils. This formation attracted the scientific interest since the first half of the 19th century and became object of treatise such as, for example, the monograph of Laube (1865) about the St Cassian Formation echinoderms, corals and sponges. Pralongià is located approximately 10 kilometers southwest of St. Kassian/San Cassiano, on a plateau on the right side of the Gadertal/Val Badia.
Collection Georg Gasser: 97 specimen, bivalves (15 specimens, including *Gryphaea* sp.), crinoids (31 specimens including *Encrinus cassianus*, *Encrinus granulosus*, *Isocrinus propinquus*, *Zardinicrinus granulosus*, *Cassiocrinus varians*?), echinoderms (18 specimens, *Cidaris alata**, *Anaulocidaris buchii*), gastropods (8 specimens, including *Loxonema nodosa*), sponges (7 specimens), ammonoids (18 specimens, including *Arpadites ruppeli*, *Badiotites eryx*, *Celtites buchii*, *Cladiscites ungeri*, *Lecanites glaucus*, see Tomelleri et al., this volume c)

Seiser Alm/Alpe di Siusi including Bad Ratzes
Age: Middle–Late Triassic
The great part of the specimens in the collection were found in the St Cassian Formation that is the most extended lithostratigraphic unit exposed on the Seiser Alm/Alpe di Siusi. A limited number of samples come from Wengen Formation, as in the case of *Daonella* sp. These units have been object of stratigraphical and paleontological studies since the 19th century.
Collection Georg Gasser: 136 specimens, brachiopods (3 specimens), corals (10 specimens), crinoids (6 specimens, including *Encrinus liliiformis*), echinoderms (11 specimens, including "*Cidaris*" sp.), bivalves (35 specimen, among these *Daonella* sp., *Schafhaeutlia* sp.*), ammonoids (2 specimens), gastropods (64 specimens, including *Dicosmos seisiensis*, Fig. 8A), scaphopod, ichnofossils (4 specimens; for details, see Baucon et al., this volume)

Sicily
Age: Cenozoic?
Georg Gasser's collection: 12 specimens, bivalves (11 specimens, including *Pecten jacobeus*, *Pecten* sp.*, *Cardium* sp.*, *Anomia* sp., *Venus pedemontana**), gastropod (1 specimen, *Fissurella* sp.*)

Strigno
Age: Mesozoic–Cenozoic
Near Strigno, Oligocene and Miocene deposits rich in fossils crop out, whereas few kilometers from this locality, Mesozoic rocks (Triassic to Cretaceous) are exposed. The heterogeneous composition of the specimens in the collection reflects this geological distribution around the site. In particular the ammonoid can be attributed to the Jurassic Rosso Ammonitico, two echinoids (*Cystoidea*?, Schizasteridae) are indicated as Cretaceous specimens on the label, whereas the other samples, echinoids, bivalve and gastropods may be attributed to Oligocene or Miocene sediments.
Collection Georg Gasser: 16 specimens, echinoids (11 specimens, *Cystoidea* sp.?, Schizasteridae, *Scutella*?), bivalve (1 specimen, *Pecten* sp.*), gastropods (3 specimens, *Ampullina* cf. *patula*, *Cassis* sp.), ammonoid (1 specimen)

Tesino
Age: Cretaceous
In the immediately surroundings of Tesino crop out Cretaceous successions.
Collection Georg Gasser: echinoderms, Micrasteridae? (PZO 14212)

Tiers/Tires
Age: Middle Triassic
Tires is situated on the southern slope of the Sciliar massif where the rock succession spans from the Permian to the Middle Triassic. The specimens can be attributed to the Schlern Dolomite that constitute the core of the massif. For more details see Tomelleri et al. (this volume c)
Collection Georg Gasser: ammonoids (2 specimens, including *Dactylioceras commune*)

Trento
Age: Triassic–Paleogene
The composition of the collection, for the Trento locality is particularly heterogeneous, reflecting the different chronological provenance of the specimens picked from the different lithostratigraphic units that crops out in the surroundings of the city, spanning from Triassic (*Megalodon triqueter*) to the Paleogene (*Cancer quadrilobatus*). Two limited Paleogene deposits, close to Trento, crop out near the villages of Martignano on the east and Piedicastello – Sardagna on the west: it could be possible to consider them as hypothetical source rocks, for the crustacean fossils.
Collection Georg Gasser: 28 specimens, ammonoids (5 specimens), crustaceans (4 specimens, including *Cancer quadrilobatus**, Fig. 4E), brachiopods (6 specimens, including *Pygope diphya*), bivalves (5 specimens, including *Megalodon triqueter**), echinoids (3 specimens), gastropods (2 specimens), ichnofossils (3 specimens)

Vajolet Valley
Age: Ladinian (Middle Triassic)
Along the Vajolet Valley are observable outcrops of Livinallongo Formation where the bivalve *Daonella* sp. is particularly common.
Collection Georg Gasser: bivalve, *Daonella* sp. (PZO 13259)

Vicenza
Age: Cenozoic
Collection Georg Gasser: 11 specimens, coral (PZO 14400), echinoid (PZO 14195), gastropods (9 specimens, among these *Ampullina acuta**)

Weissenstein/Pietralba
Age: Early Triassic
Near this location there is the spectacular outcrop of the Gröden/Val Gardena Formation in the well-known and studied canyon of Bletterbach-Butterloch. However, at southwest of Pietralba there are also outcrops of Werfen Formation, to which this sample belongs to. Specifically, the lithological type can be compared with Mazzin Member, in which one of the diagnostic fossils is the brachiopod "*Lingula*" (Brondi et al., 1974).
Collection Georg Gasser: brachiopod, *Lingula*? sp. (PZO 13110)

6.8 POLAND (THE LOCALITIES MENTIONED BELONGED TO GERMANY UNTIL 1945)

Głogów (Glogau)
Age: Silurian?
Collection Georg Gasser: 2 specimens, graptolite (PZO 13315, Fig. 9D), cephalopod (*Orthoceras* sp., PZO 12489)

Kamień Pomorski (Cammin in Pommern)
Age: Late Jurassic
Collection Georg Gasser: bivalve, *Pholadomya vesicularis** (PZO 13047)

Wrzosowo (Fritzow)
Age: Late Jurassic
Collection Georg Gasser: bivalve, *Cyprina nuculaeformis** (PZO 14728)

Zawidowice, Oleśnica (Sadewitz, Oels)
Age: Silurian
Roemer (1861) dedicated a monograph to the fossil fauna of Sadewitz locality.
Collection Georg Gasser: 3 specimens, corals (*Calamopora gotlandica**, *Calamopora alveolaris**, *Calamopora polymorpha**, Fig. 3C)

6.9 PORTUGAL

Madeira
Age: Holocene
In the archipelago of Madeira there are two places known for the presence of Holocene fauna: Porto Santo and Madeira properly. Holocene specimens of terrestrial gastropods from Madeira is restricted to the Piedade beds on Ponta de São Lourenço. Their age has been dated to 5,130±70 years. Porto Santo deposits are instead older, and they are attributed to Pleistocene. Since the 19th century the scientific interest was attracted by the rich terrestrial gastropod fauna of Madeira (Waldén, 1983).
Collection Georg Gasser: 2 specimens, gastropods (*Helix* sp.)
Remarks: Other 6 specimens of *Helix* sp. are glued on a glass plate. They lack geographic indication, although on the same plate there is a label, without associated sample, that refer to Porto Santo. It is possible to say, with fair approximation, that these specimens come from Madeira.

6.10 ROMANIA

Lăpugiu (Lapugy)
Age: Miocene
Lăpugiu is located in a Neogene basin and is famous for a rich Miocene fauna and flora intensely studied. In particular a large number of mollusc species, especially bivalves and large gastropods have been published since the 19th century (Tămaș et al., 2014).
Collection Georg Gasser: gastropods, *Turritella subangulata** (PZO 15463)

6.11 SPAIN

Menorca: "Fortaleza de La Mola" "La Mola" "Mahon"
Age: Miocene
The village of Mahon and the historic construction of Fortaleza de La Mola, placed on the eastern tip of Menorca Island, were built upon Miocene deposits.
Collection Georg Gasser: 10 specimens, including bivalves (3 specimens, among these *Pectunculus* sp.*, *Ostrea* sp.*), gastropods (6 specimens, among these *Planorbis* sp.*), echinoid.

6.12 SWITZERLAND

Würenlos
Age: Miocene
The label mentions "Muschelsandstein Würenlos Molasse". This formation is famous for its rich fossiliferous content and was mined since Roman times as building material (Allen et al., 1985).
Georg Gasser's collection: gastropod, *Turritella turris** (PZO 12928)

6.13 UNITED KINGDOM

Folkestone, Gault
Age: Early Cretaceous
Folkestone is a well-known locality where Gault clay crop out and it is possible to find in abundance the specimens present in Gasser' s collection.
Collection Georg Gasser: 2 specimens, bivalve (*Inoceramus concentricus*, PZO 12626), cephalopod (*Ammonites latedorsatus**, PZO 12635)

6.14 USA

Louisville, Kentucky
Age: Silurian
Collection Georg Gasser: coral, *Halysites* sp.* (PZO 14390, Fig. 3A)

7. CONCLUSIONS

The invertebrate fossils of the Georg Gasser Collection show a close connection between the source areas and the geopolitical texture at Gasser's lifetime, though recognizing the documentation of territories outside German influence (France, England, Spain, Piedmont, Emilia Romagna, Sicily), as well as definitely "exotic" localities (Angola, Kentucky). Anyway, starting from the fact that 45% of the samples lack an indication of provenance, Germany, Austria and Trentino Alto-Adige can be identified as the three major source areas, remarking the close link that Gasser had with territories under the control of Austrian empire or more generically the areas of German influence. However, there isn't a common thread, linked to the idea of investigating a specific typology of invertebrates and its evolution through time or a specific geographical area.
The result is a sample representation of the three geological Eras with common or representative specimens of some known fossiliferous localities, whose presence in the collection is first and foremost guided by the preferential relations that Gasser had with the area of Central Europe and the surroundings of Bolzano. Unlike the paleobotanical collection, it is evident that Mesozoic and Cenozoic specimens are predominant. Local Triassic areas and Jurassic localities of Baden-Württemberg are the best documented with a certain heterogeneity, whereas the Cenozoic is principally represented by the three main areas of the Vienna, Paris and Mainz basins. For the Paleozoic two main source areas are most recognizable: the Barrandian area in Czech Republic and the Rhenish Slate Mountains, in Germany.
Interesting is the documentation of gastropods from the Holocene of the Madeira site, which denotes Gasser's careful curiosity and interest for this type of invertebrates. Analysing the registered localities, substantially all of them reveal to have been the subject of studies and scientific research in the nineteenth century: to the most famous and best-known paleontological sites, such as the fossil Lagerstätte of Solnhofen, are flanked less common deposits, known only by researchers, locals and passionate collectors like Gasser. Effectively, even today, the re-elaboration and integration of data with current scientific knowledge, can transform the collection in a useful handbook to encourage the approach of the public to paleontology. Indeed, this idea was already in Gasser's mind: the type of exhibition he realised, in fact, was guided not only by aesthetic guidelines but also didactic function, promoting both the possibility of achieving comparisons and the potential use of fossil guides or specimens from type localities, as exemplary documentation. The inventory work and the collection of data so far carried out, is intended to create a preliminary basis to promote any future insights, also at the light of a complete review.

ACKNOWLEDGEMENTS

This research project would never have been carried out without the support of the Research funds of the Betrieb Landesmuseum ("Die Fossiliensammlung von Georg Gasser (1857–1931)", CUP H54I19000540005). Benno Baumgarten moved the historical collection in 1992 to the Museum of Nature South Tyrol and stored both the collection and all historical documents This did preserve them for future studies. We thank also the collaborators of the museum Francesco Conci, Francesca Uzzo, Roberta Branz, Barbara Lanthaler, Hendrik Nowak, and several short-time internships that helped with the logistic move of the collection as well as during the inventorisation. Herwig Prinoth (St. Ulrich/Ortisei, South Tyrol, Italy) is thanked for his helpful comments that helped us to improve the manuscript.

REFERENCES

Agricola G., 1546: De natura fossilium. Übersetzt von G. Fraustadt. Durchgesehen und ergänzt sowie mit Registern und einer Einleitung versehen von F. Krafft 2006, Wiesbaden, Marix, 434 pp.

Allen P. H., Mange-Rajetzky M. & Matter A., 1985: Dynamic palaeogeography of the open Burdigalian seaway, Swiss Molasse basin. Eclogae Geologicae Helvetiae, 78 (2): 351–381

Beetz P. F. W, 1934: Geology of South West Angola, between Cunene and Lunda axis. Transactions of the Geological Society of South Africa, 36: 137–76.

Blind W., 1963: Die Ammoniten des Lias Alpha aus Schwaben, vom Fonsjoch und Breitenberg (Alpen) und ihre Entwicklung. Palaeontographica, Abteilung A, 121: 38–131.

Boehm, J., 1929: Eocaene und Miocaene Versteinerungert aus Angola. Zeitschrift der Deutschen Geologischen Gesellschaft, 81 (9): 450–458.

Boschele S., Gatto R., Bernardi M. & Avanzini M., 2011: Fossili cenozoici della Valsugana. Catalogo della collezione Boschele, parte I. Studi Trentini di Scienze Naturali, 88: 219–309.

Boschele S., Gatto R., Bernardi M., Tattesi B., Bosellini F. R. & Avanzini M. (2016a): Fossili cenozoici della Valsugana. Catalogo della collezione Boschele, parte II. Studi Trentini di Scienze Naturali, 95: 53–102.

Boschele S., Gatto R., Bernardi M. & Avanzini M., 2017: Fossili cenozoici della Valsugana. Catalogo della collezione Boschele, parte IV. Studi Trentini di Scienze Naturali, 96: 71–131.

Böse E., 1893: Die Fauna der liasischen Brachiopodenschichten bei Hindelang (Allgäu). Jahrbuch der königlich kaiserlichen geologischen Reichsanstalt, 42: 627–650.

Brandner R. & Poleschinsky W., 1986: Stratigraphie und Tektonik am Kalkalpensüdrand zwischen Zirl und Seefeld in Tirol. Jahresbericht der Mitteilungen des oberrheinischen geologischen Vereins, 68: 67–69.

Brondi A., Fuganti A., Mittempergher M., Murara G., Nardin M., Rossi D., Scudeler Baccelle L., Sommavilla E. & Zirpoli G., 1974: Note esplicative della carta geologica d'Italia 1:50000, Foglio 027 Bolzano, 36 pp.

Bruthansová J., Fatka O., Budil P. & Král J., 2007: 200 years of trilobite research in the Czech Republic. Mikulic D. G., Landing E. & Kluessendorf J. (eds.): Fabulous fossils – 300 years of worldwide research on trilobites. New York State Museum Bulletin, 507: 5180.

Crook A. R., 1894: The Lithographic Stone Quarries of Bavaria, Germany. Scientific American, Supplements, 38 (986): 15763–15764.

Dal Piaz G. B, 1931: Sulla fauna, l'età e l'origine dei tufi basaltici dei dintorni di Brentonico nel Trentino. Bollettino dell'Istituto di Mineralogia, Geologia e Geografia Fisica della Regia Università di Padova, 1: 1–8.

De Koninck L. G., 1873: Recherches sur les animaux fossiles. Deuxième partie, Monographie des fossiles carbonifères de Bleiberg en Carinthie, 117 pp.

De Zanche V., Gianolla P. & Roghi G., 2000: Carnian stratigraphy in the Raibl/Cave del Predil area (Julian Alps, Italy). Eclogae Geologicae Helvetiae, 93: 331–347.

Diener C., 1921: Die Faunen der Hallstätter Kalke des Feuerkogels bei Aussee. Sitzungsberichte der Akademie der Wissenschaften mathematisch-naturwissenschaftliche Klasse, 130: 21–33.

Dietl G. & Schweigert G., 2004: The Nusplingen lithographic limestone – A „Fossil Lagerstaette" of late Kimmeridgian age from the Swabian Alb (Germany). Rivista Italiana di Paleontologia e Stratigrafia, 110 (1): 303–309.

Dietrich C. G., 2012: Palaeoecology, facies and stratigraphy of shallow marine macrofauna from the Upper Oligocene (Palaeogene) of the southern Pre-North Sea Basin of Astrup (NW Germany). Central European Journal of Geosciences, 4(1): 163–187.

Dreger J., 1892: Die Gastropoden von Häring bei Kirchbichl in Tirol. Annalen des Kaiserlich Königlichen Naturhistorischen Hofmuseums. 7: 11–34.

Dreger J., 1904: Die Lamellibranchiaten von Häring bei Kirchbichl in Tirol. Jahrbuch der Kaiserlich Königlichen Geologischen Reichsanstalt, 53: 253–284.

Eck H., 1865: Ueber die Formationen des bunten Sandsteins und des Muschelkalks in Oberschlesien und ihre Versteinerungen. R. Friedländer u. Sohn, Berlin, 149 pp.

Fatka O., Budil P., Crônier C., Cuvelier J., Laibl L., Oudoire T., Polechová M. & Fatková L., 2015: Cambrian fossils from the Barrandian area (Czech Republic) housed in the Musée d'Histoire Naturelle de Lille. Carnets de Géologie,15, (9):89–101.

Főzy I. & Szente I., 2014: Fossils of the Carpathian Region. Indiana University Press, 483 pp.

Franks S. & Nairn A. E. M, 1973: The equatorial marginal basins of west Africa. In: Nairn A. E. M. & Stehli F. G., (Eds): The Ocean Basins and Margins, Volume 1, The South Atlantic. Springer Science + Business Media New York, New York.

Friebe J. G., 2009: Die Naturalien-Sammlung von Norman Douglas. Norman Douglas Symposium, 5: 7–34.

Gasser P. & Baumgarten B., 2007: Gekittet und geleimt. – In: Gasser P., Baumgarten B. (eds.), Ex coll. Georg Gasser. Katalogbuch zur Ausstellung im Naturmuseum Südtirol, 2 (8): 156–158.

Geinitz, H. B., 1846: Grundriss der Versteinerungskunde. Arnoldische Buchhandlung, Dresden und Leipzig, 813 pp.

Gindre-Chanu L., Perri E., Sharp R. I., Peacock D. C. P., Swart R., Poulsen R., Ferreira H., Machado V., 2016: Origin and diagenetic evolution of gypsum and microbialitic carbonates in the Late Sag of the Namibe Basin (SW Angola). Sedimentary Geology, 342: 133–153

Girard C., Klapper G. & Feist R., 2005: Subdivision of the terminal Frasnian linguiformis conodont Zone, revision of the correlative interval of Montagne Noire Zone 13, and discussion of stratigraphically significant associated trilobites. In: Over D. J., Morrow J. R & Wignall P. B (Eds.): Understanding Late Devonian and Permian-Triassic Biotic and Climatic Events: Towards an Integrated Approach. Developments in Palaeontology and Stratigraphy, 20: 181–198.

Godard G., 2018: Early texts on the Cenozoic fossils of Aquitaine (1622–1767) and pioneering debates on the organic origin of fossils, the superpositioning of strata and the mobility of the seas. Earth Sciences Bulletin, 189(8): 1–8.

Grimm K., Grimm M. & Schindler T., 2001: Lithostratigraphy and Biostratigraphy of the Rupelian and Chattian in the Mainz Basin. Neues Jahrbuch für Geologie und Paläontologie – Abhandlungen 218(3): 343–397.

Haas H. J., 1889: Verzeichnis der in den Kieler Sammlungen befindlichen Molluskenarten aus dem Rupelthone von Itzehoe nebst Beschreibung einiger neuer seltener Formen. Schriften des Naturwissenschaftlichen Vereins für Schleswig-Holstein, 7, 34 pp.

Hagdorn H., 2011: Triassic: the crucial period of post-Palaeozoic crinoid diversification. Swiss Journal of Palaeontology, 130: 91–112.

Hahn F. F., 1910: Geologie der Kammerker-Sonntagshorngruppe. 1. Jahrbuch der kaiserlich-koniglichen geologischen Reichsanstalt, 60: 311–417.

Hébert M., Toucas M. & Munier-Chalmas E.C.P.A., 1875: Description du bassin d'Uchaux. Appendice paléontologique : fossiles du bassin d'Uchaux, par Hébert et Munier-Chalmas. Annales des sciences géologiques, 6 (2): 132 pp.

Helling S. & Becker R. T, 2022: Two new species of Gondwanaspis (Trilobita, Odontopleurida) from the Givetian-Frasnian transition of the northern Rhenish Massif (Germany). Palaeobiodiversity and Palaeoenvironment, 102: 697–709.

Hess H., 1999a: Lower Jurassic Posidonia Shale of Southern Germany. In: Hess, H., Ausich, W. I., Brett C. E. & Simms M. J. (eds), Fossil Crinoids. Cambridge University Press, Cambridge, pp. 183–196.

Janoschek W. R. & Matura A., 1980: Outline of the geology of Austria. Abhandlungen Geologische Bundesanstalt, 34, 7–98.

King A. H. & Evans D. H., 2019: High-level classification of the nautiloid cephalopods: a proposal for the revision of the Treatise Part K. Swiss Journal of Palaeontology. 138 (1): 65–85.

Kölbl-Ebert M. & Cooper B. J., 2019: Solnhofener Plattenkalk: A heritage stone of international significance from Germany. In: Hannibal J. T, Kramar S., Cooper B. J. (Eds.): Global Heritage Stone: Worldwide Examples of Heritage Stones. The Geological Society, Special Publications, London, 486: 103–113.

Kröger B. & Evans D. H., 2011: "Review and paleoecological analysis of the late Tremadocian – early Floian (Early Ordovician) cephalopod fauna of the Montagne Noire, France", Fossil record, 14(1): 5-34.

Kustatscher E., Tomelleri I. & Wagensommer A., this volume: Restoring the paleontological collection of Georg Gasser (1857–1931). Geo.Alp, 19.

L'Ancre P. de., 1622: L'incredulité et mescreance du sortilege plainement conuaincue, ou il est amplement et curieusement traicté, de la verité ou Illusion du Sortilege [..]: Et d'une infinité d'autres rares & nouueaux subjects. Paris: Nicolas Buon, 790 pp.

Laube G. C., 1865: Die Fauna der Schichten von St. Cassian. Denkschriften der Kaiserlichen Akademie der Wissenschaften, Mathematisch-Naturwissenschaftliche Classe. 24: 223–266.

Luciani V., 1989: Stratigrafia sequenziale del Terziario nella catena del Monte Baldo (province di Verona e Trento). Memorie di Scienze Geologiche, 41: 263–351.

Machado V., 2016: Origin and diagenetic evolution of gypsum and microbialitic carbonates in the Late Sag of the Namibe Basin (SW Angola). Sedimentary Geology, 342: 133–153

Mayer W. K., 2010. Der Unterjura in der Umgebung von Schwäbisch Gmünd. Pfeil, München, 256 pp.

Meister C. & Böhm F., 1993: Austroalpine Liassic Ammonites from the Adnet Formation (Northern Calcareous Alps). Jahrbuch der Geologischen Bundesanstalt, 136 (1): 163–211.

Minoux G., Marotel C. & Guillaume G., 1978: Carte géologique de la France au 1/50000, Feuille XXXIV-17, Mirecourt, et sa notice explicative, B.R.G.M, 26 pp.

Moe A., 2000: Structural development of a volcanic sequence. Of the Lahn area during the Variscan orogeny in the rhenohercynian belt (Germany). Ruprecht-Karls-Universität Heidelberg, Heidelberg.

Murchison R. I., 1859: Siluria: A History of the Oldest Fossiliferous Rocks and Their Foundations; with a brief sketch of the distribution of gold over the Earth. London, 592 pp.

Neumayr M., 1879: Zur Kenntniss der Fauna des untersten Lias in den Nordalpen. Abhandlungen der Kaiserlich-Koeniglichen Geologischen Reichsanstalt, 7 (5):1–46.

Pentecost A., 2005: Travertine. Springer-Verlag Berlin Heidelberg, Netherlands, 448 pp.

Piguet-Ruine R., 2022: La Falunière de Grignon, a fossil site like no other. url: https://patrimoine.sorbonne-universite.fr/en/news/article/35-view (consulted 1/11/2022)

Piller W., Egger H., Erhart C. W., Gross M., Harzhauser M., Hubmann B., Van Husen D., Krenmayr H.-G., Krystyn L., Lein R., Lukeneder A., Mandl G. W., Rögl F., Roetzel R., Rupp C., Schnabel W., Schönlaub H. P., Summesberger H., Wagreich M. & Wessely G., 2004: Die stratigraphische Tabelle von Österreich 2004 (sedimentäre Schichtfolgen). Kommission für die paläontologische und stratigraphische Erforschung Österreichs der Österreichischen Akademie der Wissenschaften und Österreichische Stratigraphische Kommission, 1. Auflage, Wolkersdorf.

Quenstedt F. A., 1843: Das Flözgebirge Würtembergs. Mit besonderer Rücksicht auf den Jura. Laupp, Tübingen, 558 pp.

Quenstedt F. A., 1849: Petrefactenkunde Deutschlands: Die Cephalopoden. Fues, Tübingen, 580 pp.

Quenstedt F. A., 1858: Der Jura. Laupp, Tübingen, 842 pp.

Quenstedt F. A., 1871: Petrefactenkunde Deutschlands, Die Brachiopoden. 2. Fues. Leipzig, 748 pp.

Quenstedt F. A., 1883–1885: Die Ammoniten des Schwäbischen Jura. 1. Der Schwarze Jura (Lias). Schweizerbart, Stuttgart, pp.1–440.

Quenstedt F. A., 1886–1887: Die Ammoniten des Schwäbischen Jura. 2. Der Braune Jura. Schweizerbart, Tübingen, pp. 441–815.

Rainer A., Balle T. & Donhauser X., 2016: Ein Aufschluss im Unteren Sinemurium (*bucklandi*-Zone) in Stuttgart-Vaihingen. Steinkern, 25: 32–45.

Ramsay, E. P., 1883: Catalogue of a collection of fossils in the Australian Museum. Sidney, 159 pp.

Reich M. & Frenzel P., 2002: Die Fauna und Flora der Rügener Schreibkreide (Maastrichtium, Ostsee). Archiv für Geschiebekunde, 3 (2/4): 73–284.

Riegraf W., Werner G. & Lörcher F., 1984. Der Posidonienschiefer. Biostratigraphie, Fauna und Fazies des südwestlichen Untertoarciums (Lias ε). Ferdinand Enke Verlag, Stuttgart, 195 pp.

Roemer F., 1861: Die fossile Fauna der silurischen Diluvialgeschiebe von Sadewitz bei Oels in Niederschlesien. 1–81, Brcslau.

Roman F. & Mazeran P., 1913: Monographie paléontologique de la faune du Turonien du bassin d'Uchaux et de ses

dépendances. Publications du musée des Confluences, 12 : 1–160.

Salvador R. B., Höltke O., Rasser M. W., 2018: Miocene continental gastropods from Dischingen, Germany. Palaeodiversity, 11(1): 11–19

Sandberger G., 1855: *Clymenia subnautilina* (nova species), die erste und bis jetzt einzige Art aus Nassau. Jahrbücher des Vereins für Naturkunde im Herzogthum Nassau, 1: 127–136.

Schairer G. & Schlampp V., 2003: Ammoniten aus dem Ober-Oxfordium von Gräfenberg/Ofr. (*Bimammatum*-Zone, *Hypselum*-Subzone, *semimammatum*-Horizont). Zitteliana, A, 43: 17–43.

Scherzinger A., Gräbenstein S. & Schweigert G., 2020: *Arietites solarium* (Quenstedt, 1883) – a diagnostic ammonite species in the Lower Jurassic (Early Sinemurian, *Bucklandi* Zone) of SW Germany. Volumina Jurassica, 8(1): 37–46.

Schultz O., Brzobohatý R. & Kroupa O., 2010: Fish teeth from the Middle Miocene of Kienberg at Mikulov, Czech Republic, Vienna Basin. Annalen des Naturhistorischen Museum Wien, Serie A, 112: 489–506.

Schwarz-Wings D., Klein N., Neumann C & Resch U., 2011: A new partial skeleton of Alligatorellus (Crocodyliformes) associated with echinoids from the Late Jurassic (Tithonian) lithographic limestone of Kelheim, S-Germany. Fossil Record 14 (2):195–205.

Schweigert G. & Roth S., 2021: The Nusplingen Plattenkalk – a shark lagoon in the Late Jurassic of the Swabian Alb Geopark. Geoconservation Research, 4 (2): 347–356.

Siblik M., 1993: Review of the Early Liassic brachiopods of the Northern Calcareous Alps. In Palfy J. & Voros A. (Eds.): Mesozoic Brachiopods of Alpine Europe. Hungarian Geological Society, Budapest, pp. 127–132.

Skocek V. & Valecka J., 1983: Paleogeography of the late Cretaceous Quadersandstein of Central Europe. Palaeogeography, Palaeoclimatology, Palaeoecology, 44: 71–92.

Socin C., 1936 : Nota preliminare sulla fauna dei tufi basaltici di Sorne (Brentonico). Studi Trentini di Scienze Naturali, 17(1) : 25–29.

Sornay J., 1950 : Etude stratigraphique sur le crétacé supérieur de la vallée du Rhône entre Valence et Avignon et des régions voisines. 254 pp.

Storch P., Fatka O. & Kraft P., 1993: Lower Palaeozoic of the Barrandian area (Czech Republic) – a review. Coloquios de Paleontología, 45: 163–191.

Suess E., 1858: Die Brachiopoden der Stramberger Schichten. Beiträge zur Paläontographie von Österreich 1: 15–58.

Suess, E., 1854: Über die Brachiopoden der Kössener Schichten. Denkschriften der mathematisch-naturwissenschaftlichen Classe der kaiserlichen Akademie der Wissenschaften, 7: 1–42.

Suess E. & Mojsisovics E., 1868: Studien über die Gliederung der Trias und Jurabildungen in den östlichen Kalkalpen. Nr. II. Die Gebirgsgruppe des Osterhornes. Jahrbuch der Kaiserlich Königlichen Geologischen Reichsanstalt, 18: 167–200.

Tămaș A., Tămaș D. M. & Popa M. V., 2014: Badenian small gastropods from Lăpugiu De Sus (Făget Basin, Romania). Rissoidae Family. Acta Palaeontologica Romaniae, 9 (1): 57–66.

Tollmann A., 1976: Analyse des klassischen nordalpinen Mesozoikums. Franz Deutiske Verlag, 580 pp.

Tomelleri I., Butzmann R., Cleal C., Forte G. & Kustatscher E., this volume a: The plant fossils in the palaeontological collection Georg Gasser (1857–1931). Geo.Alp, 19.

Tomelleri I., Nützel A., Karapunar B., Hagdorn H., Forte, G. & Kustatscher E., this volume c: The cephalopods in the palaeontological collection Georg Gasser (1857–1931). Geo.Alp, 19.

Vašíček Z., Reháková D. & Skupien P., 2017: Some perisphinctoid ammonites of the *Štramberk* Limestone and their dating with associated microfossils (Tithonian to Lower Berriasian, Outer Western Carpathians, Czech Republic). Geologica Carpathica, 68 (6): 583–605.

Vašíček Z., Skupien P. & Jagt J. W. M., 2018: Current knowledge of ammonite assemblages from the Štramberk Limestone (Tithonian–lower Berriasian) at Kotouč Quarry, Outer Western Carpathians (Czech Republic). Cretaceous Research, 90: 185–203.

Vörös A., Szabó J., Dulai A., Szente I., Ebli O. & Lobitzer H., 2003: Early Jurassic fauna and facies of the Schafberg area (Salzkammergut, Austria). Fragmenta Palaeontologica Hungarica, 21: 51–82.

Wagensommer A., Tomelleri I., Baumgarten B. & Kustatscher E., this volume a: Die paläontologische Sammlung von Georg Gasser (1857–1931). Geo.Alp, 19.

Wagensommer A., Tomelleri I., Baumgarten B. & Kustatscher E., this volume b: Die Kataloge der "Naturhistorischen Sammlungen" von Georg Gasser (1857–1931). Geo. Alp, 19.

Waldén H. W., 1983: Systematic and biogeographical studies of the terrestrial Gastropoda of Madeira. With an annotated Check-list. Annales Zoologici Fennici, 20 (4): 255–275

Wöhrmann S. Freiherr Von., 1889: Die Fauna der sog. Cardita- and Raibler Schichten in den Nordtiroler und bayerischen Alpen. Jahrbuch der Geologischen Reichsanstalt., 39: 181–258.

Ziegler B., 1977: The "White" (Upper) Jurassic in Southern Germany. Stuttgarter Beiträge zur Naturkunde, Serie B (Geologie und Paläontologie), 26: 1–79.

Zirkel, F., 1894: Lehrbuch der Petrographie. Leipzig, 833 pp.

Eingereicht am: 10.11.2022
Angenommen am: 1.12.2022