



**Bayerische
Staatssammlung**

für Paläontologie und Geologie

- München, 01.07.2017
- Manuscript received 02.02.2017; revision accepted 05.03.2017
- ISSN 0373-9627
- ISBN 978-3-946705-00-0

Catalogue of the fossil bird holdings of the Bavarian State Collection of Palaeontology and Geology in Munich

Ursula B. Göhlich

*Naturhistorisches Museum Wien, Geologisch-Paläontologische Abteilung, Burgring 7,
1010 Wien, Austria.*

E-mail: ursula.goehlich@nhm-wien.ac.at

Zitteliana 89, 331–349.

Abstract

A detailed compilation of the published and unpublished avian fossils housed in the Bavarian State Collection of Palaeontology and Geology in Munich is given. It is supplemented by an itemization of published but missing bird fossils, including several type specimens, that were lost since the destruction of the former collection building during World War II.

Key words: fossil birds, Aves, avian collection, Avialae

Zusammenfassung

Es wird eine detaillierte Aufstellung der publizierten und unpublizierten fossilen Vögel gegeben, die in der Bayerischen Staatssammlung für Paläontologie und Geologie in München aufbewahrt werden. Sie wird ergänzt durch eine Liste publizierter, jedoch in der Münchener Sammlung fehlender fossiler Vögel, einschließlich einiger Typusexemplare, die seit der Zerstörung der alten Sammlung im Zweiten Weltkrieg als verloren gelten.

Schlüsselwörter: fossile Vögel, Aves, Sammlung, Avialae

1. Introduction

The Bavarian State Collection of Palaeontology and Geology in Munich (SNSB-BSPG) houses an important fossil bird collection. The present compilation is aimed at providing a reference work for palaeornithologists or interested paleontologists for a quick overview of collection specimens available.

Nowadays, the fossil bird collection of the SNSB-BSPG comprises about 600 determined specimens and several hundreds of undetermined bones and it is dominated by material coming from Neogene and Paleogene deposits of Southern Germany and other European Countries. However, the fossils range from the Late Jurassic (e.g. *Archaeopteryx*) up to recently extinct taxa (e.g. moa) and comprise specimens from all over the world. The collection houses type specimens of 30 fossil bird taxa and casts of five additional avian type fossils.

Especially during the past 60 years, this fossil bird collection formed the basis of detailed palaeornithological investigations; those published specimens

are listed in more detail and are provided with references. For completeness, also undetermined avian material is listed.

Due to the bombing and complete destruction of the former collection building, the “Alte Akademie”, on 24th/25th April 1944 in WWII, about 80% of the then paleontological collection was lost. This also has affected the fossil bird collection. In a final paragraph those taxa and type specimens are listed which have been described or mentioned in historic publications (predating WWII) but which are not traceable anymore in the SNSB-BSPG collection and which probably have been destroyed and lost during this destructive event.

On the other hand, some type specimens of fossil birds described by von Ammon (1918), the whereabouts of which was unknown for a long time, were rediscovered in the SNSB-BSPG; this relevant material was formerly housed in the paleontological collection of the University of Würzburg (Germany) and was transferred to the BSPG collection in Munich in 2008 after the paleontological department at the University of Würzburg has been closed.

2. Methods

The compilation below is arranged in a systematic order and also comprises casts of type material in the SNSB-BSPG, the originals of which are housed in other collections.

Fossils that are published (mentioned or figured) are indicated by the respective reference. All determined fossils (at least to ordinal level) are listed in a first part (2.1.) followed by the undetermined materials (Aves indet., 2.2.). The compilation is supplemented by a list of bird fossils (type material and figured specimens, 3.), which are missing nowadays and must be assumed to have been destroyed during WWII. A list of all bird fossil bearing localities housed at the SNSB-BSPG can be found in appendix 1.

Taxa represented by type material are indicated by *, cast of types are indicated by °.

2.2. Abbreviations

Anatomical abbreviations:

Carpometacarpus – cmc, coracoid – cor, vertebra cervicalis – cv, furcula – furc, humerus – hum, mandibula – mand, phalanx – ph, praemaxillare – praemax, radius – rad, scapula – scap, sternum – stern, tarsometatarsus – tmt, tibiotarsus – tt, ulna – ul, caudal – caud, cranial – cran, distal – dist, proximal – prox, majoris – maj, digiti – dig,

Institutional abbreviations:

BVP: Beijing Natural History Museum, China.
 MB : Museum für Naturkunde Berlin, Germany.
 MHNL: Muséum d'histoire naturelle de Lyon (new name of collection: Centre de Conservation du Musée des Confluences Lyon), France.
 NHMUK: Natural History Museum United Kingdom, London, UK.
 PIN: Borissiak Paleontological Institute of Russian Academy of Sciences, Moscow, Russia.
 SMF-ME: Senckenberg Museum Frankfurt, Germany.
 SNSB-BSPG: Staatliche Naturwissenschaftliche Sammlungen Bayerns – Bayerische Staatssammlung für Paläontologie und Geologie München, Germany.

Other abbreviations:

MN: Mammal Neogene Unit, MP: Mammal Paleogene Unit

3. List of fossil avian holdings in the SNSB-BSPG

In the lists below, the acronym prefix SNSB-BSPG of inventory numbers is omitted for space reasons.

3.1. List of determined fossil avian holdings

Avialae

†Archaeopterygidae

**Archaeopteryx bavarica* Wellnhofer, 1993 (probably junior synonym of *A. siemensii*)

Langenaltheimer Haardt, Germany; Late Jurassic, Malm Zeta 2b.

Holotype, “Munich specimen – 7th specimen” (1999 I 50), almost complete skeleton on slab and counter slab. Figured in Wellnhofer (1999; 2008, fig. 5.119).

Archaeopteryx lithographica von Meyer, 1861

Solnhofen, Germany; Late Jurassic, Malm Zeta 2b. Single wing feather (1869 VIII 1), main slab.

Initial holotype specimen until 2011, when the “London specimen” was stated by the ICZN to be the Neotype.

Figured in von Meyer (1861, pl. 8, fig. 3), Wellnhofer (2008, fig. 5.10).

Langenaltheimer Haardt, quarry Ottmann, Germany; Late Jurassic, Malm Zeta 2b.

°Cast (no inventory no.) of Neotype “London specimen – 1st specimen” (original NHMUK 37001). Figured in Owen (1863, pl. 1–4), Wellnhofer (2008, fig. 5.23).

Blumenberg near Eichstätt, quarry Niemeyer, Germany; Late Jurassic, Malm Zeta 2b.

2 casts (1967 I 19, 1993 I 5) of “Berlin specimen – 2nd specimen” (original MB.Av.101, formerly HMN 1880, figured in Dames 1884, pl. 1); Wellnhofer (2008, fig. 5.43–5.58)

Langenaltheimer Haardt, quarry Opitsch, Germany; Late Jurassic, Malm Zeta 2b.

Cast (1992 I 9) of “Maxberg specimen – 3rd specimen” (original disappeared). Figured in Heller (1959, pl. 1–15) and Wellnhofer (2008, fig. 5.63–5.72).

Jachenhausen near Riedenburg, Late Jurassic, Malm Zeta 2.

Cast (1971 I 211) slab and counter slab of “Haarlem specimen – 4th specimen” (original Teyler Museum, Haarlem, Nr.6928 and 6929), Figured in Ostrom (1972, pl. 1–6) and Wellnhofer (2008, fig. 5.76–5.79).

Petershöhe near Eichstätt, quarry F.X. Frey near Workerszell, Germany; Late Jurassic, Malm Zeta 2b.

Casts (1974 I 323a+b) of slab and counter slab of “Eichstätt specimen – 5th specimen” (original Jura-Museum Eichstätt, JME 2257). Figured in Wellnhofer (1974, pl. 20–23; 2008, fig. 5.84–5.101).

Area Eichstätt, quarry unknown, Germany; Late Jurassic, Malm Zeta 2b.

Cast (1988 I 37) of “Solnhofen specimen – 6th specimen” (original Bürgermeister-Müller-Museum, BMMS 500). Figured in Wellnhofer (1988, 1992, 2008, fig. 5, 104–5.116).

Two casts of braincase (1978 I no individual number, 1980 I 65) of London specimen.

Solnhofen, Late Jurassic (1978 I, don. J. Hopson, Chicago) (1980 I 65 don. NHMUK)

Pygostylia

†Confuciusornithiformes

†Confuciusornithidae

Confuciusornis sanctus Hou et al., 1995

Western Liaoning, northeast China, Early Cretaceous skeleton on slab (1999 I 15).

Western Liaoning, northeast China, Early Cretaceous cast (2000 I 5) of skeleton on slab (original in unknown private coll.).

Western Liaoning, northeast China, Early Cretaceous cast (2000 I 6), skeleton on slab (original in Museum Beijing, invent.-nr. unknown).

†Enantiornithes

°*Sinornis santensis* Sereno & Rao, 1992

Chaoyang, Liaoning province, NE China, Early Cretaceous, Aptian–Albian.

Cast of holotype (1996 I 12), skeleton on slab, (original in Beijing Natural History Museum, BVP 538). Figured in Sereno & Rao (1992, figs 2, 4) and Sereno, Rao & Li (2002, figs 8.2–8.7).

°*Concornis lacustris* Sanz & Buscalioni, 1992

Las Hoyas, Cuenca Province, Spain; Early Cretaceous, Barremian.

Cast of holotype (1997 I 4), postcranial skeleton on slab, (original in Unidad de Paleontología, Universidad Autónoma de Madrid, LH2814). Figured in Sanz & Buscalioni (1992, figs 1–8) and Sanz et al. (1995, figs 2–13).

Enantiornithes indet.

Khermeen Tsav, Gobi desert, Mongolia; Late Cretaceous, Maastrichtian, Barun Goyot Fm.

Two eggs (1996 I 40–50).

†Iberomesornithiformes

†Iberomesornithidae

°*Iberomesornis romerali* Sanz & Bonaparte, 1992

Las Hoyas, Cuenca Province, Spain; Early Cretaceous, Barremian.

Cast of holotype (1997 I 4), (original LH022R, Unidad de Paleontología, Universidad Autónoma de Madrid). Figured in Sanz & Bonaparte (1992, figs 1–5).

†Ornithuromorpha

°*Ambiortus dementjevi* Kurochkin, 1982

Khurilt Ulaan Bulag, Andaikhudag Fm., Altai Mountains, Central Mongolia; Early Cretaceous, Hauterivian–Barremian.

Cast of holotype postcranial skeleton (1996 I 51) (original PIN 3790/271+273).

Figured in Kurochkin (1982, fig. 1–2) and O’Connor & Zelenkov (2013, figs 1, 6).

†Hesperornithiformes

Hesperornis sp.

Smoky Hill, Kansas, USA; Late Cretaceous, Niobrara Chalk.

Casts of fem and tmt sin. (1972 I 145). Mentioned in Lambrecht (1933: 247). Whereabouts of originals unknown.

Neornithes

Palaeognathae

†Eremopezidae

**Stromeria fajumensis* Lambrecht, 1929 (junior synonym of *Eremopezus eocaenus* Andrews, 1904, see Rasmussen et al. 2001).

Dimeh, Jebel Quatrani Fm, Fayum, Egypt; Late Eocene.

Holotype dist. tmt (1914 I 53). Figured in Lambrecht (1929, pl. 1, figs 1, 3, 5, pl. 2, fig. 1).

†Dinornithiformes (Moas)

†Dinornithidae

Dinornis robustus Owen, 1846

New Zealand, South Island; Pleistocene–Holocene. Mounted skeleton (1958 I 181) of a female (pers. comm. T. Worthy).

Emeidae

Dinornis didiformis Owen, 1844 (now called *Anomalopteryx didiformis*)

New Zealand; Pleistocene–Holocene.

Few postcranial bones (No. 61978a–d). Unclear, if these are the bones mentioned by Lambrecht (1933: 144).

Dinornithiformes indet.

New Zealand, Otago region, South Island; Pleistocene–Holocene.

Numerous postcranial bones of moas of different taxa (1955 XXI, no individual numbers, received in exchange from the Natural History Museum Vienna); some few specimens labeled as “*Dinornis*”

elephantopus", "*D. casuarius*", "*D. gracilis*", and "*D. gravis*".

Some postcranial bones (probably of one individual) (1968 I 217a, donated by the Technical University of Munich), labeled as "*D. maximus*".

Neognathae

Galliformes (Landfowl)

Phasianidae

Miophasianus altus Milne-Edwards, 1869 (junior synonym of *Miogallus altus*)

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.

Scap cran (1959 II 8383c), hum (1959 II 8383d), ulna dist (1959 II 8980), fem (1959 II 8382), tt (1959 II 8381), 3x tt dist (1959 II 8314, 1959 II 8383a and 8980), tmt dist (male) (1959 II 22072), tmt dist (female) (1959 II 8995).

Described and figured in Göhlich (2002, pl. 2, fig. 1 (8382), fig. 2 (2207), fig. 3 (8980), fig. 4 (8381)).

Rosshaupten near Burgau, Germany; (Early–Middle Miocene, MN5.
tmt (1962 XXV 41).

?*Miophasianus* sp. (junior synonym of *Miogallus*)

Thannhausen (Günzburg county), Bavaria, Germany; Middle Miocene, MN6.

Diaphysis of long bone (1974 I 30).

**Phasianus augustus* von Ammon, 1918 (probably junior synonym of *Miogallus altus*)

Dechbetten in Regensburg, Bavaria, Germany; Middle Miocene, MN5.

Holotype hum (2008 LI 576). Described and figured in von Ammon (1918, fig. 9 and 10).

**Gallus longaevus* von Ammon, 1918 (probably junior synonym of *Miogallus altus*)

Dechbetten in Regensburg, Bavaria, Germany; Middle Miocene, MN5.

Holotype cor prox (2008 LI 663). Described and figured in von Ammon (1918, fig. 8).

**Alectoris bavarica* Ballmann, 1969

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.

Holotype tmt (1937 II 18110), hum (1937 II 18028). Described and figured in Ballmann (1969, pl. 1, fig. 3 (18028), fig. 4 (18110)).

**Taoperdix miocaena* Ballmann, 1969

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.

Holotype cmc (1937 II 18111), tmt (1937 II 18112), hum (1937 II 18119), 2x hum (1937 II 18120 and 18129).

Described and figured in Ballmann (1969, pl. 2, fig. 14 (18111), fig. 15 (18112), fig. 16 (18119)).

Palaeortyx gallica Milne-Edwards, 1869

Saint-Gérard-le-Puy, Allier, France; Early Miocene, MN2, Phryganea limestone.

Cor sin. (1993 IX 625).

Mentioned in Göhlich & Mourer-Chauviré (2005).

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.

2x tt (1937 II 18106–18107) formerly referred to *P. intermedia* by Ballmann 1969, were referred to *P. gallica* by Göhlich & Mourer-Chauviré (2005).

**Palaeortyx? intermedia* Ballmann, 1969 (junior synonym of *Palaeortyx prisca* Milne-Edwards, 1969) (see Göhlich & Mourer-Chauviré 2005)

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.

Holotype cor (1937 II 18103), fem (1937 II 18108), 2x tt (1937 II 18106 and 18107), cor (1937 II 18104), 2x scap (1937 II 18109 and 18096), hum (1937 II 18036), tmt (1937 II 18105).

Described and figured in Ballmann (1969, pl. 1, fig. 1–2 (18103)).

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.

Cor prox (1959 II 8270), 4x hum dist (1959 II 8275, 8384, 8981), ulna dist (1959 II 8283), 4x ph prox dig maj (1959 II 8333, 8334, 8335, 8331), 7x tt dist (1959 II 8306, 8307, 8310, 8311, 8315–8317), tmt dist (1959 II 8322), tmt diaphysis (1959 II 8325).

Described and figured in Göhlich (2002, pl. 2 fig. 6 (8273), fig. 7 (8331) fig. 8 (8270), fig. 9 (8307)).

Palaeortyx prisca Milne-Edwards, 1869

Saint-Gérard-le-Puy, Allier, France; Early Miocene, MN2, Phryganea limestone.

Cor sin. (1993 IX 624).

Mentioned in Göhlich & Mourer-Chauviré (2005).

Palaeortyx phasianoides Milne-Edwards, 1869

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.

39x hum (1937 II 18001–18011, 18013–18018, 18020–18027, 18030–18035, 18037–18045), 2x scap (1937 II 18094–18095), 2x cor (1937 II 18097–18098), 9x cmc (1937 II 18087–18093, 18101–18102), 11x ulna (1937 II 18076–18086), 2x fem (1937 II 18099–18100), 17x tt (1937 II 18059–18075), 13x tmt (1937 II 18046–18058).

Described and figured in Ballmann (1969, pl. 1, fig. 5 (18006)).

Saint-Gérard-le-Puy, Allier, France; Early Miocene, MN2, Phryganea limestone.

2x hum (1993 IX 622–623).

Mentioned in Göhlich & Mourer-Chauviré (2005).

Phasianidae indet.

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.

Cmc dist (1959 II 8292), tmt dist (1959 II 8321).
Figured in Göhlich (2002, pl. 2 fig. 10 (8292)).

Lagopus sp.

Petersbuch 1 (fissure filling), Bavaria, Germany; Middle? Pleistocene.
Cmc (1963 XIV 166).

Helmloch cave near Etzelwang, Bavaria, Germany; Late Pleistocene–Early Holocene.
8 bones (1956 XII 74). Mentioned in Brunner (1940).

Gaiskirch cave (=Schottersmühlhöhle) near Potenstein, Bavaria, Germany; Late Pleistocene.
Tmt (1956 XII 214), cmc (1956 XII 215), tmt (1956 XII 216), cmc (1956 XII 115).

Velburg, Bavaria, Germany; Pleistocene.
tmt (without invent. no).

Anseriformes (Waterfowl)

Anas sansaniensis Milne-Edwards, 1868

Zell („Zellertal“) near Kirchheimbolanden, Rhineland-Palatinate, Germany; Early Miocene, MN1.
Egg (1875 XIV 1). Figured in von Ammon (1918, fig. 2) and mentioned in Lambrecht (1933).

Anas cf. robusta Milne-Edwards, 1868

Dechbetten in Regensburg, Bavaria, Germany; Middle Miocene, MN5.
Hum dist (2008 LI 673). Described and figured in von Ammon (1918, fig. 7).

Mionetta blanchardi (Milne-Edwards, 1863)

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.

Hum prox (1959 II 8271), hum dist (1959 II 8274), 2x cmc prox (1959 II 8292 and 8380), cmc dist (1959 II 8301), rad prox (1959 II 8288).
Described and figured in Göhlich (2002, pl. 1, fig. 1 (8271), fig. 2 (8274), fig. 3 (8380)).

Mionetta natator (Milne-Edwards, 1867)

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.

2x cor cran (1959 II 8269 and 8982), hum prox (1959 II 8272), ul dist (1959 II 8284), tt dist (1959 II 8312).

Described and figured in Göhlich (2002, pl. 1, fig. 5 (8982) and fig. 4 (8272)).

Anseriformes indet.

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.

2x ul prox. (1959 II 8280–8281), ph prox dig maj (1959 II 8379).

Described and figured in Göhlich (2002, pl. 1, fig. 6 (8281) and fig. 7 (8379)).

Anatidae

Anatidae indet.

Harrison in Western Nebraska, USA; Middle Miocene, Harrison-Beds.

Egg (1959 XXII 31). Figured in Abel (1926, fig. 217).

†**Odontopterygiformes (Bony-toothed birds)**

†Pelagornithidae

Odontopteryx toliapica Owen, 1873

Isle of Sheppey, London Clay, Great Britain; Early Eocene, MP8–9.

Cast of skull (without invent. no) (original NHMUK A 57750).

Musophagiformes (Turacos)

Musophagidae

Musophagidae indet.

Gaimersheim near Ingolstadt, fissure filling, Bavaria, Germany, Late Oligocene, MP28.

Prox. hum (1952 I 3290), figured in Ballmann (1970, fig. 1).

Gruiformes (Cranes, Rails, and Allies)

†Messelornithidae

Messelornis sp.

Messel Pit, Hesse, Germany; Early Eocene, MP11.
Skeleton on a slab (1997 I 37).

Messelornithidae indet.

Messel Pit, Hesse, Germany; Early Eocene, MP11.
Two casts of skeleton and of postcranial skeleton (both 1974 I 88) (whereabouts of original unknown).

Rallidae

Rallidae indet.

Herrlingen 1, Baden-Württemberg, Germany; Early Oligocene, MP22.

Ul fragm. (1965 XIV 16), mentioned in Palmowski & Wachendorf (1966: 242).

Porzana porzana (Linnaeus, 1766)

Friesing (Samerberg), Bavaria, Germany; Pleistocene, Eemian Interglacial.

Partial skeleton on a slab (1973 I 59) (stern, cor, scap, hum, furc, cv).

Described and figured in Hoch (1974, pl. 1).

Rallidae? indet.

Peña Caves, parish La Collada, near Gijón, Asturias, Spain; Late Pleistocene.
2x ph (1968 XXV 15).

Gruidae

**Palaeogrus mainburgensis* Göhlich, 2003

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.

Holotype tt dist (1959 II 8309), paratypes: tmt prox (1959 II 8319), rad dist (1959 II 8998), cor prox (1959 II 8385).

Described and figured in Göhlich (2002 (nomen nudum), pl. 1 fig. 11 (8319), fig. 12 (8309)) and in Göhlich (2003 fig. 2 (8309), fig. 3 (8319), fig. 4A–D (8998), fig. 4E (8385)).

Gruiformes indet.

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.

Hum dist (1959 II 8279) figured in Göhlich (2002, pl. 1 fig. 13).

Charadriiformes (Plovers)

Glareolidae

**Mioglareola gregaria* Ballmann, 1979

Steinberg (=Spitzberg) near Appetshofen in the Nördlinger Ries, pocket and fissure fillings, Bavaria, Germany; Middle Miocene, MN6.

Holotype cranium (without beak) (1970 XVIII 851), all further material without invent. no: 6x fragm. crania, 28x maxillary beaks, 5x quadrata, 23x mandibles and beaks, 2x sterna cran, 6x cor, 5x hum, 2x cmc, 3x ph prox dig maj, 3x fem, 2x tt, 15x tmt.

Described and figured in Ballmann (1979, fig. 3 and pl. 1, figs 3–5 (holotype cranium), fig. 5A–B, 6 and pl. 1, figs 1–2 (cranium), fig. 7 and pl. 1, figs 7–8 (quadratum), figs 8–9 (mand), fig. 10 (cor), figs 11–12 and pl. 2, figs 3–4, 7–10 (hum), fig. 13 (cmc), fig. 14 (ph prox dig maj), fig. 15 (tt), fig. 16 (tmt)).

**Mioglareola* n.sp.? Ballmann, 1979

Steinberg (=Spitzberg) near Appetshofen in the Nördlinger Ries, pocket and fissure fillings, Bavaria, Germany; Middle Miocene, MN6.

Hum, 2x tmt (all without invent. Nr.)

Described and figured in Ballmann (1979, fig. 20 and pl. 2, fig. 5 (hum)).

**Glareola neogena* Ballmann, 1979

Steinberg (=Spitzberg) near Appetshofen in the Nördlinger Ries, pocket and fissure fillings, Bavaria, Germany; Middle Miocene, MN6.

Holotype hum dext (1970 XVIII 852), all further material without inventory No.: maxilla, quadra-

tum, cor, 6x hum, cmc, ph prox dig maj, tmt.

Described and figured in Ballmann (1979, pl. 1, fig. 9, pl. 2, fig. 1 (holotype hum), fig. 2 (tmt)).

Goldberg hill in the Nördlinger Ries, fissure fillings, Baden-Württemberg, Germany; Middle Miocene, MN6.

Hum prox (without invent. Nr.)

Glareolidae indet.

Steinberg (=Spitzberg) near Appetshofen in the Nördlinger Ries, pocket and fissure fillings, Bavaria, Germany; Middle Miocene, MN6.

Maxilla, 2x tmt (all without invent. Nr.).

Figured in Ballmann 1979, pl. 2, fig. 6 (tmt).

Calidridinae

**Mirolia brevirostrata* Ballmann, 2004

Steinberg (=Spitzberg) near Appetshofen in the Nördlinger Ries, pocket and fissure fillings, Bavaria, Germany; Middle Miocene, MN6.

Holotype cranium (1970 XVIII without sub-number), further material all 1970 XVIII without sub-numbers: premax, mand, cor, hum, ulna, cmc, fem, tt, tmt.

Described and figured in Ballmann (2004, fig. 5 (holotype cranium)).

**Mirolia dubia* Ballmann, 2004

Steinberg (=Spitzberg) near Appetshofen in the Nördlinger Ries, pocket and fissure fillings, Bavaria, Germany; Middle Miocene, MN6.

Holotype hum (1970 XVIII without sub-number), further material all 1970 XVIII without sub-numbers: premax, mand, cor, hum, ulna, cmc, fem, tt, tmt.

Described and figured in Ballmann (2004, fig. 6 (holotype hum)).

**Mirolia parvula* Ballmann, 2004

Steinberg (=Spitzberg) near Appetshofen in the Nördlinger Ries, pocket and fissure fillings, Bavaria, Germany; Middle Miocene, MN6.

Holotype hum (1970 XVIII without sub-number), further material all 1970 XVIII without sub-numbers: cor, hum, ulna, cmc, fem, tmt.

Described and figured in Ballmann (2004, fig. 7 (holotype hum)).

**Mirolia mascaudris* Ballmann, 2004

Steinberg (=Spitzberg) near Appetshofen in the Nördlinger Ries, pocket and fissure fillings, Bavaria, Germany; Middle Miocene, MN6.

Holotype caud mand (1970 XVIII), tentatively referred material all 1970 XVIII without sub-numbers: hum, tmt.

Described and figured in Ballmann (2004, fig. 8 (holotype mand)).

Sphenisciformes (Penguins)*Spheniscus muizoni* Stucchi, 2002

Bahía Inglesa, Bahía-Inglesa-Fm, Chile; Late Miocene/Early Pliocene.

Partial skeleton (2005 VII 1–62).

Figured in Göhlich (2006, fig. 1).

Procellariformes (Tubenoses)

†Diomedeoididae

Diomedeoides lipsiensis (Fischer, 1983)

Steendorp, Belgium; Early Oligocene, Rupelium.

Hum dist (1973 VII 226).

Figured in Mayr et al. (2002, fig. 6B, D) and Mayr

(2009, fig. 7.7d).

Apodiformes (Swifts and Hummingbirds)

Apodidae

Scaniacypselus szarskii (Peters, 1985)

Messel pit, Hesse, Germany; Early Eocene, MP11.

Cast of slab with skeleton (2000 I 2) (original SMF-ME 3576A, with feather remains).

Figured in Mayr & Peters (1999, fig. 2) and Mayr (2009, fig. 12.10).

Pelecaniformes (Pelicans, Cormorants, Gannets and Allies)

Phalacrocoracoidea (Cormorants)

**Borvocarbo tardatus* Göhlich & Mourer-Chauviré, 2010

Rauscheröd near Passau, Bavaria, Germany; Early Miocene, MN4.

Holotype tt (1990 IV16), paratypes: ul prox (1990 IV 17), rad prox (1990 IV 18). All “collection R. Baumgartner” in SNSB-BSPG.

Described and figured in Göhlich & Mourer-Chauviré (2010, fig. 2, 4B, F, K (16 holotype tt), fig. 3A–D, fig. 5B,F,K,P (17), fig. 3E–F (18)) and in Pfeil & Werner (1991, pl. 5, fig. 2. (tt)).

**Phalacrocorax praecarbo* von Ammon, 1918

Dechbetten in Regensburg, Bavaria, Germany; Middle Miocene, MN5.

Holotype cor prox (2008 LI 671).

Described and figured in von Ammon (1918, fig. 3).

**Botaurites avitus* von Ammon, 1918

(junior synonym of *Phalacrocorax brunhuberi* (see Olson (1985)), which was later synonymized with *Phalacrocorax intermedius* (see Mlíkovský (1992)) Dechbetten in Regensburg, Bavaria, Germany; Middle Miocene, MN5.

Holotype cervical vertebra (2008 LI 676).

Described and figured in von Ammon (1918, figs 5–6).

**Ardea brunhuberi* von Ammon, 1918

(referred to *Phalacrocorax* by Olson (1985) and subsequently synonymized with *Phalacrocorax intermedius* (see Mlíkovský (1992))

Dechbetten in Regensburg, Bavaria, Germany; Middle Miocene, MN5.

Holotype cmc prox (2008 LI 607).

Described and figured in von Ammon (1918, fig. 4).

Compared to von Ammon’s figure the specimen is much more fragmentary nowadays, with the proximal end of the cmc completely destroyed.

Pelecanidae

Pelecanus sp.

Steinberg (=Spitzberg) near Appetshofen, Nördlinger Ries, pocket and fissure fillings, Bavaria, Germany; Middle Miocene, MN6.

Bone-bed block (1970 I 46).

Falconiformes (Diurnal Birds of Prey)

Falconiformes (Accipitriformes) indet.

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.

3 x claws (1937 II 18200–18202).

Figured in Ballmann (1969, pl. 2, fig. 17 (18200)).

Accipitridae indet., sp. A

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.

Tmt dist (1959 II 8320), tmt dist (1959 II 8997), tt dist (1959 II 8308), claw IV? (1959 II 8329), claw I/II? (1959 II 8996).

Described and figured in Göhlich (2002, fig. 2 (8320), fig. 3 (8308)).

Accipitridae indet., sp. B

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.

2x ph I 1 (1959 II 8376 and 8377).

Figured in Göhlich (2002, fig. 5 (8377)).

Accipitridae indet., sp. C

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.

Claw I/II? (1959 II 8326), claw I/II? (1959 II 8327), ph III 3 (1959 II 8378).

Described and figured in Göhlich (2002, fig. 4 (8327), fig. 6 (8378)).

Strigiformes (Owls)

Strigidae

**Intulula brevis* (Ballmann, 1969)

(originally described as *Strix brevis*)

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.

Holotype hum (1937 II 18112), tmt (1937 II 18113), tt (1937 II 18117), 2x fem (1937 II 18116, 18114), scap (1937 II 18119).

Described and figured in Ballmann (1969, pl. 1 fig. 7 (18112), fig. 8 (18113), fig. 9 (18117)).

**Otus wintershofensis* Ballmann, 1969

(after Mlíkovský 2002 *Strix wintershofensis*)

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.

Holotype tt (1937 II 18121), hum (1937 II 18223), cmc (1937 II 18225), tmt dist (1937 II 18222), scap cran (1937 II 18224), ulna prox (1937 II 18226), ulna dist (1937 II 18227).

Described and figured in Ballmann (1969, pl. 1 fig. 11 (18121), fig. 12 (18223), fig. 13 (18225)). Mlíkovský (2002: 213) referred one partial hum (1937 II 18223) of this material to *Intulula tinnipara* Mlíkovský, 1998.

Asio sp.

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.

Tmt (1937 II 18120), fem (1937 II 18115).

Strigiformes indet.

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.

Claw (1937 II 18118).

Strigidae? indet.

Peña Caves, parish La Collada, near Gijón, Asturias, Spain; Late Pleistocene.

Ph (1968 XXV 16).

Tytonidae

**Miotyto montispetrosi* Göhlich & Ballmann, 2013

Steinberg (=Spitzberg) near Appetshofen, in the Nördlinger Ries, pocket and fissure fillings, Germany; Middle Miocene, MN6.

Holotype tmt sin (1970 XVIII 867, figured in Göhlich & Ballmann 2013, figs 3, 10H–I, 11C)

paratypes: cor (872), scap (873), hum dist. 2/3 (861), hum prox. (862), ulna prox. (863), ulna prox (871), ulna dist (874), 2x os carpi ulnare (876 + 877), phal. prox. digiti maj. dext. (875), fem dext., prox. (865), tt sin. (866), tt dext. dist. (870), tmt dext. (868), os metatarsale I dext. (878), os metatarsale I sin. (879), ph I 1 dext. (880), ph I 1 dext. (881), ph II 1 dext. (882), ph II 1 sin. (883), ph II 2 dext. (884), ph III 1 dext. (885), ph III 1 sin. (886), ph III 2 dext. (887), ph III 2 sin. (888), ph III 3 or IV 4 dext.? (889), ph IV 1 dext. (890), ph IV 2 dext. (891), ph IV 3 dext. (892), ph III 3 or IV 4 dext (893), 4x unguis claws (894–897).

Holotype and all paratypes (except one ph I 1) most probably belong to one individual.

Described and figured in Göhlich & Ballmann (2013, figs 4–9, fig. 10B, D, O, R, U, W, fig. 11A, E).

Goldberg hill in the Nördlinger Ries, pocket and fissure fillings, Baden-Württemberg Germany; Middle Miocene, MN6.

Cor cran (1966 XXXIV 3276), fem (1966 XXXIV 3277), tmt sin (juvenile) (1966 XXXIV 3278), tt dist, subadult (1966 XXXIV 3279).

Mentioned in Göhlich & Ballmann (2013).

Tyto gigantea Ballmann, 1973

Monte Gargano, fissure filling Chiro/Pi I, Italy; Late Miocene.

Claw (2004 IX 14) (coll. U. Schmid)

Strigiformes indet. sp. B

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.

Ph III 2 (1959 II 8336), claw ph III (1959 II 8330), claw I? (1959 II 8328), claw II? (1959 II 8195).

Described and figured in Göhlich (2002, pl. 1, fig. 8 (8336), fig. 9 (8330)).

Trogoniformes (Trogon)

**Primotrogon wintersteini* Mayr, 1999

Céreste, Dept. Alpes de Hte. Provence, France, Middle Oligocene, MP24.

Holotype skeleton on slab with feather imprints (1997 I 38).

Described and figured in Mayr (1999, fig. 1).

Bucerotiformes (Hornbills)

Phoeniculinae

**Phirriculus pinicola* Mlíkovský & Göhlich, 2000

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.

Holotype hum (1937 II 18188), hum dist. (1937 II 18187), ulna prox. (1937 II 18184), 5x cmc (1937 II 18179–18183), tmt dist. (1937 II 18186).

Described and figured in Mlíkovský & Göhlich (2000, figs 1 and 6 (18188), figs 2 and 7 (18184), figs 3 and 8 (18179), fig. 4 (18186)).

Piciformes (Jacamars, Puffbirds, Woodpeckers and Allies)

Capitonidae

**Capitonides europeus* Ballmann, 1969

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.

Holotype cmc dext (1937 II 18162), 2x cmc (1937 II 18139, 1937 II 18163), 9x ul (1937 II 18153–18161), 6x hum (1937 II 18146–18148, 18150–18152), 5x tt (1937 II 18141–18145), (11x tmt (1937 II 18128–18130, 18132–18138, 18140).

Described and figured in Ballmann (1969, pl. 2, fig. 1 (18162), fig. 2 (18129)).

**Capitonides protractus* Ballmann, 1983
Steinberg (=Spitzberg) near Appetshofen in the Nördlinger Ries, pocket and fissure fillings, Germany; Middle Miocene, MN6.
Holotype tmt dext (1970 XVIII 853), paratypes hum, ul, cmc (1970 XVIII 854–859).
Described and figured in Ballmann (1983, fig. 2.5–2.7 (853), fig. 2.1–2.4 (854–859)).

Capitonides? sp
Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.
Tmt sin (1937 II 18131), hum (1937 II 18149).
Figured in Ballmann (1969, pl.2, fig. 3 (18131)).

Psittaciformes (Parrots)

Messelasturidae

**Tynskya eocaena* Mayr, 2000
Kemmerer, Lincoln County, Tynsky quarry, Wyoming, USA; late Early Eocene, Green River Fm. (Fossil Butte Member).
Holotype (1997 I 6) articulated skeleton on slab and counter slab (2006 I 11).
Described and figured in Mayr (2000, figs 1–5).

Psittacidae

**Bavaripsitta ballmanni* Mayr & Göhlich, 2004
Steinberg (=Spitzberg) near Appetshofen in the Nördlinger Ries, pocket and fissure fillings, Germany; Middle Miocene, MN6.
Holotype tmt (1970 XVIII 899), hum dist (1970 XVIII 900).
Described and figured in Mayr & Göhlich (2004, fig. 1A–D (899)).

Pan-Passeriformes

Zygodactylidae

**Zygodactylus ignotus* Ballmann, 1969
Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Miocene, MN3.
Holotype tmt dext (1937 II 18164), 8x tmt (1937 II 18165–18172), 6x tt (1937 II 18173–18178).
Described and figured in Ballmann (1969, pl. 2, fig. 13 (18164), fig. 12 (18175)).

Zygodactylus sp.

Möhren 6 (fissure filling), Germany; Early Oligocene, MP19.
Tmt (1969 XIII 6).
Mentioned in Heissig (1970: 336)

Passeriformes

Eurylaimidae indet.

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.
2x tmt (1937 II 18189–18190), hum (1937 II 18191), 8x ul (1937 II 18192–18199).

Described and figured in Ballmann (1969, pl. 2, fig. 6 (18190), fig. 7 (18191)).

Passeriformes indet. (Passerines)

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.
Scap (1937 II 18222), several cmc prox (1937 II 18218–18219), several hum (1937 II 18214), several ul dist (1937 II 18217), several ul prox and dist (1937 II 18215–18216), several cmc (1937 II 18220), tt (1937 II 18185), several tt dist (1939 II 18213), several tmt dist (1937 II 18212), several tmt prox (1937 II 18221), tt dist (1937 II 18207), tt dist (1937 II 18208).

Passeres indet., different taxa.

Wintershof-West near Eichstätt, fissure filling, Bavaria, Germany; Early Miocene, MN3.
Passeres, species A Ballmann, 1969
cmc (1937 II 18204, figured in Ballmann (1969, pl. 2, fig. 4))
Passeres, species B Ballmann, 1969
5x cmc (1937 II 18205)
Passeres, species C Ballmann, 1969
cmc (1937 II 18206)
Passeres species D Ballmann, 1969
cmc (1937 II 18209)
Passeres species E Ballmann, 1969
5x cmc (1937 II 18210, figured in Ballmann (1969, pl. 2, fig. 5))
Passeres species F Ballmann, 1969
cmc (1937 II 18211)

Passeriformes indet.

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.
Some hundreds of bone remains (1959 II no individual numbers)

Fringilidae

Coccothraustes coccothraustes (Linnaeus, 1758)
Helmloch cave near Etzelwang, Bavaria, Germany; Late Pleistocene.
Skull and mandible (1956 XII 75)

Troglodytidae

Troglodytes gracilis Brunner, 1958

Breitenberg cave (Breitenberghöhle) near Gössweinstein, Bavaria; Late Pleistocene (MQ 2C–E).
Following Tyrberg (1998: 205) the age of the locality is uncertain.
Holotype cmc (1982 X 6651).
Figured in Brunner (1958, fig. 10).

Corvidae? indet.

Peña Caves, parish La Collada, near Gijón, Asturias, Spain; Late Pleistocene
ul (1968 XXV 12), scaphoulare (1968 XXV 13), tmt prox (1968 XXV 14), cervical vertebra (1968 XXV 17).

3.2. List of undetermined fossil avian holdings (in stratigraphical order)

Aves indet.

Paleogene

St. Antonin near Aix-en-Provence, Southern France;
Paleocene, Sparnacian.
?Egg/eggshells? (1971 I 112).

Wyoming, USA; Late Paleocene-Early Eocene, Will-
wood-Fm. Loc. D1454.
Egg shell fragments (1992 VI 23).

Wyoming, USA; Eocene, Green River Fm.
Feather on slab and counter-slab (1995 I 37).

Wasatch County, Utah, USA; Eocene, Green River Fm.
Bird tracks (1995 I 38).

Burgmagerbein 3 (fissure filling), Bavaria, Germany;
Early Oligocene.
Some bones (no invent.-no.), mentioned in Dehm
(1978).

Möhren 7 (fissure filling), Bavaria, Germany; Early
Oligocene.
Some bone fragments (1969 XXIV 79).

Möhren 19 (fissure filling), Bavaria, Germany; Early
Oligocene, MP21.
Some bones (no invent.-no.), mentioned in Heis-
sig (1978).

Möhren 13 (fissure filling), Bavaria, Germany; Early
Oligocene, MP22.
Some bones (no invent.-no.), mentioned in Heis-
sig (1973).

Weissenburg 9 (fissure filling), Bavaria, Germany;
Early Oligocene.
Tt dist (1966 XXXVII), mentioned in Dehm (1978).

Schelklingen 1 (fissure filling), Baden-Württemberg,
Germany; Oligocene.
Hum (1966 XII 183).

Gaimersheim 1 (fissure filling) near Ingolstadt, Bava-
ria, Germany; Late Oligocene, MP28.
Synsacrum (1952 I 3291), skull with brain-filling
(1952 I), claw (1952 I no individual number).

Céreste, Dept. Alpes de Haute Provence, France;
Middle Oligocene, MP24.
Feather on slab (1976 I 103).

Coderet-Branssat, Allier, France; Late Oligocene,
MP29.
Tmt dist (1968 III 51).

Samland Peninsula (Baltic Sea), Kaliningrad county,
Northwestern Russia; Oligocene.

Feather inclusion in amber (1958 VIII 261, amber-
collection Bachofen-Echt in the BSPG)
Figured in Bachofen-Echt (1949, fig. 179.)

Neogene

Saint-Gérard-le-Puy (this locality name comprises
several localities in the Saint-Gérard-le-Puy area
(see Göhlich & Mourer-Chauviré 2005), but which
in most cases are not further specified), Allier,
France; Early Miocene, MN2.

Numerous bones, eggs and egg shells (1993 IX
21–23, 1993 IX 304, 1993 IX 324, 1993 IX).

Treuchtlingen 2, fissure filling, Bavaria, Germany;
Early Miocene, MN2.

Some bones (no invent.-no.), mentioned in Dehm
(1978).

Weissenburg 6, fissure filling, Bavaria, Germany;
Early Miocene, MN2.

Several bones (1961 XII 638), mentioned in Dehm
(1978).

Petersbuch 28, fissure filling, Bavaria, Germany; Ear-
ly Miocene, MN3.

C.50 bones (no invent.-no).

Erkertshofen 1 + 2 (fissure fillings), Bavaria, Germa-
ny; Early Miocene, MN3.

C.50 bones (no invent.-no), mentioned in Dehm
(1978).

Stubersheim 3 (fissure fillings), Bavaria, Germany;
Early Miocene, MN3.

>100 bones (no invent.-no).

Petersbuch 2, fissure filling, Bavaria, Germany; Early
Miocene, MN4.

Several hundreds of bones (no invent.-no) of galli-
forms, piciforms, strigiforms, charadriiforms, pas-
seriforms, etc., mentioned in Heissig (1978)

Raitenbuch 2, fissure filling, Bavaria, Germany; Early
Miocene, MN4–5.

Some bones (no invent.-no), mentioned in Heissig
(1978).

Undorf (house no. 112) near Regensburg, Bavaria,
Germany; Early/Middle Miocene, MN5.

Egg shells (1955 XXVIII no individual number).

Buch near Illertissen, Bavaria, Germany; Early/
Middle Miocene, MN5.

Egg shells (1965, no invent.-no.).

Adelschlag, Bavaria, Germany; Early/Middle Miocene, MN5.

Egg shells (1956 XIX no individual numbers).

Dinkelscherben (Augsburg county), Bavaria, Germany; Early/Middle Miocene, MN5.

Egg shells (1975 XVII 61, 1975 XVII 13).

Häder near Dinkelscherben, Bavaria, Germany; Early/Middle Miocene, MN5.

Egg shells (1953 I 380).

Burtenbach near Dinkelscherben, Bavaria, Germany; Early/Middle Miocene, MN5.

Egg shells (1958 I no individual numbers).

Sandelzhausen, Bavaria, Germany; Early/Middle Miocene, MN5.

Egg shells (1959 II no individual numbers).

Goldberg hill in the Nördlinger Ries, pocket and fissure fillings, Baden-Württemberg, Germany; Middle Miocene, MN6.

numerous eggs and egg shells (1952 XV 1, 1952 XV 130, 1952 I 173, 1952 I 175, 1953 I 15, 1953 I 17, 1953 I 251–253, 1954 I 60, 1966 XXXIII 35, 1973 I 32, 1973 I 34), numerous bones and bone fragments (1952 XV 3, 1953 I 17–18, 1965 XXXIII 21, 1977 XIII 71–72), feather imprint (1952 XV 131, 1952 XV 2, 1952 XV 132, 1953 I 16, 1957 I 253, 1973 I 33).

Figured in Bolten (1977, 1977 XIII 71)

Steinberg (=Spitzberg) near Appetshofen in the Nördlinger Ries, pocket and fissure fillings Bavaria, Germany; Middle Miocene, MN6.

feather imprints (1957 I 231a+b), several bone fragments (1957 I 232), a lot of bones (without invent.-nr.)

Thannhausen (Günzburg county), Bavaria, Germany; Middle Miocene, MN6.

Hum? diaphysis (1974 I 31).

Bitzenhofen near Dasing, Bavaria, Germany; Middle Miocene, MN6.

Egg shells (1962, no invent.-no).

Steinheim am Albuch, Baden-Württemberg, Germany; Middle Miocene, MN7.

Several bones (1954 I 71, 1960 I 84), egg shells (no invent.-no).

Markt Rettenbach, Bavaria, Germany; Middle Miocene, MN7/8.

Egg shells (1957 I no individual numbers).

Eichenberg near Pfänder mountain (close to Lake Constance), Baden-Württemberg, Germany; Miocene.

Egg shells (1969, no invent.-no).

Bergen near Neuburg/Danube, Bavaria, Germany; Miocene.

Egg shells (1963, no invent.-no).

Rennertshofen near Neuburg/Danube, Bavaria, Germany; Miocene.

Egg shells (1975 XVIII 6).

Aich near Simbach/Inn, Bavaria, Germany; Miocene.

Egg shell (1953 I no individual numbers).

Willershhausen at the Harz, Lower Saxony, Germany; Middle Pliocene.

Feather imprint (1974 I 261).

Pleistocene

Harburg (fissure filling) near Donauwörth, Bavaria, Germany; Pleistocene.

bone (1955 I 584).

Schernfeld near Eichstätt, Bavaria, Germany; Early Pleistocene, MN17.

Few bones (1951 XXVI no individual numbers), mentioned in Dehm (1962)

Thalheim near Bissingen, Bavaria, Germany; Late Pleistocene.

3 bones (1954 I no individual numbers).

Adlerberg near Nördlingen Bavaria, Germany; Late Pleistocene–Recent.

Bones (no invent.-no).

Kastelhänghöhle near Prunn, Bavaria, Germany; Late Pleistocene.

Some bones (1953 I 295).

Tavernelle near Perugia, Umbria, Italy; Plio-Pleistocene (Villafanchian).

Bone (1958 I no individual numbers).

Peña Caves, parish La Collada, near Gijón, Asturias, Spain; Late Pleistocene.

Several bones (1968 XXV no individual numbers).

Tito Bustillo cave in Ribadesella, Asturias, Spain.; Late Pleistocene.

Tmt (1973 VII 634), several bones (1973 V 5).

4. List of lost type material and lost figured specimens of fossil avian taxa

4.1. List of lost type material and lost figured specimens

The specimens listed below are not traceable in the collection of the SNSB-BSPG and it must be assumed that they have been destroyed and lost during WW II. The taxa are systematically arranged.

Galliformes

†Paraortygidae

**Paraortyx lorteti* Gaillard, 1908

Escamps in the Quercy region, Phosphorites du Quercy, Lot, France; Late Eocene, MP19.

Holotype hum (old No. 65). Cast of lost holotype available in the Centre de Conservation du Musée des Confluences Lyon (PQ 1083) (pers. comm. C. Mourer-Chauviré).

Described and figured in Gaillard (1908, fig. 30, pl. 6, figs 5–8).

**Paraortyx brancoi* Gaillard, 1908

Mouillac, Phosphorites du Quercy, Tarn-et-Garonne, France; Late Eocene (this species is only known from the Late Eocene deposits of the Phosphorites du Quercy (see Mourer-Chauviré 2006)). Syntype tmt (old No. 119). Cast of lost syntype available in the Centre de Conservation du Musée des Confluences Lyon (MHNL PQ 1078) (pers. comm. C. Mourer-Chauviré).

Described and figured in Gaillard (1908, fig. 32, pl. 6, figs 13–16).

†Quercymegapodiidae

**Quercymegapodius depereti* (Gaillard, 1908) (originally described as *Palaeocryptonyx depereti*. Not to be confused with *Palaeocryptonyx depereti* Ennouchi, 1930).

Escamps in the Quercy region, Phosphorites du Quercy, Lot, France; Late Eocene, MP19.

Holotype hum (old No. 127). Cast of lost holotype available in the Centre de Conservation du Musée des Confluences Lyon (PQ 1065) (pers. comm. C. Mourer-Chauviré).

Described and figured in Gaillard (1908, fig. 26, pl. 5, figs 9–12).

Phasianidae

**Palaeortyx ocyptera* Milne-Edwards, 1892 (junior synonym of *Palaeortyx brevipes* Milne-Edwards, 1869, see Mourer-Chauviré 1992).

Mouillac, Phosphorites du Quercy, Tarn-et-Garonne, France; Late Oligocene (MP25–28) (this species is only known from the Late Oligocene deposits of the Phosphorites du Quercy (see Mourer-Chauviré 2006)).

Holotype hum (old No. 126). Cast of lost holotype

available in the Centre de Conservation du Musée des Confluences Lyon (PQ 1080) (pers. comm. C. Mourer-Chauviré).

Described in Milne-Edwards (1892, p.71–72) and figured in Gaillard (1908, fig. 27, pl. 5, figs 13–16).

Palaeortyx cayluxensis Lydekker, 1891 (identified later as *P. brevipes* by Mourer-Chauviré 1992)

Mouillac, Phosphorites du Quercy, Tarn-et-Garonne, France; Late Oligocene (this species is only known from the Late Oligocene deposits of the Phosphorites du Quercy (see Mourer-Chauviré 2006)).

Tmt (old No. 241).

Described and figured in Gaillard (1908, fig. 29).

Anseriformes

Anatidae

**Anas isarensis* Lambrecht, 1933

Aumeister (left bank of River Isar) at Munich, Bavaria, Germany; Middle/Late Miocene border.

Holotype scap cran (1926 V 12b).

Described and figured in Lambrecht (1933, fig. 123A) and Stromer (1928, pl. 3, fig. 5).

**Anas luederitzensis* Lambrecht, 1929 (probably belonging to *Mionetta*, see Mourer-Chauviré, 2008)

Lüderitz (also called Lüderitzbucht), Kalahari Fm (following Brodkorb 1964) or Elizabeth Bay Fm (following Mourer-Chauviré 2008), Namibia; Early Miocene.

syntypes hum prox and cor (both no No.)

Figured in Lambrecht (1929, pl. 2, figs 4–5).

Pelecaniformes

?Ardeidae (herons)

**Ardeacites molassicus* Haushalter, 1855 (following Ammon (1918) systematic identity uncertain).

Harbartshofen in the Allgäu, Bavaria, Germany; Early Miocene (Upper Marine Molasse).

Holotype hum (no No, lost already before 1918, see von Ammon 1918).

Figured in Haushalter (1855, pl. 2, fig. 1), mentioned in von Ammon (1918:12) and Lambrecht (1933: 314f).

Charadriiformes

Scolopacidae (Sandpipers and Allies)

**Totanus edwardsi* Gaillard, 1908

Mouillac, Phosphorites du Quercy, Tarn-et-Garonne, France; Middle Eocene–Late Oligocene (old collections only).

Holotype hum dist (old No. 124). Cast of lost holotype available in the Centre de Conservation du Musée des Confluences Lyon (PQ 1067) (pers. comm. C. Mourer-Chauviré).

Described and figured in Gaillard (1908, fig. 37).

“Core-Gruiformes”

Rallidae (Rails)

Quercyrallus arenarius (Milne-Edwards, 1892) (described as *Rallus arenarius*)

Escamps in the Quercy region, Phosphorites du Quercy, Lot, France; Late Eocene, MP19.

Hum (old No. 125).

Described and figured in Gaillard (1908, fig. 33).

Columbiformes (Doves and Sandgrouse)

Pteroglididae

Archaeoganga validus (Milne-Edwards, 1892) (described as *Pterocles validus*)

Mouillac, Phosphorites du Quercy, Tarn-et-Garonne, France; Middle Eocene–Late Oligocene (old collections only).

Tt dist (old No. 38). Cast of lost tt available in the Centre de Conservation du Musée des Confluences Lyon (PQ 1062) (pers. comm. C. Mourer-Chauviré).

Described and figured in Gaillard (1908, fig. 24).

“Caprimulgiformes” (Nightjars and allies)

†Archaeotrogonidae

**Archaeotrogon zitteli* Gaillard, 1908

Mouillac, Phosphorites du Quercy, Tarn-et-Garonne, France; Early and Late Oligocene.

(this species is only known from Oligocene deposits of the Phosphorites du Quercy (see Mourer-Chauviré 2006)).

Holotype hum (old No. 128). Cast of lost holotype available in the Centre de Conservation du Musée des Confluences Lyon (PQ 1053) (pers. comm. C. Mourer-Chauviré).

Described and figured in (Gaillard 1908, fig. 17 and pl. 3, figs 24–25).

Archaeotrogon venustus Milne-Edwards, 1892

Mouillac, Phosphorites du Quercy, Tarn-et-Garonne, France; Late Eocene–Late Oligocene.

2x hum (old No. 50 and 57). No 50 is described and figured in Gaillard (1908, fig. 14, pl. 3, fig. 20–23).

There is a cast of a humerus from Munich available in the Centre de Conservation du Musée des Confluences Lyon (PQ 1052). This casted humerus does not correspond the figured hum (No 50) (pers. comm. C. Mourer-Chauviré), but might perhaps correspond the lost hum No 57.

Apodiformes

Hemiprocnidae (tree swifts)

**Cypselavus gallicus* Gaillard, 1908

Mouillac, Phosphorites du Quercy, Tarn-et-Garonne, France; Middle Eocene–Early Oligocene.

Lectotype hum (old No. 29) (lectotype designation

by Brodkorb 1971). Cast of lost lectotype available in the Centre de Conservation du Musée des Confluences Lyon (PQ 1059) (pers. comm. C. Mourer-Chauviré).

Described and figured in Gaillard (1908, fig. 13, pl. 3, figs 12–15).

Cariamae (Seriemas and allies)

†Idiornithidae

Orthocnemus major Milne-Edwards, 1892 (published in Gaillard (1908) as *O. major*, but identified later as *Idiornis gallicus* (Milne-Edwards, 1892) and nowadays named *Dynamopterus gallicus* (Milne-Edwards, 1892) (see Mourer-Chauviré 2013)

Escamps in the Quercy region, Phosphorites du Quercy, Lot, France; Late Eocene, MP19.

Tmt prox (old No. 121). Cast of lost tmt available in the Centre de Conservation du Musée des Confluences Lyon (PQ 1042) (pers. comm. C. Mourer-Chauviré).

Described and figured in Gaillard (1908, fig. 35, pl. 7, fig. 1–4).

†Ameghinornithidae

**Strigogyps dubius* Gaillard, 1908

Escamps in the Quercy region, Phosphorites du Quercy, Lot, France; Late Eocene, MP19.

Holotype tt dist (old No. 2). Cast of lost holotype available in the Centre de Conservation du Musée des Confluences Lyon (PQ 1073) (see Mourer-Chauviré 1987).

Described and figured in Gaillard (1908, fig. 5, pl. 2, figs 1–4).

Falconiformes

Sagittariidae (see Mourer-Chauviré & Cheneval, 1983)

**Pelargopappus schlosseri* (Gaillard, 1908) (described as *Amphiserpentarius schlosseri*)

Escamps in the Quercy region, Phosphorites du Quercy, Lot, France; Late Eocene, MP19.

Holotype tt dist. (old No. 1). Cast of lost holotype available in the Centre de Conservation du Musée des Confluences Lyon (PQ 1045) (pers. comm. C. Mourer-Chauviré)

Further referred material: ph prox III (old No. 114) from Mouillac, Phosphorites du Quercy, Tarn-et-Garonne, France; Middle Eocene–Early Oligocene (material from new collections is Early and Late Oligocene).

Figured in Gaillard (1908, fig. 7, pl. 2, figs 5–8 (holotype tt)) and in Cracraft & Rich (1972, fig. 5a–d).

Accipitridae

“*Aquilavus*” *hypogaeus* (Milne-Edwards, 1892) (described as *Aquila(?) hypogaea*) (old collections only)

Escamps in the Quercy region, Phosphorites du Quercy, Lot, France; Late Eocene, MP19.

Tmt dist (old No. 223). Cast of lost tmt available in the Centre de Conservation du Musée des Confluences Lyon (PQ 1044) (pers. comm. C. Mourer-Chauviré).

Described and figured in Gaillard (1908, fig. 1, pl. 1, fig. 1).

Strigiformes

Tytonidae

Necrobyas harpax Milne-Edwards, 1892

Mouillac, Phosphorites du Quercy, Tarn-et-Garonne, France; Early Oligocene. (this species is only known from the Early Oligocene deposits of the Phosphorites du Quercy (see Mourer-Chauviré 2006))

Tmt (old No. 115). Cast of lost tmt available in the Centre de Conservation du Musée des Confluences Lyon (PQ 1049) (pers. comm. C. Mourer-Chauviré).

Described and figured in Gaillard (1908, fig. 2, pl. 1, figs 5–8).

Coraciiformes

†Geranopteridae

Geranopterus alatus Milne-Edwards, 1892

Escamps in the Quercy region, Phosphorites du Quercy, Lot, France; Late Eocene, MP19.

Hum (old No. 223).

Described and figured in Gaillard (1908, fig. 9, pl. 3, fig. 16–19).

4.2. List of further untraceable materials of fossil birds in the BSPG mentioned in publications

Material of the following fossil bird taxa is mentioned (citations below) to be stored in the collection of the SNSB-BSPG, but is also untraceable. All of this material has to be assumed to be lost.

Ichthyornithes

Ichthyornis dispar (Marsh, 1872), several bones from Solomon River, Kansas, USA, Cretaceous. Mentioned in Lambrecht (1933: 581).

Ichthyornis victor Marsh, 1876, several bones from Wallace County, Kansas, USA, Cretaceous. Mentioned in Lambrecht (1933: 582).

Dinornithiformes (moas)

“*Emeus*” *casuarinus* (Owen, 1846), complete skeletons from New Zealand, Pleistocene-Holocene. Mentioned in Lambrecht (1933: 147).

“*Emeus*” *crassus* (Owen, 1846), several bones from New Zealand, Pleistocene-Holocene. Mentioned in Lambrecht (1933: 146).

“*Euryapteryx*” *elephantopus* (Owen, 1858), several

bones from New Zealand, Pleistocene-Holocene. Mentioned in Lambrecht (1933: 150).

“*Euryapteryx*” *gravipes* Lydekker, 1891, several bones from New Zealand, Pleistocene-Holocene. Mentioned in Lambrecht (1933: 152).

Dinornis ingens Owen, 1844, cast of a skeleton from New Zealand, Pleistocene-Holocene. Mentioned in Lambrecht (1933: 139).

Dinornis maxmimus Haast, 1869, several bones from New Zealand, Pleistocene-Holocene. Mentioned in Lambrecht (1933: 137).

Dinornis novaezealandiae Owen, 1843, several bones from New Zealand, Pleistocene-Holocene. Mentioned in Lambrecht (1933: 140).

Struthioniformes

Struthio karatheodoris Forsyth Major 1888, egg-shell fragments from Samos, Greece, Late Miocene. Mentioned in Lambrecht (1933: 100).

Galliformes

Palaeortyx gallica Milne-Edwards, 1869, several bones from Phosphorites du Quercy, France, Late Oligocene. Mentioned in Lambrecht (1933: 452).

Taoperdix pessieti (Gervais, 1862), slab with skeleton from Armissan near Narbonne, France, Oligocene. Mentioned in Lambrecht (1933: 432).

Miophasianus sp. (junior synonym of *Miogallus*), unspecified material from fissure filling Attenfeld near Neuburg, Germany, Miocene. Mentioned in Lambrecht (1933: 681).

Anseriformes

“*Anas*” (*Mionetta*) *blanchardi* Milne-Edwards, 1863, several bones from Montaignu-le-Blin in the Saint-Gérard-le-Puy area, France, Miocene, MN2a. Mentioned in Lambrecht (1933: 356f).

Anas sansaniensis Milne-Edwards, 1868, several bones, eggs and feather imprints from Hahnenberg near Appetshofen, and Wallerstein hill in the Nördlinger Ries, both Germany, Miocene. Mentioned in Lambrecht (1933: 358).

Anas velox Milne-Edwards, 1868, tt and ph? from fissure filling north of Attenfeld near Neuburg, eggs from Hahnenberg, both Germany, Miocene. Mentioned in v. Ammon (1918), Lambrecht (1933), and Schlosser (1916).

Gruiformes

Palaeoaramides christyi (Milne-Edwards, 1869), several bones from Montaignu-le-Blin in the Saint-Gérard-le-Puy area, France, Miocene, MN2a. Mentioned in Lambrecht (1933: 462).

Palaeogrus excelsa (Milne-Edwards, 1871), several bones from St.-Gérard-le-Puy, France, Miocene, MN2a. Mentioned in Lambrecht (1933: 519).

Charadriiformes

Totanus lartetianus Milne-Edwards, 1868, several bones from Montaigu-le-Blin in the Saint-Gérard-le-Puy area, France, Miocene, MN2a. Mentioned in Lambrecht (1933: 537).

Larus elegans Milne-Edwards, 1868, several bones from Saint-Gérard-le-Puy, France, Miocene, MN2a. Mentioned in Lambrecht (1933: 542).

Tringa gracilis Milne-Edwards, 1868, some bones from Saint-Gérard-le-Puy, France, Miocene, MN2a. Mentioned in Lambrecht (1933: 534).

Phoenicopteriformes

Palaelodus ambiguus Milne-Edwards, 1871, mounted skeleton from Saint-Gérard-le-Puy, France, Miocene, MN2a. Mentioned in Lambrecht (1933: 339).

Columbiformes

“*Pterocles*” (*Archaeoganga*) *larvatus* Milne-Edwards, 1892, hum from Mouillac (old collections only), Phosphorites du Quercy, France; Middle Eocene-Late Oligocene. Mentioned in Lambrecht (1933: 589).

Apodiformes

Aegialornis gallicus Lydekker, 1891, hum from Phosphorites du Quercy, France, Middle and Late Eocene. Mentioned in Lambrecht (1933: 623) and Gaillard (1908: 55).

Pelecaniformes

“*Oligocorax*” (*Nectornis*) *miocaenus* Milne-Edwards, 1867, several bones from Montaigu-le-Blin in the Saint-Gérard-le-Puy area, France, Miocene, MN2a. Mentioned in Lambrecht (1933: 291).

“*Pelecanus*” (*Miopelecanus*) *gracilis* Milne-Edwards, 1868, several bones from Hahnenberg near Appetshofen, Germany, Middle Miocene. Mentioned in Lambrecht (1933: 277), Mlíkovský (1995: 633), and Fraas (1870).

“*Pelecanus*” (*Miopelecanus*) *intermedius* Fraas, 1870, sternum, pelvis etc. from Hahnenberg near Appetshofen, Germany, Middle Miocene. Mentioned in Lambrecht (1933: 277, Mlíkovský (1996: 633), and Fraas (1870).

“*Ibis*” (*Gerandibis*) *pagana* Milne-Edwards, 1868, several bones from Montaigu-le-Blin in the Saint-Gérard-le-Puy area, France, Miocene, MN2a. Mentioned in Lambrecht (1933: 331).

Ardeidae indet. (*Ardea?* sp.) Aumeister (left bank of River Isar) at Munich, Bavaria; Middle/Late Miocene border. Mentioned in Stromer (1928: 4), Lambrecht (1933: 677), and Mlíkovský (1996: 636).

Cariamiformes

Filholornis paradoxa Milne-Edwards, 1892 (junior synonym of *Elaphrocnemus phasianus*), hum (old nr. 118) from Phosphorites du Quercy, France, Late Eocene-Early Oligocene. Mentioned in Lambrecht (1933: 456) and Gaillard (1908: 76).

“*Orthocnemus*” (*Idiornis*) *minor* Milne-Edwards, 1892 (now named *Dynamopterus minor*), tt from Phosphorites du Quercy, France, Middle Eocene-Early Oligocene (mentioned in Lambrecht 1933: 490).

Falconiformes

?*Milvus deperditus* Milne-Edwards, 1871, some bones from the Phosphorites du Quercy, France, Middle Eocene-Early Oligocene. Mentioned in Lambrecht (1933: 418.).

Dedication

This article is dedicated to my dear colleague Dr. Winfried Werner, who was a scientific long-time companion during the earlier stage of my scientific career in Munich in honor to his deep devotion to the palaeontological collection at the BSPG.

Acknowledgements

I thank Laura L. Schulz (Tracy, USA), who has assisted in the past in collecting data for this compilation. I am grateful to Cécile Mourer-Chauviré (Université Claude-Bernard Lyon 1, France) who helped with information on the age of some French localities and who provided data on the casts of some of the lost specimens. Thanks to Markus Moser and Mike Reich (both BSPG) for helping with some inventory numbers, Oliver Rauhut (BSPG) for giving access to the collection and to Trevor Worthy (Flinders University, Adelaide, Australia) for an updated determination of the mounted Moa skeleton in the BSPG. I thank my colleagues Cécile Mourer-Chauviré and Gerald Mayr (SFM) for improving this article through their thorough reviews.

5. References

- Abel O. 1926. Amerikafahrt: Eindrücke, Beobachtungen und Studien eines Naturforschers auf einer Reise nach Nordamerika und Westindien. Jena, Gustav Fischer, 462 p.
- Ammon L von. 1918. Tertiäre Vogelreste von Regensburg und die jungmiocäne Vogelwelt. Abhandlungen des naturwissenschaftlichen Vereins zu Regensburg, 12, 1–69.
- Andrews CW. 1904. On the pelvis and hind-limb of *Mullerornis betsilei* M.-Edw. & Grand., with a note on the occurrence of a ratite bird in the upper Eocene beds of the Fayum, Egypt. Proceedings of the Zoological Society of London 1904, 163–171.
- Bachofen-Echt A. 1949. Der Bernstein und seine Einschlüsse. Wien, Springer-Verlag, 204 p.

- Ballmann P. 1969. Die Vögel aus der altburdigalen Spaltenfüllung von Wintershof (West) bei Eichstätt in Bayern. *Zitteliana* 1, 5–60.
- Ballmann P. 1970. Ein neuer Vertreter der Musophagidae (Aves) aus dem Chattium von Gaimersheim bei Ingolstadt (Bayern). *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Historische Geologie*, München 10, 271–275.
- Ballmann P. 1979. Fossile Glareolidae aus dem Miozän des Nördlinger Ries (Aves: Charadriiformes). *Bonner Zoologische Beiträge* 30, 51–101.
- Ballmann P. 1983. A new species of fossil barbet (Aves: Piciformes) from the Middle Miocene of the Nördlinger Ries (Southern Germany). *Journal of Vertebrate Paleontology* 3(1), 43–48.
- Ballmann P. 2004. Fossil Calidridinae (Aves: Charadriiformes) from the Middle Miocene of the Nördlinger Ries. *Bonner Zoologische Beiträge* 52(1/2), 101–114.
- Bolten RH. 1977. Die karbonatischen Ablagerungen des obermiozänen Kratersees im Nördlinger Ries. PhD Thesis, University Munich, Munich, 249 p.
- Brodkorb P. 1964. Catalogue of fossil birds: Part 2 (Anseriformes through Galliformes). *Bulletin of the Florida State Museum (Biol. Sci.)* 8(3), 195–335.
- Brodkorb P. 1971. Catalogue of fossil birds: Part 4 (Columbiformes through Piciformes). *Bulletin of the Florida State Museum (Biol. Sci.)* 15(4), 163–266.
- Brunner G. 1940 Das Helmloch bei Etzelwang (Obpf.) Fund von *Dolomys lenki* Heller nebst einigen Beobachtungen zur Morphologie der fränk. Alb. *Zeitschrift der Deutschen Geologischen Gesellschaft* 92, 499–528.
- Brunner G. 1958. Nachtrag zur Breitenberghöhle bei Gössweinstein/Ofr. *Neues Jahrbuch für Geologie und Paläontologie*, Monatshefte 1958, 500–517.
- Cracraft J, Rich PV. 1972. The systematics and evolution of the Cathartidae in the Old World Tertiary. *Condor* 74, 272–283.
- Dames W. 1884. Ueber Archaeopteryx. *Palaeontologische Abhandlungen* 2, 119–196.
- Dehm R 1962. Altpleistozäne Säuger von Schernfeld bei Eichstätt in Bayern. *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Historische Geologie* 2, 17–61.
- Dehm R. 1978. Neue tertiäre Spaltenfüllungen im süddeutschen Jura. *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Historische Geologie* 18, 289–313.
- Ennouchi E. 1930. Contribution à l'étude de la faune du Tortonien de La Grive St-Alban (Isère). *Les Presses Modernes*, Paris, 135 p.
- Fischer K. 1983. Möwenreste (Laridae, Charadriiformes, Aves) aus dem mitteloligozänen Phosphoritknollenhorizont des Weissesterbeckens bei Leipzig (DDR). *Mitteilungen aus dem Zoologischen Museum in Berlin* 59, Suppl., *Annalen für Ornithologie* 7, 151–155.
- Forsyth Major CJ. 1888. Sur un gisement d'ossements fossiles dans l'île de Samos, contemporains de l'âge de Pikermi. *Comptes Rendus Hebdomadaires de l'Académie des Sciences (Paris)* 107, 1178–1181.
- Fraas O. 1870. Die Fauna von Steinheim. Mit Rücksicht auf die miozänen Säugethier- und Vogelreste des Steinheimer Beckens. *Württembergische naturwissenschaftliche Jahreshefte* 26(2–3), 184 p.
- Gaillard C. 1908. Les oiseaux des phosphorites du Quercy. PhD Thesis, Faculté des Sciences de l'Université de Lyon, Lyon, 178 p.
- Gervais P. 1862. Examen d'un ornitholithe d'Armissan (Aude). *Comptes Rendus Hebdomadaires de l'Académie des Sciences (Paris)* 54, 895–896.
- Göhlich UB. 2002. The avifauna of the Miocene Fossilagerstätte Sandelzhausen (Upper Freshwater Molasse, Southern Germany). *Zitteliana* 22, 169–190.
- Göhlich UB. 2003. A new crane (Aves, Gruidae) from the Middle Miocene of Sandelzhausen (Upper Freshwater Molasse, Southern Germany). *Journal of Vertebrate Paleontology* 23(2), 387–393.
- Göhlich UB. 2006. Ein Pinguin aus der Wüste - *Spheniscus urbinai* Stucchi, 2002. *Jahresbericht 2005 und Mitteilungen der Freunde der Bayerischen Staatssammlung für Paläontologie und Geologie München* 34, 45–47.
- Göhlich UB, Ballmann P. 2013. A new barn owl (Aves: Strigiformes: Tytonidae) from the Middle Miocene of the Nördlinger Ries (Germany) with remarks on the history of the owls. In: Göhlich UB, Kroh A (Eds) *Paleornithological Research 2013 – Proceedings of the 8th International Meeting of the Society of Avian Paleontology and Evolution*. Vienna, Natural History Museum Vienna, 103–122.
- Göhlich UB, Mourer-Chauviré C. 2005. Revision of the phasianids (Aves, Galliformes) from the Early Miocene of Saint-Gérand-le-Puy (Allier, France). *Palaeontology*, 48(6), 1331–1350.
- Göhlich UB, Mourer-Chauviré C. 2010. A new cormorant-like bird (Aves, Phalacrocoracoidea) from the Early Miocene of Rauscheröd (Southern Germany). In: Boles WE, Worthy TH (Eds) *Proceedings of the VII International Meeting of the Society of Avian Paleontology and Evolution*. Records of the Australian Museum 62(1), 61–70.
- Haast, J. 1869. On the measurements of *Dinornis* bones obtained from excavations in a swamp situated at Glenmark, on the property of Messrs Kermode and Co., up to 15th February, 1868. *Transactions and Proceedings of the New Zealand Institute* 1, 80–89.
- Hausalter CL. 1855. Merkwürdige fossile Tierüberreste aus der Allgäuer Molasse. PhD Thesis, University Munich, Munich.
- Heller F. 1959. Ein dritter *Archaeopteryx*-Fund aus den Solnhofener Plattenkalken von Langenaltheim/Mfr. *Erlanger Geologische Abhandlungen* 31, 1–25.
- Heissig K. 1970. Neue Fundstellen oligozäner Spaltenfaunen im Schwäbisch-Fränkischen Jura. *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Historische Geologie*, München 10, 331–350.
- Heissig K. 1973. Oligozäne Vertebraten aus der Spaltenfüllung „Möhren 13“ bei Treuchtlingen, Fränkischer Jura. *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Historische Geologie* 13, 177–182.
- Heissig K. 1978. Fossilführende Spaltenfüllungen Süddeutschlands und die Ökologie ihrer oligozänen Huftiere. *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Historische Geologie* 18, 237–288.
- Hoch E. 1974. The spotted crane, *Porzana porzana* (L.) (Rallidae, Aves), from a Bavarian Eem interglacial lake deposit. *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Historische Geologie* 14, 11–20.
- Hou L, Zhou Z, Gu Y, Zhang H. 1995. *Confuciusornis sanctus*, a new Late Jurassic sauriurine bird from China. *Chinese Science Bulletin* 40(18), 1545–1551.
- Kurochkin EN. 1982. New order of birds from the Lower Cretaceous in Mongolia. *Proceedings of the USSR Academy of Sciences Doklady AN SSSR* 262(2), 215–218.
- Lambrecht K. 1929. Ergebnisse der Forschungsreisen Prof. E. Stromers in den Wüsten Aegyptens. V. Tertiäre Wirbeltiere. 4. *Stromeria fajumensis* n. g., n. sp., die kontinentale Stammform der Aepyornithidae, mit einer Übersicht über die fossilen Vögel Madagaskars und Afrikas. *Abhandlungen der Bayerischen Akademie der Wissenschaften, math.-naturwiss. Abt.*, Neue Folge 4, 1–18.
- Lambrecht K. 1933. *Handbuch der Palaeornithologie*. Berlin, Verlag Gebrüder Borntraeger, 1024 p.
- Linnaeus C. 1758. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus differentiis, synonymis, locis* I. Stockholm, Laurentii Salvii, 824 p.
- Linnaeus C. 1766. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus differentiis, synonymis, locis* I (12th ed). Stockholm, Laurentii Salvii, 1327 p.
- Lydekker R. 1891. *Catalogue of the Fossil Birds*. London, British Museum, 368p.
- Marsh OC. 1872. Discovery of a remarkable fossil bird. *American Journal of Science* 5, 56–57.
- Marsh OC. 1876. Notice of new Odontornithes. *American Journal of Science* 3(11), 509–511.
- Mayr G. 1999. A new trogon from the Middle Oligocene of Céreste, France. *The Auk* 116(2), 427–434.

- Mayr G. 2000. A new raptor-like bird from the Lower Eocene of North America and Europe. *Senckenbergiana Lethaea* 80(1), 59–65.
- Mayr G. 2009. Paleogene fossil birds. Heidelberg, Springer, xiii+262 p.
- Mayr G, Peters DS. 1999. On the systematic position of the Middle Eocene swift *Aegialornis szarskii* Peters 1985 with description of a new swift-like bird from Messel (Aves, Apodiformes). *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte* 1999, 312–320.
- Mayr G, Göhlich UB. 2004. A new parrot from the Miocene of Germany, with comments on the phylogenetic significance of hypotarsus morphology of the Psittacidae. *Belgian Journal of Zoology* 134(1), 47–54.
- Mayr G, Peters DS, Rietschel S. 2002. Petrel-like birds with a peculiar foot morphology from the Oligocene of Germany and Belgium (Aves: Procellariiformes). *Journal of Vertebrate Paleontology* 22(3), 667–676.
- Meyer von H. 1861. *Archaeopteryx lithographica* (Vogel-Feder) und *Pterodactylus* von Solenhofen. *Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefakten-Kunde* 1861, 678–679.
- Milne-Edwards A. 1863. Mémoire sur la distribution géologique des oiseaux fossiles et description de quelques espèces nouvelles. *Annales des sciences naturelles* (4)20, 132–176.
- Milne-Edwards A. 1867–1868. Recherches anatomiques et paléontologiques pour servir à l'histoire des oiseaux fossiles de la France, I. Paris, Victor Masson et fils, 472 p. + Atlas I, pl 1–96.
- Milne-Edwards A. 1869–1871. Recherches anatomiques et paléontologiques pour servir à l'histoire des oiseaux fossiles de la France, II. Paris, Librairie de G. Masson, 627 p + Atlas II, pl 97–200.
- Milne-Edwards A. 1892. Sur les oiseaux fossiles des dépôts éocènes de phosphate de chaux du sud de la France. *Proceedings of the 2nd International Ornithological Congress (Compte-Rendu 2^e Congrès Ornithologique International)*, Budapest (1891), 60–80.
- Mlíkovský J. 1996. Tertiary Avian Localities of Europe. *Acta Universitatis Carolinae* 39 (3–4), 846 p.
- Mlíkovský J. 1998. Two new owls (Aves: Strigidae) from the early Miocene of the Czech Republic, with comments on the fossil history of the subfamily Striginae. *Buteo* 10, 5–22.
- Mlíkovský J. 2002. *Cenozoic birds of the world, part 1: Europe*. Praha, Ninox Press, 406 pp.
- Mlíkovský J, Göhlich UB. 2000. A new wood-hoopoe (Aves: Phoeniculidae) from the early Miocene of Germany and France. *Acta Societatis Zoologicae Bohemicae* 64, 419–424.
- Mourer-Chauviré C. 1987. Les Strigiformes (Aves) des Phosphorites du Quercy (France): systématique, biostratigraphie et paléobiogéographie. In: Mourer-Chauviré C (ed) *L'évolution des Oiseaux d'après le Témoignage des Fossiles*. Documents des Laboratoires de Géologie de Lyon 99, 89–136.
- Mourer-Chauviré C. 1992. The Galliformes (Aves) from the Phosphorites du Quercy (France): Systematics and Biostratigraphy. In: Campbell KE Jr (ed) *Papers in avian paleontology honoring Pierce Brodkorb*. Natural History Museum of Los Angeles County Sciences Series 36, 67–95.
- Mourer-Chauviré C. 2006. The avifauna of the Eocene and Oligocene Phosphorites du Quercy (France): An updated list. *Strata*, série 1, vol.13, 135–149.
- Mourer-Chauviré C. 2008. Birds (Aves) from the Early Miocene of the Northern Sperrgebiet, Namibia. In: Senut B, Pickford M (Eds) *Geology and Palaeobiology of the Namib Desert, Southwestern Africa*. Vol. 3. *Palaeobiology of the Northern Sperrgebiet*. Memoir of the Geological Survey of Namibia, Ministry of Mines and Energy 20, 147–167.
- Mourer-Chauviré C. 2013. *Idiornis*/Oberholser, 1899 (Aves, Gruiformes, Cariamae, Idiornithidae): a junior synonym of *Dynamopterus*/Milne-Edwards, 1892 (Paleogene, Phosphorites du Quercy, France). *Neues Jahrbuch für Geologie und Paläontologie, Abh.* 270(1), 13–22.
- Mourer-Chauviré C, Cheneval J. 1983 Les Sagittariidae Fossiles (Aves, Accipitriformes) de l'Oligocène des Phosphorites du Quercy et du Miocène inférieur de Saint-Gérard-le-Puy. *Geobios* 16(4), 443–459.
- O'Connor JK, Zelenkov NV. 2013. The phylogenetic position of *Ambiortus*: Comparison with other Mesozoic birds from Asia. *Paleontological Journal* 47(11), 1270–1281.
- Olson SL. 1985. The fossil record of birds. In: Farner DS, King JR, Parkes KC (Eds): *Avian Biology* 8, 79–256.
- Ostrom JH. 1972. Description of the Archaeopteryx specimen in the Teyler Museum, Haarlem. *Proceedings Koninklijk Nederlandse Akademie van Wetenschappen B75(4)*, 289–305.
- Owen R. 1843. Remains of *Dinornis novaezealandiae*. *Proceedings of the Zoological Society London* 11, 8–10.
- Owen R. 1844. On *Dinornis*, an extinct genus of tridactyle struthious birds, with descriptions of portions of the skeleton of five species which formerly existed in NewZealand (Part I). *Transactions of the Zoological Society of London* 3, 235–275.
- Owen R. 1846. On *Dinornis* (Part II), containing descriptions of portions of the skull, the sternum and other parts of the skeleton of the species previously determined, with osteological evidences of three additional species, and a new genus, *Palapteryx*. *Transactions of the Zoological Society of London* 3, 307–329.
- Owen R. 1858. On *Dinornis* (Part VII): containing a description of the bones of the leg and foot of *Dinornis elephantopus*, Owen. *Transactions of the Zoological Society of London* IV (5), 149–158.
- Owen R. 1863. On the *Archaeopteryx* of von Meyer with a description of the fossil remains of a long-tailed species, from the lithographic stone of Solenhofen (sic!). *Philosophical Transactions of the Royal Society London* 153, 33–47.
- Owen R. 1873. Description of the skull of a dentigerous bird (*Odontopteryx toliapicus* [sic], Ow.) from the London Clay of Sheppey. *Quaternary Journal of the Geological Society of London* 29, 511–521.
- Palmowski J, Wachendorf H. 1966. Eine unteroligozäne Wirbeltierfauna aus einer Spaltenfüllung in Herrlingen/Blau (Württ.). *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Historische Geologie* 6, 229–245.
- Peters DS. 1985. Ein neuer Segler aus der Grube Messel und seine Bedeutung für den Status der Aegialornithidae (Aves, Apodiformes). *Senckenbergiana Lethaea* 66(1/2), 143–164.
- Pfeil F, Werner W. 1991. Sammlung R. Baumgartner. *Jahresbericht und Mitteilungen der Freunde und Förderer der bayerischen Staatssammlung für Paläontologie* 19, 12–21.
- Rasmussen DT, Simons EL, Hertel F, Judd A. 2001. Hindlimb of a giant terrestrial bird from the upper Eocene, Fayum, Egypt. *Palaeontology* 44, 325–337.
- Sanz JL, Bonaparte JF. 1992: A new order of birds (class Aves) from the Lower Cretaceous of Spain. In: Campbell KE (Ed) *Papers in avian Paleontology – Honoring Pierce Brodkorb*. Los Angeles, Natural History Museum of Los Angeles County, 39–49.
- Sanz JL, Buscalioni AD. 1992. A new bird from the Early Cretaceous of Las Hoyas, Spain, and the early radiation of birds. *Palaeontology* 35(4), 829–845.
- Sanz JL, Chiappe LM, Buscalioni AD. 1995. The osteology of *Concornis lacustris* (Aves: Enantiornithes) from the Lower Cretaceous of Spain and a reexamination of its phylogenetic relationships. *American Museum Novitates* 3133, 1–23.
- Schlosser M. 1916. Neue Funde fossiler Säugetiere aus der Eichstätter Gegend. *Abhandlungen der königlich Bayerischen Akademie der Wissenschaften, math.-phys. Kl.* 28(6), 1–78.
- Sereno PC, Rao C 1992. Early evolution of avian flight and perching: new evidence from Lower Cretaceous of China. *Science* 255 (5046), 845–848.
- Sereno PC, Rao C, Li J 2002. *Sinornis santensis* (Aves: Enantiornithes) from the Early Cretaceous of northeastern China. In: Chiappe LM Witmer L (Eds), *Mesozoic birds: above the heads of dinosaurs*. Berkeley, University of California Press, 184–208.
- Stromer E. 1928. Wirbeltiere im obermiozänen Flinz Münchens. *Abhandlungen der Bayerischen Akademie der Wissenschaften, math.-naturwiss. Abh.* 32(1), 1–71.
- Stucchi M. 2002. Una nueva especie de *Spheniscus* (Aves: Spheniscidae) de la Formación Pisco, Perú. *Boletín de la Sociedad Geológica del Perú* 94, 17–24.

- Tyrberg T. 1998. Pleistocene birds of the Palearctic: A catalogue. Nuttall Ornithological Club 27, 720 pp.
- Wellnhofer P. 1974. Das fünfte Skelettexemplar von *Archaeopteryx*. The fifth skeletal specimen of *Archaeopteryx*. Palaeontographica A147, 169–216.
- Wellnhofer P. 1988. Ein neues Exemplar von *Archaeopteryx*. *Archaeopteryx* 6, 1–30.
- Wellnhofer P. 1992. A new specimen of *archaeopteryx* from the Solnhofen limestone. In: Campbell KE Jr (ed) Papers in avian paleontology honoring Pierce Brodkorb. Natural History Museum of Los Angeles County Sciences Series 36, 3–23.
- Wellnhofer P. 1993. Das siebte Exemplar von *Archaeopteryx* aus den Solnhofener Schichten. *Archaeopteryx* 11, 1–48.
- Wellnhofer P. 1999. Der bayerische Urvogel *Archaeopteryx bavarica* aus den Solnhofener Schichten. *Patrimonia* 177, 5–18.
- Wellnhofer P. 2008. *Archaeopteryx* - Der Urvogel von Solnhofen. München, Verlag F. Pfeil, 256 p.

Appendix 1

List of bird fossil bearing localities housed at the SNSB-BSPG

(in alphabetical order within each country)

Germany

- Adelschlag, Bavaria; Early/Middle Miocene, MN5.
- Adlerberg near Nördlingen Bavaria; Late Pleistocene-Recent.
- Aich near Simbach/Inn, Bavaria; Miocene.
- Bergen near Neuburg/Danube, Bavaria; Miocene.
- Bitzenhofen near Dasing, Bavaria; Middle Miocene, MN6.
- Blumenberg near Eichstätt, quarry Niemeyer; Late Jurassic, Malm Zeta 2b.
- Breitenberg cave (Breitenberghöhle) near Gössweinstein, Bavaria; Late Pleistocene?.
- Buch near Illertissen, Bavaria; Early/Middle Miocene, MN5.
- Burgmagerbein 3 (fissure filling), Bavaria; Early Oligocene.
- Burtenbach near Dinkelscherben, Bavaria; Early/Middle Miocene, MN5.
- Dechbetten, nowadays a part of the city of Regensburg, Bavaria, Middle Miocene, MN5.
- Dinkelscherben (Augsburg county), Bavaria; Early/Middle Miocene, MN5.
- Eichenberg near Pfänder mountain (close Lake Constance), Baden-Württemberg; Miocene.
- Eichstätt area, quarry unknown; Late Jurassic, Malm Zeta 2b.
- Erkertshofen 1 + 2 (fissure fillings), Bavaria; Early Miocene, MN3.
- Friesing (Samerberg), Bavaria; Pleistocene, Eemian Interglacial.
- Gaimersheim near Ingolstadt, fissure filling, Bavaria; Late Oligocene, MP28.
- Gaimersheim 1 (fissure filling) near Ingolstadt, Bavaria; Late Oligocene, MP28.
- Gaiskirch cave (=Schottersmühlhöhle) near Pottenstein, Bavaria; Late Pleistocene.
- Goldberg hill in the Nördlinger Ries, fissure fillings, Baden-Württemberg; Middle Miocene, MN6.
- Häder near Dinkelscherben, Bavaria; Early/Middle Miocene, MN5.
- Harburg (fissure filling) near Donauwörth, Bavaria; Pleistocene.
- Helmloch cave near Etzelwang, Bavaria; Late Pleistocene–Early Holocene.
- Herrlingen 1, Baden-Württemberg; Early Oligocene, MP22.
- Kastelhänghöhle near Prunn, Bavaria; Late Pleistocene.
- Langenaltheimer Haardt (quarry Opitsch, quarry Ottmann); Late Jurassic, Malm Zeta 2b.
- Markt Rettenbach, Bavaria; Middle Miocene, MN7/8.
- Messel Pit, Hesse; Middle Eocene, MP11.
- Möhren 6 (fissure filling); Early Oligocene, MP19.
- Möhren 7 (fissure filling), Bavaria; Early Oligocene.
- Möhren 13 (fissure filling), Bavaria; Early Oligocene, MP22.
- Möhren 19 (fissure filling), Bavaria; Early Oligocene, MP21.
- Petersbuch 1, Bavaria; Middle? Pleistocene, fissure filling.
- Petersbuch 2, fissure filling, Bavaria; Early Miocene, MN4.
- Petersbuch 28, fissure filling, Bavaria; Early Miocene, MN3.
- Petershöhe near Eichstätt, quarry F.X. Frey near Workerszell; Late Jurassic, Malm Zeta 2b.
- Raitenbuch 2, fissure filling, Bavaria; Early Miocene, MN4–5.
- Rauscheröd near Passau, Bavaria; Early Miocene, MN4.
- Rennertshofen near Neuburg/Danube, Bavaria; Miocene.
- Rosshaupten near Burgau; Early/Middle Miocene, MN5.
- Sandelzhausen, Bavaria; Early/Middle Miocene boundary, Karpatian/Badenian boundary, MN5.
- Schelklingen 1 (fissure filling), Baden-Württemberg; Oligocene.
- Schernfeld near Eichstätt, Bavaria; Early Pleistocene, MN17.
- Solnhofen, Germany; Late Jurassic, Malm Zeta 2b
- Spitzberg (see Steinberg near Appetshofen)
- Steinberg(=Spitzberg) near Appetshofen in the Nördlinger Ries, pocket and fissure fillings, Bavaria; Middle Miocene, MN6.
- Steinheim am Albuch, Baden-Württemberg; Middle Miocene, MN7.
- Stubersheim 3(fissure fillings), Bavaria; Early Miocene, MN3.
- Thalheim near Bissingen, Bavaria; Late Pleistocene.
- Thannhausen (Günzburg county), Bavaria; Middle Miocene, MN6.
- Treuchtlingen 2, fissure filling, Bavaria; Early Miocene, MN2.
- Undorf (house no. 112) near Regensburg, Bavaria; Early/Middle Miocene, MN5.
- Velburg, Bavaria; Pleistocene.
- Weissenburg 6, fissure filling, Bavaria; Early Miocene, MN2

Weissenburg 9 (fissure filling), Bavaria; Early Oligocene.

Willershausen at the Harz, Lower Saxony; Middle Pliocene.

Wintershof-West near Eichstätt, fissure filling, Bavaria; Early Miocene, MN3.

Zell („Zellertal“) near Kirchheimbolanden, Rhineland-Palatinate; Early Miocene, MN1.

France

Céreste, Dept. Alpes de Haute Provence, France, Middle Oligocene, MP24.

Coderet-Branssat, Allier, France; Late Oligocene, MP29.

Montaigu-le-Blin (one of the localities in the Saint-Gérard-le-Puy area), Allier, Early Miocene, MN2a, Phryganea limestone.

St. Antonin near Aix-en-Provence, Southern France; Paleocene, Sparnacian

Saint-Gérard-le-Puy, Allier, France; Early Miocene, MN2, Phryganea limestone (this locality name comprises several localities in the Saint-Gérard-le-Puy area (see Göhlich & Mourer-Chauviré 2005), but which are in most cases not precised).

Belgium

Steendorp, Belgium; Early Oligocene, Rupelium.

Great Britain

Isle of Sheppey, London Clay; Early Eocene, MP8–9.

Spain

Las Hoyas, Cuenca Province; Early Cretaceous, Barremian.

Peña Caves, parish La Collada, near Gijón, Asturias; Late Pleistocene.

Tito Bustillo cave in Ribadesella, Asturia; Late Pleistocene.

Italy

Gargano, Chirò quarry, fissure filling, Chirò/Pi I, Late Neogene (MN13–MN14).

Tavernelle near Perugia, Umbria; Plio–Pleistocene (Villafanchian).

USA

Harrison in Western Nebraska; Middle Miocene, Harrison-Beds

Kemmerer, Lincoln County, Tynsky quarry, Wyoming; late Early–Eocene, Green River Fm. (Fossil Butte Member).

Smoky Hill, Kansas; Late Cretaceous, Niobrara Chalk

Wasatch County, Utah; Eocene, Green River Fm.

Wyoming; Late Paleocene–Early Eocene, Willwood-Fm. Loc. D1454.

Wyoming; Eocene, Green River Fm.

Chile

Bahía Inglesa, Bahía-Inglesa-Fm; Late Miocene/Early Pliocene.

Egypt

Dimeh, Jebel Qatrani Fm, Fayum; Late Eocene.

China

Chaoyang, Liaoning province, Early Cretaceous, Aptian–Albian, western Liaoning, Early Cretaceous

Mongolia

Kherment Tsav, Gobi desert; Late Cretaceous, Maastrichtian, Barun Goyot Fm.

Khurilt Ulaan Bulag, Altai Mountains; Early Cretaceous, Hauterivian–Barremian. Andaikhudag Fm.

New Zealand;

unprecised localities; Pleistocene–Holocene

localities of untraceable/lost bird fossils

Germany

Attenfeld near Neuburg, Miocene

Aumeister (left bank of River Isar) at Munich, Bavaria; Middle/Late Miocene border

Harbartshofen in the Allgäu, Bavaria; Early Miocene (Upper Marine Molasse)

Hahnenberg near Appethshofen

Wallerstein hill in the Nördlinger Ries, both Germany, Miocene

France

Armissan near Narbonne, France, Oligocene

Escamps in the Quercy region, Phosphorites du Quercy, Lot, France; Late Eocene, MP19

Montaigu-le-Blin in the Saint-Gérard-le-Puy area, France, Miocene, MN2a

Mouillac, Phosphorites du Quercy, Tarn-et-Garonne, France; Middle Eocene–Late Oligocene (old collections only). For more recent collections and for some bird taxa described from the Quercy deposits the stratigraphic age can be more precise (see Mourer-Chauviré 2006).

St.-Gérard-le-Puy, France, Miocene, MN2a

Namibia

Lüderitz (also called Lüderitzbucht), Kalahari Fm (following Brodkorb 1964) or Elizabeth Bay Fm (following Mourer-Chauviré 2008); Early Miocene

USA

Solomon River, Kansas, USA, Cretaceous

Wallace County, Kansas, USA, Cretaceous