

Tertiary Avian Localities of Switzerland

J. MLÍKOVSKÝ

Institute of Geology and Paleontology, Charles University,
Albertov 6, 128 43 Praha 2, Czech Republic;
and Institute of Ecology, Czech Academy of Sciences,
Květná 8, 603 65 Brno, Czech Republic.

Accepted January 23, 1996

Abstract: At least 23 Tertiary avian localities are known from Switzerland. However, skeletal remains were described only from two of them, while most of the localities yielded avian footprints.

Key-words: Aves, Tertiary, Oligocene, Miocene, Switzerland.

INTRODUCTION

Remains of Tertiary birds from Swiss deposits were for the first time mentioned by A. Escher von der Linth and Hermann von Meyer in 1839 (Escher 1939, Meyer 1839). The remains were found in the early Oligocene locality Matt, and later described as *Protornis glarniensis* by Meyer (1865). While *Protornis glarniensis* was often mentioned in literature (see below), only scattered remarks have been published on Tertiary bird remains from other Swiss localities (Gaudin 1854, Heer 1865, Bachmann 1878, Schaub 1929, 1940a, b, Thenius 1959). In last decades, finds of Tertiary avian footprints were reported more frequently (Speck 1945, Bräm 1954, Gasser 1966, de Clercq and Holst 1971, Weidmann and Reichel 1979, Berger 1985). A previous review of the Tertiary avian localities of Switzerland was given by Mlíkovský (1992).

The stratigraphical divisioning of the Paleogene follows Schmidt-Kittler (1987), that of the Neogene follows Mein (1990). Most of the records came from the rich molasse deposits. Following Richter (1940, see also Homewood *et al.* 1989), four basic molasse layers are distinguished: Lower Marine Molasse (UMM), Lower Freshwater Molasse (USM), Upper Marine Molasse (OMM), and Upper Freshwater Molasse (OSM). Thickness of these molasse layers reaches up to several hundred meters, and covers more MP

and/or MN zones. Moreover, age of the layers is different in different parts of Switzerland (Berger 1992). Recent attempts at a correlation of Swiss molasse with MP and MN zones (Berger 1986, 1992, Engesser and Mayo 1987, Engesser 1990, Burbank *et al.* 1992) allow to assign the majority of the molasse layers to the following zones: UMM = MP 23-24, USM = MP 29 - MN 1, OMM = MN 3, and OSM = MN 4-8. Because this is a simplified correlation, I assigned the localities cited below also to molasse layers.

Museum acronyms are as follows:

- MGL: Musée Géologique, Lausanne, Switzerland
MHNF: Musée d'Histoire Naturelle, Fribourg, Switzerland
NMB: Naturhistorisches Museum, Basel, Switzerland
NMZ: Naturhistorisches Museum, Zürich, Switzerland.

LIST OF LOCALITIES

(1) EGERKINGEN

Location: Solothurn Province. Middle Eocene, MP ?11-13 (Russell *et al.* 1982).

Avifauna: Several bone fragments of a giant flightless (?ratite) bird, *Eleutherornis* (Schaub 1929, 1940a,b, Mlíkovský 1992). Deposited in NMB. Type locality of *Eleutherornis helveticus* Schaub 1940a.

(2) CHAMBLON

Location: Vaud Province. Middle Eocene, MP ?11-13 (Russell *et al.* 1982).

Avifauna: Unspecified bird remains (Thenius 1959). Their whereabouts is unknown.

(3) MATT (Engi-Matt, Engi)

Location: Glarus Province. Early Oligocene, MP ? (Kozur 1984).

Avifauna: Partial skeletons of the Momotidae (*Protornis*), and Trogonidae (indet.) (Escher 1839, Meyer 1839, 1844, 1865, Gervais 1844, Heer 1865, Peyer 1949, 1957, Stüssi 1958, Baumann 1958, Olson 1976). Deposited in NMZ (type of *Protornis glarniensis*). The whereabouts of *Protornis blumeri* is unknown. Type locality of *Protornis glarniensis* Meyer 1844, *Protornis glaronensis* Meyer 1856 and *Protornis blumeri* Heer 1865. *Osteornis scolopacinus* Gervais 1844, and *Protornis glarisiensis* Anonymous 1844 are nomina nuda (see Mlíkovský 1992).

(4) LAMMSCHLUCHT

Location: Vaud Province. Late Oligocene, USM, MP ? (cf. Weidmann and Reichel 1979).

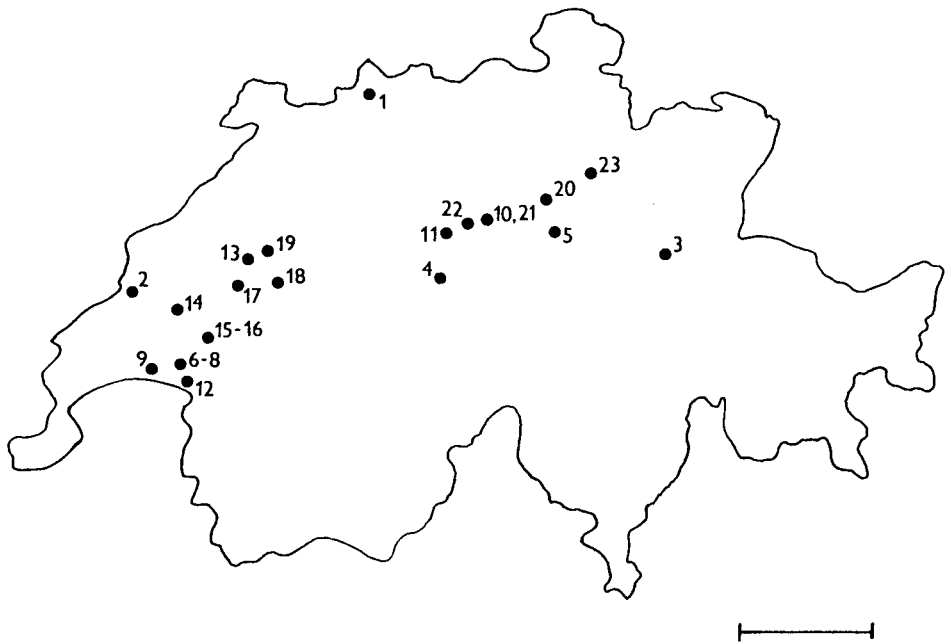


Fig. 1. Tertiary avian localities of Switzerland. The numbering of the localities corresponds with that in the text. Scale bar = 50 km.

Avifauna: Footprints, attributed to the Rallidae (de Clercq and Holst 1971, Weidmann and Reichel 1979). Their whereabouts is unknown.

(5) GOLDAU

Location: Schwyz Province. Late Oligocene, USM, MP ? (cf. Weidmann and Reichel 1979).

Avifauna: Unidentified bird footprints (Bräm 1954). Their whereabouts is unknown.

(6) CHAUDERON

Location: Vaud Province. Late Oligocene, USM, MP ? (Weidmann and Reichel 1979).

Avifauna: Footprints, attributed to the Rallidae and Anatidae (Weidmann and Reichel 1979). Deposited in MGL.

(7) LES ROCHES

Location: Vaud Province. Late Oligocene, USM, MP ? (Weidmann and Reichel 1979).

Deposited in MGL.

Avifauna: Footprints, attributed to a small wader and a ?passerine bird (Weidmann and Reichel 1979).

(8) CRAU COULET

Location: Vaud Province. Late Oligocene, USM, MP ? (Weidmann and Reichel 1979).

Avifauna: Two footprints, attributed to the Scolopacidae (Weidmann and Reichel 1979). Deposited in MGL.

(9) LAUSANNE

Location: Vaud Province. Late Oligocene, MP 27-30 (cf. Berger 1986).

Avifauna: Eggshell fragments (Gaudin 1854). Their whereabouts is unknown.

(10) EMMENWEID

Location: Luzern Province. Miocene, OSM, MN? (cf. Bachmann 1878, Lambrecht 1933).

Avifauna: Egg remains (Bachmann 1878). Their whereabouts is unknown.

(11) FISCHENBACH

Location: Luzern Province. Early Miocene, USM, MN 2 (cf. Weidmann and Reichel 1979). This locality was erroneously called Fischbach by Mlíkovský (1992).

Avifauna: Footprints, attributed to the Charadriiformes (Gasser 1966, Weidmann and Reichel 1979). Deposited in MGL.

(12) FLON MORAND

Location: Luzern Province. Early Miocene, OMM, MN 3 (cf. Weidmann and Reichel 1979).

Avifauna: Footprints, attributed to the Scolopacidae and Laridae (Weidmann and Reichel 1979). Deposited in MGL.

(13) LES USSEMENTS

Location: Vaud Province. Early Miocene, OMM, MN 3 (cf. Weidmann and Reichel 1979).

Avifauna: Footprints, attributed to the Charadriidae and Scolopacidae (Weidmann and Reichel 1979). Deposited in MHNF.

(14) AUGINE 7

Location: Vaud Province. Early Miocene, OMM, MN 3 (Berger 1985).

Avifauna: Small unidentified avian footprints (Berger 1985). Deposited in MHNF.

(15) MAFFLON 1

Location: Fribourg Province. Early Miocene, OMM, MN 3 (Berger 1985).

Avifauna: Unidentified avian footprints (Berger 1985). Deposited in MHNF.

(16) LIEFFRENS 5

Location: Fribourg Province. Early Miocene, OMM, MN 3 (Berger 1985).

Avifauna: Unidentified avian footprints (Berger 1985). Deposited in MHNF.

(17) BRÉ 8

Location: Fribourg Province. Early Miocene, OMM, MN 3 (Berger 1985).

Avifauna: Footprints, attributed to the Scolopacidae (Berger 1985). Deposited in MHNF.

(18) HEITENRIED 7

Location: Fribourg Province. Early Miocene, OMM, MN 3 (Berger 1985).

Avifauna: Two types of unidentified avian footprints (Berger 1985). Deposited in MHNF.

(19) BURG (Burggraben)

Location: Fribourg Province. Early Miocene, OMM, MN 3 (Berger 1985).

Avifauna: Unidentified avian footprints (Berger 1985). Deposited in MHNF.

(20) WALDHALDE

Location: Zug Province. Early Miocene, OMM, MN 3 (cf. Weidmann and Reichel 1979).

Avifauna: Footprints, attributed to the Cursoriidae and Charadriidae (Speck 1945, 1952, Peyer 1950, pl. 16). Deposited in NMZ (one of the plates).

(21) RENGGBACH

Location: Luzern Province. Early Miocene, OMM, MN 3 (cf. Weidmann and Reichel 1979).

Avifauna: Footprints, attributed to the Scolopacidae and Recurvirostridae (Weidmann and Reichel 1979). Deposited in MGL.

(22) SULZIGTOBEL

Location: Luzern Province. Middle Miocene, OSM, MN 5-6 (cf. Bolliger *et al.* 1988, Č. Bůžek, pers. communication).

Avifauna: Unidentified avian footprints (Weidmann 1979). Their whereabouts is unknown.

(23) RISITOBEL

Location: Zürich Province. Middle Miocene, OSM, MN 5-6 (Bolliger *et al.* 1988).

Avifauna: Unidentified avian footprints (Weidmann and Reichel 1979). Deposited in NMZ (?).

DISCUSSION

Most of the localities mentioned above yielded avian footprints from lacustrine and marine deposits. Skeletal remains were mentioned only from the middle Eocene locality Egerkingen and the early Oligocene locality Matt as yet.

REFERENCES

- Anonymous, 1844: Inhalt. *Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefaktenkunde* 1844: iii-xviii.
- Bachmann I., 1878: Fossile Eier aus der obern Süswassermolasse der Umgebung von Luzern. *Abhandlungen der Schweizerischen Paläontologischen Gesellschaft* 5 (4): 1-7.
- Baumann F., 1958: Affine Entzerrung mit einfachen optischen Mitteln. *Schweizerische Paläontologische Abhandlungen* 73(5): 17-21.
- Berger J.-P., 1985: La transgression de la molasse marine supérieure (OMM) en Suisse occidentale. *Münchener Geowissenschaftliche Abhandlungen (A)* 5: 1-208.
- Berger J.-P., 1986: Biozonation préliminaire des charophytes oligocènes de Suisse occidentale. *Eclogae Geologicae Helveticae* 79: 897-912.
- Berger J.-P., 1992: Correlative chart of the European Oligocene and Miocene: application to the Swiss Molasse Basin. *Eclogae Geologicae Helveticae* 85: 573-609.
- Bolliger T., Gatti H. & Hantke R., 1988: Zur Geologie und Paläontologie des Zürcher Oberlandes. *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich* 133: 1-24.
- Bräm H., 1954: Fährten von Wirbeltieren aus der subalpinen Molasse des Bergsturzgebietes von Goldau. *Eclogae Geologicae Helveticae* 47: 306-316.
- Burbank D. W., Engesser B., Matter A. & Weidmann M., 1992: Magnetostratigraphic chronology, mammalian faunas, and stratigraphic evolution of the Lower Freshwater Molasse, Haute-Savoie, France. *Eclogae Geologicae Helveticae* 85: 399-431.
- Clercq S. W. de & Holst H. K. K., 1971: Footprints of birds and sedimentary structures from the subalpine molasse near Flühli (Canton of Luzern). *Eclogae Geologicae Helveticae* 64: 63-69.
- Engesser B., 1990: A preliminary mammal zonation of the Upper Marine Molasse of Switzerland. In: Lindsay E. H., Fahlbusch V. & Mein P. (Eds.), *European Neogene mammal chronology*. New York: Plenum Press, pp. 177-180.
- Engesser B. & Mayo N. A., 1987: A biozonation of the Lower Freshwater Molasse (Oligocene and Agenian) of Switzerland and Savoy on the basis of fossil mammals. In: Schmidt-Kittler

- N. (Ed.), International symposium on mammalian biostratigraphy and paleoecology of the European Paleogene. *Münchener Geowissenschaftliche Abhandlungen (A)* 10: 67-84.
- Escher A., 1839: (Untitled abstract of a lecture). *Verhandlungen der Schweizerischen Naturforschenden Gesellschaft* 24: 50. (In German.)
- Gasser U., 1966: Sedimentologische Untersuchungen in der äusseren Zone der subalpinen Molasse des Entlebuches (Kt. Luzern). *Eclogae Geologicae Helveticae* 59: 723-772.
- Gaudin C. T., 1854: (Untitled abstract of a lecture). *Bulletin des Séances de la Société Vaudoise des Sciences Naturelles* 3: 281. (In French.)
- Gervais P., 1844: Remarques sur les oiseaux fossiles. Paris: Imprimerie de Poussielgue, 40 pp.
- Heer O., 1865: Die Urwelt der Schweiz. Zürich: Friedrich Schulthess, xxix + 622 pp.
- Homewood P., Rigassi D. & Weidmann M., 1989: Le bassin molassique suisse. In: Purser B. A. (Ed.), *Dynamique et méthodes d'étude des bassins sédimentaires*. Paris: Association des Sedimentologistes Françaises, pp. 299-314.
- Kozur H., 1984: Tertiär. In: Tröger K.-A. (Ed.), *Abriß der historischen Geologie*. Berlin: Akademie-Verlag, pp. 427-469.
- Mein P., 1990: Updating of MN zones. In: Lindsay E. H., Fahlbusch V. & Mein P. (Eds.), *European Neogene mammal chronology*. New York: Plenum Press, pp. 73-90.
- Meyer H. von, 1839: Ein Vogel im Kreideschiefer des Kantons Glaris. *Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefaktenkunde* 1839: 683-685.
- Meyer H. von, 1844: (Untitled communication). *Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefaktenkunde* 1844: 329-340. (In German.)
- Meyer H. von, 1865: Schildkröte und Vogel aus dem Fischeschiefer von Glarus. *Palaeontographica* 4: 84-95.
- Mlíkovský J., 1992: The present stage of knowledge of the Tertiary birds of Central Europe. In: Campbell K. E. (Ed.), *Papers in avian palaeontology honoring Pierce Brodkorb*. *Natural History Museum of Los Angeles County (Science Series)* 36: 433-458.
- Olson S. L., 1976: Oligocene fossils bearing on the origins of the Todidae and the Momotidae (Aves: Coraciiformes). In: Olson S. L. (Ed.), *Collected papers in avian palaeontology honoring the 90th birthday of Alexander Wetmore*. *Smithsonian Contributions to Paleobiology* 27: 111-119.
- Peyer B., 1949: *Protornis glaronensis* H. v. Meyer. Ergebnisse der Präparation. *Verhandlungen der Schweizerischen Naturforschenden Gesellschaft* 129: 141-142.
- Peyer B., 1950: Geschichte der Tierwelt. Zürich: Gutenberg.
- Peyer B., 1957: *Protornis glaronensis* H. v. Meyer. Neubeschreibung des Typusexemplars und eines weiteren Fundes. *Schweizerische Paläontologische Abhandlungen* 73 (1): 1-47.
- Richter M., 1940: Die Gliederung der subalpinen Molasse. *Neues Jahrbuch für Mineralogie und Paläontologie (B)* 83: 1-45.
- Russell D. E., Hartenberger J.-L., Pomerol C., Sen S., Schmidt-Kittler N. & Vianey-Liaud M., 1982: Mammals and stratigraphy: the Paleogene of Europe. *Palaeovertebrata, Mémoire Extraordinaire*, 77 pp.
- Schaub S., 1929: Über cocäne Ratitenreste in der osteologischen Sammlung des Basler Museums. *Verhandlungen der Naturforschenden Gesellschaft in Basel* 40: 588-598.

- Schaub S., 1940a: Ein Ratitenbecken aus dem Bohnerz von Egerkingen. *Verhandlungen der Schweizerischen Naturforschenden Gesellschaft* 120: 154-155. (Abstract.)
- Schaub S., 1940b: Ein Ratitenbecken aus dem Bohnerz von Egerkingen. *Eclogae Geologicae Helvetiae* 33: 274-284.
- Schmidt-Kittler N., 1987: European reference levels and correlation tables. In: Schmidt-Kittler N. (Ed.), International symposium on mammalian biostratigraphy and paleoecology of the European Paleogene. *Münchner Geowissenschaftliche Abhandlungen (A)* 10: 13-31.
- Speck J., 1945: Fährtenfunde aus dem subalpinen Burdigalien und ihre Bedeutung für Fazies und Paläogeographie der oberen Meeresmolasse. *Eclogae Geologicae Helvetiae* 38: 411-416.
- Speck J., 1952: Erdgeschichtliches Werden. In: Das Buch vom Lande Zug. *Zuger Neujahrsblatt* 1952: 17-24.
- Stüssi F., 1958: Die Entzerrung von Fossilien am Beispiel des *Protornis glaronensis*. *Schweizerische Paläontologische Abhandlungen* 73 (5): 1-16.
- Thenius E., 1959: Tertiär: Wirbeltierfaunen. Stuttgart: Ferdinand Enke, 328 pp.
- Weidmann M. & Reichel M., 1979: Traces de pattes d'oiseaux dans la Molasse suisse. *Eclogae Geologicae Helvetiae* 72: 953-971.