Naturhistorisches Museum Basel
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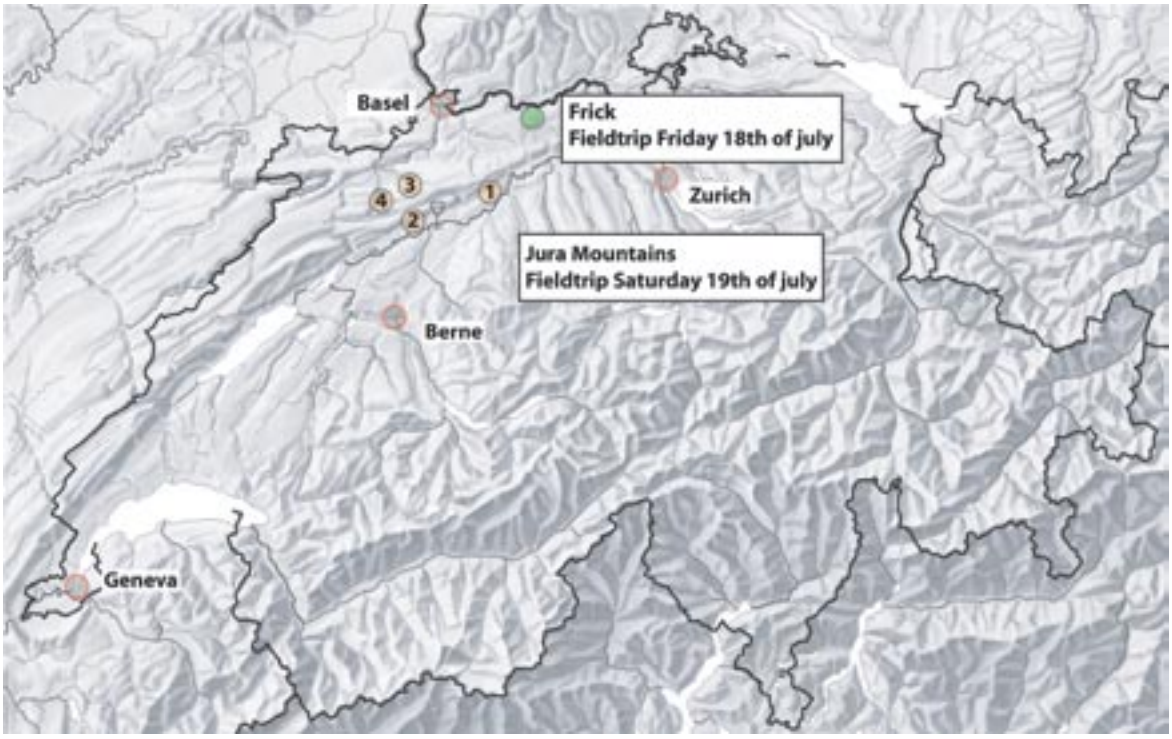
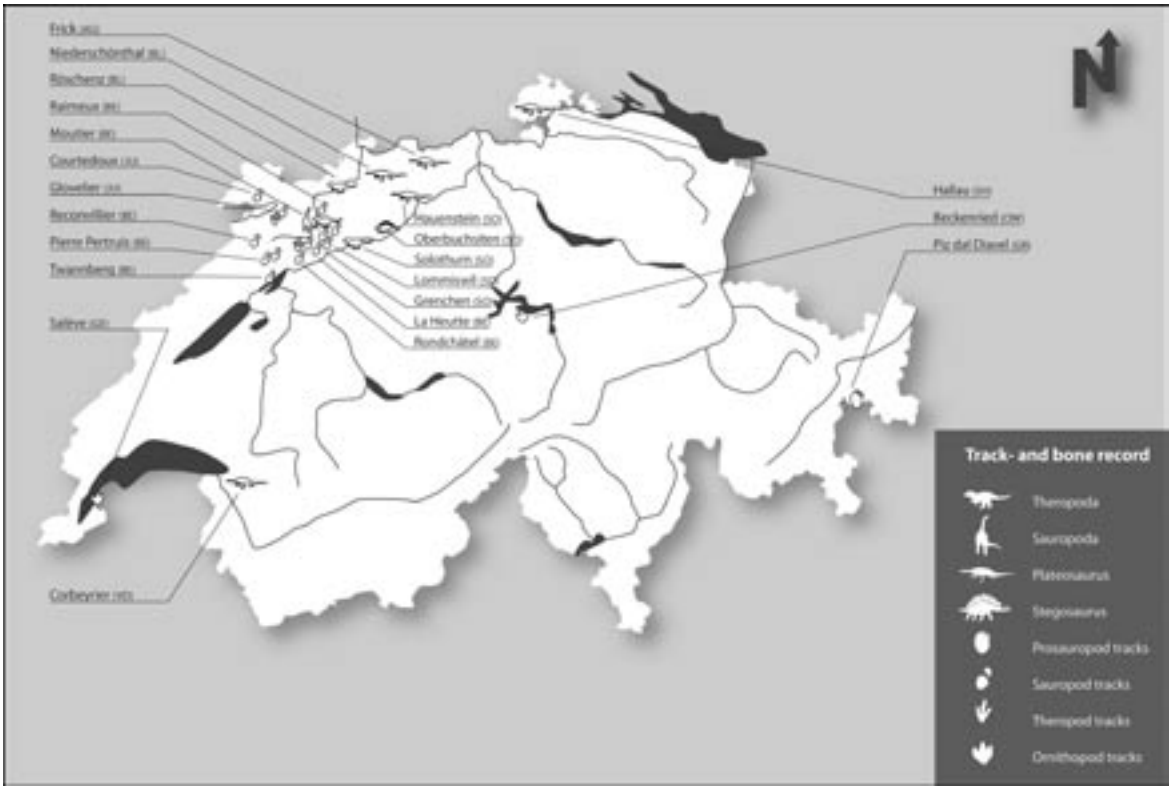
1st EAVP MEETING BASEL

Field Trip Guide Book



Map of Northwestern Switzerland where localities of the two field trips are indicated



Overview of dinosaur localities in Switzerland.

Field trip Frick

Friday 18th of july

Program

13.30 h Departure by bus from Münsterplatz

14.15 h Visit of the claypit Gruhalde, Frick

16.00 h Visit of the dinosaurmuseum in Frick followed by a reception offered by the major of Frick

Stop 1: Quarry Gruhalde near Frick (Coord. 643.000/261.900; LK Frick)

The claypit „Gruhalde" just west of the railway station Frick (Canton Aargau) has marvelous exposures of Late Triassic and Lower Jurassic terrestrial and marine sediments (Fig. 2). This locality is well known to amateur collectors for the rich ammonite fauna, however it has become the most important dinosaur locality in Switzerland.
The lowermost part of the sequence, predominantly sandstones and clays of the Schilfsandstein Gruppe (Carnian) are covered today by piles of rubble. This fluviatile sediments as well as the overlying „Untere Bunte Mergel" have not yielded any fossils so far. The „Gansingen Dolomit" is thought to have formed in a very shallow lagoon. The „Obere Bunte Mergel" (Norian) have been formed in a large alluvial coastal plain. In the middle part of this sequence many different types of vertebrates have been found, amongst them one complete skeleton of the prosauropod *Plateosaurus*.

The Triassic bone record in Switzerland
The first dinosaurs in Switzerland were announced by Rütimeyer 1867 from the Late Triassic near Niederschönthal. The bones and a geological section were sent to him by Amanz Gressly (letter dated september 9th, 1856), the first sketch of the bones were he attributed them to *Belodon* (in pencil) but overwrote it with *Gresslyosaurus* (in ink) were found in the archives of Basel Natural History Museum (Fig. 1). Subsequently more bones were found and attributed to the plateosaurid *Gresslyosaurus ingens*. Galton reviewed most of the skeletal remains and placed it in synonymy with *Plateosaurus engelhardti*. A large quantity of isolated bones were later on collected In the area around Niederschönthal , but a taphonomical and sedimentological study of these assemblages is still missing.
In 1961 the children of a qualitiy controller of a brickwork company found while playing scraps of bones in the Knollenmergel at Gruhalde near Frick which were tentatively identified as remains of plateosaurids. Subsequently several excavations were made from 1976 until 1988 (Fig. 3 & 4). The last excavation yielded one of the most complete skeletons ever found, it is attributed to *Plateosaurus engelhardti*. The fauna of the bone bed at Frick includes teeth of the theropod *Liliensternus*, shark and fish remains (*Hybodus, Ceratodus, Lepidotus*), remains of aetosaurs sphenodontids and cynodonts. In a extensive study of the Norian bonebeds of Central Europe Sander (1990) came to the conclusion that the uniformly upright position of the carcasses argues for in situ preservation. Depressions in the floodplain deposits of the Knollenmergel (Norian) must have formed efficient traps where the animals became mired and scavenged by theropods.

Scattered records of plateosaurid bones from Hallau, Beggingen and the Hauenstein railway tunnel demonstrate that this genus genus was widespread throughout the northern part of Switzerland. In 1984 Late Triassic sediments near Corbeyrier have yielded some isolated teeth that have been tentatively attributed to prosauropods.

Further upsection, the Triassic/Jurassic boundary is exposed, however the deposits of the Late Triassic (Rhaetian) as well as those from the Lowermost Jurassic (early Hettangian) are missing. The „Obere Bunte Mergel" are directly overlain by the „Insektenmergel". The latter contain molluscs, such as small bivalves, ammonites and brittle stars. The „Angulaten-Kalke" and the „Arieten-Kalke" are known for the rich ammonite fauna. Bivalves, trace-fossils and echinoderms are also very common. Remains of bonyfishes, shark teeth (*Acrodus*), chimaeroids and ichthyosaurs as well as pyritized wood fragments *(Araucarioxylon)* are also known from this locality.
Most of these fossils are on display in the Sauriermuseum Frick that will be visited after the quarry.

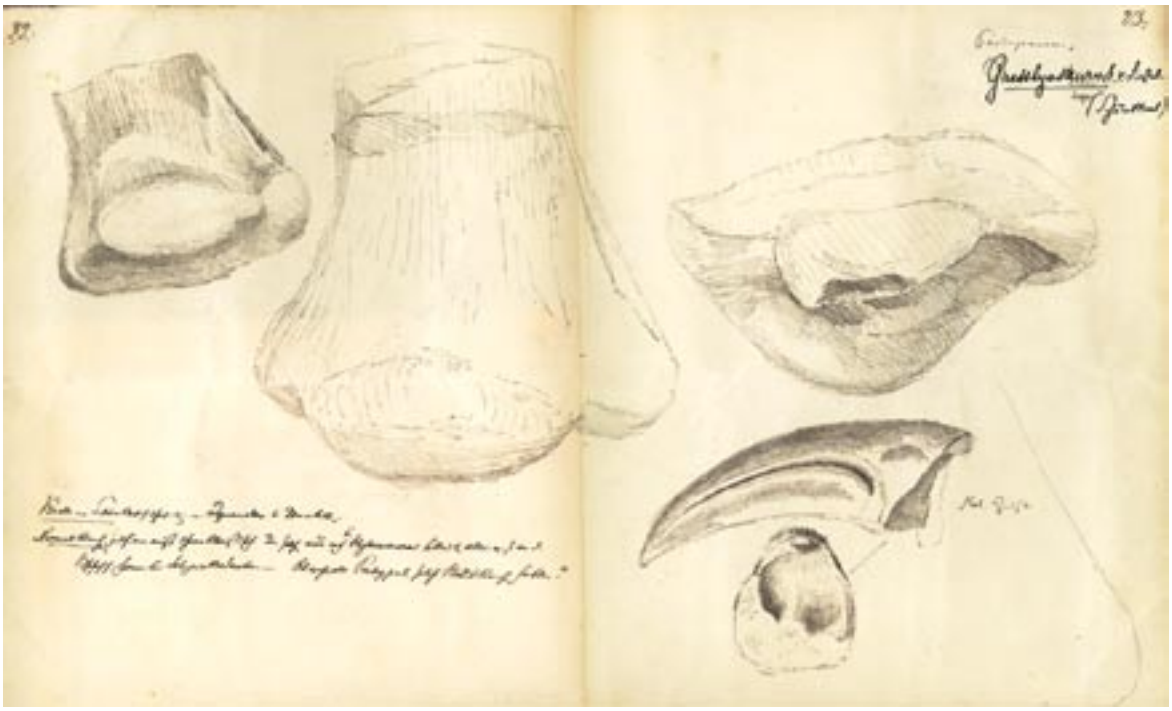


Fig. 1: The first sketch of dinosaur bones from the Late Triassic of Niederschönthal. Original drawing by Rütimeyer and attributed to *Gresslyosaurus*.

Fig. 2: Sketch of the claypit Gruhalde (Frick) with the general stratigraphy

Fig. 3: The Late Triassic locality Frick with a view of an exposed partial skeleton of *Plateosaurus engelhardti* (Excavation 1985, courtesy B. Imhof).

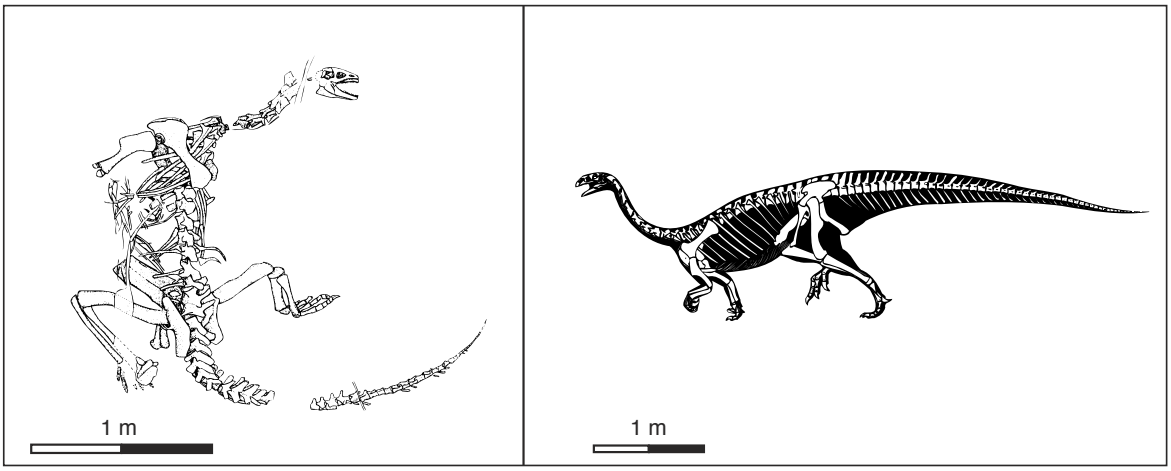


Fig. 4: left: skeleton of *Plateosaurus* found in Frick, right: reconstruction of *Plateosaurus*.

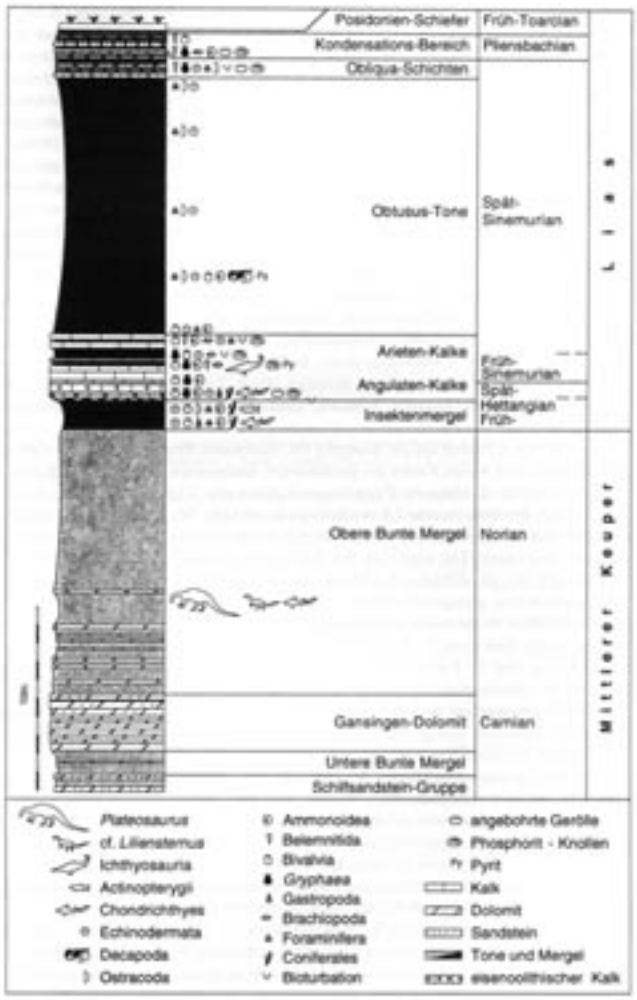


Fig. 5: Geological section at the claypit Gruhalde (Frick)

Field Trip Jura Mountains

Saturday 18th of july

Program

8.30h Departure by bus from Münsterplatz

Stop1 Quarry Oberbuchsiten (Late Jurassic/Eocene)

Stop 2 Quarry Lommiswil (Late Jurassic), Restaurant Tanne, lunch

Stop 3 Vermes section (Tertiary lacustrine deposits with mammals)

Stop 4 Verrerie de Roches (Tertiary terrestrial deposits with mammals)

Return to Basel around 17.30 h

Stop1: Abandoned quarry Oberbuchsiten/ Egerkingen (TK 25 Balsthal, Nr. 1107, Koord. 654 700/245 000).

The old quarry between Oberbuchsiten and Egerkingen, close to the highway intersection Egerkingen has been opened in the Baden – and Wettingen beds that are of Late Jurassic (Kimmeridgian) age. A large surface with a 45° dip to the south can be seen. This layer – a hardground with perforations and secondary overgrowth of oysters forms part of the Baden beds (Villigen Formation, early Kimmeridgian) .
In the upper part of the sequence oolitic limestones of the Wettingen beds (Villigen Formation, early Kimmeridgian) can be seen. These shallow water limestones contain teeth of the mesosuchian crocodile *Machimosaurus hugii* VON MEYER , teeth and postcranial elements of *Steneosaurus sp.* , crushing teeth and dorsal spines of the hybodontid shark *Asteracanthus ornatissimus*. A common element is the irregular sea urchin *Pygurus tenuis* DESOR . Furthermore a carapax of a turtle *(Plesiochelys etalloni)* and remains of an undescribed ichthyosaur have been found. The very well-sorted oolitic sediments indicate a subtidal high-energy environment. From the same beds comes the fragment of a left femur of a *stegosaur* (MEYER & HUNT 1996).
This and the adjacent quarry became famous because of their rich Eocene fissure fills. Most of those fissure formed part of a fossil cave system, depending on the depth within the Mesozoic sediments, they show a classical doline-outline or small ellipsoidal cross-sections that are typical for deeper tier karst-systems.The sediments consist of white quarz-rich sands, oolitic iron ooids and lateritic soils, that have been deposited in these cave systems. The mammals indicate a Late Eocene age; there is a wide spectrum mammals present.

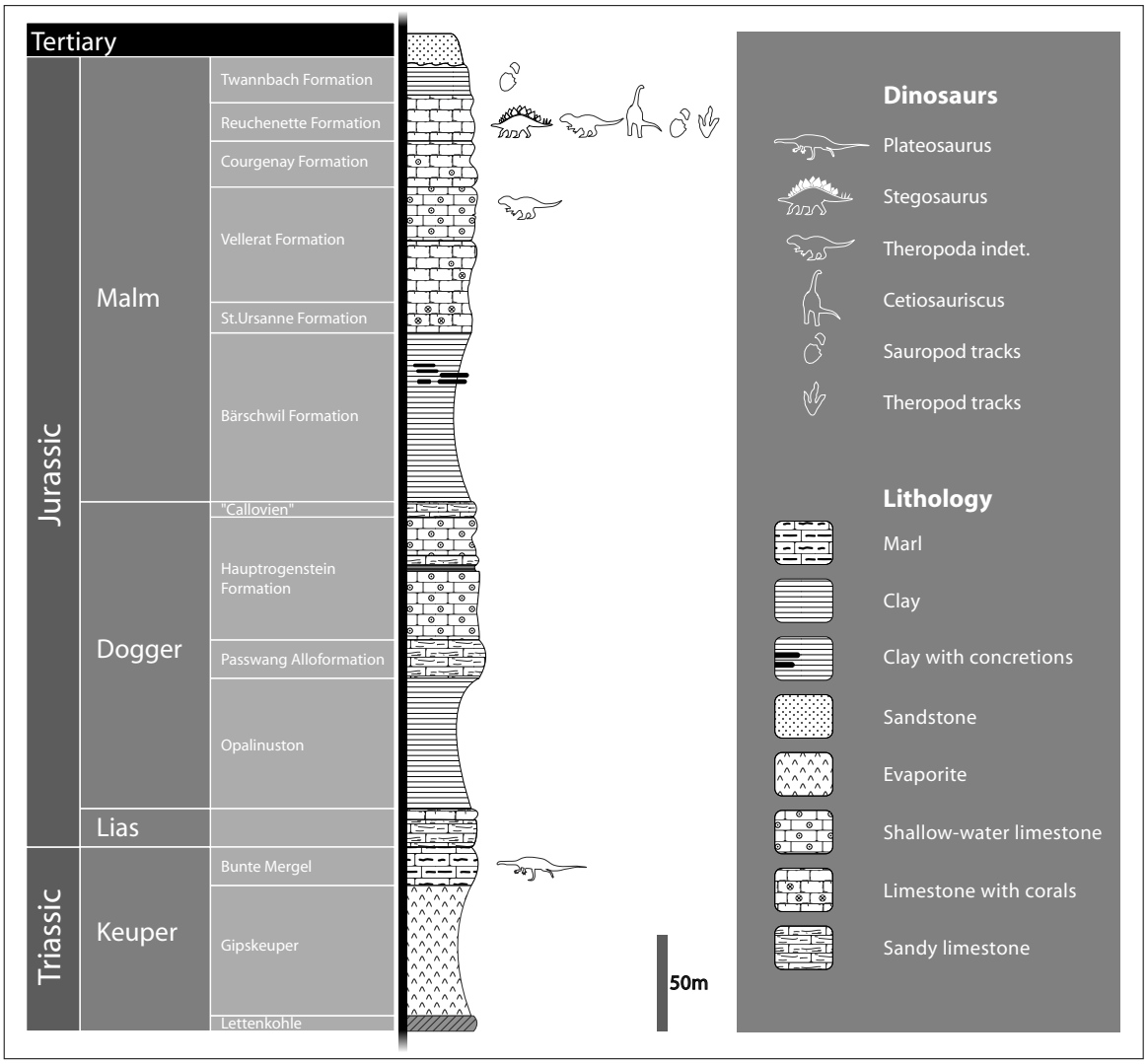


Fig. 6: General stratigraphy of Northern Switzerland with location of dinosaur sites.

Stop 2: Quarry Steingrueben, Lommiswil. (TK 25 Moutier 1106 Koord. 654 700/245 000)

Just recently, the Steingrueben quarry has been reactivated to extract the famous „Solothurn marble" that comes from the uppermost part of the Reuchenette Formation, (Late Kimmeridgian; autissiodorensis-zone; MEYER & PITTMANN 1994).
The three quarried beds are very fossiliferous and can be correlated with the famous Solothurn Turtle limestone that crops out close to the city that has given its name. Carapax and plastron remains of marine turtles *(Plesiochelys etalloni)*, as well as hybodontid sharks *(Asteracanthus)*, and chelae of hermit crabs have been found. Very common are cross-sections of nerineid gastropods (*Ptygmatis, Cossmannea, Trochalia)* the sclerosponge *Cladocoropsis mirabilis* and the strong bioturbation by decapod crustaceans (*Thalassinoides)*. In 1994 a large slab with a lower jaw and several postcranial elements of *Steneosaurus* have been found.
During the course of investigations of this limestone at a quarry near the small town of Lommiswil Meyer identified what turned out to be the first Late Jurassic dinosaur tracks reported from Switzerland. Given the attention that many geologists have focused on quarries such as the one at Lommiswil it is surprising that tracks are so easily overlooked. At Lommiswil individual tracks are up to a meter or more in diameter and one trackway can be traced for about 90 meters, making it one of the longest in Europe. Track morphology and trackway pattern clearly identify them as those of large sauropods. The tracks are not so well preserved that they reveal clear details such as toe impressions. On the whole 450 individual footprints can be seen, and more were exposed in recent years with ongoing quarry operations. The general trackway configuration, however, reveals that the trackmaker was of the wide-gauge variety (Fig. 8 & 9). Within the same megatracksite level several small sites have been found (Fig. 10). A small surface near Grenchen, another close to Bürenberg and several around La Heutte. One surface at the La Heutte site yielded a single, shallow imprint of a theropod. This confirmed, that the megatracksite is an example of the Brontopodus ichnofacies.

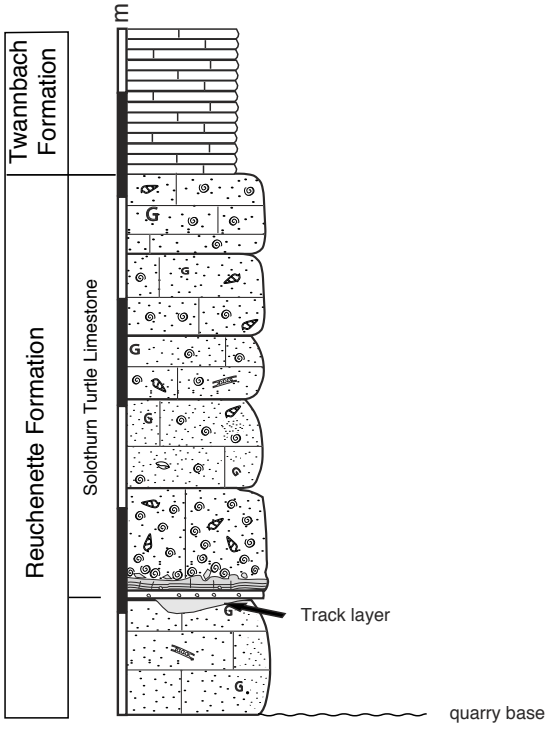


Fig. 7: Geological section of the Lommiswil dinosaur tracksite (Upper Reuchenette Formation, Late Kimmeridgian)

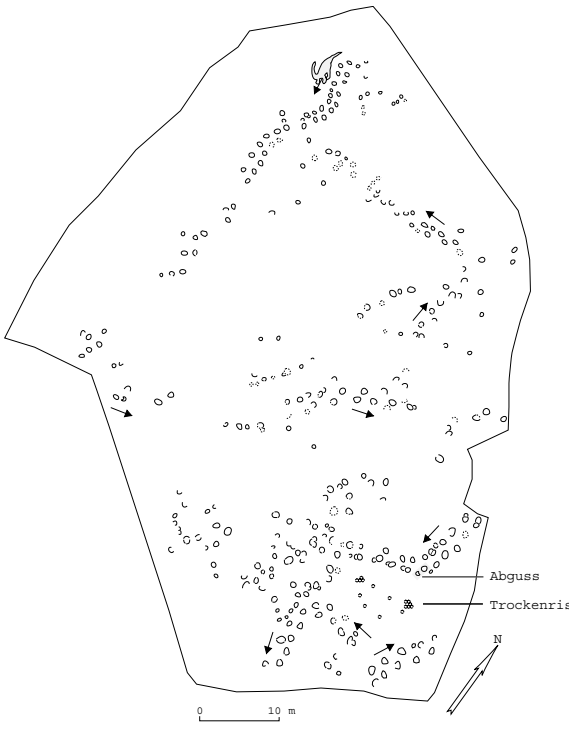


Fig. 8: Map of the Lommiswil dinosaur tracksite (Upper Reuchenette Formation, Late Kimmeridgian).

Fig. 9: View of the Lommiswil dinosaur tracksite (Upper Reuchenette Formation, Late Kimmeridgian) with casting staff for scale.

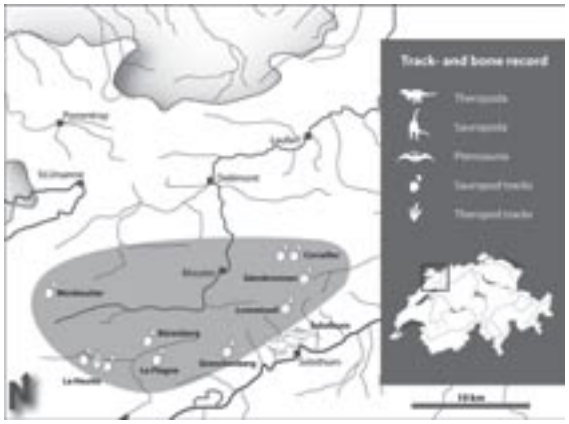


Fig. 10: Geographic extent of the megatracksite in the Upper Reuchenette Formation with principal track and bone localities.

Fig. 11: *Cetiosauriscus greppini* (Huene) from the Reuchenette Formation, Basses Montagnes, Moutier. a: left ischium (NHM 387), b: right humerus (NHM 260), scalebar 10 cm.

One of the Swiss national pastimes is rock climbing, and it is through this activity that a number of dinosaur tracksites have been found. In fact most of the dinosaur tracksites found in Switzerland were found as a result of combining professional geology with rock climbing. The second largest dinosaur tracksite in Switzerland, in terms of surface area and number of footprints, was found in the Moutier canyon in the Jura mountains. This site was discovered in 1996 by prospecting a large surface (Moutier II) ; the previous year on a small surface nearby sauropod tracks had been detected (Moutier I). The site is a well known area for rockclimbers, and has been seen by many people, but evidently by none that were looking for dinosaur tracks. It can be best described as a stomping ground were there is evidence of various degrees of trampling or dinoturbation. The results of a two week survey in 1997 was the recognition of about 2000 footprints distributed more or less randomly across a steeply inclined surface of about 6000 m^2. Only a few tracks are sufficiently clear and only a few allowed us to distinguish large pes tracks and manus tracks. It is difficult to say much about the number of sauropod trackmakers that were in the area, the type (wide- or narrow-gauge), size, though some were large (footprint length 1 m, Fig.14 & 15), or direction of travel of these sauropods. Work is still in progress, in an attempt to explain why some tracks are very deep (40 cm) and others so shallow as to be barely perceptible. The main tracksite occurs on a dense mudstone that shows birdseyes and is overlain by algal laminites, further upsection two more levels with sauropod footprints can be seen, but due to the small outcrop area, no additional information can be given. Stratigraphically, the site has to be placed in the lower part of the Reuchenette Formation and has been formed in an inter- to supratidal environment. Just about 300 m in a southwesterly direction from the tracksite, coeval strata have yielded the skeletal remains of *Cetiosauriscus* (Fig. 11).
Close by in the southern part of the Moutier anticline, two small sites with sauropod footprints have been found that occur on the same level (Moutier III, IV), further east close to the village Corcelles two addtional surfaces with moderately preserved footprints of sauropods have been discovered by Phillipe Saunier in 1996. In 1998 Bernhard Hostettler, a local amateur, discovered a surface with sauropod footprints along a new roadcut in the vicinty of Glovelier. Later on George Alain Beuchat, teacher from Glovelier discovered a surface with a theropod trackway in the vicinity (Fig. 13).

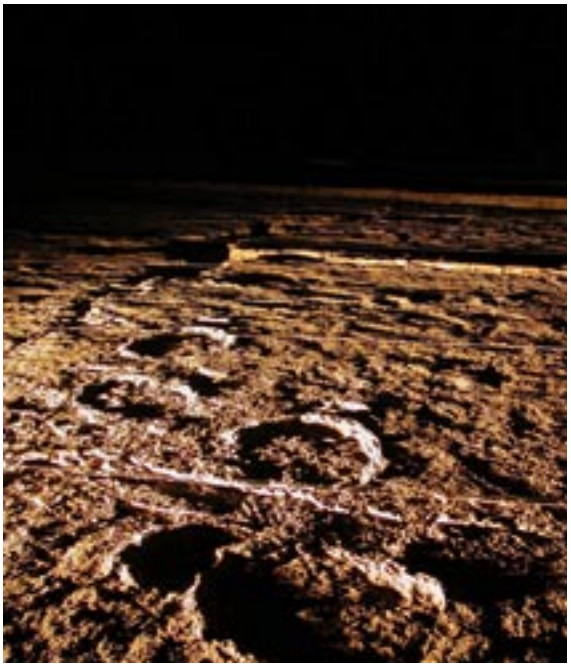


Fig. 12: Trackway of a narrow gauge sauropod form the Combe Ronde site near Courtedoux (Lower Reuchenette Formation, Late Early Kimmerdigian).

Fig. 13: Trackway of a medium sized theropod from Glovelier (Lower Reuchenette Formation).

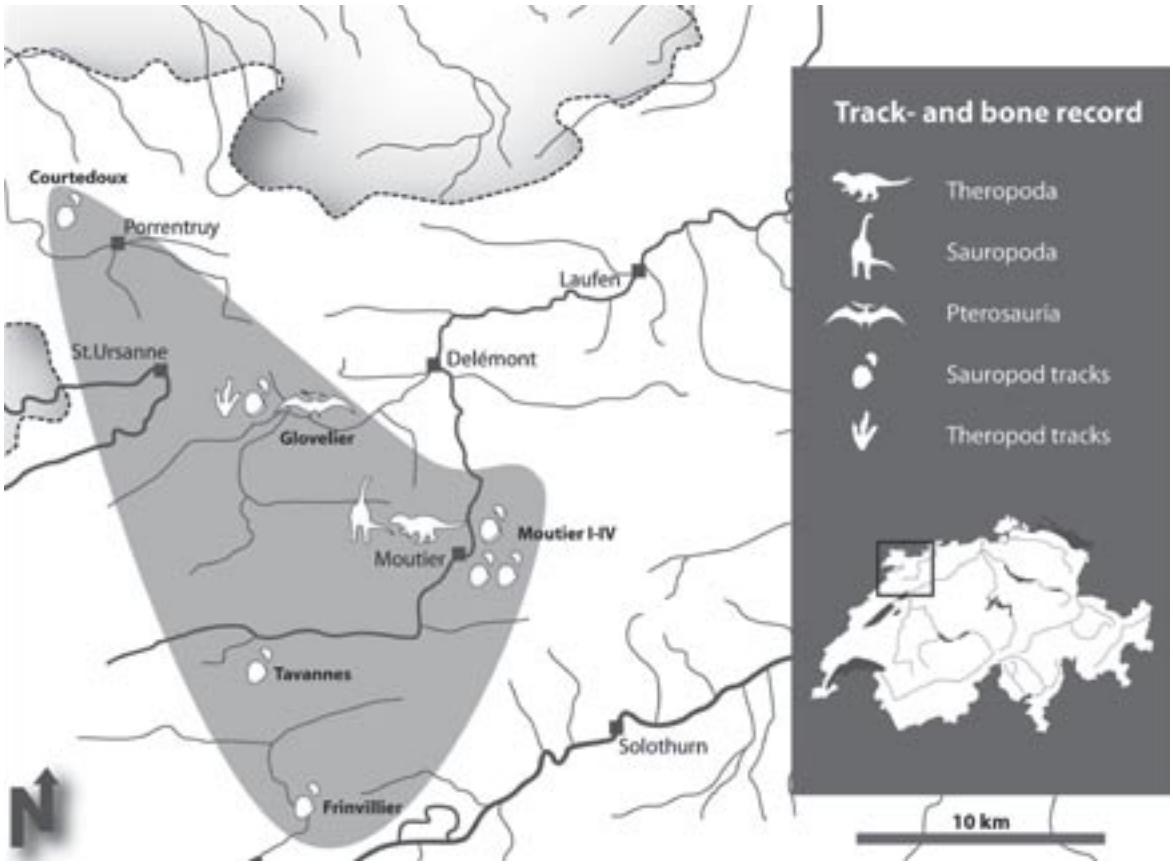


Fig. 16: Geographic extent of the megatracksite in the Lower Reuchenette Formation with principal track and bone localities.

Fig. 14: Aerial view of the Moutier (Moutier II) dinosaur tracksite (Reuchenette Formation, Late Early Kimmerdigian).

Fig. 15: Close up view of a right pes print of a sauropod dinosaur (footprint length 1 m) from the Moutier II tracksite.

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Stop 3 Vermes (Koord.: 603.000/242.000)

The mammal locality of Vermes which has been known for more than a century belongs to the „Obere Süsswassermolasse“ (OSM), to the Oeningian. On the basis of new material of micromammals, it is possible to distinguish two faunas of different ages: Vermes 1 = NM 5 (Orleanian) and Vermes 2 = NM 8 (upper Astaracian). Because of only 2 – 3 m of sediment separate the two layers, however there is a considerable difference in age. A total of 29 mammal taxa are known from Vermes 1 and 11 taxa form Vermes 2. Both faunas are found in lithologically identical layers: micrites, oncomicrites and lignitic marls. Sedimentological analysis suggest that the environment was a shallow lake or a swamp wihtout detritic supply with frequent and extended periods of desiccation indicated by pedogenetic phenomena. The main elements of the fauna are: Masurpialia, insectivores, bats, lagomorphs, and rodents.

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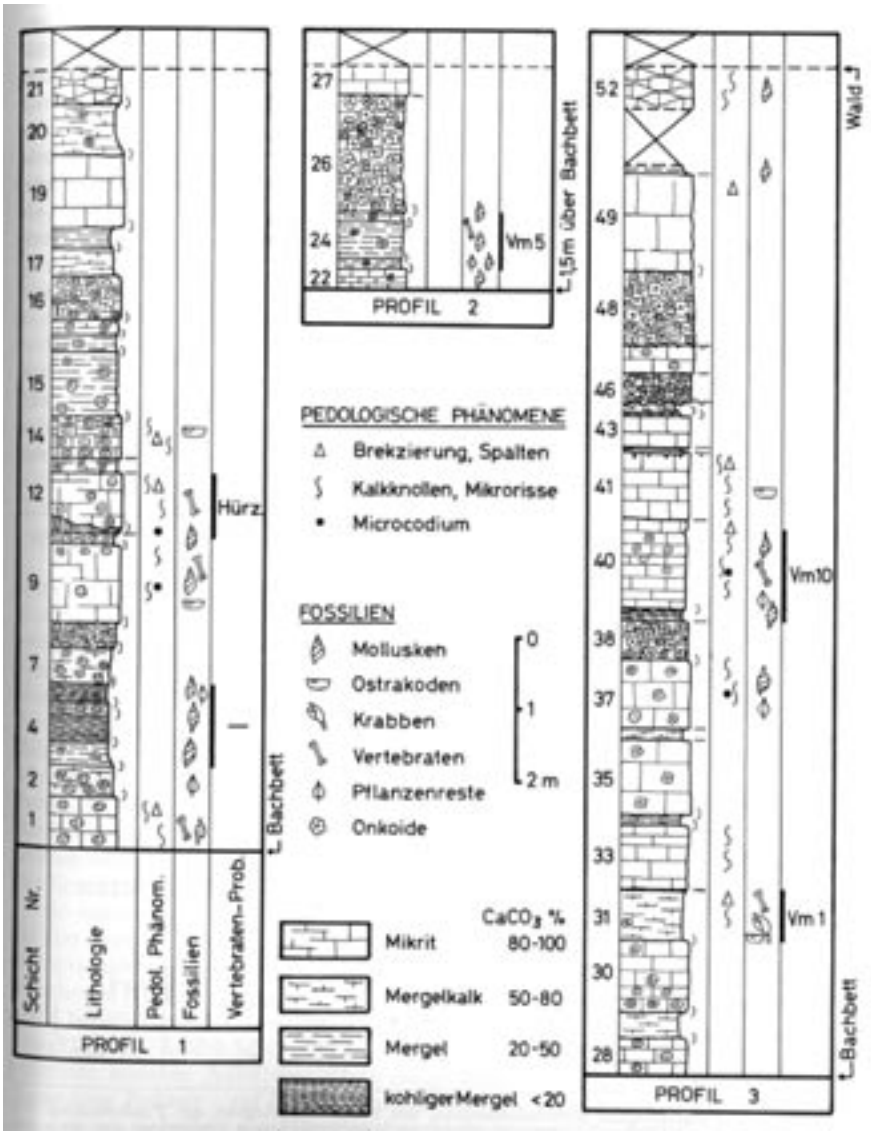

Fig. 17: Section of the mammal localities Vermes 1 and 2.