

THE PROTECTION OF FOSSILS IN BADEN-WÜRTTEMBERG (FEDERAL REPUBLIC OF GERMANY)

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Abstract. In Baden-Württemberg, fossils of special scientific and public interest have been protected as cultural monuments by the Monument Protection Law since 1972. Two areas of outstanding importance, Holzmaden and Nusplingen, are declared Protected Excavation Area. Other important permanent fossil sites are protected by the Nature Conservation Law, either as Nature Reserve or as Monument of Nature.

This legislation alone cannot provide absolute protection, but gives a framework on the status of fossils and the rights and obligations of all whose activities concern fossils. Furthermore, the legislation provides the state's support in the case of conflict. Actually, conflicts are rare; under the provisions of the law a sense of trust and co-operation has developed. The public benefits from a great number of outstanding finds made possible by the regulations since 1972.

Riassunto. Nel Baden-Württemberg, i fossili di speciale interesse scientifico e pubblico sono protetti come monumenti culturali dalla Legge di Protezione dei Monumenti fin dal 1972. Due aree di eminente importanza, Holzmaden e Nusplingen, sono state dichiarate Aree Protette di Scavo. Altri importanti siti fossiliferi permanenti sono protetti dalla Legge di Conservazione della Natura, sia come Riserva Naturale che come Monumento Naturale. La legislazione da sola non può fornire una protezione assoluta, ma dà un quadro generale sullo status dei fossili e sui diritti e doveri di tutti coloro la cui attività riguarda i fossili. Inoltre, la legislazione fornisce l'appoggio dello Stato in caso di contrasti. In effetti, i contrasti sono rari; sotto le disposizioni della legge si è sviluppato un senso di fiducia e cooperazione. Il pubblico beneficia di un gran numero di notevoli ritrovamenti resi possibili dai regolamenti sin dal 1972.

Introduction

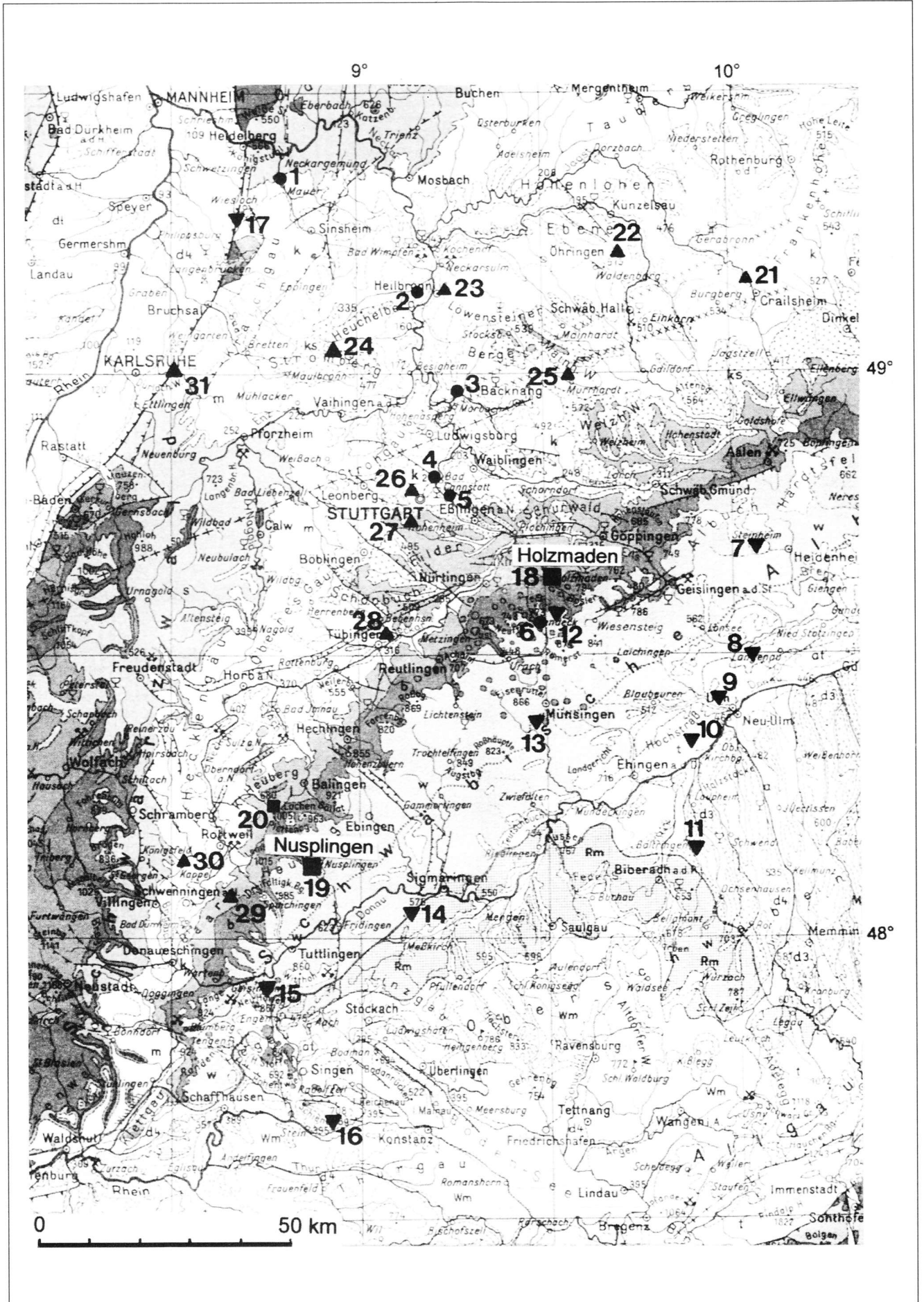
The framework for heritage protection in Germany is based on its federal structure, consisting of 16 states (In German "Länder", singular "Land"). From their po-

litical independence in the 19th century, the states maintained in particular the responsibility for inner security, education and culture. As the study of paleontology belongs to culture, each Land has its own regulations; in the present contribution those for Baden-Württemberg will be considered, one of the most fossiliferous regions in Germany (Fig. 1). For further details see Keller (1985) and Wild (1986, 1988 and 1993).

Fossils are not in general protected in German Law. In most Länder only those fossils which are of special scientific importance and therefore also of interest to the public are protected. "Special" means that the protection is restricted to extraordinary cases in order to avoid ambiguity or uncertainty and frequent conflict with private collectors. In practice, in Baden-Württemberg, almost exclusively only vertebrates are protected and only exceptionally invertebrates, e.g. large and well-preserved crinoid colonies or belemnites with soft parts. So there is generally a clear rule as to what can be collected without problem. Because fossil groups are defined as protected (see below, Holzmaden) it is not necessary, as a rule, to designate single specimens as protected, in contrary, single specimens can be released from the general protected status of the group to which it belongs (see below).

Monument Protection Law

As science and public interest are aspects of culture, protected fossils are cultural monuments although they are not man-made. Consequently, they are protected by the Law for the Protection of Cultural Monuments



(Monument Protection Law for short, in German “Denkmalschutzgesetz”) which is special in each Land. Single fossils are not considered in the Nature Conservation Law (“Naturschutzgesetz”); the significance of this law will be regarded below. In a few Länder the status of fossils is unclear. Only in Bavaria are fossils legally almost unprotected, a consequence of the strong economical interests in the Solnhofen area.

In Baden-Württemberg, the Land has been the owner of protected fossils from January 1st 1972 when

the state’s Monument Protection Law (“Denkmalschutzgesetz”) came into force. This law is in the tradition of the “Royal Treasure Trove” (“Königliches Schatzregal”) by which former kings were owners of all detected treasures. Today, the Land’s claim on fossils is justified by the Basic Constitutional Law of Germany of May 23rd 1949 according to which ownership is socially subordinated and can be restricted where necessary for the welfare of the public.

The owner of unprotected fossils is primarily the land-owner. Collectors must therefore ask for the permis-

Fig. 1 - Geological map of Baden-Württemberg with exception of the south-westernmost part. Indicated are important, mostly historical localities which have yielded protected fossils, generally vertebrates; well illustrated descriptions in Heizmann 1998 (see also Adam 1987; Heizmann 1992; Schweigert 1998; Dietl & Schweigert 1999 and 2001; Heizmann & Reiff 2002). The localities with bold numbers indicate localities under protection of the Nature Conservation Law.

Stratigraphy of the Triassic, Jurassic, and Tertiary:

t = Tertiary

w = Weisser Jura, Upper Jurassic

b = Brauner Jura, Middle Jurassic and very few Upper Jurassic

l = Schwarzer Jura, Lower Jurassic

k = Keuper, uppermost Middle Triassic and Upper Triassic

m = Muschelkalk, Middle Triassic

s = Buntsandstein, Lower Triassic and lowermost Middle Triassic.

Locations:

● 1–6: **Quaternary**, up to Eemian Interglacial; the numerous important fossil localities of the last glacial, often with human artifacts, are omitted.

1 Mauer, former sand-pit, Cromerian, locality of *Homo heidelbergensis*.

2 Frankenbach, gravel-pit, Cromerian.

3 Steinheim an der Murr, former gravel-pits, Holsteinian, locality of *Homo steinheimensis*.

4 **Stuttgart-Bad Cannstatt, Protected excavation area**, travertine quarries, Holsteinian.

5 Stuttgart-Untertürkheim, travertine quarry, Eemian.

6 Heppenloch, cave, Holsteinian.

▼ 7–17: **Tertiary**, mostly Neogene

7 Steinheim am Albuch, gastropod sand-pit, impact crater, equivalent to Upper Freshwater Molasse, Miocene.

8 Langenau, fluvial gravel, equivalent to Brackish Water Molasse, exposed during construction of motorway A7 (E43), Miocene (Figs. 6-8).

9 Ulm, limestones and marls of Lower Freshwater Molasse, marginal facies, excavations for new buildings and streets, lowermost Miocene.

10 Eggingen, former sand-pits, Grimmelfingen Sands, Brackish Water Molasse, Miocene, and underlying marls of Lower Freshwater Molasse, uppermost Oligocene (Paleogene).

11 Heggbach, former sand-pit, sands and marls of Upper Freshwater Molasse, basinal facies, Miocene.

12 Randecker Maar, volcanic crater, limestone and bituminous shales, Miocene. **Status of Protected Excavation Area in preparation.**

13 Böttingen, Böttingen Marble, former quarry of red thermal sinter, Miocene.

14 Engelswies, former quarry in freshwater limestone, transition Brackish Water Molasse to Upper Freshwater Molasse, Miocene.

15 **Höwenegg: Protected excavation area**, volcanic crater, limnic mudstone, uppermost Miocene.

16 Öhningen, former quarry in freshwater limestone, volcanic crater, Miocene.

17 Wiesloch-Frauenweiler, former clay-pits, marine bituminous shale (“Fischschiefer”), Oligocene.

■ 18–20: **Jurassic**

18 **Holzmaden: Protected excavation area**, quarries in bituminous shales, Toarcian, Lower Jurassic.

19 **Nusplingen: Protected excavation area**, quarries in lithographic limestones, Kimmeridgian, Upper Jurassic (Fig. 2).

20 Dotternhausen, quarry in bituminous shales, Toarcian, Lower Jurassic.

▲ 21–32: **Triassic**

21 Crailsheim, quarries in Muschelkalk, Ladinian, Middle Triassic.

22 Kupferzell-Bauersbach, construction of motorway A6 (E50), dolomitic shale and carbonate of Lower Keuper, late Ladinian, Middle Triassic (Fig. 4). **Status of Protected Excavation Area in preparation.**

23 Heilbronn, former sandstone quarries in Schilfsandstein, Carnian, Upper Triassic.

24 Pfaffenhofen (Stromberg), former sandstone quarry in Stubensandstein, Norian, Upper Triassic.

25 Murrhardt, sandstone quarries in Stubensandstein, Norian, Upper Triassic.

26 Stuttgart-Feuerbacher Heide, former sandstone quarries in Schilfsandstein, Carnian, Upper Triassic.

27 Stuttgart-Heslach, former sandstone quarries in Stubensandstein, Norian, Upper Triassic.

28 Tübingen-Lustnau, lane-cut, Schilfsandstein, Carnian, Upper Triassic.

29 Trossingen, historical natural exposure, Knollenmergel, lower Rhetian, Upper Triassic (Fig. 5).

30 Kappel, former sandstone quarry, Middle Buntsandstein, Olenekian, Lower Triassic.

31 Karlsruhe-Durlach, former sandstone quarry, Upper Buntsandstein, Anisian, lowermost Middle Triassic.

sion of the land-owner to collect fossils and to become themselves owners of the collected specimens.

Fossil finds must be reported if they appear 'special' and might therefore be cultural monuments. In case of in-situ finds excavation work must be stopped and the location of the find kept open for up to four days. The land-owner must tolerate the interruption of work, but it is always the intention to keep interruptions as short as possible in order not to lose the cooperation of land-owners. In practice, the inspection of a findspot is carried out on the day the find is notified. In most cases, during excavation and investigation of the site, work can be re-arranged in such a way that costs or disadvantages for the land-owner remain as low as possible or can be entirely avoided.

The notification can be made to local administrative authorities of different levels who have the duty to pass the information promptly to the responsible state authorities, either the Land Monument Office ("Landesdenkmalamt") or its representative, the State Museum of Natural History Stuttgart ("Staatliches Museum für Naturkunde Stuttgart"). Any subsequent excavation is normally carried out by the specialists of the Museum. The permission to excavate protected fossils can also be granted to other qualified persons under strict conditions who, as a rule, are honorary assistants of the Natural History Museum. Digging and even the search for protected fossils requires the permission of the Land Monument Office, even the Natural History Museum requires such permissions, in order that the responsible office is always informed on all activities in this field.

Nature Conservation Law

Besides fossils as single specimens, fossil assemblages in situ can also be protected. Such localities are subject of the Nature Conservation Law (with exception of Protected Excavation Areas, see below). This law prohibits the removal of objects of any kind from the protected location. But collecting for scientific purposes can be permitted as rare exceptions. A locality becomes protected in this sense through the regional authority of the government ("Regierungspräsidium").

The owner of the location, mostly a town or other community, must take care of the protected site and this is done through honorary or volunteer assistance. This law could also be applied to GSSPs or similar reference sites if selected within the Land. In such sites such as ancient quarries, recent flora and fauna can also be protected. There are two types of protected site recognisable through this law, Nature Reserves ("Naturschutzgebiete") and Monuments of Nature ("Naturdenkmale"). The latter can be, for instance, single trees or rocks. In the case of a pure geological object as Monument of Nature, e. g. the cliff of the Miocene sea in Heldenfingen, Swabian Alb, recent flora and fauna are not included.

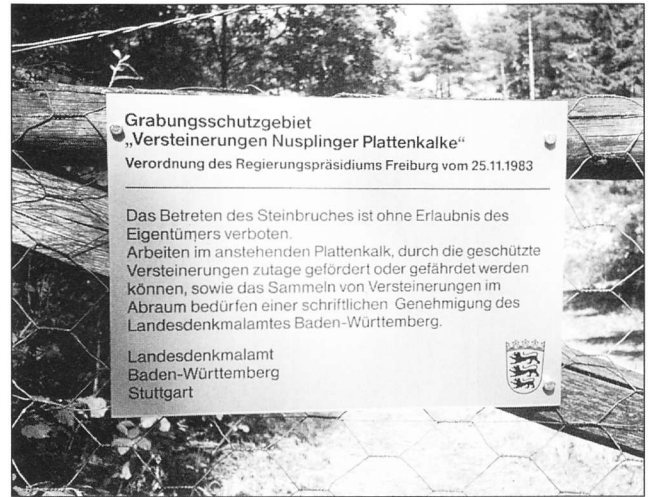


Fig. 2 - Entrance to one of the two quarries in Nusplingen Lithographic Limestone. - Translation of the German text: Protected Excavation Area "Fossils of Nusplingen Flaggy Limestones". Decree of the District Government Freiburg of 25/11/1983. No trespassing of the quarry without permission of the owner. Activities in the outcropping limestone which could uncover or endanger protected fossils, as well as the collecting of fossils in the waste material require the permission of the Land Monument Office of Baden-Württemberg, Land Monument Office Baden-Württemberg, Stuttgart.

Protected Excavation Areas

Areas of important fossil finds can be declared Protected Excavation Areas ("Grabungsschutzgebiete") within the provisions of the Monument Protection Law. In this case, recent flora and fauna are not included in the protection. To date there are two areas of this kind in the Jurassic of Baden-Württemberg, the area of Holzmaden with its bituminous shales of Lower Toarcian age and Nusplingen with its lithographic limestones of Upper Kimmeridgian age (Fig. 2). A third area is in upper Miocene in the southern part of the country, Höwenegg, a volcanic crater with fossiliferous lake sediments. A fourth area is in the Pleistocene travertines of Stuttgart-Bad Cannstatt. All works in these areas which might uncover or endanger protected fossils require the approval of the Land Monument Office. There are special and stricter regulations for the report of building projects and the notification of fossil finds (see below).

In the case of Holzmaden, besides complete skeletons of vertebrates also cuttlefish, crustaceans, crinoids and plants are protected; these fossil groups are listed in the decree of the "Holzmaden Protected Excavation Area" of 1979. In the declaration of this area the following directives came into force (Wild 1988: 185-187):

Each public building project within the borders of the protected area must be reported to the State Museum of Natural History in Stuttgart (SMNS) some months before work begins, so that the Museum can comment on the development's effect on the fossil deposit. The start of work on site must be announced at least four days in

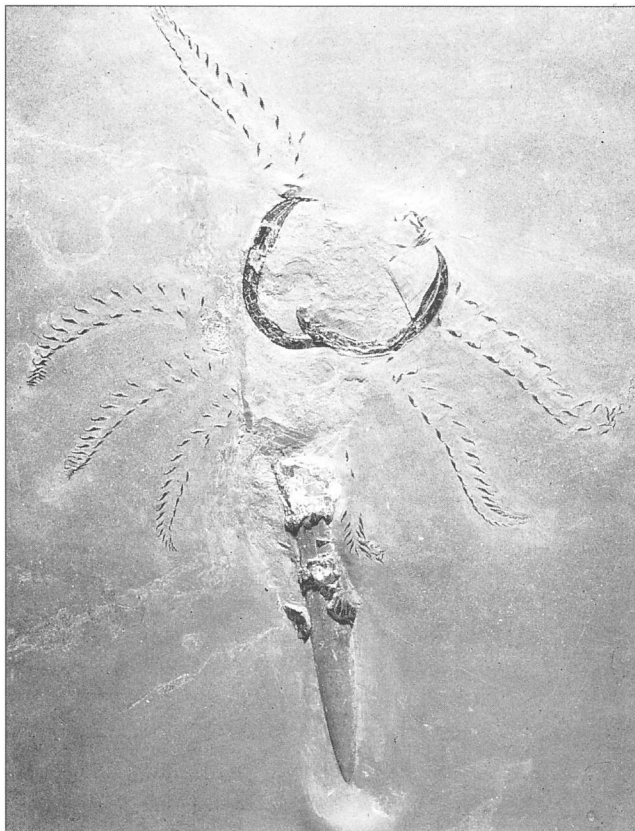


Fig. 3 - Belemnite with preserved soft parts, example of a protected specimen of a normally unprotected invertebrate group (cephalopods). Length of rostrum about 10 cm. Bituminous shale of the Lower Toarcian (Posidonienschiefer), Schlierbach near Göppingen, kept in the State Museum of Natural History in Stuttgart.

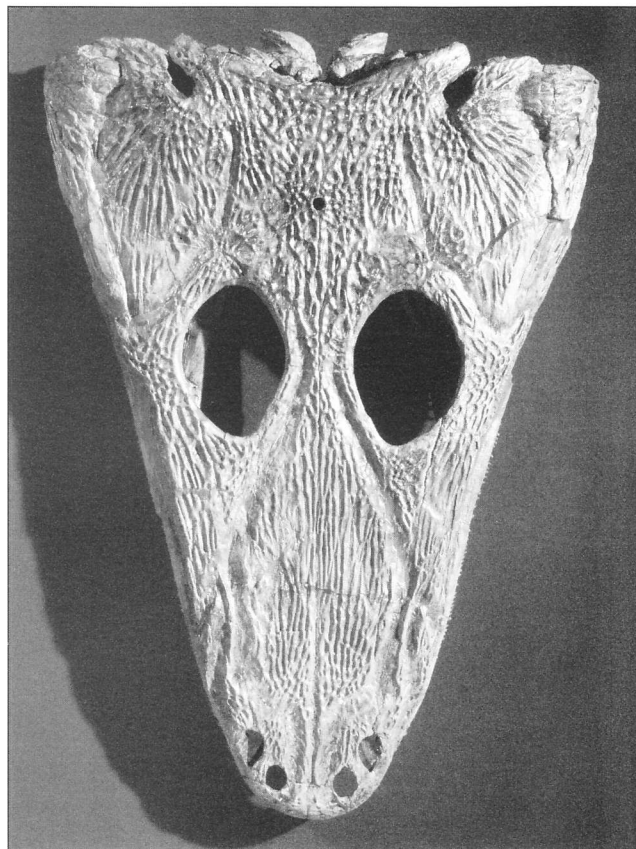


Fig. 4 - Skull of *Mastodonsaurus giganteus*. This species was the largest amphibian that ever lived with a length up to 6 m. During the construction of the motorway A6 (E50) a rich material in excellent preservation could be excavated in the Lower Keuper (Ladinian) near Kupferzell-Bauersbach which enabled the exact reconstruction of the animal for the first time (Schoch 1999). The same was possible with other vertebrates from here (Gower 1999; Hellrung 2003). Length of skull 50 cm.

advance. Officers of the SMNS have the right to monitor and control work on site, and their directions concerning protected fossils must be followed. If they are absent when protected fossils are found, the SMNS must be informed by telephone. All protected fossils which are designated as cultural monuments must be handed to the museum.

All recipients of a permit to construct a private building get an 'instruction card'. This informs them of the purpose of the protected area, lists the specified protected fossils and their importance, gives advice on how to recognize such fossils, and how to look for missing parts, and tells them of their obligation under the law to inform the SMNS of finds.

For the quarries working in the Holzmaden Protected Excavation Area the following additional regulations apply: the exploitation methods are regulated in detail and the legal permission for quarrying depends on that they are respected. These regulations concern restrictions on machine quarrying, blasting operations and careful controlling of bedding planes. Since only one layer at the base of the sequence, the "Fleins", is of commercial interest, almost all of the 6-10 m thick Posidonienschiefer

is waste material in economical sense. In spite of that, all "waste" layers must be removed carefully down through the sequence and workmen must be properly trained for this job. Machines employed must be approved by the authorities. Blasting must be limited to one or a few layers at a time and used only to loosen the sediment. Boreholes must be at least a specified minimum distance from one another. These instructions are enforced through periodic, unannounced inspections of the quarries by the SMNS staff. There is the sanction under law to withdraw the quarry firm's permit for extraction if an infringement of the regulations occurs.

Once the SMNS has been informed of the discovery of a protected fossil in a quarry, the quarry firm itself is authorized by the Museum to extract the find (being experienced in both recognizing and removing fossils, and equipped to do so). The costs of this operation, and of searching for missing parts of a fossil, are carried by the SMNS - a procedure that is much cheaper for the Museum than if it would excavate the fossil itself. From time to time, new finds are inspected when they are reg-

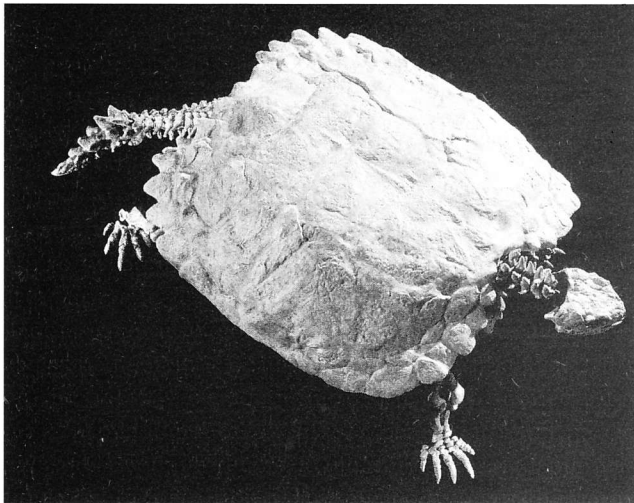


Fig. 5 - Complete skeleton of the early turtle *Proganochelys*, Knollenmergel, lower Rhetian, Upper Triassic, Trossingen, kept in the State Museum of Natural History in Stuttgart; length of skeleton 110 cm. Trossingen is the findspot of the largest Triassic dinosaur skeletons of Baden-Württemberg, *Plateosaurus engelhardti*.

istered, numbered, and scientifically evaluated on a special form. This registration form records all essential information concerning the find, i. e. date, identification, quarry, stratigraphic horizon, finder, dimensions, preservation, orientation and any other remarkable features.

Rarely, a find qualifies immediately for cultural monument status, according to the law, even before preparation; in this case it is taken directly to the SMNS. Also rarely, a specimen of a protected category is judged immediately to be outside the scope of the law; such a fossil is released to the skilled technicians of the quarry firm for preparation. After preparation is completed, the fossil is given a final inspection and an official certificate of release which allows it to be sold.

In most cases, however, no immediate decision can be made on the status of a find, and it must be further exposed by preparation. This work is mostly assigned to the quarry firm, following the production of a written contract based on an estimate from them of the costs involved. After this superficial preparation, the fossil is inspected again by SMNS staff. If it now qualifies as a culturally significant find it is taken by the Museum, and the firm is reimbursed in accordance with the already agreed contract.

Alternatively, the specimen may be released and given to the firm for further preparation and disposal. Nevertheless, as a matter of principle, each specimen receives a final inspection once its preparation is completed and before its release, as a last check to make sure that it does not merit cultural monument status. Only then is it issued with an official certificate of release which includes almost all informations on the original registration form. Such certification is an essential prerequisite



Fig. 6 - One of the most fossiliferous sites in the Miocene of southern Germany was opened during the construction of the motorway A7 (E43) near Langenau. Only a relatively short time was available for the excavation. The help of amateur collectors contributed to the success of this project. The co-operation of the building firm was also of high value; without the use of its machines, see lifting a large accumulation of bones, the work would have been far more difficult.

for the legal sale and acquisition of a Holzmaden fossil. Any illegal trade in fossils is thereby prevented.

The quarry firms are presently experiencing severe difficulties because of a strong reduction in demand for Holzmaden slabs. The use of this material as decorative element in houses is dependent on fashion. At the current moment no quarry is operating, but the site is kept open so that it can be reactivated if fashion changes. The quarries will only survive if they can be operated economically, so there must be trust and co-operation on both sides, i. e. quarry firms and paleontologists working together under the provisions of the law. Any additional income from the sale of fossils can help to keep them operating in the future. As protected fossils will be discovered almost exclusively in the quarries, the goodwill of the quarry firms is of paramount importance. And only while the quarries remain active can they continue as productive sites for paleontological research.

There is no problem for private collectors to obtain a permission from the Land Monument Office to collect unprotected fossils, for instance ammonites, in the waste material of the quarries. This permission is valid two years and the collectors are registered in the quarries in order to keep out commercial collectors; these lists are also monitored by the Natural History Museum Stuttgart.

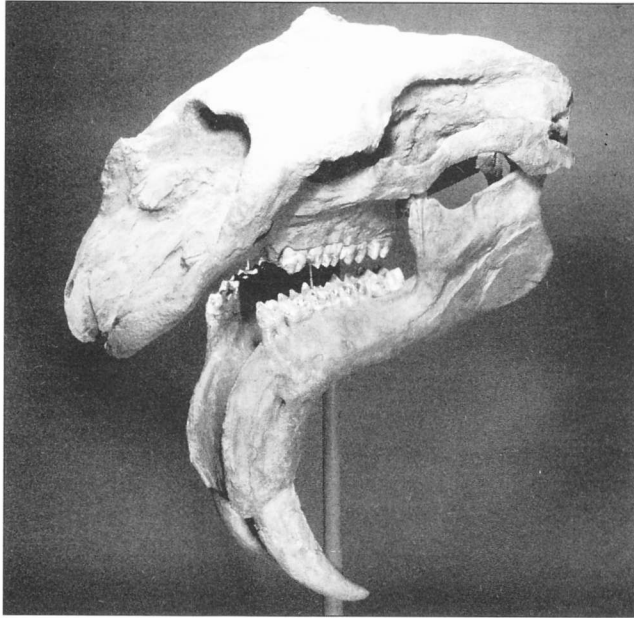


Fig. 7 - Skull of *Deinotherium cf. bavaricum*; length of skull 95 cm. Complete skeletons have been found in the site shown in Fig. 6, embedded in gravels and oxbow muds of a river running from the north to the sea of the Brackish Water Molasse (Miocene). The deltaic context is recognizable by the co-occurrence of freshwater and brackish water faunal elements.

Compensation

As already mentioned, the Land of Baden-Württemberg is the owner of protected fossils and no payment is therefore required for such specimens. A find reward, however, is granted as voluntary payment, notably for the finding only, not for the specimen, as it is unreasonable for a collector to expect a large sum for simply finding an unprepared protected fossil. A finder has no right to appeal against the size of the reward allocated. It should be kept in mind that the high market prices of fossils include the expenses for the time-consuming work of skilled preparation. Expenses can be compensated only in special cases, e.g. for the use of machines especially to extract a specimen or for partial preparation in a quarry workshop to find out if a specimen is a Cultural Monument – although full preparation of a fossil in a quarry workshop as public contract is, of course, fully paid and a portion of the budget of the Natural History Museum is reserved every year for such purposes.

Practical experience

Regulations alone can never provide absolute protection but they provide a framework for protection and, if necessary, provide the state's support. The application of the law in Baden-Württemberg has meant that there is generally a satisfying co-operation with private collectors, quarry owners, land owners, building firms and authorities of all levels. Offences against the Monument

Protection Law are rare; there are only two cases of the confiscation of finds by the police since the Law came into force. Even in such cases an agreement with the finders is preferred over punishment.

Honorary Assistants and other private support

Besides the legislation, honorary assistants of the Museum are of invaluable importance for the effective protection of fossils. Honorary assistants are working in different parts of the Land; they know their home region well and inform the Museum on significant new exposures as well as when protected fossils are found or endangered. Informations come also from honorary assistants of the Württembergian Land Museum ("Württembergisches Landesmuseum") looking for archeological finds. Honorary assistants are provided with a certificate indicating that they are empowered by the Land to act on behalf of the museum whose assistant they are. Their activities are based on instructions of the museum, e. g. to control fossil sites. They have no sovereign functions, as e. g. of police.

The three richest new excavation sites yielding protected fossils of the last 25 years, Kupferzell-Bauersbach, Langenau and Ulm-Westtangente, were all detected and reported by private collectors who also, together with other collectors, strongly supported the Museum's efforts to extract as much of the fossil accumulations as possible in the restricted available time (Fig. 6). For these laymen it was a fascinating experience participating in the opening of a window into an impressive scenery of the geological past.

Public benefit

The public benefits from a great number of outstanding finds made possible by the described regulations since 1972. The quarries of the Holzmaden Protected Excavation Area have yielded since its designation 1979 hundreds of vertebrate skeletons, not only of common ichthyosaurs and fishes, but also of crocodiles, plesiosaurs, pterosaurs, and, as rare exceptions, of formerly unknown forms such as of a pleurosaurid sphenodontoid, and even a bone of a dinosaur (*Obmdenosaurus*) has been found. Not all finds merited 'cultural monument' status in the sense of the law defined above, but no scientifically important find has been lost to paleontology. A special case is the Nusplingen Protected Excavation Area because the two existing quarries are owned by the Society for Natural History of Württemberg and exploited exclusively by the State Museum of Natural History Stuttgart (Dietl & Schweigert 1999, 2002, and present volume).

The benefit of numerous other fossiliferous sites is comparable. Many formerly unknown taxa, new for our region and sometimes new to science, have been detected, which amplify not only our knowledge of ancient forms of life, but also of ecological conditions and of biogeo-

graphic relationships. For many forms complete skeletons have been recorded for the first time, and thereby facilitate the first possible accurate reconstructions. All these new results keep the interest of the public vivid and increases the attraction of the museum. It is a valuable means of education; a great number of school classes visit the museum around the year. Young children enjoy the impressive fossils and models and motivate their parents to go to the museum (Fig. 8). Private collectors benefit from the contact with the museum, at least when they are not only interested in the commercial value of fossils.

Most of all, science benefits from the regulations and practice in Baden-Württemberg. There is a considerable interest from paleontologists from all over the world in the rich, rapidly growing collection of well-preserved specimens in the SMNS, and the museum has continuously succession of scientific visitors who come to work amongst these remarkable collections.

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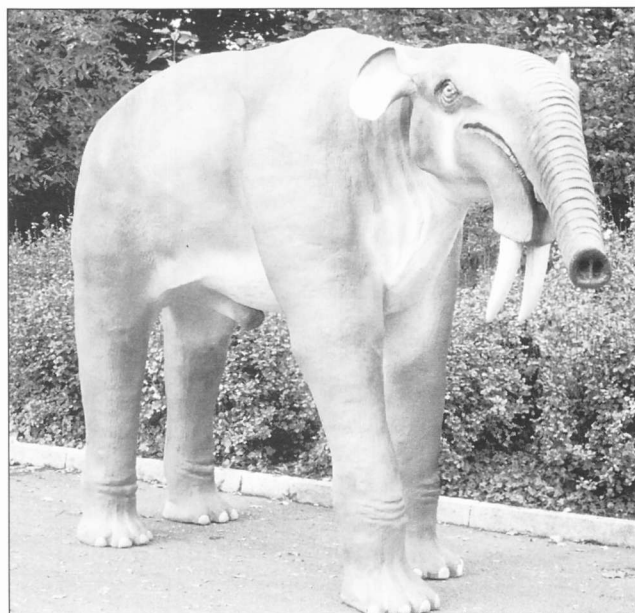


Fig. 8 - *Deinotherium* cf. *bavarium*, formed on basis of the skeletons from the site of Fig. 6. Height of shoulder 265 cm. Skull see Fig. 7. The form is older and smaller than *D. bavarium*, its systematic status is not yet established. The model shows that protected fossils do not only contribute to science but also demonstrate paleontology to the public in an impressive way.

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