

ZOFIA KIELAN-JAWOROWSKA & RINCHEN BARSBOLD

NARRATIVE OF THE POLISH-MONGOLIAN PALAEOLOGICAL EXPEDITIONS 1967—1971

(Plates I-II)

Abstract. — Results of field work in the Gobi Desert, carried out in Bayn Dzak in 1967, 1968 and 1969 are briefly described. The course and results of the Polish-Mongolian Palaeontological Expeditions to various localities in the Gobi Desert in 1970 and 1971 are discussed. The main achievement of the 1970 and 1971 expeditions was the discovery that the Lower Nemegt Beds (possibly Campanian), previously regarded as unfossiliferous, contained a rich and varied fauna. This fauna was found in the localities of Nemegt, Khulsan and Khermeen Tsav II. The Soviet-Mongolian Expedition discovered in 1969 the locality of Khermeen Tsav I, containing the Lower and Upper Nemegt Beds. This locality was also visited and the first discoveries of mammals and lizards in the Lower Nemegt Beds were made there. The Lower Nemegt Beds at these four localities yielded the following: about 80 mammals, 260 lizards, few crocodylians, the skull of an unknown pachycephalosaurid dinosaur, 3 specimens of new ankylosaurid dinosaurs, numerous fragmentary skeletons and skulls of *Protoceratops* sp., incomplete skeletons of small carnivorous dinosaurs, tortoises, very numerous dinosaur eggs and diplopod myriapods. The expeditions also carried out excavatory work in the Upper Nemegt Beds (late Campanian or Early Maastrichtian) in the localities of Nemegt and Altan Ula, collecting there: 4 incomplete skeletons of ornithomimid dinosaurs, 2 fragments of skeletons of coeluroid dinosaurs, 2 skeletons of *Saurolophus angustirostris*, and several fragments of the same species, the skull with fragmentary postcranial skeleton of a new pachycephalosaurid dinosaur, the postcranial skeleton of a large ankylosaurid dinosaur, tortoises and numerous isolated dinosaur bones. In addition the expedition carried out excavatory work on a smaller scale in Bayn Dzak, Toogreeg and Sheeregeen Gashoon.

1967, 1968 AND 1969 EXPEDITIONS

After the completion of the Polish-Mongolian Palaeontological Expeditions of 1963—1965 (KIELAN-JAWOROWSKA & DOVCHIN, 1968/69), field work in Mongolia for the Polish palaeontologists was suspended for one year.

In the years 1967, 1968 and 1969 three small expeditions were sent to the Mongolian People's Republic by the Palaeozoological Institute of the Polish Academy of Sciences, to search for mammals in the Upper Cretaceous sediments of the Djadokhta Formation in Bayn Dzak (Shabarakh Usu) in the Gobi Desert. These journeys came within the terms of an agreement on the exchange of scientists between the Polish and Mongolian Academies of Sciences. The Polish palaeontologists were guests of the Mongolian Academy of Sciences which, on each occasion, delegated one person to accompany the group, also putting a car with driver at their disposal. The 1967, 1968 and 1969 expeditions did not undertake any excavatory work but confined themselves to searching for fossils in the outcrops of Cretaceous sandstone in Bayn Dzak.

In 1967, Eng. M. KUCZYŃSKI and Mr. W. SKARŻYŃSKI spent from 23 September to 23 October in Mongolia, two weeks being spent in Bayn Dzak. They were accompanied by two Polish geologists Dr. J. LEFELD and Dr. H. ŁOBANOWSKI, carrying out their own programme, and the Mongolian geologist Mr. CEVEG.

In 1968, Dr. H. OSMÓLSKA, Mr. W. SKARŻYŃSKI and Prof. Z. KIELAN-JAWOROWSKA were in Mongolia from 16 July to 7 August. Most of this time was spent searching for fossils in Bayn Dzak. They were accompanied by Mr. DOVCHIN, a technical assistant in the Institute of Biological Sciences of the Academy of Sciences in Ulan Bator.

In 1969, Dr. H. OSMÓLSKA, Dr. A. SULIMSKI and Prof. Z. KIELAN-JAWOROWSKA spent from 25 July to 13 August in Mongolia, working most of the time, as in the previous year, in Bayn Dzak. The Polish group was accompanied by the Mongolian palaeontologist Mrs. P. NARMANDACH.

During these 3 years, 20 mammal specimens were collected (KIELAN-JAWOROWSKA, 1969, 1970*a*, 1970*b*, 1971), more than 20 lizards (SULIMSKI, 1972) as well as the fragmentary skeleton of a crocodile (OSMÓLSKA, 1972).

1970 EXPEDITION

Under the agreement signed in Ulan Bator in May 1969 between the Polish and Mongolian Academies of Sciences, 2 large Polish-Mongolian expeditions were to be organized in 1970 and 1971 to continue the work done in 1963—1965. They were to work in the same regions as in previous years, that is in Bayn Dzak and in the Nemegt Basin and surrounding area (GRADZIŃSKI *et al.*, 1968/69). The expeditions were to be organized on the same principles as those of 1963—1965 (KIELAN-JAWOROWSKA & DOVCHIN, 1968/69), but with this difference that the cost of equipment, engaging workes and transporting the collections were to be covered solely by the Polish side.

The transport for the 1970 expedition consisted of 2 cars brought from Poland (a Polish truck Star 660 and a jeep type Romanian car MS 461) as well as a truck of Soviet production Gas 63, hired in Ulan Bator together with Mongolian driver. In addition, several extra trucks with trailers were hired to take the equipment from Ulan Bator to Bayn Dzak and Gurvan Tes in the Nemegt Basin and transport the collections back to Ulan Bator.

The 12 Polish members of the Expedition were:

1. Mr. ADAM GŁODZIŃSKI — doctor and cook
2. Doc. RYSZARD GRADZIŃSKI — geologist, vice-leader
3. Prof. ZOFIA KIELAN-JAWOROWSKA — palaeontologist, leader of the Polish group
4. Eng. MACIEJ KUCZYŃSKI — technical leader
5. Mr. WIESŁAW MACZEK, M. Sc. — botanist and driver
6. Dr. TERESA MARYAŃSKA — palaeontologist
7. Mr. ALEKSANDER NOWIŃSKI, M. Sc. — palaeontologist
8. Dr. HALSZKA OSMÓLSKA — palaeontologist
9. Mr. WOJCIECH SICIŃSKI — technical assistant
10. Mr. WOJCIECH SKARŻYŃSKI — technical assistant
11. Dr. HUBERT SZANIAWSKI — palaeontologist and driver
12. Prof. ADAM URBANEK — palaeontologist

The Mongolian group consisted of 3 persons:

1. Dr. RINCHEN BARSBOLD — palaeontologist, leader of the Mongolian group, who did not actually take part in the expedition, but visited it twice in the field
2. Mr. DEMBERLYIN DASHZEV, M. Sc. — palaeontologist (with the expedition from 8 to 22 July)
3. Mr. ALTANGEREL PERLE, M. Sc. — palaeontologist.

In addition to the above, one Mongolian worker was engaged in Ulan Bator for the whole period of the expedition and 6 extra workers hired for the period 10 August — 26 September.

All the necessary equipment including cars, was dispatched by rail from Poland on 12 May, arriving at Ulan Bator on 15 June, where it was received by the Mongolian side. On 23 June, a four person technical group — KUCZYŃSKI, MACZEK, SZANIAWSKI and SKARŻYŃSKI flew to the Mongolian capital. During two weeks they unloaded the equipment and had it taken to Bayn Dzak and Gurvan Tes, where the stores for the expedition were established.

On 3 July, three other members of the expedition (KIELAN-JAWOROWSKA, URBANEK, GRADZIŃSKI) arrived by air in Ulan Bator. At a meeting next day, the leaders of the Polish and Mongolian sides set down the programme of work for the expedition. On 6 July the remaining five members joined the expedition.

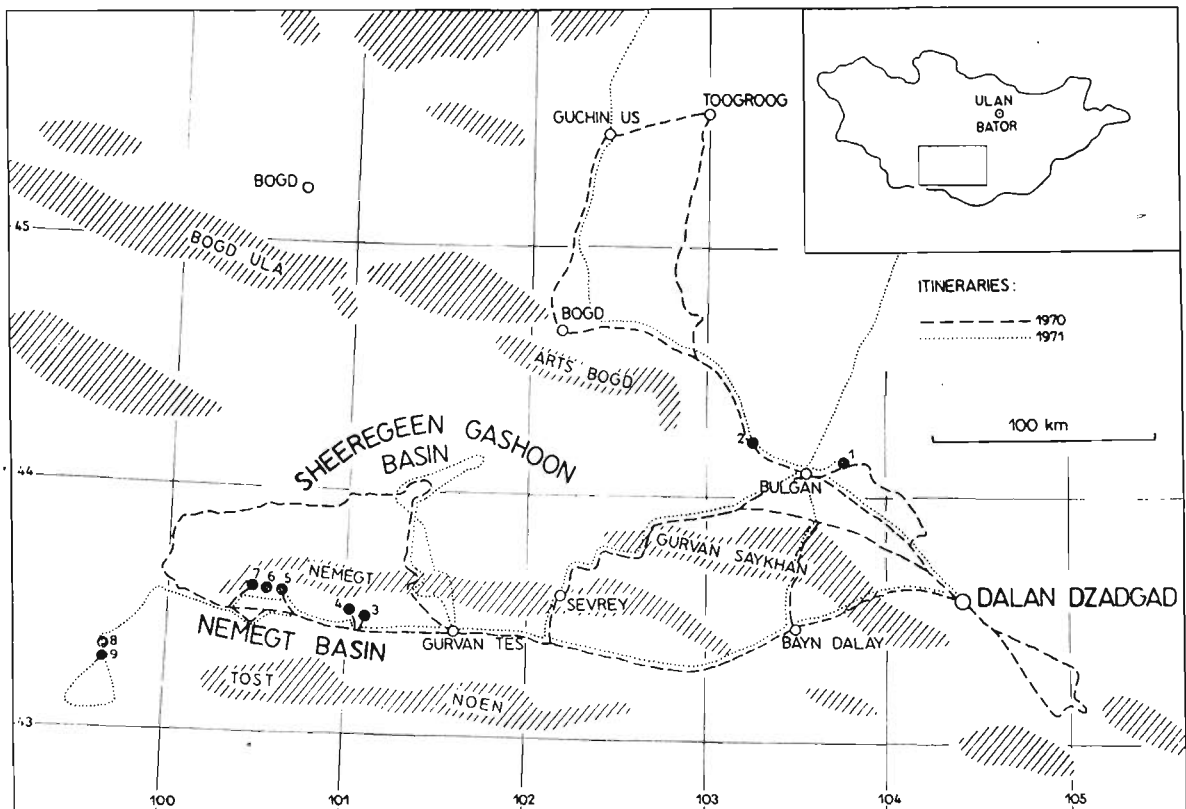


Fig. 1

Itineraries of the Polish-Mongolian Palaeontological Expeditions 1970-1971. 1 — Bayn Dzak, 2 — Toogreeg (Toogreegeen Shire), 3 — Khulsan, 4 — Nemegt, 5 — Altan Ula II, 6 — Altan Ula III, 7 — Altan Ula IV, 8 — Khermeen Tsav II, 9 — Khermeen Tsav I.

On 7 and 8 July the members of the expedition set out in two groups for Bayn Dzak (see Text-fig. 1), where they remained until 21 July. In Bayn Dzak a few incomplete mammal skulls and many lizards were found. In addition, a skeleton, skull and several fragments of skeletons of *Protoceratops andrewsi* (see GRANGER & GREGORY, 1923, BROWN & SCHLAIKJER, 1940), a pelvic girdle and hind limbs of *Pinacosaurus* sp. (see MARYAŃSKA, 1971) as well as several dinosaur eggs were recovered.

While in Bayn Dzak a party of five (GRADZIŃSKI, KIELAN-JAWOROWSKA, MACZEK, OSMÓLSKA and DASHZEVEG) went between 13 and 16 July to the Guchin Us outcrops, situated about 200 km NW of Bayn Dzak, where mammal-bearing Lower Cretaceous sediments, which had been explored by the Soviet-Mongolian Palaeontological Expedition occur. Between 17 and 19 July, a second party (GRADZIŃSKI, MARYAŃSKA, SZANIAWSKI and URBANEK) made a trip to investigate Cretaceous outcrops in the vicinity of Dalan Dzagad.

On the 21 July the camp in Bayn Dzak was wound up and the expedition proceeded to the outcrops of Nemegt (GRADZIŃSKI & JERZYKIEWICZ, 1972) in the Nemegt Basin, to carry out excavatory work in the Upper Cretaceous sediments referred to as the Upper Nemegt Beds and to search for fossils in the Lower Nemegt Beds (GRADZIŃSKI *et al.*, 1968/69; see also GRADZIŃSKI, 1970; MARYAŃSKA, 1970; OSMÓLSKA & RONIEWICZ, 1970; SZCZUCHURA & BŁASZYK, 1970; KARCZEWSKA & ZIEMBIŃSKA-TWORZYDŁO, 1970; NOWIŃSKI, 1971; KHOSATZKY & MLYNARSKI, 1971).

During the 2 month stay in Nemegt the following specimens from the Upper Nemegt Beds were recovered:

1. Two incomplete skeletons of *Tarbosaurus* sp. (see MALEYEV, 1955*a*, 1955*b*; ROZHDESTVENSKY, 1965) and several fragments of the skeletons of the same species.
2. One almost complete skeleton and some fragments of the skeletons of *Saurolophus angustirostris* ROZHDESTVENSKY (ROZHDESTVENSKY, 1957).
3. One almost complete postcranial skeleton and some fragmentary skeletons of ornithomimid dinosaurs (OSMÓLSKA, RONIEWICZ & BARSBOLD, 1972).
4. Two fragments of skeletons of small coeluroid dinosaurs.
5. Very well preserved skull and fragment of postcranial skeleton of a new representative of the Pachycephalosauridae.
6. Numerous tortoises (MLYNARSKI & NARMANDACH, 1972).

In addition, sedimentological observations were carried out and numerous samples for micropalaeontological investigations collected.

While in Nemegt three journeys were made to the outcrops of Altan Ula, some 50 km to the west of Nemegt (between 21 and 25 August: GRADZIŃSKI, OSMÓLSKA, SKARŻYŃSKI and SZANIAWSKI; between 30 August and 2 September: GŁODZIŃSKI, NOWIŃSKI, SICIŃSKI, SKARŻYŃSKI, URBANEK and 4 workers; between 9 and 11 September: GRADZIŃSKI, MACZEK, MARYAŃSKA and PERLE). During these journeys an incomplete skeleton of *Tarbosaurus bataar*, fragments of a skeleton of *Saurolophus angustirostris* and fragmentary limb of an ornithomimid dinosaur were excavated. Between 30 August and 5 September GRADZIŃSKI, KIELAN-JAWOROWSKA, MACZEK, MARYAŃSKA and PERLE set out on a reconnaissance to the Sheeregeen Gachoon Basin, situated north of the Nemegt range. Here they collected in Cretaceous sediments a few dinosaur remains and a carapace of a tortoise (MLYNARSKI & NARMANDACH, 1972). The exact age of these sediments has not been defined.

In the second half of the stay in Nemegt, work was mainly concentrated on the Lower Nemegt Beds, which underlay the Upper Nemegt Beds. The Lower Nemegt Beds crop out in two localities: in the eastern and southern part of the locality of Nemegt, in the areas de-

signated Southern Monadnocks, Red Monadnocks and Red Walls and in the locality of Khulsan (GRADZIŃSKI & JERZYKIEWICZ, 1972, Text-figs. 3 and 4). The Lower Nemegt Beds were regarded by EFREMOV (1950, 1954) as unfossiliferous and referred to as barren series. The work in this series proved successful beyond expectation. Here were found fragmentary skeletons of *Protoceratops* sp., incomplete skull of an ankylosaurid dinosaur, numerous dinosaur eggs of different sizes, about 80 lizards, diplopod myriapods, tortoises (MŁYNARSKI, 1972) and skulls of mammals. In the course of 2 weeks, 22 mammalian specimens were collected, among them several nearly complete, well preserved skulls of multituberculates and insectivores. A preliminary investigation of the mammals collected, studied by the first author, indicates that the Lower Nemegt Beds are somewhat younger than the Djadokhta Formation, being probably of Campanian age.

On 26 September the expedition left Nemegt, arriving in Ulan Bator on 29 September where the collections were divided for scientific study. The Polish members of the expedition left Ulan Bator in several groups during October, the last group arriving in Warsaw on 25 October.

1971 EXPEDITION

After the 1970 expedition, part of the Polish equipment was left over the winter in Ulan Bator. New equipment for the 1971 expedition was sent by rail from Warsaw on March 15, arriving on April 28 in Ulan Bator, where it was received by the Academy of Sciences of the Mongolian People's Republic. The transport for the expedition consisted of 2 cars, left after the 1970 expedition in Ulan Bator (a Polish truck Star 660 and a jeep-type Romanian car MS 461), as well as a truck Gaz 63 of the Soviet production, hired in Ulan Bator together with a Mongolian driver, for the whole period of the expedition. In addition two extra trucks were hired at the beginning to take the equipment from Ulan Bator to Gurvan Tes, and at the end of the expedition, to transport the collections from Gurvan Tes to Ulan Bator.

The 12 Polish members of the expedition were:

1. Mr. ANDRZEJ BALIŃSKI, M. Sc. — palaeontologist
2. Mr. JAN BIJAK — doctor and cook
3. Mr. ANDRZEJ ELŻANOWSKI — student
4. Dr. TOMASZ JERZYKIEWICZ — geologist
5. Prof. ZOFIA KIELAN-JAWOROWSKA — palaeontologist, leader of the Polish group
6. Eng. MACIEJ KUCZYŃSKI — technical leader and driver
7. Mr. CYPRIAN KULICKI, M. Sc. — palaeontologist
8. Dr. TERESA MARYAŃSKA — palaeontologist, vice-leader
9. Mr. EDWARD MIRANOWSKI — driver
10. Mr. WOJCIECH SKARŻYŃSKI — technical assistant
11. Dr. ANDRZEJ SULIMSKI — palaeontologist
12. Mrs. MARIA ZIEMBIŃSKA-TWORZYDŁO, M. Sc. — palaeobotanist.

The Mongolian group consisted of 3 persons:

1. Dr. RINCHEN BARSBOLD, palaeontologist, leader of the Mongolian group, not taking actually part in the expedition
2. Mr. ALTANGEREL PERLE, M. Sc. — palaeontologist
3. Mr. SAMBU — technical assistant.

In addition to the above, 3 Mongolian workers were hired for a period of 26 June to 24 July.

On 28 April a four person technical group (KUCZYŃSKI, JERZYKIEWICZ, KULICKI and MIRANOWSKI) flew to Ulan Bator. During two weeks they unloaded the equipment and had it taken to Gurvan Tes, where the store for the expedition was established.

On 11 May KIELAN-JAWOROWSKA and MAYRAŃSKA arrived at Ulan Bator. During next days KIELAN-JAWOROWSKA and BARSBOLD set down the programme for the expedition. On 14 May the remaining six Polish members joined the expedition.

On 16 May the expedition set out for Khulsan (see Text-fig. 1) in the Nemegt Basin, arriving there on 20 May. In Khulsan the expedition stayed until 23 June. During this period the Lower Nemegt Beds at Khulsan and Nemegt were explored (GRADZIŃSKI & JERZYKIEWICZ, 1972). From the Lower Nemegt Beds in these two localities the following specimens were collected: about 80 lizards, about 35 mammals, a few diplopods and numerous dinosaur eggs of various sizes. In addition, at Khulsan the skull of a small pachycephalosaurid dinosaur was found and the anterior part of the skeleton (skull and a half of the trunk) of an unknown ankylosaurid dinosaur. The excavation of this skeleton proved difficult, as it was found in a cliff 4 m above the ground level, and it was necessary to build special scaffolding for its excavation. While in Khulsan groups of several persons went twice to Khermeen Tsav (see below).

On 23 June the camp at Khulsan was wound up and the expedition proceeded to the outcrops of Altan Ula IV in the Nemegt Basin, to carry out excavatory work in the Upper Nemegt Beds (GRADZIŃSKI *et al.* 1968/69). During six weeks stay at Altan Ula the following specimens from the Upper Nemegt Beds were recovered:

1. The skeleton of a very large individual of *Tarbosaurus* sp. and one incomplete skeleton of a small individual of the same species, both from Altan Ula III.
2. The incomplete skeleton, with well preserved skull of a small individual of *Saurolophus angustirostris* ROZHDESTVENSKY, from Altan Ula IV.
3. Three fragmentary skeletons of ornithomimid dinosaurs, one from Altan Ula III and two from Altan Ula IV.
4. The skeleton (without skull) of a very large ankylosaurid dinosaur from Altan Ula III.
5. Turtles, isolated bones and fragments of skeletons of various dinosaurs from Altan Ula III and IV.

While in Altan Ula one journey to Khermeen Tsav and one to Sheeregeen Gashoon were organized.

The expedition visited the outcrops of the Upper Cretaceous sediments at Khermeen Tsav on three separate occasions: between 31 May and 5 June (JERZYKIEWICZ, KIELAN-JAWOROWSKA, KUCZYŃSKI, MARYAŃSKA; MIRANOWSKI and SKARŻYŃSKI), between 11 and 17 June (ELŻANOWSKI, KIELAN-JAWOROWSKA, KUCZYŃSKI, KULICKI, MIRANOWSKI, PERLE and SULIMSKI) and between 28 June and 8 July (BALŃSKI, BIJAK, ELŻANOWSKI, JERZYKIEWICZ, KULICKI, MARYAŃSKA, MIRANOWSKI and ZIEMBIŃSKA-TWORZYDŁO).

The Cretaceous sediments of Khermeen Tsav were discovered by the second author and Dr. V. ZHEGALLO in 1969, during the work of the Soviet-Mongolian Palaeontological Expedition (see BARSBOLD *et al.* 1971; KALANDADZE & RESHETOV, 1971). Khermeen Tsav is an area of extensive badlands of Upper Cretaceous sediments, situated some 50 km south-westwards from Naran Bulak. They can be approached from the Nemegt Basin driving from Naran Bulak about 28 km westwards along the Ekheen Dzooganay Gol sayr, then turning southwards and driving 34 km south-westwards. The Khermeen Tsav badlands extend

west-east and can be approached from the western end. The sediments dip slightly south-westwards (GRADZIŃSKI & JERZYKIEWICZ, 1972). In the lower part of the section there occur the orange sand and sandstone with dark red sandy concretions, yielding *Protoceratops* sp. (probably *Protoceratops andrewsi*). This sandstone passes upwards into yellowish-grey sandstone, the latter yielding the bones and skeletons of big dinosaurs.

In 1970 the Soviet-Mongolian Palaeontological Expedition carried out the excavatory work in the upper part of Khermeen Tsav section. The main aim of the trips of the Polish-Mongolian Expedition in 1971 to Khermeen Tsav was to search for mammals and lizards in the beds yielding *Protoceratops* sp. In 1971 the Polish-Mongolian Expedition visited also the outcrops of the red sandstone, situated north to the Khermeen Tsav badlands, and separated from it by a belt of 3—5 km pediment. These beds were examined palaeontologically for the first time on this occasion, and are designated Khermeen Tsav II (GRADZIŃSKI & JERZYKIEWICZ, 1972, Text-fig. 5), in contradistinction to the badlands of the true Khermeen Tsav, designated Khermeen Tsav I. From the sandstones that crop out in Khermeen Tsav II we collected fragmentary skeletons of *Protoceratops* sp., an incomplete skeleton of an ankylosaurid dinosaur, dinosaur eggs, a few diplopods, about 80 lizards and 24 specimens of mammals. From the sandstones that occur in the lower part of the section of Khermeen Tsav I, we collected fragmentary skeletons of *Protoceratops* sp., dinosaur eggs, fragmentary skeletons of small carnivorous dinosaurs, about 20 skeletons of comparatively big lizards and 2 skulls of multituberculates. In contradistinction to the outcrops of Khermeen Tsav II, the mammals are very rare in the red sandstone of Khermeen Tsav I.

Preliminary investigation of the mammals collected in Khermeen Tsav I and II, done by the first author, shows that they belong to the same species as those found in the Lower Nemegt Beds in Khulsan and Nemegt. This is the basis for the first author's conclusion that the sandstone of Khermeen Tsav II and the red sandstone of Khermeen Tsav I are contemporaneous with the Lower Nemegt Beds and belong possibly to the Campanian. The yellowish-grey sandstone which overlies the red sandstone in Khermeen Tsav I would correspond to the Upper Nemegt Beds.

Between 12 and 19 July the party of six (JERZYKIEWICZ, KUCZYŃSKI, MARYAŃSKA, MIRANOWSKI, PERLE and SKARŻYŃSKI) set out on a trip to Sheeregeen Gashoon Basin. From the Cretaceous outcrops occurring there, they collected the postcranial skeleton of a small theropod dinosaur, an almost complete skeleton, entirely embedded in rock, of a small, unidentified reptile and several isolated dinosaur bones.

On 3 August the expedition wound up the camp at Altan Ula and proceeded to the locality of Toogreeg (Toogreegeen Shire) situated some 30 km westwards from Bayn Dzak. Cretaceous sediments at Toogreeg are white-yellowish sand and sandstone, yielding *Protoceratops andrewsi*, dinosaur eggs and small theropod dinosaurs. The expedition collected here two skulls and two skeletons of *Protoceratops andrewsi*, as well as the skeleton of a *Velociraptor mongoliensis* preserved together with the skeleton of *Protoceratops andrewsi*. The state of preservation of those two skeletons (*Velociraptor* embraces with its fore-limbs the skull of *Protoceratops*) shows that their preservation in association is not accidental and that they possibly died during the fight.

On 12 August the expedition wound up the camp at Toogreeg, returning to Ulan Bator on 19 August. The assembled collection was divided for scientific study between the Polish and Mongolian Academies of Sciences. The Polish members of the expedition left Ulan Bator in several groups, the last group arriving in Warsaw on 14 September.

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In Mongolia, at the same time as the Polish-Mongolian Expeditions of 1970 and 1971 were other Palaeontological Expeditions, Soviet-Mongolian ones. They were organized on the Soviet side by The Palaeontological Institute of the Academy of Sciences of U. S. S. R. The first author wishes to express her sincere gratitude to the authorities of the Soviet side of these expeditions, to Dr. N. W. KRAMARENKO and Dr. V. I. ZHEGALLO, for the assistance shown to the Polish group during their stay in Mongolia and to Dr. V. J. RESHETOV for friendly cooperation in the field. The cooperation with the late Prof. A. G. VOLOGDIN was greatly appreciated.

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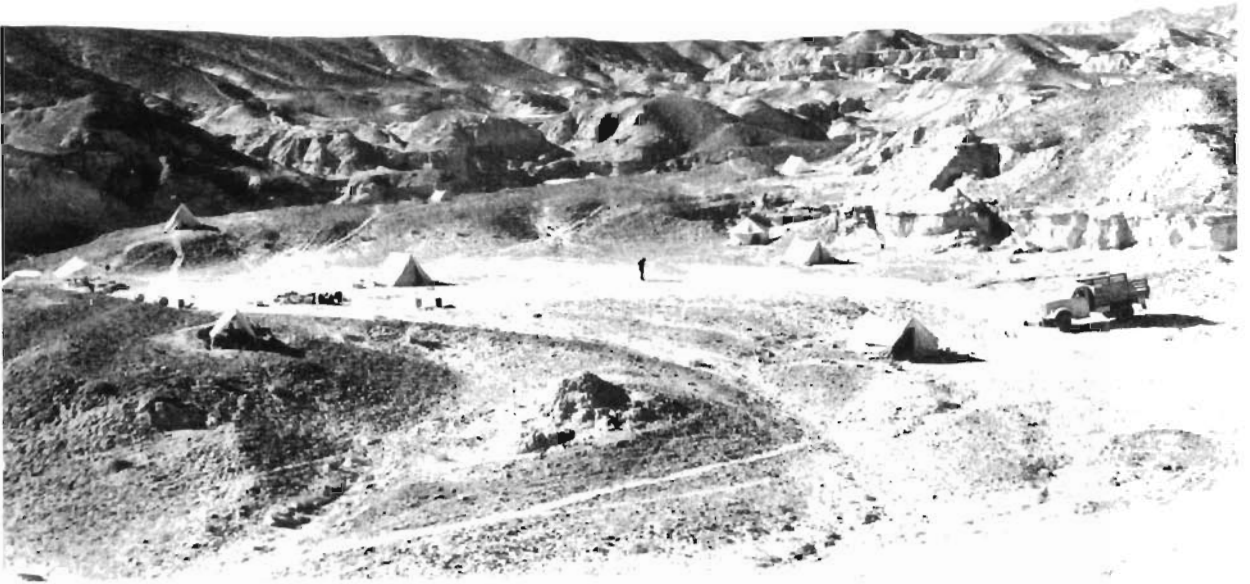
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