

China

Zhuding Qiu & Gerhard Storch

Qiu, Z.D. & Storch, G. China. In: Hoek Ostende, L.W. van den, Doukas, C.S. & Reumer, J.W.F. (eds), *The Fossil Record of the Eurasian Neogene Insectivores (Erinaceomorpha, Soricomorpha, Mammalia), Part I. Scripta Geologica Special Issue*, 5: 37-50, Leiden, November 2005.

Z. Qiu, Institute of Vertebrate Paleontology and Paleoanthropology (IVPP), Academia Sinica, P.O. Box 643, Beijing 100044, China, (zdqiu@263.net); G. Storch, Forschungsinstitut Senckenberg, Senckenberg-Anlage 25, D-60325 Frankfurt am Main, Germany (Gerhard.Storch@senckenberg.de).

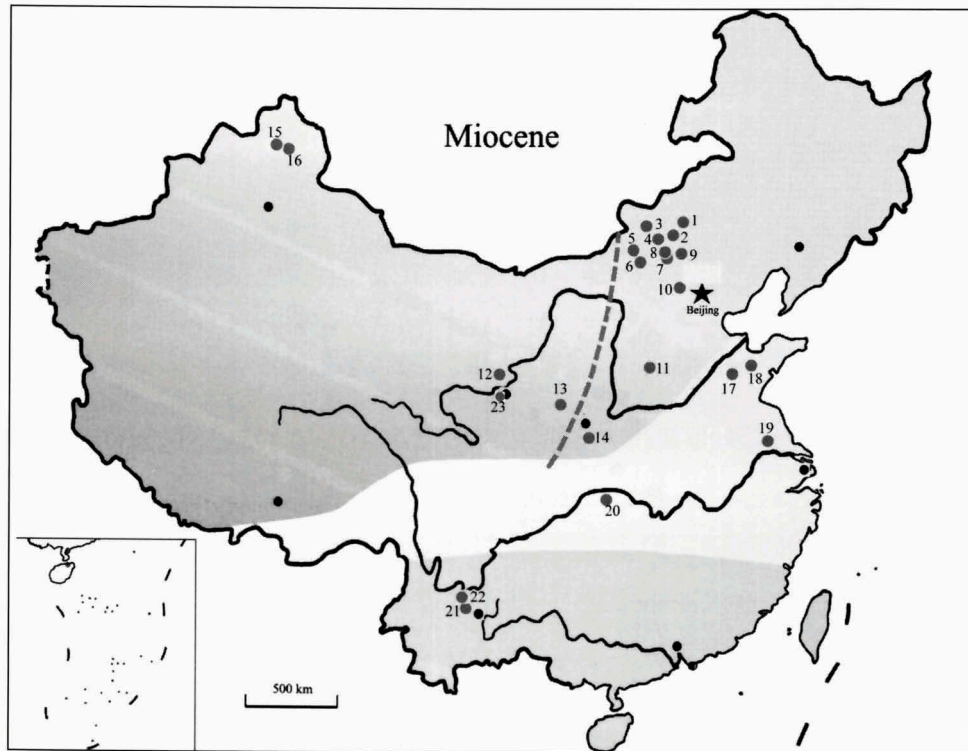
Contents

Introduction	37
Insectivore faunas in the Neogene of China	38
References	48

Introduction

Extensive excavation activities by the Institute of Vertebrate Paleontology and Paleoanthropology, Beijing (IVPP) over the last 20 years have increased our knowledge of the Neogene micromammals from China considerably. Yet, it is still rather fragmentary; we deal with a very vast country with a complex geological and faunal history and varied ecological conditions at all times. The fossil sites are not distributed evenly in time and space (Fig. 1), and among Neogene micromammals, insectivores are often disregarded taxonomically, even though they are a major element in most assemblages.

Qiu (1988) and Qiu & Qiu (1995) discussed the major Neogene micromammal faunas from China and presented faunal lists, including insectivores. The location of the local faunas is shown in Fig. 1. A synopsis of fossil records of soricids from Asia was given by Storch *et al.* (1998). Detailed taxonomic studies of Neogene insectivores deal with local faunas such as Lufeng in the south and Tunggur, Ertemte, and Bilike in the north of China. Where necessary, we updated for the present paper the biochronological and local (administrative/geographical) settings and consulted type specimens of various taxa. Some taxa, however, still would require a more comprehensive review. Unlike the other contributions in this volume, we used the terms of the Chinese Land Mammal Ages for the chronological setting instead of the European Neogene Mammal units (MN zones). Our correlation with MN zones must be considered tentative for the most part. Within each Age the localities are arranged stratigraphically. All specimens are housed in the collections of IVPP, aside from the holotype of *Metexallerix gaolanshanensis*.



Location of Neogene insectivore localities in China.

Miocene: 2. Gashunyinadege; 3. Tunggur; 4. Tairum Nor; 5. Amuwusu; 6. Shala; 7. Ertemte; 12. Quantougou; 14. Bahe; 15. Suosuoquan; 16. Halamagai; 17. Shanwang; 18. Yinan; 19. Xiacaowan; 21. Shihuiba; 22. Leilao; 23. Gaolanshan.

Miocene + Pliocene: 8. Harr Obo; 11. Yushe (Mahui, Gaozhuang, Mazegou); 13. Lingtai.

Pliocene: 1. Gaodege; 9. Bilike; 10. Daodi; 18. Yinan; 20. Damiao.

Insectivore faunas in the Neogene of China

Xiejian

Suosuoquan Formation

Location – Fuyun, Xinjiang Uygur Autonomous Region, China.

Stratigraphy – Fluvio-lacustrine deposits, Xiejian. Equivalent of ~MN 1-2.

Literature – Wu *et al.* (1998), Bi (1999, 2000).

Insectivores – Erinaceidae: *Amphechinus bohlini* Bi, 2000 (type locality), *Amphechinus* cf. *A. minimus* (Bohlin, 1942), *Metexallerix junggarensis* Bi, 1999 (type locality).

Taxonomic descriptions – Wu *et al.* (1998) reported on the insectivores and Bi (1999, 2000) gave descriptions.

Storage of material – IVPP.

Gaolanshan

Location – Lanzhou, Gansu Province, China.

Stratigraphy – Fluvio-lacustrine deposits, Xiejian. Equivalent of ~MN 2.

Literature – Qiu & Gu (1988).

Insectivores – Erinaceidae: *Metexallerix gaolanshanensis* Qiu & Gu, 1988 (type locality).

Taxonomic descriptions – Qiu & Gu (1988) described the first *Metexallerix* known from the Chinese Neogene.

Storage of material – Lanzhou University, Gansu Province, China.

Shanwangian

Xiacaowan

Location – Sihong, Jiangsu Province, China.

Stratigraphy – Fluvial deposits, Shanwangian. Equivalent of ~MN 4.

Literature – Li *et al.* (1983), Qiu & Qiu (1995).

Insectivores – Erinaceidae: *Lantanotherium* sp., Galericinae gen. et sp. indet. Soricidae: *Crocidosorex* sp.

Taxonomic descriptions – Li *et al.* (1983) presented the Xiacaowan fauna, including the insectivores. Qiu & Qiu (1995) removed *Galerix* sp. of Li *et al.* (1983) and consider it an undetermined genus and species of Galericinae.

Storage of material – IVPP.

Gashunyinadege

Location – Sunitezuoqi, Nei Mongol (Inner Mongolia) Autonomous Region, China.

Stratigraphy – Fluvial deposits, Shanwangian. Equivalent of ~MN 4-5.

Literature – Meng *et al.* (1996), Qiu & Wang (1999).

Insectivores – Erinaceidae: *Mioechinus?* or *Amphechinus* sp., *Metexallerix* sp. Talpidae: Talpidae gen. et sp. indet. Soricidae: Soricidae gen. et sp. indet.

Taxonomic descriptions – Meng *et al.* (1996) reported on the Gashunyinadege fauna, including an undetermined species of *Metexallerix*. Qiu & Wang (1999) listed the above insectivores based on an additional collection.

Storage of material – IVPP.

Shanwang

Location – Shanwang, Linqu County, Shandong Province, China.

Stratigraphy – Diatomite Quarry, Late Shanwangian. Equivalent of ~MN 5.

Literature – Storch & Qiu (2004).

Insectivores – Soricidae: *Lusorex taishanensis* Storch & Qiu (2004) (type locality).

Taxonomic descriptions – Storch & Qiu (2004) described the dentition and skeleton of the holotype and discussed its intercontinental systematic relationships. It represents the first completely preserved heterosoricine shrew.

Storage of material – IVPP.

Tunggurian

Halamagai Formation

Location – Fuhai, Xinjiang Uygur Autonomous Region, China.

Stratigraphy – Fluvio-lacustrine deposits, Tunggurian. Equivalent of ~MN 6.

Literature – Bi *et al.* (1999).

Insectivores – Erinaceidae: *Mioechinus?* cf. *M. gobiensis* Qiu, 1995, *Schizogalerix duolebulejinensis* Bi, Wu, Ye & Meng, 1999 (type locality).

Taxonomic descriptions – Bi *et al.* (1999) described the insectivores.

Storage of material – IVPP.

Tairum Nor

Location – Suniteyuoqi, Nei Mongol Autonomous Region, China.

Stratigraphy – Fluvio-lacustrine deposits, Tunggurian. Equivalent of ~MN 8.

Literature – Qiu & Wang (1999).

Insectivores – Erinaceidae: *Mioechinus?* cf. *M. gobiensis* Qiu, 1995.

Taxonomic descriptions – Qiu & Wang (1999) reported the Tairum micromammalian fauna, including the hedgehog listed here.

Storage of material – IVPP.

Tunggur

Location – Suniteyuoqi, Nei Mongol Autonomous Region, China.

Stratigraphy – Fluvio-lacustrine deposits, Tunggurian. Equivalent of ~MN 8.

Literature – Qiu *et al.* (1988), Qiu, (1996).

Insectivores – Erinaceidae: *Mioechinus? gobiensis* Qiu, 1996 (type locality), *Mioechinus?* sp., Erinaceinae gen. et sp. indet. Talpidae: *Desmanella storchi* Qiu, 1996 (type locality), *Proscapanus* sp., *Quyania* sp., *Yanshuella* sp., Talpidae gen. et sp. indet. Soricidae: *Mongolosorex qiu* Qiu, 1996 (type locality), Soricinae gen. et sp. indet, Soricidae gen. et sp. indet.

Taxonomic descriptions – Tunggur is a classic middle Miocene locality in eastern Asia, but no insectivore was known until a re-excavation made in a new fossil site in 1988. Qiu *et al.* (1988) reported the results of the excavation, including the insectivores. Qiu (1996) revised the taxa and described the above insectivores. The heterosoricine shrew *Mongolosorex qiu* was described based on the original *Dinosorex* sp. of Qiu *et al.* (1988). *Desmanella storchi* is the first record of its genus from Asia.

Storage of material – IVPP.

Quantougou

Location – Lanzhou, Gansu Province, China.

Stratigraphy – Earthy deposits, Tunggurian. Equivalent of ~MN 8.

Literature – Qiu (2000).

Insectivores – Erinaceidae: *Mioechinus? gobiensis* Qiu, 1996.

Taxonomic descriptions – Qiu (2000) described the Quantougou micromammalian fauna, including the hedgehog.

Storage of material – IVPP.

Baodean**Amuwusu**

Location – Suniteyouqi, Nei Mongol Autonomous Region, China.

Stratigraphy – Fluvial deposits, Baodean. Equivalent of ~MN 9.

Literature – Qiu (1988), Qiu & Wang (1999).

Insectivores – Erinaceidae: *Mioechinus? gobiensis* Qiu, 1996. Erinaceinae gen. et sp. indet. Talpidae: *Yanshuella* sp. Soricidae: Soricidae gen. et sp. indet., Heterosoricinae gen. et sp. indet.

Taxonomic descriptions – Qiu (1988) reported the Amuwusu micromammalian fauna, including a few taxa of insectivores. Qiu & Wang (1999) listed the above insectivores based on collections made since 1986.

Storage of material – IVPP.

Bahe

Location – Lantian, Shaanxi Province, China.

Stratigraphy – Fluvio-lacustrine deposits, Baodean. Equivalent of ~MN 10.

Literature – Liu *et al.* (1978), Qiu *et al.* (2003).

Insectivores – Erinaceidae: *Erinaceus* sp. Soricidae: Soricinae gen. et sp. indet. 1-3.

Taxonomic descriptions – Liu *et al.* (1978) reported the hedgehog and Qiu *et al.* (2003) listed the shrews.

Storage of material – IVPP.

Leilao

Location – Yuanmou, Yunnan Province, China.

Stratigraphy – Fluvial deposits, Baodean. Equivalent of ~MN 11.

Literature – Ni & Qiu (2002).

Insectivores – Erinaceidae: *Hylomys* sp. aff. *H. suillus* Müller, 1839. Talpidae: *Yunoscaptor scalprum* Storch & Qiu, 1990. Soricidae: *Heterosorex wangi* Storch & Qiu, 1990, *Anourosorex oblongus* Storch & Qiu, 1990, *Sorex* sp. 1-2.

Taxonomic descriptions – Ni & Qiu (2002) reported the Yuanmou micromammalian fauna, including the above insectivores, and assessed the biochronological position based on rhizomyine, cricetine and murine rodents.

Storage of material – IVPP.

Shala

Location – Suniteyouqi, Nei Mongol Autonomous Region, China.

Stratigraphy – Fluvial deposits, Baodean. Equivalent of ~MN 11.

Literature – Qiu & Wang (1999).

Insectivores – Erinaceidae: Erinaceidae gen. et sp. Talpidae: *Asthenoscapter* sp., *Yanshuella primaeva* (Schlosser, 1924). Soricidae: *Paranourosorex* sp., Soricidae gen. et sp. indet.

Taxonomic descriptions – Qiu & Wang (1999) reported the Shala micromammalian fauna, including the insectivores.

Storage of material – IVPP.

Shihuiba

Location – Lufeng, Yunnan Province, China.

Stratigraphy – Marsh deposits with rich lignite, Baodean. Equivalent of ~MN 11-12.

Literature – Qiu *et al.* (1984), Storch & Qiu (1991).

Insectivores – Erinaceidae: *Lantanothereium sanmigueli* Villalta & Crusafont, 1944, *Hylomys* sp., aff. *H. suillus* Müller, 1839. Talpidae: *Yunoscaptor scalprum* Storch & Qiu, 1991 (type locality), Talpinae gen. et sp. indet. Soricidae: *Heterosorex wangi* Storch & Qiu, 1991 (type locality), *Anourosorex oblongus* Storch & Qiu, 1991 (type locality), *Blarinella* sp., *Sorex* sp., Soricinae gen. et sp. indet.

Taxonomic descriptions – Qiu *et al.* (1984) reported the Lufeng micromammalian fauna, including its insectivores. Storch & Qiu (1990) described the above insectivores in detail. The original *Galerix* was referred to *Hylomys*, and the undetermined Heterosoricinae and Scalopini in Qiu *et al.* (1984) were assigned by Storch & Qiu to *Heterosorex* and *Yunoscaptor*, respectively.

Storage of material – IVPP.

Mahui Formation

Location – Yushe, Shanxi Province, China.

Stratigraphy – Fluvial deposits, Baodean. Equivalent of ~MN 13.

Literature – Flynn & Wu (1994).

Insectivores – Talpidae: Talpinae gen. et sp. indet. Soricidae: cf. Blarinini, Soricidae gen. et sp. indet.

Taxonomic descriptions – Flynn & Wu (1994) described the insectivores.

Storage of material – IVPP.

Ertemte

Location – Huade, Nei Mongol Autonomous Region, China.

Stratigraphy – Lacustrine deposits, Baodean. Equivalent of ~MN 13.

Literature – Schlosser (1924), Miller (1927), Fahlbusch *et al.* (1983), Storch & Qiu (1983), Storch (1995).

Insectivores – Erinaceidae: *Erinaceus mongolicus* Schlosser, 1924 (type locality). Talpidae: *Quyania chowi* Storch & Qiu, 1983 (type locality), *Yanshuella primaeva* (Schlosser, 1924) (type locality), Talpinorum gen. et sp. indet. Soricidae: *Alloblarinella sinica* Storch, 1995 (type locality), *Cokia kowalskae* Storch, 1995 (type locality), *Paenelimnoecus obtusus* Storch, 1995 (type locality), *Paenepetenya zhudingi* Storch, 1995 (type locality), *Paranourosorex inexpectatus* (Schlosser, 1924) (type locality), *Sorex ertemteensis* Storch, 1995 (type locality), *Sorex minutoides* Storch, 1995 (type locality), *Sorex pseudoalpinus* Rzebik-Kowalska, 1991, *Zelceina kormosi* (Schlosser, 1924) (type locality).

Taxonomic descriptions – Schlosser (1924) described the Ertemte fauna, including some of the insectivores listed above. Fahlbusch *et al.* (1983) made a re-investigation of this locality and added several insectivores to the faunal list. Storch & Qiu (1983) described two new genera of moles, *Yanshuella* and *Quyania*. Storch (1995) described the new soricine genera *Alloblarinella*, *Cokia*, and *Paenepetenya* as well as six new soricine species. He transferred *Crocidura kormosi* Schlosser 1924 (= *Blarinella kormosi* in Miller, 1927) to *Zelceina* and *Neomys inexpectatus* Schlosser 1924 (= *Anourosorex inexpectatus* in Miller, 1927) to *Paranourosorex*.

Storage of material – IVPP.

Lingtai

Location – Lingtai, Gansu Province, China.

Stratigraphy – Fluvio-lacustrine deposits, Baodean-Yushean. Equivalent of ~MN 13~17.

Literature – Zhang & Zheng (2000, 2001), Zheng & Zhang (2001).

Insectivores – Late Miocene; Erinaceidae: *Erinaceus* sp.

Early Pliocene; Erinaceidae: *Erinaceus* sp. Soricidae: *Crocidura* sp., ?*Antesorex* sp., *Chimarroale* sp., *Chodsigoa* sp.

Late Pliocene; Erinaceidae: *Erinaceus* sp.; Talpidae: *Talpa* sp. Soricidae: *Crocidura* sp., *Beremendia* sp., *Chimarroale* sp., *Sorex* sp., *Soriculus* sp.

Taxonomic descriptions – Zhang & Zheng (2000, 2001) and Zheng & Zhang (2001) listed the above insectivores from a rather continuous section at Lingtai and assessed the biochronological position based on other small mammals.

Storage of material – IVPP.

Yushean

Harr Obo

Location – Huade, Nei Mongol Autonomous Region, China.

Stratigraphy – Lacustrine deposits, Yushean. Equivalent of ~MN 14.

Literature – Andersson (1923), Fahlbusch *et al.* (1983), Storch & Qiu (1983), Storch (1995).

Insectivores – Talpidae: *Quyania chowi* Storch & Qiu, 1983, *Yanshuella primaeva* (Schlosser, 1924); Soricidae: *Cokia kowalskae* Storch, 1995, *Paenepetenya zhudingi* Storch, 1995, *Paranourosorex inexpectatus* (Schlosser, 1924), *Sorex ertemteensis* Storch, 1995, *Sorex minutoides* Storch, 1995, *Sorex pseudoalpinus* Rzebik-Kowalska, 1991, *Zelceina kormosi* (Schlosser, 1924).

Taxonomic descriptions – Previous collecting at this locality did not produce insectivores (Andersson, 1923). Fahlbusch *et al.* (1983) re-investigated the locality and listed insectivores for the first time. The taxonomical allocations of moles and shrews represented at Harr Obo correspond with those from Ertemte (see above).

Storage of material – IVPP.

Bilike

Location – Huade, Nei Mongol Autonomous Region, China.

Stratigraphy – Fluvio-lacustrine deposits, Yushean. Equivalent of ~MN 14~15.

Literature – Qiu (1988), Qiu & Storch (2000).

Insectivores – Erinaceidae: *Erinaceus mongolicus* Schlosser, 1924. Talpidae: *Quyania* cf. *chowi* Storch & Qiu, 1983, *Yanshuella primaeva* (Schlosser, 1924), *Desmana* sp. Soricidae: *Lu-*

nanosorex cf. lii Jin & Kawamura, 1996, *Paenelimnoecus obtusus* Storch, 1995, *Parasoriculus tongi* Qiu & Storch, 2000 (type locality), *Petenyia katrinae* Qiu & Storch, 2000 (type locality), *Sorex ertemteensis* Storch, 1995, *Sorex minutoides* Storch, 1995, *Sorex pseudoalopinus* Rzebik-Kowalska, 1991, *Sorex* sp., *Sulimskia ziegleri* Qiu & Storch, 2000 (type locality).

Taxonomic descriptions – Qiu (1988) reported the Bilike micromammalian fauna, including some of the insectivores. Qiu & Storch (2000) studied the fauna, including the above insectivores, in detail on the basis of material excavated at the locality in 1992. *Parasoriculus* was described as new, and *Petenyia* and *Sulimskia* were reported from China for the first time.

Storage of material – IVPP.

Gaozhuang Formation

Location – Yushe, Shanxi Province, China.

Stratigraphy – Fluvial deposits, Yushean. Equivalent of ~MN 14-15.

Literature – Flynn & Wu (1994).

Insectivores – Talpidae: *Scaptochirus* sp., *Yanshuella primaeva* (Schlosser, 1924), *Desmana nehringi* Kormos, 1913. Soricidae: *Soriculus praecursus* Flynn & Wu, 1994 (type locality), *Blarinini* gen. et sp. indet.

Taxonomic descriptions – Flynn & Wu (1994) described the insectivores. *Desmana* and *Blarinoides* were recorded from China for the first time. *Soriculus praecursus* is considered to be the earliest occurrence of the genus.

Storage of material – IVPP.

Gaodege (Gouochtock Oula)

Location – Gaotege Ula (Gouochtock Oula), Abagaqi, Nei Mongol Autonomous Region, China.

Stratigraphy – Fluvial deposits, Yushean. Equivalent of ~MN 14-15.

Literature – Teilhard (1926), Li *et al.* (2003).

Insectivores – Erinaceidae: *Erinaceus* sp. Talpidae: *Yanshuella primaeva* (Schlosser, 1924), *Desmana* sp. Soricidae: *Lunanosorex cf. lii* Jin & Kawamura, 1996, *Petenyia katrinae* Qiu & Storch, 2000, *Sorex ertemteensis* Storch, 1995, *Sorex pseudoalopinus* Rzebik-Kowalska, 1991, *Sorex* sp., *Sulimskia cf. S. ziegleri*, Qiu & Storch 2000.

Taxonomic descriptions – The Gaodege fauna was first reported by Teilhard (1926), but did not include insectivore remains at that time. Li *et al.* (2003) listed the insectivores and discussed the biochronology of the mammalian fauna.

Storage of material – IVPP.

Daodi

Location – Nihewan, Hebei Province, China.

Stratigraphy – Fluvio-lacustrine deposits, Yushean. Equivalent of ~MN 16.

Literature – Cai (1987), Cai & Qiu (1993).

Insectivores – Erinaceidae: *Erinaceus* sp. Talpidae: Talpidae gen. et sp. indet. 1-2. Soricidae: *Lunanosorex* cf. *L. lii* Jin & Kawamura, 1996, *Paenelimnoecus* sp., *Sorex* spp., cf. *Sorex* sp., Soricidae gen. et sp. indet. 1-3.

Taxonomic descriptions – Cai (1987) reported the Daodi micromammalian fauna, including its insectivores. Cai & Qiu (1993) assessed the biochronological position based on murine rodents. ?*Beremendia* sp. in Cai (1987) is similar to the type species of *Lunanosorex* and is here tentatively referred to it.

Storage of material – IVPP.

Mazegou Formation

Location – Yushe, Shanxi Province, China.

Stratigraphy – Fluvial deposits, Yushean. Equivalent of ~MN 16.

Literature – Flynn & Wu (1994), Jin & Kawamura (1996a), Storch *et al.* (1998).

Insectivores – Erinaceidae: *Erinaceus* sp. Talpidae: *Scaptochirus* sp., *Yanshuella primaeva* (Schlosser, 1924). Soricidae: *Peisorex pohaiensis* Kowalski & Li, 1963, *Blarinoides* sp.

Taxonomic descriptions – Flynn & Wu (1994) described the insectivores. Jin & Kawamura (1996) referred *Peisorex pliocaenicus* to *Beremendia* while Storch *et al.* (1998) advocated the validity of *Peisorex*.

Storage of material – IVPP.

Yinan

Location – Yinan, Shandong Province, China.

Stratigraphy – Cave deposits, Yushean. Equivalent of ~MN 16.

Literature – Jin & Kawamura (1996a, b).

Insectivores – Soricidae: *Lunanosorex lii* Jin & Kawamura, 1996 (type locality), *Paenelimnoecus chinensis* Jin & Kawamura, 1996 (type locality).

Taxonomic descriptions – Jin & Kawamura (1996a, b) described the insectivores and assessed the biochronological position on the basis of rodents.

Storage of material – IVPP.

Nihewanian

Damiao

Location – Wushan, Hubei Province, China.

Stratigraphy – Cave deposits, Nihewanian. Equivalent of ~MN 17.

Literature – Huang & Fang (1991).

Insectivores – Erinaceidae: *Hylomys* cf. *suillus* Müller, 1840, *Neotetracus* cf. *sinensis* Trouessart, 1909, *Erinaceus koloshanensis* Young & Liu 1950, *Erinaceus* sp. Talpidae: *Uropsilus soricipes* Milne-Edwards, 1872, *Scaptonyx fuscicaudus* Milne-Edwards, 1872, *Mogera insularis* Swinhoe, 1863, ?*Talpa* sp. Soricidae: *Crocidura* sp., *Blarinella quadraticauda* (Milne-Edwards, 1872), *Blarinella* sp., *Chimarrigale* cf. *himalayica* (Gray, 1842), *Soriculus leucops* Horsfield, 1885, *Soriculus parva* Allen, 1923, *Soriculus* sp.

Taxonomic descriptions – Huang & Fang (1991) reported the Wushan Fauna, including the above insectivores.

Storage of material – IVPP.

References

- Allen, G.M. 1923. New Chinese insectivores. *American Museum Novitates New York*, **100**: 1-11.
- Andersson, J.G. 1923. Essays on the Cenozoic of northern China. *Memoirs Geology Survey China*, **A3**: 1-152.
- Bi, S.D. 1999. *Metaxallorix* from the Early Miocene of North Junggar Basin, Xinjiang Uygur Autonomous Region, China. *Vertebrata Palasiatica*, **37** (2): 140-155.
- Bi, S.D. 2000. Erinaceidae from the Early Miocene of North Junggar Basin, Xinjiang Uygur Autonomous Region, China. *Vertebrata Palasiatica*, **38** (1): 43-51.
- Bi, S.D., Wu, W. Y., Ye, J. & Meng, J. 1999. Erinaceidae from the middle Miocene of North Junggar Basin, Xinjiang Uygur Autonomous Region, China. *Proceedings VII Annual Meeting Chinese Society of Vertebrate Paleontology*: 157-166. China Ocean Press.
- Bohlin, B. 1942. The Fossil Mammals from the Tertiary Deposit of Tabebu, Western Nansu. Reports from the Scientific Expedition to the North-Western Provinces of China under the Leadership of Dr. Sven Hedin. Publication 20, VI. *Vertebrata Palaeontology* 3. *Palaeontologica Sinica C*, (New Series) **8b**: 1-110.

- Cai, B.Q. 1987. A preliminary report on the late Pliocene micromammalian fauna from Yangyuan and Yuxian, Hebei. *Vertebrata Palasiatica*, **25** (2): 124-136.
- Cai, B.Q. & Qiu, Z.D. 1993. Murid rodents from the late Pliocene of Yangyuan and Yuxian, Hebei. *Vertebrata Palasiatica*, **31** (2): 267-293.
- Fahlbusch, V., Qiu, Z.D. & Storch, G. 1983. The Neogene mammalian faunas of Ertemte and Harr Obo in Nei Mongol, China. 1. Report on field work in 1980 and preliminary results. *Scientia Sinica*, **B26**: 205-224.
- Flynn, J.F. & Wu, W.Y. 1994. Two new shrews from the Pliocene of Yushe Basin, Shanxi Province, China. *Vertebrata Palasiatica*, **32** (2): 73-86.
- Gray, J.E. 1842. Description of some new genera and fifty unrecorded species of Mammalia. *The Annals and Magazine of Natural History, including Zoology, Botany, and Geology*, **10** (65): 255-267.
- Horsfield, T. 1855. Brief notices of several new or little-known species of Mammalia, lately discovered and collected in Nepal, by Brian Houghton Hodgson, Esq. *The Annals and Magazine of Natural History, including Zoology, Botany, and Geology*, (serie 2), **16** (92): 101-114.
- Huang, W.B. & Fang, Q.R. (eds) 1991. *The site of Wushan Man*. China Ocean Press, Beijing: 229 pp.
- Jin, C.Z. & Kawamura, Y. 1996a. The first reliable record of *Beremendia* (Insectivora, Mammalia) in East Asia and a revision of *Peisorex* Kowalski and Li, 1963. *Transactions and Proceedings of the Palaeontological Society of Japan*, (New Series) **182**: 432-447.
- Jin, C.Z. & Kawamura, Y. 1996b. A new genus of shrew from the Pliocene of Yinan, Shandong Province, northern China. *Transactions and Proceedings of the Palaeontological Society of Japan*, (New Series) **182**: 478-483.
- Kormos, T. 1913. Trois nouvelles espèces fossiles des Desmans en Hongrie. *Annales Musei Nationalis Hungarici*, **11**: 135-145.
- Kowalski, K. & Li, C.K. 1963. A new form of the Soricidae (Insectivora) from the Pleistocene of north China. *Vertebrata Palasiatica*, **7** (2): 138-143.
- Li, C.K., Lin, Y.P. & Gu, Y.M. 1983. The Aragonian vertebrate fauna of Xiacaowan, Jiangsu. *Vertebrata Palasiatica*, **21** (4): 313-327.
- Li, Q., Wang, X.M. & Qiu, Z.D. 2003. Pliocene mammalian fauna of Gaotege in Nei Mongol (Inner Mongolia), China. *Vertebrata Palasiatica*, **41** (2): 104-114.
- Liu, T.S., Li, C.K. & Zhai, R.J. 1978. Pliocene vertebrates of Lantian, Shensi. *Professional Paper Stratigraphy and Palaeontology*, **7**: 149-200.
- Meng, J., Wang, B.Y. & Bai, Z.Q. 1996. A new middle Tertiary mammalian locality from Suniteyuoqi, Nei Mongol. *Vertebrata Palasiatica*, **34** (4): 297-304.
- Miller, G.S. 1927. Revised determinations of some Tertiary mammals from Mongolia. *Palaeontologia Sinica*, **C5** (2): 5-20.
- Milne Edwards, A. 1872. In David, A.: *Rapport adressé à MM. les professeurs-administrateurs du Muséum d'Histoire Naturelle. Nouvelles Archives du Muséum d'histoire naturelle de Paris*, **7** (4): 92 (footnote)
- Müller, S. 1839-1840. De zoogdieren van de Indischen Archipel (prt 1/2). In: C.J. Temminck (ed.), *Verhandelingen over de natuurlijke geschiedenis der Nederlansche Overzeesche Bezittingen Land- en Volkenkunde, Zoologie*: 1-57.
- Ni, X.J. & Qiu, Z.D. 2002. The micromammalian fauna from the Leilao, Yuanmou hominoid locality: Implications for biochronology and paleoecology. *Journal of Human Evolution*, **42**: 535-546.
- Qiu, Z.D. 1988. Neogene micromammals of China. In: Whyte, P., Aigner, J.S., Jablonski, N.G., Taylor, G., Walker, D. & Wang, P.X. (eds), *The Palaeoenvironment of East Asia from the Mid-Tertiary. Proceedings of the second Conference*, **2**: 834-848.
- Qiu, Z.D. 1996. *Middle Miocene micromammalian fauna from Tunggur, Nei Mongol*. Science Press, Beijing: 216 pp.
- Qiu, Z.D. 2000. Insectivore, dipodoidean and lagomorph from the middle Miocene Quantougou fauna of Lanzhou, Gansu. *Vertebrata Palasiatica*, **38** (4): 287-302.
- Qiu, Z.D., Han, D.F., Qi, G.Q. & Lin, Y.F. 1984. A preliminary report on a micromammalian assemblage from the hominoid locality of Lufeng, Yunnan. *Acta Anthropologia Sinica*, **4** (1): 13-32.
- Qiu Z.D. & Storch, G. 2000. The early Pliocene micromammalian fauna of Bilike, Inner Mongolia, China (Mammalia: Lipotyphla, Chiroptera, Rodentia, Lagomorpha). *Senckenbergiana lethaea*, **80** (1): 173-229.

- Qiu, Z.D. & Wang, X.M. 1999. Small mammal faunas and their ages in Miocene of central Nei Mongol (Inner Mongolia). *Vertebrata PalAsiatica*, **37** (1): 120-139.
- Qiu, Z.D., Zheng, S.H., Sen, S. & Zhang, Z.Q. 2003. Late Miocene micromammals from the Bahe Formation, Lantian, China. - In: Reumer & J.W.F., Wessels, W. (eds.), Distribution and Migration of Tertiary Mammals in Eurasia. *A volume in honour of Hans de Bruijn. Deinsea*, **10**: 443-454.
- Qiu, Z.X. & Gu, Z.G. 1988. A new locality yielding Mid-Tertiary mammals near Lanzhou, Gansu. *Vertebrata PalAsiatica*, **26** (3): 209-218.
- Qiu, Z.X. & Qiu, Z.D. 1995. Chronological sequence and subdivision of Chinese Neogene mammalian faunas. *Paleogeography, Palaeoclimatology, Palaeoecology*, **116**: 41-70.
- Qiu, Z.X., Yan, D.F., Chen, G.F. & Qiu, Z.D. 1988. Preliminary report on the paleontological expedition of Nei Mongol. *Chinese Science Bulletin*, **32** (19): 1487-1491.
- Rzebik-Kowalska, B. 1991. Pliocene and Pleistocene Insectivora (Mammalia) of Poland. VIII. Soricidae: *Sorex* Linnaeus, 1758, *Neomys* Kaup, 1829, *Macroneomys* Fejfar, 1966, *Paenelimnoecus* Baudelot, 1972 and Soricidae indeterminate. *Acta Zoologica Cracoviensia*, **34** (2): 323-424.
- Schlosser, M. 1924. Tertiary vertebrates from Mongolia. *Palaeontologia Sinica*, **C1**: 1-119.
- Storch, G. 1995. The Neogene mammalian faunas of Ertemte and Harr Obo in Inner Mongolia (Nei Mongol), China. - 11. Soricidae (Insectivora). *Senckenbergiana lethaea*, **75** (1/2): 221-251.
- Storch, G. & Qiu, Z.D. 1983. The Neogene mammalian faunas of Ertemte and Harr Obo in Inner Mongolia (Nei Mongol), China. - 2. Moles - Insectivora: Talpidae. *Senckenbergiana lethaea*, **64** (2/4): 89-127.
- Storch, G. & Qiu, Z.D. 1991. Insectivores (Mammalia: Erinaceidae, Soricidae, Talpidae) from the Lufeng hominoid locality, late Miocene of China. *Geobios*, **24** (5): 601-621.
- Storch, G. & Qiu, Z.D. 2004. First complete heterosoricine shrew: A new genus and species from the Miocene of China. *Acta Palaeontologica Polonica*, **49**(3): 357-363.
- Storch, G., Qiu, Z.D. & Zazhigin, V.S. 1998. Fossil history of shrews in Asia. In: Wójcik, J.M. & Wolsan, M. (eds), *Evolution of shrews*: 93-120. Mammal Research Institute, Polish Academy of Sciences, Białowieża.
- Swinhoe, R. 1862. On the mammals of the island of Formosa (China). *Proceedings of the scientific meetings of the Zoological Society of London*, **1862**: 347-365.
- Teilhard de Chardin, P. 1926. Description de mammifères Tertiaires de Chine et de Mongolie. *Annales de Paléontologie*, **15**: 1-52.
- Trouessart, E.L. 1909. *Neotetracus sinensis*, a new insectivore of the family Erinaceidae. *The Annals and Magazine of Natural History, Zoology, Botany and Geology* (Serie 8), **4**: 389-391.
- Villalta, J.F. & Crusafont, M. 1944. Nuevos Insectívoros del Mioceno Continental del Vallés-Penedés. *Notas y comunicaciones del Instituto Geológico y Minero de España*, **12**: 39-65.
- Wu, W.Y., Ye J., Meng, J., Wang, X.M., Liu, L.P., Bi, S.D. & Dong, W. 1998. Progress of the study of Tertiary biostratigraphy in North Junggar Basin. *Vertebrata PalAsiatica*, **36** (1): 30-44.
- Young, C.C. & Liu, P.T. 1950. On the mammalian fauna at Koloshan near Chungking, Szechuan. *Bulletin of the Geological Society of China*, **30** (1-4): 43-90.
- Zhang, Z.Q. & Zheng, S.H. 2000. Late Miocene-Early Pleistocene micromammals from Wenwanggou of Lingtai, Gansu, China. *Vertebrata PalAsiatica*, **38** (1): 58-71.
- Zhang, Z.Q. & Zheng, S.H. 2001. Late Miocene-Pliocene biostratigraphy of Xiaoshigou section, Lingtai, Gansu. *Vertebrata PalAsiatica*, **39** (1): 54-66.
- Zheng, S.H. & Zhang, Z.Q. 2001. Late Miocene-Early Pleistocene biostratigraphy of the Leijiahe area, Lingtai, Gansu. *Vertebrata PalAsiatica*, **39** (3): 215-228.