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SEQUENCES OF LLANDOVERIAN CHITINOZOANS IN YANGZI REGION

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Summary

This paper is dedicated as a token of homage and gratitude to Prof. Mu En-zhi, the nestor in the field of graptolite studies, who introduced

us chitinozoan studies with constant supports in many ways, and who died on 8th April, 1987. The Palaeontological Society of China has decided to

publish a special volume in memory of this outstanding scientist.

The study of chitinozoan sequences from the Llandoveryan strata of the Yangzi Region still remains in its infancy with a large amount of basic, descriptive, taxonomic, and stratigraphic work waiting to be done. This paper represents a preliminary report on the first extensive study of chitinozoan sequences in the region.

The proposed chitinozoan zonal sequences permit correlations with standard Llandoveryan graptolite zonal sequences established in the British Isles. A correlation chart with chitinozoan zones is provided to summarize the results (Table I in the Chinese text). The Yangzi Region provides well-exposed sections of Llandoveryan age available for the task. It is hoped that further study will serve to refine the Llandoveryan chitinozoan biostratigraphy.

In the Yangzi Region seven chitinozoan zones may be defined as follows:

1. ?*Belonechitina aspera* Zone

The zonal fossil is present at 2 m above the base of the Lungmachi Formation at the Dazhongba section of Yichang, W. Hubei (locality 3, fig. 1), where graptolites are indicative of the *vesiculosus* Zone (Mu En-zhi, *et al.*, 1984), with the lower and upper limits so far left unknown.

2. *Conochitina* sp. nov. Zone

This zone spans an interval from the Lungmachi Formation to the lower part of the Lojoping Formation at the Dazhongba section. The lower limit is defined by the earliest appearance of *Conochitina* sp. nov. which ranges above the upper limit, and the upper limit is defined by the earliest appearance of *Conochitina rossica*.

Ages of the superjacent and subjacent strata have been established, thereby bracketing the age of the interval occupied by this zone. Beneath the interval there occurred graptolites indicating the *cyphus* zone (Mu En-zhi, 1959) or the *lecl* zone (Ni Yu-nan, 1978); immediately above it there existed the chitinozoan *Conochitina rossica*.

3. *Conochitina rossica* Zone

At Dazhongba, *Conochitina rossica* is confined within the Lojoping Formation. The lower

and upper limits of this zone are marked by the appearance and disappearance of *Conochitina rossica* respectively; there the zone is within the graptolite *arcuata* Zone, a zone only for local application. However, in 1982, Jin Chun-tai *et al.* found from the *arcuata* Zone at Guanyinqiao of Qijiang (locality 6, fig. 1) the graptolites *Petalolithus minor* and *Cephalongraptus uburlariformis* which were restricted to the *convolutus* Zone (Li Ji-jin, 1986, oral communication).

4. *Conochitina iklaensis*-*C. emmastensis* Zone

At Dazhongba, this zone is situated in an interval from the top of the Lojoping Formation to the middle of the Shamao Formation, with the lower limit defined by the disappearance of *C. rossica* and the upper limit by that of *C. iklaensis*. Within the *sedgwickii* Zone, *C. iklaensis* becomes extinct (Nestor, 1984), and *C. emmastensis* makes its debut (Nestor, 1982a); thence *C. iklaensis* associated with *C. emmastensis* is undoubtedly referred to the *sedgwickii* Zone.

5. *Plectochitina jiangsuensis* Zone

This zone spans a depth from 3,000 to 3,008 m in Borehole Di-2 of Xinghua, Jiangsu (locality 1, fig. 1), the lower and upper limits so far left unknown. ?*Clathrochitina* sp. 2 peculiar to Member 3 of the Jupiter Formation on the Anticosti Island, Quebec, Canada (Achab, 1981) has been confidently assigned to *Plectochitina jiangsuensis* by Geng *et al.* in 1987. According to Uyeno and Barnes (1981), conodonts from this member belong to the lower *staurognaethoides* fauna ($C_2 \cdots$), approximately corresponding to the lower part of the *turriculatus* Zone (Aldridge, 1972).

6. *Eisenackitina daozenensis*-*Plectochitina brevicollis* Zone

This zone is present at the top of the Hanchiatien Formation at Bayu of Daozhen, Guizhou (locality 5, fig. 1) (Geng Liang-yu, 1986). The graptolites from there have been extracted by Geng, one of the writers, and identified by Chen Xu (1986) as *Streptograptus nidifer*, a species ranging from the *turriculatus* Zone to the *crispus* Zone (Chen Xu, 1984; Ni Yu-nan, 1986). At present the lower and upper limits of the zone are unknown because relationship between this zone

and those above and below has not been studied in detail.

7. *Angochitina longicollis* Zone

At the top of the Xiushan Formation at Zhangjiajie of Dayong, NW Hunan (locality 4, fig. 1), *Angochitina longicollis* makes its first appearance in association with the conodonts including elements of both the *celloni* Zone and the *amorphognathoides* Zone. However, neither *Spathognathodus celloni* nor *Pterospathodus amorphognathoides* has been discovered therein. This interval is called Interval II or Zone B (Zhou Xi-yun *et al.*, 1981, 1985). It is worth notice that *Oktavites spiralis* occurs in the sandy shale, which is 1.2 m be-

low the top of the Tewu Formation in Tingri, South Xizang (locality 10, fig. 1), while conodonts referable to Interval II or Zone B are present at 3.6 m below the shale. The base of the overlying Kede Formation contains *Pterospathognathodus amorphognathoides* (Zhou Xi-yun *et al.*, 1985). From this it is clear that Zone B is probably equivalent to the upper part of the *griestoniensis* Zone in Britain. If this is the case, then *Angochitina longicollis* is present at most in the upper part of the C₅ subdivision of the Telychian, and extends into the early Wenlockian. Also, this zone has a wide distribution in the investigated region (localities 2, 4, 7—10).

图 版 说 明

所有图影标本均保存在中国科学院南京地质古生物研究所。

图 版 I

1, 2. *Plectochitina jiangsuensis* Geng, Grahn et Qian, 1987

1. 侧视, ×350, 扫描电镜号 NIGPA 1345。江苏兴化获 2 井 3,000—3,008m。

2. 图 1 底缘放大, ×1155, 扫描电镜号 NIGPA 1346。产地层位同上。

3. *Angochitina longicollis* Eisenack, 1959

侧视, ×220, 扫描电镜号 NIGPA 2367。南京江宁坟头组顶部。

4. *Conochitina emmastensis* Nestor, 1982

侧视, ×186, 扫描电镜号 NIGPA 3671。湖北宜昌大中坝罗惹坪组中段。

5. *Plectochitina brevicollis* (Geng), 1986

侧视, ×260, 扫描电镜号 NIGPA 6562。贵州道真巴渔韩家店组上部。

6, 7. *Eisenackitina daozenensis* Geng, 1986

6. 侧视, ×260, 扫描电镜号 NIGPA 6568。产地层位同上。

7. 侧视, ×260, 扫描电镜号 NIGPA 6560。产地层位同上。

8. *Conochitina iklaensis* Nestor, 1980

侧视, ×205, 扫描电镜号 NIGPA 3694。湖北宜昌大中坝罗惹坪组中段。

9. *Conochitina rossica* Zaslavskaya, 1983

侧视, ×254, 扫描电镜号 NIGPA 3701。湖北宜昌大中坝罗惹坪组罗惹坪段。

10. *Conochitina* sp. nov.

侧视, ×205, 扫描电镜号 NIGPA 3697。湖北宜昌大中坝罗惹坪组罗惹坪段。

11. ? *Belonechitina aspera* Nestor, 1980

侧视, ×230, 扫描电镜号 NIGPA 3812。湖北宜昌大中坝龙马溪组底部。

