

ASIA / PACIFIC

CHENGJIANG FOSSIL SITE

CHINA



WORLD HERITAGE NOMINATION – IUCN TECHNICAL EVALUATION

CHENGJIANG FOSSIL SITE (People’s Republic of China) – ID No. 1388

IUCN RECOMMENDATION TO WORLD HERITAGE COMMITTEE: To inscribe the property under natural criteria

Key paragraphs of Operational Guidelines:

77 Property meet natural criteria

78 Property meets conditions of integrity and protection and management requirements

1. DOCUMENTATION

a) Date nomination received by IUCN: 11 March 2011

b) Additional information officially requested from and provided by the State Party: Following the technical evaluation mission the State Party was requested to provide supplementary information on 12 October 2011. The information was received in November 2011. Subsequent to the IUCN World Heritage Panel meeting, further supplementary information was requested on 5 December 2011 and the information was received in January 2012.

c) Additional Literature Consulted: Dingwall, P., Weighell T. & Badman, T. (2005) **Geological World Heritage: A Global Framework**. IUCN / WCPA; Fortey, R. (2001) **Science's Compass - Perspectives - Evolution: The Cambrian Explosion Exploded?** Science. 293 (5529): 438; Hou, X. (2004). **The Cambrian fossils of Chengjiang, China: The flowering of early animal life**; Malden, MA: Blackwell. Levinton, Jeffrey S. (2008). **The Cambrian Explosion: How Do We Use the Evidence?** BioScience. 58 (9): 855; Lin, Jih-Pai. (2007) **From a fossil assemblage to a paleoecological community time, organisms and environment based on the Kaili Lagerstätte (Cambrian), South China and coeval deposits of exceptional preservation**. Ohio State University, 2007; Monge-Nájera J , and X Hou. (2000) **Disparity, decimation and the Cambrian "explosion": comparison of early Cambrian and present faunal communities with emphasis on velvet worms (Onychophora)**. Revista De Biología Tropical . 48 (2-3); Wells, R.T. (1996) **Earth's Geological History: A Contextual Framework for Assessment of World Heritage Fossil Site Nominations**. IUCN Report; Zhang, Xi-guang, Jan Bergstrom, Richard G. Bromley, and Xian-guang Hou (2007) **Diminutive trace fossils in the Chengjiang Lagerstätte**. Terra Nova. 19 (6): 407-412

d) Consultations: Fourteen external reviewers consulted. The mission also met with national and local officials, representatives of site managers and Yunnan University, local communities and scientists associated with the property.

e) Field Visit: Professor Patrick J. Mc Keever and Professor Mohd Shafeea Leman, 23-25 September 2011

f) Date of IUCN approval of this report: April 2012

2. SUMMARY OF NATURAL VALUES

Chengjiang Fossil Site (referred to as CFS hereafter) is a relatively small hilly area located in the eastern part of Chengjiang County of Yuxi City in south China's Yunnan Province. It is roughly oblong in shape with its western boundary about 5 km east of Chengjiang Town, while its southern boundary is only about 4 km northeast of Fuxian Lake shoreline. CFS is bordered by Luxishao Village in the west, Xiaolantian Village in the north, Ganhaizi, Longtang and Dongxishao Villages in the east, and Xincun Village in the south. Loulishan Village is the only village included in the CFS buffer zone and is located in the southeast. CFS comprises a total area of c.512 ha, and is surrounded by a buffer zone of c.220 ha that does not form part of the nominated property.

CFS is mostly newly reforested land with some native and introduced tree species. The buffer zone area is mostly agricultural land, including, to the southeast of CFS, the traditional Loulishan Village, situated in gently rolling agricultural land.

Tectonically, the CFS falls into the eastern part of Kunming Platform fold belt and has undergone several tectonic episodes including Caledonian and Hercynian (543 Ma to 250 Ma) movements; the Mesozoic (250 Ma to 65 Ma) uplift; the Himalayan (about 50 Ma) mountain building; and the Xiaojiang (3 Ma to 4 Ma) faulting. The nominated site as a whole is underlain by an asymmetric syncline which has an axial trend of 30° E and the eastern limb of which is the steeper.

The western limb of the syncline exposes a continuous succession representing the lower part of Lower Cambrian as well as part of the underlying Pre-Cambrian strata. The stratigraphy (from oldest to youngest) of the nominated site can be summarized as follows:

i) Yuhucun Formation [age: Late Sinian]

This is the oldest sequence within the CFS nominated site that consists of four members (from top to bottom):

the Dahai Member with dark grey and bluish-grey phosphorite and phosphoric dolomite; the Xiaowaitou Member with greyish-yellow microbedded dolomite and brown silicolite, plus grey dolomite with black silicolitic fragments and black silicolite; the Baiyanshao Member with grey, brownish-grey and muddy dolomites; and the Jiucheng Member consisting of grey-green medium to thick bedded dolomite.

ii) Heilinpu Formation [age: Early Cambrian]
Disconformably overlying the Yuhucun Formation; consists of two members (from top to bottom) the Yu'anshan Member and the Shiyantou Member. The Yu'anshan Member with a thickness of 200m is mainly made up of yellowish- and greenish-grey shale and thin mudstone interbedded with thin to medium beds of silty dolomite and calcareous siltstone. Repeated beds of fine quartz sandstone occur at 2-4m intervals in the upper parts. The base is made up of thinly bedded yellowish grey silty mudstone containing spherical calcite-dolomite nodules and phosphatic silty dolomite. The Shiyantou Member is approximately 80m thick and is mainly made up of dark grey, thin to medium bedded argillaceous siltstone with light grey, banded, micaceous dolomitic siltstone, grey-black thin to very thin bedded silty mudstone.

iii) Canglangpu Formation [age: Early Cambrian]
This member conformably overlies the Heilinpu Formation and has a thickness of approximately 150m with the upper part being eroded. It is mainly made up of thin to medium bedded purple-red, grey micaceous fine quartz sandstone and grey-green thinly bedded silty mudstone.

CFS provides direct evidence for the roots of animal biodiversity, it presents the most complete record of an early Cambrian marine community, it contains a prolific and exceptionally preserved biota, displaying the anatomy of hard and soft tissues in a very wide variety of organisms, invertebrate and vertebrate, in exquisite detail; its fossils bear upon fundamental questions regarding the design of animal body parts and the genetic generation of evolutionary novelty, it records the early establishment of a complex marine ecosystem, with food webs called by sophisticated predators.

The fossils of the Chengjiang fauna occur in the yellowish-weathering grey mudstone and shale from the upper part of the Yu'anshan Member of Heilinpu (Qiongzhusi) Formation. Radiometric dating from the lowest beds containing the Chengjiang Fauna gives a date of 530 Ma, and the fauna is estimated to be from a geological interval of 2-3 Ma duration.

The upper part of the Yu'anshan Member can be divided into four parts, as follows (from top to bottom):

i) Yellow silty sandstone (113 m) with reduced fauna. Only some trilobites such as *Eoredlichia* and *Yunnanocephalus*, some bradoriid such as

Kuanyangia and *Kunmingella*, and brachiopods *Lingulella* and *Lingulepis* remain.

ii) Yellowish green shale interbedded with thin to medium (10-20 cm) siltstones and sandstones (40-50 m) represent the main beds yielding soft-bodied fossils, especially in its lower and middle parts. This interval has extremely diverse arthropods such as *Naraoia*, *Leancoilia*, *Isoxys*, *Kunmingella*, *Eoredlichia* and *Yunnanocephalus*, lobopodians, eldoniids, worms and sponges.

iii) Black siltstone and shale. This interval yields mainly trilobites such as *Tsunyidiscus* and *Wutingaspis* and bradoriids *Hanchungella* and *Emeillopsis* belonging to the *Parabadiella* Biozone, and lacks key soft-bodied Chengjiang Fauna. The fauna lies between the Meishucun fauna and Chengjiang fauna.

iv) Black siltstone. This horizon contains the oldest trilobites in China such as *Parabadiella*, together with the bradoriids *Hanchiangella*, *Liangshanella*, *Nanchengella*, amongst others.

IUCN requested clarification from the State Party regarding the fossil fauna within the area that is nominated, rather than the wider region. Supplementary information supplied by the State Party indicates that the nominated property has a total of 152 documented species, or 44 less than documented in the original nomination file. These species are found in the region but outside the property, and are not at present proposed for inscription; however they do provide important context for the property. It is also noted that the strata which has produced those species (lower part of the Yu'anshan Member) is present within the nominated property boundaries; however collecting has not been undertaken in this part of the site.

3. COMPARISONS WITH OTHER AREAS

It is very rare to find fossils of soft-bodied organisms in the fossil record let alone find them in such abundance at such a key point in the evolutionary development of life on Earth. Among non-hominid palaeontological sites on the World Heritage List, several sites such as the Messel Pit in Germany and the Monte San Girogio transnational site between Italy and Switzerland also include soft-bodied preservation from different parts of the geological record. The Burgess Shale locality in Canada, part of the Canadian Rocky Mountain Parks World Heritage Site (and initially inscribed on the World Heritage List as a fossil site in 1980), is strongly comparable to the CFS and a specific comparison is provided in the nomination document.

The nomination notes that CFS represents a time period that is more than 10 million years older than the period represented by the Burgess Shale (Middle Cambrian: 510-505). Both provide relatively short but highly diverse snapshots of Cambrian life. CFS and Burgess Shale

represent different marine palaeogeographical locations, CFS representing a lower shoreface to proximal offshore environment and the Burgess Shale representing the seaward part of a submarine escarpment. The CFS fauna is obtained from fine grey mudstones and that from the Burgess Shale is from fine, dark grey to black shales. Both faunas represent muddy, bottom level communities where the fossils are flattened with some relief, and with exceptional soft-bodied preservation.

The Burgess Shale and CFS have produced similarly rich numbers of phyla, genera and species however, the species represented in the fossil record at CFS are virtually mutually exclusive of the Burgess Shale as only six species coincide with those at the Burgess Shale. The fauna at the two sites show similarities at the phyla level however the CFS records an earlier stage of development of these groups.

Both sites represent high diversity for a range of groups; however the CFS fossil record pushes the appearance of proto-vertebrates back in time to the Early Cambrian. Two species found within the site *Yunnanozoon lividum* and *magnificissimi* may be the oldest known hemichordates (a phylum closely related to chordates).

There are other Lower Cambrian sites that yield soft-bodied fossils that are not on the World Heritage List, including the Sirius Passet in northern Greenland, the Orsten Fossil Site in Sweden, or the Emu Bay Shale in Australia. However the latter two sites are more limited in their diversity and therefore in what they can really tell us about the record and evolution of life at this critical time in Earth history. The Greenlandic site also contains exceptionally well preserved Lower Cambrian fossils, including soft-bodied fossils, but to date the diversity of forms recovered from this remote site remains low. Although not noted in the comparative analysis, IUCN also notes that Cambrian fossil values are also part of the nomination of the Lena Pillars Nature Park, which is internationally noted as a fossil reef ecosystem. However as an emblematic site for the record of life in the Cambrian period, it does not provide the breadth and diversity of CFS.

IUCN set out carefully in its contextual study (Wells, 1996) recommendations for the selection of fossil World Heritage properties, and this has provided the framework for a longstanding and consistent approach for the recognition of fossil sites on the World Heritage List. The nomination provides a clear and specific response to the questions that are applied to evaluation of fossil sites, and these are summarised and added to in Annex 1. Whilst the Burgess Shale is already recognised as part of a listed World Heritage Site, the nominated property makes a convincing case for equivalent and complementary value and with a record that is geologically older. Whilst the early discovery of the Burgess Shale and its long-standing acknowledgement as the iconic site for the Cambrian Explosion of life on Earth is without doubt, this does not exclude the

possibility of considering that CFS, of equal significance, is of Outstanding Universal Value.

4. INTEGRITY, PROTECTION AND MANAGEMENT

4.1. Protection

The Chengjiang Fossil Site is state-owned and protected under the Article 9 of the constitution of the PR of China and by various laws including the Environmental Protection Law of the PR of China (2002), the Law of the PR of China on Cultural Relic Protection (2002), the regulations on the management of palaeontological specimens (Ministry of Land and Resources, 2002), regulations on the protection and management of geological relics (1995) and the regulation on the protection of Yunnan Chengjiang Fauna Fossil (1997).

Today the area is largely covered with secondary forest and shrub and there is no industrial activity or permanent human habitation within the boundary. The property is protected under a zoning scheme that is applied to Chinese Geoparks, and this provides strong protection to its values. Supplementary information included a map displaying in Chengjiang Fossil Site Management Institute clearly showing the zonation of the National Geopark and also clearly showed that key fossil sites of the nominated property enjoy the maximum level (“Special Protection”) of protection and Maotianshan, the heart of the nominated property, lies in the Zone of highest protection. The boundary of the Class I protection zone corresponds to the remainder of the nominated property. The buffer zone is entirely within the Class II protection zone where limited development is permitted.

National oversight is provided by the Ministry of Land and Resources, the Ministry of Urban-Rural Development and the Chinese National Commission for UNESCO. At the Provincial level, management is overseen by the Yunnan Provincial Departments of Land and Resources and Construction as well as the Yunnan World Heritage Management Committee. Locally, management is coordinated between the Yuxi Municipal Government and the Chengjiang County Government with various municipal departmental offices (e.g. Land & Resources, Forestry, Tourism etc). They in turn work with the academic teams from Yunnan University, Kunming University of Science and technology, Nanjing Institute of Geology and Palaeontology. On the ground, day-to-day management is provided by the Chengjiang Fossil National Geopark Management Committee. The roles of each organisation are clear and this system of management appears to function very well.

The IUCN considers that the protection status of the nominate property and buffer meets the requirements set out in the Operational Guidelines.

4.2 Boundaries

The boundaries of the nominated property and its buffer zone are very well delineated. The boundary has been selected taking into consideration stratigraphical and structural factors to ensure that the CFS has geological consistency and coherence with regard to the fossiliferous horizons. The boundary has also been influenced by topographic considerations and with regard to the zones of least disturbance within the Chengjiang National Geopark.

The boundaries of both the nominated property and the buffer zone are very well signed on the ground and the boundary is both appropriate and does not need to be adjusted.

IUCN considers that the boundaries of the nominated property meet the requirements set out in the Operational Guidelines.

4.3 Management

Day-to-day management is provided by the Chengjiang Fossil National Geopark Management Committee. A management station undertakes the daily monitoring of the nominated property. The management committee employs 13 staff with range of qualifications, and including staff specialised in palaeontology, geology, management and museum studies. A further 16 local personnel are employed as part-time rangers. Supplemented by geological expertise from provincial and national universities, the staff quota appears to be adequate for a property of this size.

Three management plans are relevant to the nominated property. In 2001 the “Master Plan for the Yunnan Chengjiang Fossil National Geopark” was drafted and was updated in 2008 following a revision of management requirements by the Ministry of Land and Resources. In 2005 the “Plan for the Ecological and Geological Control and Management for the Protection of the Chengjiang Fauna Fossils in Surrounding Areas of Maotianshan” was prepared by provincial authorities. Finally, in 2010 the “Chengjiang Fossil Site Management Plan” was adopted for the particular management of the nominated property. Details of these plans are highlighted in the nomination dossier and together they appear to be more than adequate for the CFS.

Local involvement in the CFS appears to be somewhat limited to the provision of information seminars where local villagers have been made aware of the significance of the site. IUCN notes this as an area that could be significantly strengthened, not only in relation to the property, but also to the regulation and management of fossil sites in the wider landscape surrounding CFS.

Curation arrangements are in place for the property. Chengjiang fossils are widely displayed and available for study in China, including a public-access onsite field station with museum at Maotianshan and a purpose-built

new museum in Chengjiang town. There are also museum displays in Yunnan University and at the Nanjing Institute of Palaeontology and Stratigraphy (NIGPAS, Academia Sinica). Curated collections are held at several Chinese institutions, including the Key Laboratory for Palaeobiology, Yunnan University, and NIGPAS. Provision is made for domestic and international scientists to study material from the property within its overall management system.

Visitor statistics provided show that only a few thousand (4-5,000) individuals visit the property annually, most of whom are locals or individuals from neighbouring areas. Foreign visitors appear to largely fall into the category of visiting scientists. Supplementary information notes forecast increased visitation to 30-40,000 within five years, pending inscription on the World Heritage List. Strategies for managing tourism visitation include provision of guides, designation of restricted areas, and strict restrictions on fossil collecting.

The nomination dossier highlights monitoring activities at the property and further clarification regarding monitoring programs with indicators of the protection, presentation and promotion of the paleontological values was provided within the supplementary Information. The proposed monitoring program adequately documents processes for assessing indicators for the conservation of this property. However, some of the indicators proposed need to be fully integrated with enhanced land-use planning in areas surrounding the property.

The finances of the CFS come largely from national sources and are supplemented by smaller contributions at the city and county level. Figures show a significant increase in funding from 4.9 million RMB in 2008 to 28 million RMB in 2009. Supplementary information includes details regarding stable and special funding for the ongoing management of the property.

IUCN considers the management of the nominated property meets the requirements set out in the Operational Guidelines.

4.4 Threats

Mining

Prior to 2004, 14 phosphate mining operations occurred in the buffer zone of the nominated property; however, all have been closed down since 2008. The process of rehabilitating these former mining sites is ongoing and will take some considerable time. However, it is clear that no mining activities have actually impacted on the nominated property itself and the county and provincial governments have repeated their re-assurances that no new mines will be opened within the nominated property or its buffer zone.

Visitor management and infrastructure

Regulation and management of visitor use will be an essential and ongoing requirement on the site, including assuring no damage, illegal collection or removal of

geological materials takes place. The management plan for the property outlines measures to be taken in this regard appears adequate.

The mission noted with concern that some constructions had occurred within the nominated property in relation to the two key fossil localities. At the key stratigraphic section of Xiaolantian, a deep excavation has been made into the rock, including the fossiliferous layers hosting the Chengjiang Fauna, to create a walkway. The construction of this path had impacted on the integrity of the site through widening what had been done before the evaluation mission to the site. Additionally, a museum has been built at Miaotanshan, over the site of the first Chengjiang Fauna fossil discovery. Here, the construction of the museum building has also undoubtedly impacted negatively on the integrity of this key site during the building process (constructing foundations, access roads and landscaping).

Further supplementary information was requested to provide for a clear inventory of the impacts of human development and to provide information on plans for remediation to damaged areas. In addition, requests for outlines of policies and procedures for further infrastructure development to avoid further impacts on the integrity of the property was made. Supplementary information outlined the process for systematic review and approval for development. Moreover, the management authority has completely restricted future infrastructure development in the nominated property. IUCN notes that the operation of these new procedures is essential, and in the event of the inscription of the property on the World Heritage List, the process of notifying possible alterations of the property, and their assessment in line with paragraph 172 of the Operational Guidelines will need to be followed.

Site restoration

Considerable effort has taken place to restore those parts of the nominated property affected by human industrial and agricultural activity prior to 1997. While initial efforts resulted in the planting of non-native species of vegetation, recent efforts have ensured that only native species are being planted.

In summary, IUCN considers the nominated property meets the conditions of integrity as outlined in the Operational Guidelines.

5. ADDITIONAL COMMENTS

Fossils of scientific importance have been excavated and collected outside the proposed boundaries (in Dapotou, Hongjiachong, and Fengkoushao villages) of the nominated property. Consideration for management and protection of important fossil sites bearing Chengjiang biota (especially the Haikou region) in the wider region is required, to complement research and furthering the understanding of this significant stage of Earth's history. As noted above this wider landscape

level protection is also required in view of the fact that some finds of significant fossils have been made outside the boundaries of the nominated property, even if the strata from which they have been found are also found inside the boundaries of CFS. Enhanced land-use planning as well as management and protection through national and provincial laws is imperative to ensure that the fossil record complements the story at the proposed property. There may be the case, in future, to consider modifications of the boundaries of the property to include additional sites, although this requires considerable further study.

6. APPLICATION OF CRITERIA

The property has been nominated under criterion (viii).

Criterion (viii): Earth's history and geological features

The Chengjiang Fossil Site presents an exceptional record of the rapid diversification of life on Earth during the early Cambrian period, 530 million years before present. In this geologically short interval almost all major groups of animals had their origins. The property is a globally outstanding example of a major stage in the history of life, representing a palaeobiological window of great significance.

The exceptional palaeontological evidence of the Chengjiang Fossil Site is unrivalled for its rich species diversity. To date at least 16 phyla, plus a variety of enigmatic groups, and about 196 species have been documented. Taxa recovered range from algae, through sponges and cnidarians to numerous bilaterian phyla, including the earliest known chordates. The earliest known specimens of several phyla such as cnidarians, ctenophores, priapulids, and vertebrates occur here. Many of the taxa represent the stem groups to extant phyla and throw light on characteristics that distinguish major taxonomic groups.

The property displays excellent quality of fossil preservation including the soft and hard tissues of animals with hard skeletons, along with a wide array of organisms that were entirely soft-bodied, and therefore relatively unrepresented in the fossil record. Almost all of the soft-bodied species are unknown elsewhere. Fine-scale detailed preservation includes features as the alimentary systems of animals, for example of the arthropod *Naraoia*, and the delicate gills of the enigmatic *Yunnanozoon*. The sediments of Chengjiang provide what are currently the oldest known fossil chordates, the phylum to which all vertebrates belong.

The fossils and rocks of the Chengjiang Fossil Site, together, present a complete record of an early Cambrian marine community. It is one of the earliest records of a complex marine ecosystem, with food webs capped by sophisticated predators. Moreover, it demonstrates that complex community structures had developed very early in the Cambrian diversification of animal life, and provides evidence of a wide range of

ecological niches. The property thus provides a unique window of understanding into the structure of early Cambrian communities.

IUCN considers that the nominated property meets this criterion.

7. RECOMMENDATIONS

IUCN recommends the World Heritage Committee adopt the following draft decision:

The World Heritage Committee,

1. Having examined Documents WHC-12/36.COM/8B and WHC-12/36.COM/INF.8B2;

2. Inscribes the **Chengjiang Fossil Site, People's Republic of China**, on the World Heritage List on the basis of criterion (viii);

3. Adopts the following Statement of Outstanding Universal Value:

Brief synthesis

The Chengjiang Fossil Site, located in the Province of Yunnan, China, conserves fossil remains which are of exceptional significance. The rocks and fossils of the Chengjiang Fossil Site present an outstanding and extraordinarily preserved record that testifies to the rapid diversification of life on Earth during the early Cambrian period, 530 million years before present. In this geologically short interval, almost all major groups of animals had their origins. The diverse geological evidence from the Chengjiang Fossil Site presents fossil remains of the highest quality of preservation and conveys a complete record of an early Cambrian marine community. It is one of the earliest records of a complex marine ecosystem and a unique window of understanding into the structure of early Cambrian communities.

Criterion

Criterion (viii)

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The exceptional palaeontological evidence of the Chengjiang Fossil Site is unrivalled for its rich species diversity. To date at least 16 phyla, plus a variety of enigmatic groups, and about 196 species have been documented. Taxa recovered range from algae, through sponges and cnidarians to numerous bilaterian phyla, including the earliest known chordates. The earliest known specimens of several phyla such as cnidarians,

ctenophores, priapulids, and vertebrates occur here. Many of the taxa represent the stem groups to extant phyla and throw light on characteristics that distinguish major taxonomic groups.

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The fossils and rocks of the Chengjiang Fossil Site, together, present a complete record of an early Cambrian marine community. It is one of the earliest records of a complex marine ecosystem, with food webs capped by sophisticated predators. Moreover, it demonstrates that complex community structures had developed very early in the Cambrian diversification of animal life, and provides evidence of a wide range of ecological niches. The property thus provides a unique window of understanding into the structure of early Cambrian communities.

Integrity

The property has clear boundaries including the most significant rock exposures of the region, and has a buffer zone that provides wider protection to the property. It is noted that fossil evidence is provided in some sites that lie outside the property boundaries and its buffer zone, and these areas need to receive appropriate wider protection and are important to provide context for the property.

Prior to 2004, 14 phosphate mining operations occurred in the buffer zone of the property. Since 2008 they have all been closed down. The process of rehabilitating these former mining sites is ongoing and will take some considerable time. No mining activities have actually impacted on the property itself and the ongoing commitment of County and Provincial governments to not open or re-open mines within the property or its buffer zone are critical to protect the values of the property.

Various excavations have occurred within the property in relation to the two key fossil sites. At the key stratigraphic section of Xiaolantian, a deep excavation has been made to create a walkway. Additionally, a museum has been built at Miaotanshan, over the site of the first Chengjiang Fauna fossil discovery. Both the path and museum construction have had impacts on the integrity of the site. The State Party has introduced a process for systematic review and approval for any development which may impact on the site. Moreover,

the management authority has completely restricted future infrastructure development in the property.

Protection and management requirements

The Chengjiang Fossil Site is state-owned and protected under the Article 9 of the constitution of the People's Republic of China and by various laws including the Environmental Protection Law of the People's Republic of China (2002), the Law of the People's Republic of China on Cultural Relic Protection (2002), the regulations on the management of paleontological specimens (Ministry of Land and Resources, 2002), regulations on the protection and management of geological relics (1995) and the regulation on the protection of Yunnan Chengjiang Fauna Fossil (1997).

The property is designated as a protected area ensuring that potentially damaging human activities within the site can be prevented. The area is largely covered with secondary forest and shrub and there is no industrial activity or permanent human habitation within the boundary. The property lies entirely within a Chinese National Geopark.

There is an effective management plan, supported by a dedicated and adequately staffed and resourced management body. The Chengjiang Fossil Site Management Institute is responsible for coordinating on-site management of the protected area. The property protection strategy includes a National Geopark zoning plan which affords adequate protection to key fossil sites, supported by staffing for implementation. The finances of the Chengjiang Fossil Site come largely from national sources and are supplemented by smaller contributions at the City and County levels. Stable and special funding for the ongoing management of the property is adequate to address ongoing protection, promotion and presentation of the property. The property has an established monitoring programme including defined indicators for the conservation of this property, and which needs to be integrated with monitoring of the protection of the wider surroundings of the property. The need for ongoing and effective curation of fossil specimens collected from the property, to the highest international standards, is fully recognised and provided for by the State Party.

Visitor numbers are anticipated to increase from a few thousand (4-5,000) individuals in 2012, most of whom

are locals or individuals from neighbouring areas and visiting scientists. Increased visitation to the property requires effective management strategies and the provision of guides, designation of restricted areas, and strict restrictions on fossil collecting. It will be essential to carefully regulate visitor numbers within the capacity of the property. The anticipated maximum numbers at the time of inscription were estimated at c.30-40,000 people. There is a need to assure effective land-use planning in areas surrounding the property in order to secure its long-term conservation, including the conservation of fossil sites in the surrounding area that provide context for understanding the value of the property.

4. Commends the State Party on its continued and responsive efforts to improve protection and management of the property and on increasing conservation investments;

5. Requests the State Party to:

- a) Continue to strengthen and enhance land-use planning to avoid further impacts to the values and integrity of the property and its buffer zones;
- b) Ensure proactive tourism management in anticipation of increased future visitation, and to ensure that visitation remains within the capacity of the property;
- c) Ensure any proposed infrastructure development and excavations are sympathetic to the site's values and are subject to rigorous prior impact assessments, to determine if they are appropriate, including via reporting to the World Heritage Committee in line with paragraph 172 of the Operational Guidelines to the World Heritage Convention.

6. Strongly encourages strengthened management and protection of important fossil sites and strata bearing Chengjiang biota in the wider region to complement research and further the understanding of this significant stage of Earth's history. Enhanced land-use planning as well as management and protection through national and provincial laws is imperative to ensure that the fossil record in the wider landscape is protected, as it provides important context for the comprehension of the property.

ANNEX 1: Fossil Checklist**Chengjiang Fossil Site*****(1) Does the site provide fossils which cover an extended period of geological time? i.e. how wide is the geological window.***

The Chengjiang Fossil Site presents a snapshot of biodiversity at a critical time in the early evolution of animal life. It represents a limited period of geological time but is a palaeobiological window of exceptional significance.

(2) Does the site provide specimens of a limited number of species or whole biotic assemblages? i.e. how rich is the species diversity?

The biota is extremely rich and diverse. Taxa recovered range from algae, through sponges and cnidarians to numerous bilaterian phyla, including the earliest known vertebrates. It is the most completely preserved early Cambrian community known.

(3) How unique is the site in yielding fossil specimens for that particular period of geological time? i.e. would this be the 'type locality' for study or are there similar areas that are alternatives?

The Chengjiang fossil Lagerstätte contains the most diverse and disparate fauna known from the lower Cambrian, most of the diversity of which is represented in the nominated property. As well as representatives of skeletonized groups (e.g. brachiopods, hyoliths, bradorids, trilobites, echinoderms), it contains a wide variety of soft-bodied taxa, including many vermiform animals. Almost all of these soft-bodied species are unknown elsewhere, although a few genera are also found in other lower Cambrian sites around the world. It can be regarded as the 'type locality' for early Cambrian life.

(4) Are there comparable sites elsewhere that contribute to the understanding of the total 'story' of that point in time/space? i.e. is a single site nomination sufficient or should a serial nomination be considered?

The Burgess Shale is the most closely comparable site on the current World Heritage list to the Chengjiang, and is a much earlier and better known discovery, but is younger in age and with a mostly different fossil fauna represented. There are a small number of other lower Cambrian sites that display soft-tissue preservation, contain some additional taxa and, therefore, contribute to the total story of global early Cambrian biodiversity such as Sirius Passet, North Greenland and the Emu Bay Shale, Australia). There are also numerous lower Cambrian sites worldwide that preserve skeletal remains only, but include taxa that are not present in the Chengjiang biota.

(5) Is the site the only or main location where major scientific advances were (or are being) made that have made a substantial contribution to the understanding of life on earth?

The Chengjiang fossil Lagerstätte is one of the most important palaeontological sites in the world. With the possible exception of the younger Burgess Shale, no other locality has yielded as much information on the nature of early Cambrian representatives of extant phyla and on the

structure of the earliest animal communities. The very fine scale anatomical detail preserved in the specimens renders them highly informative for the interpretation of early body plans, and numerous key fossils have been described that shed light on the early evolution of many major animal groups. The Chengjiang biota continues to make a highly significant contribution to developing fields of evolutionary biology.

(6) What are the prospects for ongoing discoveries at the site?

There is considerable potential for ongoing discoveries. Although many thousands of specimens have been collected, new major discoveries continue to be made every year. This is demonstrated by the continuing publication of papers in high-profile journals. Existing collections contain numerous enigmatic specimens, some in very small numbers, whose true nature will only be determined when additional specimens are recovered.

(7) How international is the level of interest in the site?

The site is of the highest international interest. The fossils have been studied by many international teams, resulting in numerous publications. For instance an iconic temporary exhibition of Chengjiang fossils was held in the University of Oxford Museum in 2010, as part of the museum's 150th anniversary celebrations. At the International Palaeontological Congress 3 in 2010 nine papers were presented specifically on fossils from the Chengjiang fossil Lagerstätte. The biota has attracted continual extensive coverage in global newspapers, radio and television.

(8) Are there other features of natural value (e.g. scenery, landform, vegetation) associated with the site? i.e. does there exist within the adjacent area modern geological or biological processes that relate to the fossil resource?

The prime importance of the site lies in its exceptional scientific value, but it is situated within a scenically attractive and unspoilt area of rural China, enhancing its appeal.

(9) What is the state of preservation of specimens yielded from the site?

The state of preservation of the fossils is truly exceptional, not just for the lower Cambrian, but for the entire fossil record. At Chengjiang, soft tissues such as gills, eyes and guts are commonly preserved, and there are numerous fossils of animals that were entirely soft-bodied.

(10) Do the fossils yielded provide an understanding of the conservation status of contemporary taxa and/or communities? i.e. how relevant is the site in documenting the consequences to modern biota of gradual change through time?

The Chengjiang fossil Lagerstätte records the original establishment of a marine ecosystem structure, with complex food chains. The maintenance of this basic structure through geological history provides a context within which to understand modern marine ecosystems.

Map 1: Location of the Chengjiang Fossil Site in China



Map 2: Detailed map of the Chengjiang Fossil Site

