Permophiles

International Commission on Stratigraphy

8th INTERNATIONAL BRACHIOPOD CONGRESS

Brachiopods in a changing planet: from the past to the future

Milano, 11-14 September 2018
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8th INTERNATIONAL BRACHIOPOD CONGRESS

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Milano 11-14 September 2018

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CONGRESS MAIN PROGRAM

	am				pm			
	I	Coffee Break	II	LUNCH	III	Coffee break	IV	V
Sept 6-9th	Pre-Congress excursion							
Monday Sept 10th							Registration Ice Breaker Party	
Tuesday Sept 11th	Opening Cerimony Plenary Lars Holmer		Scientific sessions S1		Scientific sessions S1		Scientific sessions S6	Poster Wine and Cheese
	Registration							
Wednesday Sept 12th	Plenary Uwe Brand Scientific sessions S5		Scientific sessions S5		Scientific sessions S5-S4		Scientific sessions S4	Group photo Concert Gala dinner
Thursday Sept 13th	Free day or Mid-Congress excursions							
Friday Sept 14th	Plenary Elizabeth Harper Scientific sessions S3		Scientific sessions S3		Scientific sessions S3-S2		Scientific sessions S2	
Sept 15-18th	Post-Congress excursions							

Monday 10th September 2018

16:30-19:00	**REGISTRATION**
17:30-19:30	**ICE BREAKER PARTY**

Tuesday 11th September 2018

08:30-08:50 **OPENING CERIMONY**
Institutional greetings
Prof. E. Erba (Dipartimento di Scienze della Terra 'A. Desio' and Società Geologica Italiana)
Prof. G. Carnevale (Società Paleontologica Italiana)
Sig. G. Agostoni (Comunità Montana Valsassina, Valvarrone, Val d'Esino e Riviera)

08:50-09:40 **PLENARY LECTURE**
Moderator: **Posenato R.**
Holmer L. E., Zhang Z., Zhang Z., Brock G. A., Popov L. E.
Brachiopod phylogeny in the Cambrian

09:40-10:00 **COFFEE-BREAK**

SESSION 1 ***Systematics and evolution***
Convenors: **Carlson S.**, **Alvarez F.** and **Jin J.**

10:00-10:25 *Keynote lecture*
Butler A. D., Eitel M., Wörheide G., Carlson S. J., Sperling E. A.
Phylogenomic analysis of Brachiopoda: revealing the evolutionary history of biomineralization with an integrated palaeontological and molecular approach

10:25-10:40 Kuzmina T. V., Malakhov V. V., Temereva E.
Support of the "brachiopod fold hypothesis" in Recent rhynchonelliformeans: a new view on the evolution of brachiopod life cycles

10:40-10:55 Madison A., Kuzmina T.
Fossil records of the evolution of brachiopod life cycles

10:55-11:10 Zhang Z., Popov L. E., Holmer L. E., Chen F., Zhang Z.
Earliest ontogeny of Early Cambrian acrotretoid brachiopods — first evidence for metamorphosis and its implications

11:10-11:25	Chen Y., Zhang Z., Zhang Z. **Geometric morphometric analysis reveals the ontogeny of Early Cambrian (Series 2) brachiopods *Eohadrotreta zhenbaensis* from Cigui, Hubei Province, South China**
11:25-11:40	Garbelli C. **Modelling the shape of brachiopod valves**
11:40-11:55	Liang Y., Zhang Z. **New data on shell structure in *Heliomedusa orienta*: taxonomic and phylogenetic implications**
11:55-12:10	Chen F., Zhang Z., Betts M. J., Zhang Z., Liu F. **First report on Guanshan Biota (Cambrian Stage 4) at the stratotype area of Wulongqing Formation in Malong County, eastern Yunnan**
12:10-12:25	Skovsted C. B., Liu F., Topper T. P., Zhang Z., Shu D. **Are hyoliths brachiopods?**
12:25-12:40	Lavié F., Serra F., Feltes N. **Microbrachiopods from the Las Aguaditas and Las Chacritas Formations (Middle Ordovician), Precordillera terrane of western Argentina: a preliminary taxonomic analysis**
12:40-13:50	**LUNCH**
13:50-14:15	*Keynote lecture* Stigall A. L. **Brachiopods as key to evolutionary theory: from foundational systematics and phylogenetics to speciation and biogeography**
14:15-14:30	Jin J. **Morphological plasticity in the early diversification of the post-extinction Silurian pentameride fauna**
14:30-14:45	Zhou H., Huang B. **Population analysis of the Silurian brachiopod *Atrypoidea foxi* Jones from Qujing, Yunnan Province**
14:45-15:00	Lü D., Ma X. **Small-sized brachiopods from the Upper Frasnian (Devonian) of central Hunan, China**
15:00-15:15	Qiao L. **Devonian brachiopod fauna from the Baoshan block in western Yunnan, China**
15:15-15:30	Wu H., Shi G. R., He W. **A quantitative taxonomic review of *Fusichonetes* and *Tethyochonetes* (Chonetidina, Brachiopoda)**
15:30-15:50	**COFFEE-BREAK**

SESSION 6 — *Modern brachiopods*

Convenors: **Bitner M. A.**, **Cusack M.** and **Lüter C.**

15:50-16:15
Keynote lecture
Temereva E., Kuzmina T.
Organization of the lophophore in linguliform *Pelagodiscus atlanticus* (King) and the evolution of the lophophore in brachiopods

16:15-16:30
Lüter C., Furchheim N.
Light sensation in adult brachiopods

16:30-16:45
Simonet-Roda M., Milner Garcia S., Müller T., Griesshaber E., Jurikova H., A., Eisenhauer A., Harper D.A.T., Jansen U., Schmahl W. W.
The evolution of thecideide brachiopod shell microstructure from Triassic to modern times

16:45-17:00
Simon E., Motchurova-Dekova N., Mottequin B.
Diving into the morphology and ontogeny of the micromorphic rhynchonellide genus *Tethyrhynchia* Logan, 1994 in an attempt to elucidate a conflict between morphological and molecular phylogenies

17:00-17:15
López Carranza N., Carlson S. J.
Quantifying variability and understanding species delimitation: a case study integrating morphological and genetic datasets in terebratulide brachiopods

17:15-17:30
Carlson S. J., López Carranza N., Butler A. D., Sperling E. A.
Extant Terebratellidina phylogeny and homology of the long loop

17:30-17:45
Gaspard D.
Recent brachiopods of the French Insular Caribbean Region

17:45-18:00
Pakhnevich A. V., Galkin S. V.
New data on brachiopods at the underwater Piip Volcano (Bering Sea)

18:00-18.15
Bitner M. A.
Recent brachiopods from the Tonga Islands, SW Pacific: taxonomy and biogeography

18:15-18.30
Williams U. M., Robinson J., Lee D., Lamare M.
Investigating the ecology and environmental tolerance to sedimentation of the brachiopod *Calloria inconspicua* in Otago Harbour, New Zealand

18:30-20:30
POSTER WINE AND CHEESE

Wednesday 12th September 2018

8:45-9.35 **PLENARY LECTURE**
Moderator: **Angiolini L.**
Brand U.
Modern brachiopods: superheroes of archives

SESSION 5 ***Biologic mineralization of natural functional materials and archives of geochemical proxies***
Convenors: **Griesshaber E.** and **Eisenhauer A.**

09:35-10:00 *Keynote lecture*
Ziegler A., Simonet-Roda M., Griesshaber E., Henkel D., Häusermann V., Eisenhauer A., Laudin J., Schmahl W. W.
Mechanisms of calcite fibre formation in *Magellania venosa*

10:00-10:15 Takayanagi H., Nishio T., Fujioka H., Yamamoto K., Endo K., Iryu Y.
A generalized monthly growth curve of modern brachiopod shells

10:15-10:30 Robinson J. H.
Drill-hole repair in Cenozoic and Recent brachiopods

10:30-10:45 Ye F., Angiolini L., Garbelli C., Shen S.
Evolution and fabric differentiation of Palaeozoic rhynchonelliformean brachiopod shells

10:45-11:05 **COFFEE-BREAK**

11:05-11:20 Mages V., Casella L., Simonet-Roda M., Ye F., Crippa G., E. Griesshaber, Angiolini L., Schmahl W. W.
The intermediate stages of diagenetic overprint deduced from hydrothermally altered and fossil brachiopod shells

11:20-11:35 Romanin M., Bitner M.A., Angiolini L., Gatta D. G., Brand U.
Cement-filled fossil brachiopod punctae and potential analytical bias in paleoenvironmental reconstructions

11:35-12:00 *Keynote lecture*
Rollion-Bard C., Milner Garcia S., Saulnier S., Burckel P., Vigier N., Angiolini L., Tomašových A., Henkel D., Jurikova H., Lécuyer C.
What can geochemical proxies tell about the biomineralization processes of brachiopods?

12:00-12:15 Bajnai D., Fiebig J., Tomašových A., Milner Garcia S., Rollion-Bard C., Raddatz J., Löffler N., Primo-Ramos C., Angiolini L., Henkel D., Brand U.
Assessing kinetic fractionation in brachiopod calcite using clumped isotopes

12:15-12:30 Smajgl D., Mandic M., Böhm F., Eisenhauer A.
New approach in stable isotope analysis of carbonates: isotope ratio infrared spectrometry

12:30-12:45 Jurikova H., Liebetrau V., Gutjahr M., Krause S., Büsse S., Gorb S. N., Henkel D., Hiebenthal C., Schmidt M., Leipe T., Laudien J., Eisenhauer A.
Major and trace element composition and microstructure of cultured brachiopods – new proxies?

12:45-13:00 Nishio T., Takayanagi H., Asami R., Shinjo R., Yamamoto K., Iryu Y.
Variations in trace element concentrations of modern brachiopod shells

13:00-14:10 **LUNCH**

14:10-14:25 Müller T., Tomašových A., Mikuš T.
Variation of Mg/Ca in brachiopod shell: expression of growth rate rather than temperature seasonality

14:25-14:40 Fuchs R., Lazar B., Angiolini L., Crippa G., Felletti F., Fruchter N., Eisenhauer A., Stein M.
Reconstructing $^{87}Sr/^{86}Sr$ and $\delta^{88/86}Sr$ in Pliocene-Pleistocene seawater by fossil brachiopods, bivalves, gastropods and foraminifera

14:40-14:55 Wang W., Garbelli C., Shen S.
Permian strontium isotope stratigraphy based on brachiopod shells from South China

SESSION 4 *Mass extinctions and recovery*

Convenors: **Shen S.**, **Baliński A.** and **García Joral F.**

14:55-15:20 *Keynote lecture*
Vörös A.
Mass extinctions and fatal extinctions in the history of brachiopods: review and post-Paleozoic cases

15:20-15:35 Hughes Z. E., Belben R. A., Johnson K. G, Twitchett R. J., Hughes C.
Brachiomatic: utilising new museum collections digitisation protocols to examine brachiopod size across extinction boundaries cases

15:35-15:50 Chen D., Rong J.
The linguliform and craniiform brachiopods from the latest Ordovician *Hirnantia* fauna of South China and Myanmar

15:50-16:10 **COFFEE-BREAK**

16:10-16:25 Huang B., Jin J., Rong J.
Diversification patterns of brachiopods after the end Ordovician mass extinction and its palaeobiogeographic significance

16:25-16:40 Mottequin B., Bartzsch K., Simon E., Weyer D.
Evolution of the brachiopod assemblages at the Devonian–Carboniferous boundary (Hangenberg Crisis) in basinal facies from SE Thuringia (Germany)

16:40-16:55 Jurikova H., Gutjahr M., Wallmann K., Flögel S., Liebetrau V., Posenato R., Angiolini L., Garbelli C., Brand U., Eisenhauer A.
Major marine carbon cycle perturbations during the Permian-Triassic mass extinction

16:55-17:20 *Keynote lecture*
Shen S., Ramezani J., Chen J., Cao C., Erwin D. H., Zhang H., Xiang L., Schoepfer S. D., Henderson C. M., Zheng Q., Bowring S. A., Wang Y., Li X., Wang X., Yuan D., Zhang Y., Mu L., Wang J., Wu Y.
A sudden end-Permian mass extinction in South China

17:20-17:35 Wang F., Chen J., Dai X., Song H.
A new Induan (Early Triassic) brachiopod fauna from South China and implications for biotic recovery after the Permian-Triassic extinction

17:35-17:50 MacFarlan D. A. B.
Early Jurassic terebratulide brachiopods from Zealandia

17:50-18:05 Piazza V., Aberhan M.
Selectivity of temperature-related stresses towards brachiopods across the Early Toarcian (Early Jurassic) extinction event in Neo-Tethys

18:05-19:00 **POSTERS**

19:00-20:00 **CONCERT**

20:00-23:00 **GALA DINNER**

Friday, 14th September 2018

08:30-09.20 **PLENARY LECTURE**
Moderator: **Brand U.**
Harper E. M.
Living brachiopods: hanging on or fit for a modern world?

SESSION 3 *Ecosystems in time and space*
Convenor: **Harper D.A.T.**

09:20-09:45 *Keynote lecture*
Zhang Z., Holmer L. E., Brock G. A., Topper T. P.
Paleoecological complexities during Cambrian explosion: evidence from brachiopods

09:45-10:00 Topper T. P., Harper D. A. T.
Back to the beginning: the life and times of Cambrian brachiopods

10:00-10:15 Liu F., Zhang Z., Chen Y., Chen F.
A diverse fossil assemblage from a new section through the Shipai Formation (Cambrian Series 2, Stage 4) in western Hubei Province, South China

10:15-10:30 Pan B., Skovsted C. B., Li L., Li G.
The Cambrian Epoch 2 brachiopod fauna from the Xinji Formation, Shuiyu section of North China

10:30-10:50 **COFFEE-BREAK**

10:50-11:15 *Keynote lecture*
Harper D. A. T.
The rise of the rhynchonelliform brachiopods: the role of the great Ordovician biodiversification event

11:15-11:30 Candela Y., Harper D. A. T., Mergl M.
Early Ordovician (late Tremadocian – early Floian) brachiopods from the Fezouata Shale, Anti-Atlas, SE Morocco

11:30-11:45 Zhan R., Jin J., Rong J.
***Foliomena* fauna: Macroevolution of deep water benthic communities with the environmental changes**

11:45-12:00 Cocks L. R. M., Torsvik T. H.
Useful and useless – brachiopods and palaeogeogeography

12:00-12:15 Jansen U.
Evolution, stratigraphy and palaeobiogeography of late Pridolian–early Eifelian brachiopods from the Rhenish Massif (Germany)

12:15-12:30 Guo W., Sun Y., Nie T.
Facies control on the Lower Emsian (Lower Devonian) brachiopod faunas in South China

12:30-12:45 Balinski A., Halamski A. T., Racki G.
A diverse Early Frasnian brachiopod fauna from central Poland and its palaeoecological characteristics

12:45-13:00 Halamski A. T.
Palaeobiogeography and evolutionary affinities of the Early Frasnian brachiopod fauna from central Poland

13:00-14:00 **LUNCH**

14:00-14:15 Xu H., Zhang Y., Qiao F., Shen S.
A new Changhsingian (Late Permian) brachiopod fauna from the Xiala Formation at Coqen in the central Lhasa Block and its palaeogeographical implications

14:15-14:40 *Keynote lecture*
Twitchett R. J.
Brachiopods in post-Permian hothouse worlds

14:40-14:55 Kiel S., Peckmann J.
The ecology of brachiopods in ancient methane-seep environments

14:55-15:10 Dulai A., Özcan E., Less G.
Eocene brachiopods of the Thrace Basin (NW Turkey)

15:10-15:25 García-Ramos D. A., Zuschin M.
Cyclicity of *Terebratula* pavements in a mixed carbonate-siliciclastic prograding wedge: Early Pliocene of SE Spain

15:25-15:40 Buono G.
Brachiopods in Italy: a very long record and a new database

SESSION 2 *Taphonomy and Palaeoecology*

Convenors: **Pérez-Huerta A.** and **Tomašových A.**

15:40-16:05 *Keynote lecture*
Shiino Y.
Form and function of fossil brachiopods: insights into evolutionary morphology

16:05-16:20 Tomašových A., Kidwell S. M., Müller T.
Time averaging of brachiopods in the southern California bight: implications for paleoecology, taphonomy, and conservation paleobiology

16:20-16:35 **COFFEE-BREAK**

16:35-16:50 Cisterna G. A., Sterren A. F., Shi G.R.
Carboniferous-Permian glacial-deglacial events and their effects on the brachiopod faunas from Argentina and Australia

16:50-17:05 Yuan Z., Sun Y., Shen B.
An *in situ* preserved late early Carboniferous brachiopod fauna in southern Guizhou, China

17:05-17:20	Bahrammanesh M., Rezaee H., Mossadegh H. **Tournaisian (Mississippian) brachiopods from the Mobarak Formation, eastern Alborz (north Iran)**
17:20-17:35	Sun Y., Li T., Nie T., Shen B., Guo W. ***Dzieduszyckia* in southern China: morphological variation and population dynamics**
17:35-17:50	Sproat C. D., Zhan R. **A late Katian (Late Ordovician) low diversity and high dominance brachiopod fauna from the Tarim Basin in Northwest China**
17:50-18:05	Chen J., Song H., Wang F. **Size evolution of brachiopods from the Late Permian through the Middle Triassic in South China**

POSTERS

SESSION 1 *Systematics and evolution*

1 Bahrammanesh M., Zahabizadeh B., Alaeddini K.
Carboniferous brachiopods from NW Havir Lake (Damavand, N Iran)

2 Berrocal-Casero M., Barroso-Barcenilla F., García Joral F.
Micrornamentation and other external features as distinctive criteria for the Coniacian (Upper Cretaceous) terebratulides from Northern Spain

3 Buono G.
Famous brachiopods, part 1: brachiopods in lapidary stones

4 Buono G.
Famous brachiopods, part 3 – brachiopods in philately

5 Legrand-Blain M.
Gigantoproductid and allied brachiopods from "L'ardoisiere" (Visean), northern Massif Central, France

6 Leone M. F., Benedetto J. L.
Phylogenetic relationships of the Silurian Afro-South American Realm rhynchonellide brachiopods *Anabaia*, *Harringtonina* and *Clarkeia*: new insights from their ontogeny

7 Mottequin B., Lefèvre U., Cisterna G. A.
A review of the brachiopod subfamily Septosyringothyridinae (Spiriferinida) from the Carboniferous of Laurussia and Gondwana

8 Taddei Ruggiero E., Raia P.
The old, misnamed, misunderstood *Terebratula sinuosa*

SESSION 2 *Taphonomy and Palaeoecology*

9 Angiolini L., Banks V., Carniti A., Della Porta G., Stephenson M.
How mud mounds controlled brachiopod population growth and life-style in the Carboniferous: an example from the Viséan of Derbyshire, UK

10 Baliński A., Skompski S., Szulczewski M., Zawadzka I.
The origin of the Middle–Late Devonian brachiopod shell concentration within intrashelf basinal carbonates in the Holy Cross Mountains (central Poland)

11 Madison A., Kuzmina T.
The tube-like structures on the juvenile shells of strophomenids and billingsellids as evidence of their life cycles

12 Pakhnevich A. V.
Preservation of brachiopod soft tissues outside the Lagerstätte conditions

SESSION 3 *Ecosystems in time and space*

SESSION 4 *Mass extinctions and recovery*

SESSION 5 ***Biologic mineralization of natural functional materials and archives of geochemical proxies***

38 Romanin M., Crippa G., Ye F., Bitner M. A., Gaspard D., Häussermann V., Laudien J., Brand U.
Trace elements, stable isotope composition and shell microstructure, defining the optimal sampling shell segment for geochemical analyses in five modern brachiopod species

39 Simonet-Roda M., X. Yin, Cross E., Harper E.M., Ziegler A., Schmahl W. W., Peck L., Griesshaber E.
Microstructure formation in the shell of the Antarctic brachiopod *Liothyrella uva* (Broderip 1833): transition from larval to juvenile stages

40 Twitchett R. J., Paulus C., Hughes Z.E., Brownscombe W.
Giants in the hot tub? Sclerochronology of Pliocene brachiopods of southeast UK

41 Ye F., Jurikova H., Angiolini L., Brand U., Crippa G., Henkel D., Laudien J., Hiebenthal C., Šmajgl D.
Variation in brachiopod microstructure and isotope geochemistry under low pH - ocean acidification – conditions

SESSION 6 *Modern brachiopods*

42 Bitner M. A., Romanin M.
Recent brachiopods from the South China Sea, NW Pacific

43 Bitner M. A.
The first recent record of the genus *Neobouchardia* (Brachiopoda: Bouchardiidae) from the Coral Sea, SW Pacific

44 Buono G., Davidde B., Sacco Perasso C., Ricci S.
“Famous brachiopods”, part 2 – brachiopods on archeological remains

45 Endo K., Motchurova-Dekova N., Suzuki N., Maekawa Y., Takayanagi H., Hirose M.
A new locality of a living platidiid in northern Japan observed by a remotely operated vehicle

46 Temereva E., Kuzmina T.
Spermatogenesis in the deep-sea brachiopod *Pelagodiscus atlanticus* (Brachiopoda: Linguliformea)

47 Posenato R.
A cancelled field excursion: Upper Permian to Middle Triassic brachiopod beds of the Dolomites (Italy)

of the crisis interval at both locations are heavily bioturbated and experimental work on modern brachiopods suggests that they are hardly affected by ocean acidification, unlike bivalves. We tentatively suggest a strong role of heat stress, although a secondary role of acidification is not excluded. The opposite directions of changes in body size suggest that size reductions in marine invertebrates are not a general response to environmental stress before the Toarcian extinction event, and differential patterns may reflect variable strengths of TRS and/or differences in the adaptation of local faunas against environmental change.

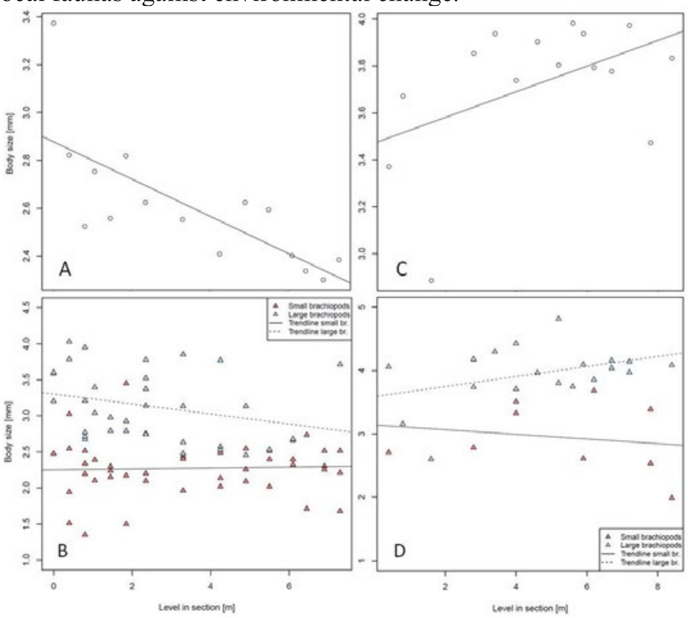

Fig. 1 Body size variation in the pre-extinction interval at Fonte Coberta (A-B) and Barranco de la Cañada (C-D). Body size is represented by the mean of the log geometric mean of all individuals of respective samples. Figs. 1A, C show the mean body size of the community for each sample. The specific trends for larger- and smaller-sized brachiopods for the same interval are shown in Figs. 1B, D.

A cancelled field excursion: Upper Permian to Middle Triassic brachiopod beds of the Dolomites (Italy)

Renato Posenato
Dipartimento di Fisica e Scienze della Terra, Università degli studi di Ferrara, Ferrara, Italy

The Upper Permian marine succession of the Dolomites is represented by the Bellerophon Fm, an overall transgressive sequence, punctuated by some transgressive-regressive cycles. It consists of a lower sulphate-evaporite unit, deposited in a barren basin, and an upper shallow-marine carbonate unit, deposited along a low-energy ramp setting. The older brachiopod occurrence is represented by large sized lingulid shells of *Trentingula prinothi* Posenato, which has been found in a clayey fine-grained sandstone bed from the upper part of the Val Gardena Sandstone tongue (lower part the Lo 4 sequence; Posenato et al., 2014; Posenato, 2016).

The older rhynchonelliform brachiopod-bearing beds (lower *Comelicania* beds) of the Bellerophon Fm, about 1.5 m thick, contain only the athyridid *Comelicania*. They are located at about 50 m (maximum flooding surface of the sequence Lo 4) below the top of the Bellerophon Fm and have been correlated to the Changhsingian *Clarkina changxingensis* Zone. In the Gardena Valley, the lower *Comelicania* beds contain a rich nautiloid fauna characterized by *Tirolonautilus crux* (Stache). *Comelicania* is represented by *C. doriphora* Merla and *C. haueri* (Stache), characterized by mid sized shells (about 50 mm wide; Posenato and Prinoth, 2004; Posenato, 2010).

The middle *Comelicania* beds (about 2 m thick) occur at about 15 m below the top of the Bellerophon Fm (maximum flooding surface of Lo 5 sequence). The brachiopods (*C. haueri*, about 10-12 cm in width) are contained in black bioclastic wackestone with abundant calcareous algae and diversified foraminifer assemblage, which suggest more stable and fully marine conditions with respect to the lower *Comelicania* beds.

The upper *Comelicania* beds (from 0.4 cm to 1.5 m thick) are contained within the black bioclastic wackestone/grainstone of the Bulla Member (upper Bellerophon Fm), which contains the most diversified foraminifer assemblage of the Upper Permian marine succession. The brachiopod fauna is again dominated by the athyridid *Comelicania*, which is represented by very large sized shells (up to 15 cm in width) of *C. haueri* (Stache), *C. megalotis* (Stache), and *C. merlai* (Posenato). The latter species, characterized by short wings, is frequent in the uppermost packstone/grainstone (max 10-15 cm thick) of the Bulla Member, where many other brachiopod species first appear (*Janiceps peracuta* (Stache), *J. cadorica* (Stache), *J. papilio* (Stache), *J. bipartita* (Stache), *Comelicothyris recticardinis* (Merla), *C. laterosulcata* Posenato, *Ombonia tirolensis* (Stache) and *Orthothetina ladina* (Stache) (Broglio Loriga et al., 1988; Posenato, 1988, 2001, 2010, 2011). The upper *Comelicania* beds have been referred to the lower *H. praeparvus* Zone (Farabegoli et al., 2007).

The Bulla Mb (Bellerophon Fm) is overlain by the Tesero Mb of Werfen Fm, a thick mixed siliciclastic-carbonate succession, predominantly Lower Triassic in age (approximately 200 - 600 m thick), which records the survival and early recovery phases connected with the end-Permian mass extinction. The Bulla and Tesero members are separated by a barely perceptible erosional surface, which occurrence and interpretation have been deeply discussed in the literature (subaerial erosion and microkastification, leaching by acid rain or acid marine water; Farabegoli et al., 2007; Posenato, 2009; Farabegoli and Perri, 2012). The basal beds, 5 – 20 cm thick, of the Tesero Mb consist of crystalline ooid grainstones, which record the end Permian mass extinction and thermal peaks in the Dolomites (e.g., Farabegoli et al., 2007; Posenato, 2010, Brand et al., 2012). This unit (*Ombonia* and *Orthothetina* beds) contains a brachiopod assemblage dominated by the orthotetid *Ombonia* and *Orthothetina*. The athyridid *Janiceps* and *Comelicothyris* (reworked?) are still present, while *Comelicania* seems to be disappear (Posenato 2010, 2011).

The last occurrence of the rhynchonelliform brachiopods is recorded within marlstone lenses occurring between microbial limestone and stromatolitic beds of the Tesero Mb (*H. changhsingensis* Zone and lower *H. parvus* Zone). The brachiopods are common only in the Tesero section, where they disappear at about 2.5 m above the formational base. The brachiopod assemblage is dominated by the ambocoelid *Orbicoelia dolomitensis* Chen followed, in order of abundance, by the orthotetid *Teserina nerii* (Posenato) and *Ombonia tirolensis* (Stache). The athyridids are represented by mm-sized individuals of ?*Spirigerella teseroi* Chen. *Spinomarginifera* and *Prelissorhynchia* are also present, but very rare (e.g., Broglio Loriga et al., 1988; Chen et al., 2006; Posenato 2009, 2010).

The brachiopods occurring in the overlying members of Werfen Fm are only represented by lingulids, a disaster taxon recording the early Triassic aftermath of the end-Permian mass extinction. They appear in the Mazzin Mb, few meters above the base of Werfen Fm (8 m at Tesero section, *H. parvus* Zone). These lingulids (*Trentingula mazzinensis* Posenato) are characterized by small-sized shells (4-5 mm in length) and occur in great abundance, generally as storm accumulations, throughout the Mazzin Mb. These brachiopods record the Lilliput effect, a survival strategy of skeletal miniaturization related to the end-Permian environmental crisis (e.g., Twitchett, 2007; Posenato et al., 2014, Posenato, 2016). Lingulids are also occasionally present in the overlying members, where they are characterized by larger shells (*Trentingula lorigae* Posenato), generally double in size with respect to those of the Mazzin Member.

The Triassic recovery of the rhynchonelliform brachiopods occurs in the Pelsonian (Anisian) Recoaro / Dont Fms. The most common brachiopod species belong to the following genera: *Angustothyris, Coenothyris, Decurtella, Koeveskallina, Mentzelia, Punctospiriferella*, and *Tetractinella* (e.g., Posenato, 2008).

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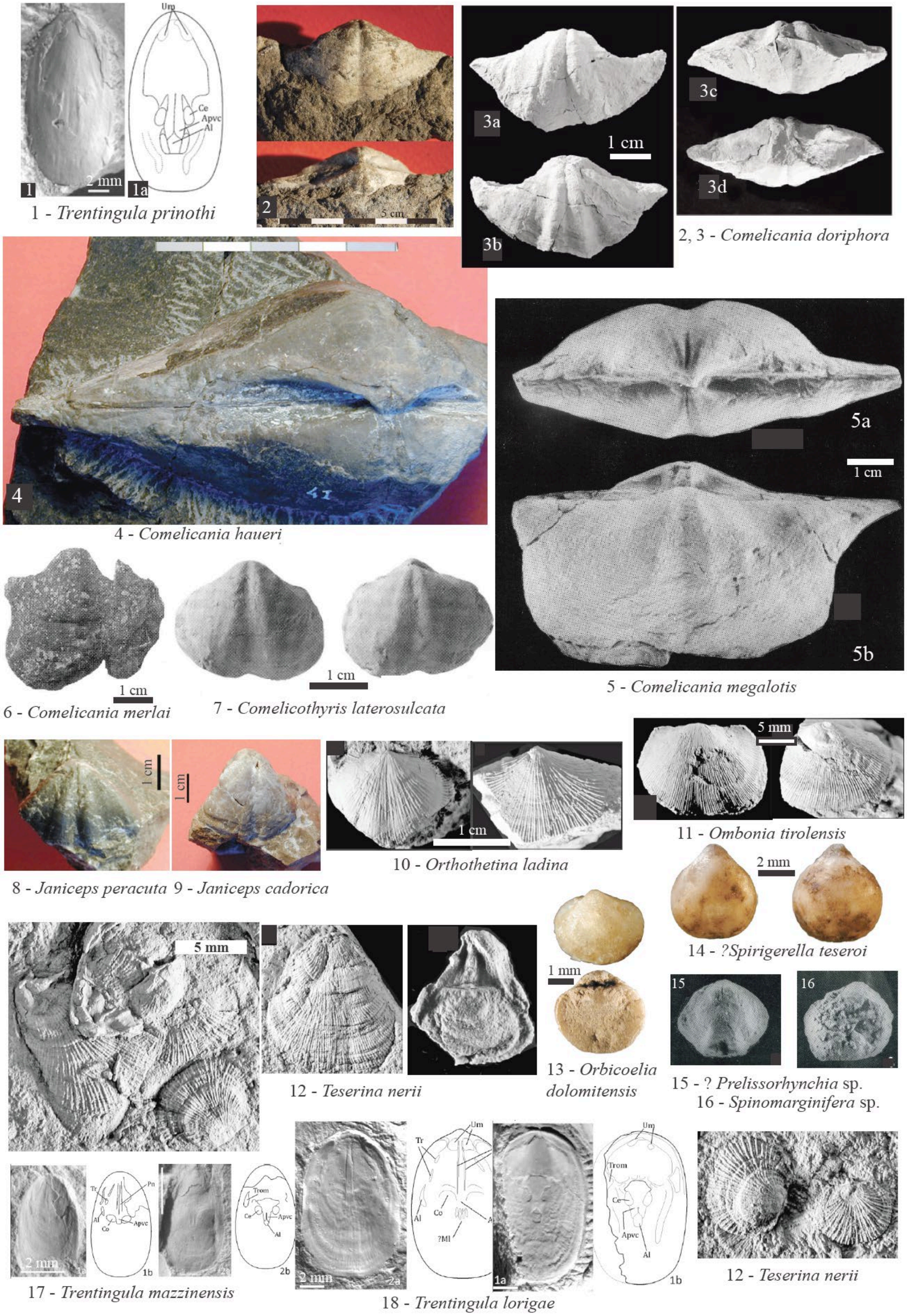

1 - *Trentingula prinothi*

2, 3 - *Comelicania doriphora*

4 - *Comelicania haueri*

5 - *Comelicania megalotis*

6 - *Comelicania merlai*

7 - *Comelicothyris laterosulcata*

8 - *Janiceps peracuta* 9 - *Janiceps cadorica*

10 - *Orthothetina ladina*

11 - *Ombonia tirolensis*

12 - *Teserina nerii*

13 - *Orbicoelia dolomitensis*

14 - *?Spirigerella teseroi*

15 - ? *Prelissorhynchia* sp.

16 - *Spinomarginifera* sp.

17 - *Trentingula mazzinensis*

18 - *Trentingula lorigae*

12 - *Teserina nerii*