

Report on the second IGCP 572 field workshop, Feb. 20-26, 2010, in the Sultanate of Oman

By Aymon Baud¹ and Michaela Bernecker²

1)BGC, Rouvraie 28, CH-1018 Lausanne, Switzerland,
2) German University of Technology in Oman (GUtech),
Athaibah, PC 130, Sultanate of Oman

Following the report on the very successful first IGCP 572 field workshop, Sept. 2-6, 2009, in Antalya, southern Turkey given in *Albertiana* 38 p. 14, we are reporting here our second field workshop organized five months later, Feb. 20-26, 2010, in the Sultanate of Oman, also dedicated to the Memory of Jean Marcoux, with a reminder of his entire scientific career and his works on the Permian and Triassic of Oman.

A one-day meeting, Feb. 21, has been organized at the GUtech campus (Muscat area) by Michaela Bernecker.

The participants and invited scientists (about 50) were welcomed by the Rector of GUtech, Prof. Dr. Burkhard Rauhut.

Following a short presentation of the IGCP 572 Program by its leader Zhong Qiang Chen, Aymon Baud presented an introduction to the field trip, with the main topics to be discussed on the Permian-Triassic transition outcrops.

Thomas Aigner gave the Keynote lecture: "Outcrop Characterization of the Khuff Formation from Production- to Exploration-scale". Zhong Qiang Chen gave a talk on

"Permian-Triassic mass extinction and subsequent recovery: an ecosystem's perspective" and Oliver Weidlich with co-authors presented: "a review of the Permian-Triassic Boundary in the Middle East".

After coffee break we had the following talks:

- "End of gigantism in tropical seas by cooling: End-Guadalupian (Permian) extinction of the photosymbiotic tropical trio" by Yukio Isozaki and Dunja Aljinovic;

- "An unusually well preserved mollusk fauna from the earliest Triassic of South China: A unique window into the early survival phase after the end-Permian mass extinction event" by Michael Hautmann and co authors;

- "Ostracods (Crustacea) and Permian-Triassic boundary events" by Sylvie Crasquin.

After lunch, the afternoon session comprised 7 talks:

- "A Permian-Triassic carbonate sequence in southwestern Tibet, China and implications of dramatic environmental changes across the Permian-Triassic boundary in the oceanic setting in Neotethys" by Shu-zhong Shen, Yi-chun Zhang, Chang-qun Cao and Charles Henderson.

- "End-Permian mass extinction and boundary microbialite in Upper Yangtze Region" by Xinchun Liu, Xiaozheng Chen, Wei Wang, Zhuoting Liao, Yue Wang and Yuping QI.

- "Early and Middle Triassic recovery of the carbonate biofactory in the Western Tethys domain by Joachim Szulc.

- "Deep water records of the Latest Permian Extinction from NW Pangea and the Tethys: Buchanan Lake versus Buday'ah" by Stephen Grasby, Benoit Beauchamp and Aymon Baud.

- "The Middle Permian succession at Wadi Wasit Section, Oman" by Charles Henderson, Alda Nicora and Aymon Baud.

- "Deep water Permian-Triassic successions from Tethys:



Photo 1: Welcome to the participants at the GUtech meeting room by the Rector of GUtech, Prof. Dr. Burkhard Rauhut



Photo 2: Conference at the GUtech meeting room.

Oman Buday'ah revisited" by Aymon Baud, Benoit Beauchamp, Fabrice Cordey, Stephen Grasby, Charles Henderson, Leopold Krystyn, Jean Marcoux, Alda Nicora and Sylvain Richoz.

- "Upper Permian to Lower Triassic carbon isotope record in the Oman Mountains: An overview from the shallow platform to the basin" by Sylvain Richoz, Aymon Baud, Leopold Krystyn, Jean Marcoux and Michal Horacek.

The talks were concluded by a round table discussion followed by a 5 posters session

- "The Permian-Triassic sedimentary sequences in the External Dinarides (Croatia)" by Dunja Aljinovic and Yukio Isozaki

- "Carbon isotopic composition of the basinal carbonates of the Upper Permian Zechstein Limestone (Ca1) in West Poland" by Tadeusz Marek Peryt and Stanislaw Halas

- "Carbon and oxygen stable isotope composition of fish teeth from Lower Triassic of Spitsbergen as an environmental proxy" by Blazej Blazejowski, Andrzej Gażdżicki and Krzysztof Malkowski.

- "Complex colonisation patterns of benthic communities in the immediate aftermath of the end-Permian mass extinction: New data from the Dolomites" by Richard Hofmann, Michael Hautmann, Nicolas Goudemand, Martin Wasmer, and Hugo Bucher.

- "Lower Triassic of the Julian Alps: first record of a fossil

amphibian in Slovenia" by Tea Kolar-Jurkovšek, Spencer G. Lucas & Bogdan Jurkovšek.

The great official dinner closed this successful first day.

The four and a half day field workshop excursion offered to the 27 participants the opportunity to visit the magnificent outcrops of the Oman Mountains that provide unparalleled access to the Permian-Triassic transition units along the Gondwana margin of the Tethys, from shallow carbonate platform, Tilted block margin, continental slope and abyssal plain deposits.

It started on Feb. 22 with a half day trip on Permian Triassic boundary of the metamorphic autochthonous unit at Wadi Aday, close to Muscat, and led by *Oliver Weidlich and Michaela Bernecker*. This very interesting outcrop shows that this part of the Oman margin act as a high where the basal Triassic dolomites has been removed by erosion (basal Mahil unconformity, Weidlich and Bernecker, 2011).

For the second day, Feb. 22, led by *Aymon Baud and Sylvain Richoz*, the participants moved to the Saiq Plateau locality. Situated on the southern flank of the Djebel Ak-dhar antiform, around the mountain village of Saiq at the altitude of 2000m (about 100km SW of Muscat), it is one of the best exposure of the Permian-Triassic transition of the Oman Autochthonous and the type area of the Permian Saiq Formation.

The 3 stops of the day were situated below and at an aban-



Photo 3: Explanations on the Wadi Aday uppermost Permian surface outcrop by Oliver Weidlich (up-center, red backpack).

doned quarry (coordinates: N23°10' 00" E 57° 39' 50").

The first one was situated at the top of the Member B (=B4) of the Saiq Formation where the Permian-Triassic transition light dolomitic mudstone are overlying the dark bioclastic dolostone with rugose corals colony of *Wentzelella*-type. Climbing along the Induan Member C of the Saiq Formation the participants had opportunity to discuss the new data brought by the Late Griesbachian conodont recovered by C. Henderson and A. Nicora at the top of C1 Member and the overlying unconformity – erosional surface at the base of the 14m thick lithoclastic dolorudstone (C2). The lithoclasts accumulation is due to rapid lithification and tectonic instability with bloc tilting. At the last stop in the abandoned quarry we examined the oolitic dolograinsstone with hardground at the top of the Saiq Formation and the green, brown and red clay mudstone with desiccation cracks at the base of the Mahil Formation (Olenekian).

On the way back, the opportunity to look at the Middle Permian spectacular giant bivalve *Alatoconchida* sp. level were given to the interested participants.

For the third day, Feb. 23, led by L. Krystyn, S. Richoz, A. Baud and C. Henderson, the participants went to the locality of Wadi Wasit, about 80 km south of Muscat, that provides one of the best and the most extensive exposures of Permian and Triassic deep-water sediments in the allochthon of the Hawasina window. There, the Permian to Lower Triassic Al Jil Formation consists of a 250m thick Middle Permian volcano-sedimentary sequence of pillow basalt with 4 main intercalations, 10 to 30m thick, of cherts, of volcanic breccias, of calcareous gravity flow deposits with Lower and Middle Permian shallow shelf or reef boulders and of cephalopod red lime wackestones. After

a stratigraphic gap of nearly 10 My, the Lower Triassic record begins with breccias of Dienerian age followed by platy limestones of Late Dienerian to Smithian age, dated at different places by conodonts.

The breccias sandwiched between Permian turbiditic and Lower Triassic platy limestones, are of variable thickness and are very widespread. They are channelized, clast-supported debris flows deposits, which cut deeply into the underlying calcareous or volcanic rocks of Middle Permian age.

The Wasit block is a unique geological archive that contains evidence of an extraordinarily rapid faunal recovery after the P-Tr crisis with, at the same time, an increase of $\delta^{13}\text{C}_{\text{carb}}$ isotope values from +1.2‰ in the basal Triassic transgression to 3.1‰ at the end of the Griesbachian (signifying probably an increase in productivity?) as presented by Sylvain Richoz.

It contains also the most diverse Griesbachian assemblage known to date, which has a community structure not normally recorded in pre-Spathian (Early Triassic) rocks and which was living under well oxygenated conditions.

This shows us that where conditions of oxygenation and productivity are favorable, a diverse fauna will be recorded.

The fourth day, February 25, led by A. Baud, with explanations of S. Richoz, B. Beauchamp, S. Grasby, C. Henderson and L. Krystyn, the participants went to the Buday'ah area, about 150km west of Muscat. The object was to examine the Middle Permian to Lower Triassic Buday'ah section of oceanic sediments belonging to the south margin of the Tethys. This locality (coord.: N 23° 44' 43" E 56° 54' 21") is among the very few places of real Tethyan Permian radiolarites.



Photo 4: Group photo in front of the Saiq village.



Photo 5: Explanation of the geology of the Saiq Plateau by the leaders: Sylvain Richoz (left) with E. Isozaki, and Aymon Baud (center of right photo) with part of the group.



Photo 6: Leopold Krystyn (right), Aymon Baud, Benoit Beauchamp and Charles Henderson sitting on the Wasit block.

The first stop looked at the truncated substratum of the sedimentary succession that consists of pillow basalts erupted in the Hawasina basin far away from the continent, from truly oceanic settings, but located near hot spots and the next stops examined the oceanic successions. In the discussion we compared our Tethyan oceanic section with published Panthalassa sections, showing that all localities display radiolarian cherts as the dominant type strata in the lower Late Permian. Up section, successions graded into “boundary shales” and/or black shales of various thicknesses. Conodonts indicate that the Permian-Triassic boundary succession occurs in the first platy lime mudstone beds above a Changhsingian siliceous to calcareous shale unit. The platy lime mudstone beds include an Upper Griesbachian bloom of calcite filled spheres (radiolarians?) that marks a potential world-wide event. New conodonts indicate an early Olenekian age for overlying grey papery limestone that are devoid of both macrofossils and trace fossils indicating that recovery from the Late Permian

extinction has not yet progressed within this deep-water environment.

At the end of the day, our Chinese and part of our Polish colleagues leaved us to go back to the airport and we continue our trip to overnight in the Emirates near Hatta. We were sorry that our Slovenian and Croatian colleagues were not allowed to enter in the Emirates.

The last day, February 26, starting from the Emirates near Hatta the participants went to the entrance of Wadi Maqam belonging to the Oman territory (coord.: N 24°46'30" E 55°51'43"), to look at the Permian-Triassic transition in the Sumeini area with the leaders of the day: *S. Richoz, A. Baud, B. Beauchamp, S. Grasby, C. Henderson and L. Krystyn*.

The lower part of the Sumeini Group represented by a thick sequence slope carbonate deposits is included in the Maqam Formation (Middle Permian to Lower Jurassic), further subdivided into 6 members, A, B, C, D, E and F.

The top part of the B Member and the transition to C Member records the end Permian events. Different types of Permian-Triassic transition outcrops were shown at stop 1 and 2 where the participants had the opportunity to sample the most complete uppermost Permian succession with late Changhsingian conodont, followed by the thickest boundary shales (up to 3m) of the area. The conodont *H. parvus* has been recovered at the base of the overlying papery and platy limestones.

Sylvain Richoz presented his detailed Carbon isotope curve based on the conodont biochronology of *Leopold Krystyn*. Information on the new Chemostratigraphic data were given by *Stephen Grasby* and *Benoit Beauchamp*, showing a significant drop in total carbon content suggesting disruption of carbonate sedimentation associated with



Photo 7: Wasit block: silicified basal Triassic bivalves and brachiopodes (wide 4cm).

the extinction event. After lunch the participants moved to the close Wadi Shuyab to look at the upper part of the very thick (up to 900m) Smithian platy limestones and shales succession with the spectacular development of the ichnofauna.

After samples collecting and lively last discussion, all the participants warmly thanked the organizers, Michaela Bernecker and Aymon Baud, for their deep involvement in this great field workshop and conference.

Some of the participants came back to Muscat, others went to Dubai Airport and some stay for achieving important field studies.

References:

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Photo 8: Part of the participants looking on the Olenekian papery limestone.



Photo 9: Sylvain Richoz (right), Leopold Krystyn (middle) and Aymon Baud (left) explaining the very thick Smithian platy limestones and shales succession.