IGU Commission on Land Degradation and Desertification
COMLAND Meeting and Fieldtrip, July 5-11, 2010

Organized by Prof. Moshe Inbar
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Organizing Committee and Field Trip Co-Leaders

Moshe Inbar (lead organizer), Amos Frumkin, Noam Greenbaum, Micha Klein, Dan Malkinson, Dorit Sivan, Lea Wittenberg, Ali Zgaier

Overview of Meeting and Fieldtrip Highlights, by Paul Hudson

The International Geographical Union's (IGU) Commission on Land Degradation and Desertification (COMLAND) held a meeting before the IGU Regional Congress in Tel Aviv. The meeting included paper session in Haifa, followed by a five day field trip to environs of the Carmel and Hermon Mountains and the Jordan and Dead Sea Rift Valleys.

The meeting opened the evening of July fifth with a warm welcome from Prof. Moshe Inbar in the Department of Geography at the University of Haifa. The paper sessions were held on July sixth, and started with an introduction from Paul Hudson, Secretary of COMLAND. The eighteen papers were presented by participants from nine nationalities, including Israel, Poland, Russia, Japan, Ghana, Hungary, United States, Italy, and Brazil. The topics spanned the range of COMLAND interests on land degradation, including natural and anthropogenic drivers of land degradation, as well as policy and social implications of land degradation. The full list of titles and abstracts is included in the accompanying document compiled by Moshe Inbar.

Following a full day of very good and interesting presentations the participants proceeded on the COMLAND field trip, the signature event of a COMLAND conference. The field trip was organized and led by Prof. Moshe Inbar, with assistance from a number of experts, several of them former students. The initial field excursion was in the vicinity of Haifa and followed immediately after the final paper was delivered. The group descended a transect, which extended along the spine of the Carmel Mountains to the Mediterranean Sea. The day ended at an excellent local seafood restaurant overlooking the Mediterranean. The warm atmosphere and view of the sun setting across the Mediterranean was an unforgettable experience, and the start of a remarkable five day intellectual journey.

From sea to sea, the Mediterranean to the Dead, the organization of the fieldtrip afforded maximum exposure to the diverse landscapes within compact northern Israel, and spanned an impressive array of temporal and spatial scales. Vertically the landscapes and fieldtrip stops ranged from the Hermon Mountains, adjacent to the highest point in Israel (2,800 m), to the Dead Sea; the lowest place on Earth (-422 m). Temporally, the range of topics included old and modern physical and human phenomena, and especially their interaction.

An overview of the fieldtrip highlights follows, and is further itemized in the daily log below, which includes the names of co-leaders. It is not possible to review every interesting site and experience encountered along the fieldtrip, nor is it necessary. And in the company of scholars in their element - the field - spontaneous stops and ensuing discussion at seemingly minor sites are often as meaningful to the intellectual discourse and overall fieldtrip experience as are those that are more grandiose in scale.

The field trip started along the Mediterranean coast in the vicinity of Haifa with a regional overview of the geology, geomorphology, and history of human settlement of this fascinating section of the Levant. Especially memorable was the discussion of submerged Neolithic villages and historic anthropogenic impacts to coastal environments in relation to Holocene sea level rise and human settlement. The following day, after examining some of the challenges of urban river management in a dry environment, the Qishon River within Haifa, we traveled north along the narrowing coastal plain to Akko (Acre). Here the geoarchaeological development of the adjacent fluvial-coastal environment and urban settlement were discussed from atop a Bronze Age tell that overlooks the Mediterranean Sea and the modern city. Impressive was the tour of the well preserved, and recently reconstructed, twelfth century Crusader city that had been buried by many centuries of urban neglect and resettlement associated with changing political fortunes. Then, we headed north by northeast and ascended into and up the Hermon Mountains (mainly massive Jurassic dolomite). This phase of the journey included stops within a traditional village to discuss and examine erosional processes associated with adjacent hillslopes and agricultural terraces that date to perhaps ~2,000 years BP, and within the Navuraya National Forest to consider the intricacies of modern soil erosion and plant succession processes associated with recent land use change and forest fires. Our accommodations for the two nights were at Kibbutz Manara, high (880 m) above the rift valley. Over the past few decades kibbutzes have undergone a transformation in Israel, as we learned, and increasingly rely less on communal agriculture as they become privatized to support more diverse economic enterprises.

Crossing the Hermon Mountains we descended into the northern Jordan Rift Valley, the northernmost tip of the same Great Rift Valley that bisects the western Middle East, the Red Sea, and eventually extends deep into southeastern Africa. This segment of the trip afforded the opportunity to examine the geology and landscapes associated with an active rift valley, and to consider the challenges associated with agriculture and settlement within an arid environment. The volcanic landscape with numerous cinder cones observed within the Golan Heights along the western side of the rift valley have resulted in very different water resource opportunities in comparison to the more carbonate eastern side of the rift. Additionally, while the dominant regional scale geologic processes associated with rift valley topography are tectonically driven, it results in a myriad of interesting local-scale geomorphic processes that further sculpt the surficial environment. An excellent example was seen at Banyas Spring, which flows directly out of the bowels of the carbonate Hermon Mountain. Downstream, the river has deeply incised the basement basalt, creating a narrow slot canyon that includes impressive cascades and a step-pool sequence, with the canyon walls draped in relict Pleistocene travertine. In the context of an arid environment such springs represent critical water resources and Banyas Spring is an important headwater source for the Jordan River, supplying 25% of its total discharge. Future climate change will likely influence spring flow and thus the Jordan River discharge, which would most strongly be felt downstream in the extensive system of drained fields of the Hula Valley and also the Sea of Galilee.

Although it once represented an extensive hydrologic and ecological niche comprised of a complex mosaic of swamps and sinuous channels, the Hula valley was “improved” (transformed by engineering) into a typical rectilinear pattern in the late 1950s by the construction of a series of ditches and drained fields to support intensive agriculture in a polder-like landscape. This triggered abrupt subsidence and subsequent ecological degradation, which was disastrous to millions of birds that rested and recharged in the Hula Valley before continuing their Europe to North Africa migration. Recent restoration works, however, including the creation of a new lagoon and wetland complex are promising, and have witnessed a return of migratory waterfowl and water plants, including endemic papyrus. The

consequences of this severe hydrologic alteration were rapidly manifest downstream to the Sea of Galilee (Lake Kinneret), which is currently 213 m below sea level, and dropping. An enormous flood in 1969 resulted in the first recorded lacustrine subaerial delta formation in the Sea of Galilee, which was probably driven by the absence of an upstream sink to buffer discharge peaks and store sediment. The associated subaqueous deltaic deposits and shallower depths are exacerbated by the recent lowering of the Sea of Galilee, a major source of freshwater for Israel. But the lowering of the Sea of Galilee is seen most strongly along the lakeshore at ancient settlements, such as the holy sites of Tabgha and Capernaum.

Our descent along the rift valley ended at the ultimate base level: The Dead Sea. At 422 m below sea level the Dead Sea is the lowest place on Earth. Here we were fortunate to spend two nights along the western rift at the Ein Gedi Field School, which afforded especially splendid early morning views of the adjacent carbonate escarpments of the Judean Hills. The Dead Sea was certainly amongst the most impressive, in terms of the scale and what it represented, but also from the standpoint of the landscapes and history associated with adjacent rift topography. The ancient fortitude of *Masada*, for example, perched atop a horst high above the Dead Sea basin was essentially a "sky island" that required clever and sophisticated solutions to the problem of water supply. Despite the aridity in this part of Israel (precipitation < 100 mm/yr), local springs and oases cut deeply into the bounding cliffs and create diverse ecological niches. This was observed at Ein Gedi Oasis, a refreshing place to cool off in the 43º C heat. While we were able to swim in the Dead Sea, we didn't frolic: The extreme salinity meant that a single drop of water caused an instant burning to the eyes or mouth, and it simply wasn't tolerable for an extended period.

The sea may be dead, but the adjacent geomorphic processes are very active. Rapid cliff retreat of enormous slabs of rock salt from Mount Sedom (Miocene/Pliocene salt diapir) is occurring along the western edge of the southern Dead Sea basin, and it is here where the extensive shallow salt pans and associated mineral industries are located. The Dead Sea level dropped by about 30 m over the past century, which in part is caused by excessive irrigation in the upper Jordan River valley. The importance of this to landscape processes is that over the past thirty years or so thousands of "collapse" sink holes have developed, and are apparently triggered by a drop in sea level (base level) and the interaction of ground water with the salt rock. The drop in base level has also resulted in rapid fluvial incision into late Quaternary fan deposits flanking the Dead Sea coast, exposing cobbles and boulders deposited during large events associated with a dynamic paleoflood hydrology. While the abruptness of the recent geomorphic response is fascinating science, it has also resulted in significant practical problems, such as destabilized building foundations, power lines, and transportation infrastructure, highlighting the importance of understanding the drivers of this unique style of land degradation.

On the fifth day of the fieldtrip we ascended the high cliffs of the western Dead Sea Rift and crossed the Judean Desert to the final fieldtrip stop, Jerusalem, which straddles the drainage divide between the Mediterranean Sea and the Dead Sea. As it is today, the reliable delivery of water was a significant limitation to urbanization in ancient times. This point was illustrated where we were able to hike through the original subterranean passages excavated for the water supply system of the ancient City of David.

The field trip concluded with a banquet in Jerusalem, whereby Prof. Moshe Inbar was presented the COMLAND Award in recognition of his contribution to COMLAND through his efforts in

organizing a superb meeting. Many things contributed to the tremendous success of this conference; camaraderie with scholars in a new landscape, well-coordinated logistics, the cuisine (excellent hummus!), and the continuity of themes whether we were at the Mediterranean or Dead Sea. But foremost was the tireless dedication and deep knowledge exhibited by our fearless leader, Prof. Moshe Inbar, whose constant dialogue, facts, side stories, and observations could have only come from decades of scholarly endeavor driven by a relentless intellectual curiosity about the nature of land degradation and geomorphology of a fascinating landscape.

Sincerely,

Paul F. Hudson
Secretary, IGU – COMLAND
Department of Geography and the Environment
University of Texas at Austin

Field trip participants at the ancient fortification of *Masada*, high atop a horst with the Dead Sea Rift Valley in background. The field trip participants included (left to right, back to front) Gábor Gercsák (Hungary), Pawel Prokop (Poland), Gergely Horváth, (Hungary), Moshe Inbar (Israel), Andrea Vacca (Sardinia, Italy), Annabel Jordan (USA), Paul Hudson (USA), Bella Bychkova-Jordan (USA), Silvio Rodriguez (Brazil), Edinam Glover (Ghana), and Hiroshio Suwa (Japan).

Overview of Fieldtrip Highlights

Day 1: Monday, July 6: Haifa and regional environs

Co-leaders: Lea Wittenberg, Micha Klein, and Ehud Galili.

Specific highlights included:

- Regional geomorphic prospectus of Carmel Mountains and coastal plain
- Origin of carbonate rock notches
- Forest fire research in Carmel Mountains
- Historic human impacts on coastal environments, water engineering
- Submerged Neolithic villages along Carmel coast
- Late Quaternary and modern sea level change

Day 2: Wednesday, July 7: Depart Haifa for northern Israel

Co-leaders: Dorit Sivan, Elyezer Shtern, Ali Zgaier, Lea Wittenberg

Highlights included:

- Qishon River and Haifa Bay: modern environmental problems and land degradation
- Tell Akko: Bronze Age to nineteenth century geoarchaeological development, including changes in river and coastal environments
- Akko (Acre): Old walled city, including urban Crusader settlement
- Yrka, Druse village: historic agricultural terraces and slope stability, modern terrace formation
- Birya: Nevoraya National Forest fires and soil erosion and plant succession
- Overnight: Kibbutz Manara guest house

Day 3: Thursday, July 8: upper Jordan Rift Valley

Highlights included;

- Geological overview of northern Jordan Rift Valley: Galilee and Hermon Mountains
- Banyas Spring and Waterfall: historic settlement, ecological importance, relation to water resources of Jordan River Valley, fluvial channel development, basalt
- Ram maar lake; origin, irrigation and groundwater, and associated agriculture
- Golan, cinder cones, volcanic landscapes, and water resources
- Kibbutz Naod: Changes in Israel's kibbutz organization and function
- Overnight: Kibbutz Manara guest house

Day 4: Friday, July 9: Jordan River Valley and Sea of Galilee (Lake Kinneret) to Dead Sea Basin

Highlights included;

- Hula Valley, within northern Jordan Rift Valley: evolution of landscape, drainage and subsidence, papyrus, management conflicts between nature and agriculture, downstream water resources
- Sea of Galilee (Lake Kinneret): change in lake levels, holy sites, Jordan River delta evolution
- Overnight: Ein Gedi Field School

Day 5: Saturday, July 10: Dead Sea Rift Valley

Highlights included:

- Dead Sea Rift Valley: origin, drop in surface levels
- Masada: ancient Jewish fortification against Romans, atop horst within Dead Sea Rift
- Ein Gedi oasis
- Swimming in Dead Sea
- Southern Dead Sea basin: salt making and cliff retreat
- Overnight: Ein Gedi Field School

Day 6: Sunday, July 11: Dead Sea Rift Valley and Jerusalem

Co-leader: Amos Frumkin

Highlights included:

- Landscape response to base level change (Dead Sea dropping): sink hole formation, fluvial response and incision, infrastructure concerns
- Jerusalem: old city, ancient water infrastructure below City of King David
- Return to Tel Aviv