FOG-COLLECTING BEETLES OF THE NAMIB DESERT

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There exists in the Namib Desert of southwest Africa a group of beetles that collects moisture from the fog-laden air blowing in from the Atlantic coast. These all belong to the Family Tenebrionidae, Subfamily Pimeliinae. Those found on stamps to date include the following:

Saucer Trench Beetle, *Lepidochora discoidalis* Gebien (*Lepidochara* of some)
Namibia, Sc#1249c, 22 September 2012, $5.80

Onymacris paiva Haag
Comoro Islands, unlisted, 28 July 2011, 2500fr SS (LR margin) (Stamperija)

Fog-basking or Fog-drinking Beetle, *Onymacris unguicularis* Haag
Comoro Islands, Sc#1078, 2 March 2009, 3000fr SS (L margin)
Mozambique, Sc#1919, 30 November 2009, 175m SS (MR margin)
Namibia, Sc#967a, 22 May 2000, $2
Namibia, Sc#1109, 15 February 2007, "Standard Mail" ($1.90) (with Web-footed Gecko) (perf 14×13¼)
Namibia, Sc#1109a, 2008, "Standard Mail" ($1.90) (same, perf 14)
Namibia, Sc#1168, 1 October 2008, "Registered Mail" ($18.20) (with False Ink Cap mushroom)
Namibia, Sc#1186f, 8 February 2010, "Postcard Rate" ($4.60)
Namibia, unlisted, 2010, "Standard Mail" ($2.50) (design similar to Sc#1186f)

Long-legged White Namib Beetle, *Stenocara eburnea* Pascoe
Niger, Sc#1054a, 27 July 2000, 200fr

Namib Desert Beetle, *Stenocara gracilipes* Solier
Kenya, Sc#854y, 16 November 2011, 65sh

These are flightless beetles, many with fused wing covers (elytra). They are diurnal, burying themselves in their sandy habitat at night, and emerging during the day. There are 21 species of *Onymacris*, four of *Stenocara*, three of *Lepidochora*, and four of *Physasterna*. The last genus has not yet appeared on stamps. These beetles use three methods of collecting water from the fog-laden breezes blowing off the cold Atlantic Ocean.

The species of genus *Lepidochora* dig trenches in the sand perpendicular to the wind. The resulting ridges protrude into the breeze and cause moisture to condense. *L. discoidalis* is a flat, disk-shaped, short-legged beetle about ¼ inch long. It digs trenches about ⅛ inch deep on the seaward side of the sand dunes. These trenches can be as long as three feet and the ridges thus formed can cause from two- to six-fold increase in the water content of the sand. The beetles extract the moisture from the ridges of damp sand, thereby increasing the water content of the beetles by more than ten percent.[1] *Lepidochora* species also construct water-catching webs.

Lepidochora discoidalis
Namibia, 2012, Sc#1249c

Onymacris unguicularis
Mozambique, 2009, Sc#1919

O. unguicularis, typical of this genus, is all black, long-legged and ⅜ to ⅝ inches long. It is perhaps the best known of these desert beetles. This the only genus that is a fog-basker. The fog is 10–12°C cooler than the sand and this temperature difference triggers the beetle to tilt its abdomen up into the fog-laden breeze. The smooth, grooved elytra are hydrophobic, causing the condensing moisture to run down the insect's back to its mouth where it can drink the water.[2]

O. paiva is black with brown edging on the elytra. The habits are similar to *O. unguicularis*.

Members of the *Stenocara* genus gather moisture with a third method. This genus has hydrophilic tips or bumps on the elytra that serve to interrupt the fog-laden breeze while the rest of the elytra are hydrophobic, causing the water to run off to the beetle's mouth. It does not tilt its body to collect moisture, but rather extends its wings into the sea breeze and the moisture runs down to the mouth. *S. eburnea* is ¼ to ⅜ inches long and has a white abdomen, black head, and long legs.

Stenocara eburnea
Niger, 2000, Sc#1054a

S. gracilipes is similar, but has brown and white stripes from head to tail. It also has bumps on the elytra to collect moisture as does *S. eburnea*.

The principle of condensing water from moist sea breezes is being studied to develop methods of obtaining water in deserts around the world. Several organizations have artificially created roughened surfaces like the beetle wings and such materials can extract several quarts per day from the air. Efforts to make such items economical and practical are underway by NBD Nanotechnologies Inc., Massachusetts Institute of Technology, and various military centers.

The principle of the Namib beetle elytra have led to the development of the Airdrop irrigation system, whereby cool air passes through underground pipes resulting in condensation at the roots of plants. Edward Linacre, a Melbourne-based industrial designer, was awarded the 2011 James Dyson Award for the design of the Airdrop.

Linacre Airdrop System

Notes:

1. "Fog Catchment Trenches Constructed by Tenebrionid Beetles, *Lepidochora*, from the Namib Desert," M.K. Seely & W.J. Hamilton, Jr.. *Science*, 6 August 1976, 193: 4252, pp 486-88.
2. "Fog-Basking Behavior and Water Collection Efficiency in Namib Desert Darkling Beetles," Thomas Norgaard & Marie Dacke, *Frontiers in Zoology*, 2012, 7:23