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FOG HISTORY OF ATACAMA RECONSTRUCTED

by Jonathon Amos (BBC Science Correspondent, San Francisco)

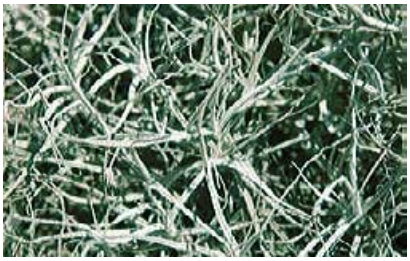
(Reprinted from the June, 2016 Newsletter of the Far North Coast Bromeliad Study Group, N.S.W. Australia. The **Atacama** in the title is the Atacama Desert in Chile. It is the driest non polar place in the world with an area of 40,501 square miles. A few places have not had a drop of rain since rain recording began. Ed.)

It is hard to imagine you could reconstruct a record of fog dating back thousands of years, but this is exactly what Chilean scientists have done. The low-lying cloud is seemingly so transient and intangible, and unlike rivers and glaciers it leaves no easy-to-read impressions on the landscape.

Atacama Desert with masses of tillandsias

And yet, a Santiago team has been able to trace the fog history of the Atacama Desert by studying Tillandsia plants. Their chemistry suggests strongly that this local fog has increased over time. It is a period covering the last 3,500 years. "I don't think there's any other place in the world where I've actually seen a record of fog, even spanning the last hundred years," said Claudio Latorre Hidalgo from the Catholic University of Chile.

"What little we know about fog is from measurement instrumental data that we have, and from satellite data that only spans the last 20 years. "So, this is actually a unique opportunity to study the evolution of a fog ecosystem over the Late Holocene, (The Holocene Epoch began 12,000 to 11,500 years ago at the close of the Paleolithic Ice Age and continues through today - Ed.), and what are the major drivers and controls of the mechanisms that produce that fog in the long term - the very long term." The palaeoclimate expert was discussing his team's research here at the Fall Meeting of the American Geophysical Union - the world's largest annual gathering of Earth scientists.



Tillandsias tangled in a mesh

Tillandsia trichomes

The Atacama is famous for its super-arid conditions; there are places where it has not rained for years. But life can eke out an existence if it can exploit the fog that rolls in off the Pacific. Tillandsias are perfectly adapted opportunists. These wiry, grey plants have no roots. They clutch weakly at sand dunes, but arrange themselves at every spatial scale to maximise their capture of the fog.

They derive everything they need from the damp air - not simply the must-have water, but also all the chemical nutrients required to underpin their biology. Dr. Latorre Hidalgo and colleagues have dug deep into the dunes to uncover a multi-millennia succession of Tillandsia; and they have described a pronounced trend: the younger the plants, the more of the lighter type, or isotope, of nitrogen atom that they have incorporated into their tissues.

Analysis of modern fog suggests this lighter nitrogen is favoured, and so the observed trend in the Tillandsia would strongly indicate the fogs of the Atacama have increased over time… with some complications. "How the nitrogen gets into the fog is a much more complex question," said Dr. Latorre Hidalgo.

"I suspect a lot of

that nitrogen is of marine origin. There is a huge oxygen minimum zone off the coast of northern Chile, where there is a lot of denitrification going on. The structure of Tillandsia maximizes fog capture – by growing in a mesh (see photo bottom of page 1, left) and using appendages on the leaves called trichomes to corral the water. (See photo bottom of page 1, right.) The plants, pictured here by co-worker Angélica Gonzalez, underpin a whole ecosystem.

"So, there is a lot of molecular nitrogen going into the air and a lot of nitrous oxide as well. We know there is both ammonia and nitrate in the fog. So you get both organic and inorganic forms of nitrogen."

Oxygen-minimum zones are mid-water regions in the ocean that are extremely low in oxygen abundance, in part because marine organisms are removing it very fast and also because the waters that move into the zone fail to replenish the oxygen as they themselves are depleted. This is usually cold, upwelling water.

And, again, this fits the overall picture because cold coastal waters will produce more fog. "Our monthly fog collector data shows there is a significant trend with the coastal sea-surface temperatures and the fog. So, when you get El Niño events (and local surface waters warm), this warm water dissipates the thermal inversion that's holding in the low-lying cloud and this dissipates the fog.

"We think that over the last three thousand years, the coastal waters have gotten much colder, much more productive and that's releasing nitrogen from this oxygen-minimum zone to fertilise the plants."

And it is more than just the Tillandsia that are benefitting. The plants' success in trapping and using fog anchors a whole ecosystem that supports creatures as diverse as beetles, scorpions, spiders and even lizards. ❑

BILLBERGIA COLOR, SHADE AND WATER

by Derek Butcher

(Reprinted from BROM GAZETTE, May/June 2010 newsletter of the Bromeliad Society of South Australia)

I am sure that more shade is being used to combat the heat that we didn't get. This becomes the $64,000 question. Some plants did not have the colour to the leaves you expect for certain genera like billbergias. I remember challenging Don Beadle 'Mr Billbergia on the world stage" some 20 years ago as to why his billbergias did not form tight leaf tubes in Florida. They always looked floppy whereas ours in South Oz formed tight tubes to help them through summer. It must have been 30 years ago that I visited the Queensland Mr. Billbergia (how is it there never seems to be a Ms or Mrs Billbergia?) It was Clyde Wasley who was Grace Goode's brother-in-law and he grew billbergias better than she did! You see, he grew under cover so they did not get direct Queensland rains! Some growers whine about the fast flowering of Billbergia and yet the emphasis is on leaf colour. This is exactly the same as hybrid neoregelias and yet nobody complains about their flowers!! I rest my case!

(Derek has a point! I seem to be the only one who grows and flowers *Billbergia decora,* including expert growers like Michael Kiehl who can't shade it to the moderate light I have in my dry apartment. Ed.)

NEXT MEETING - Tuesday, November 1st, 2016 promptly at 7:00 P.M. at the Ripley-Grier Studios 520 8th Ave. (36 St. & 37 St.) Rm 10C on the 10th floor.
EXPLORING FOR BROMELIADS IN ECUADOR Part 2 , Cuenca to Quito. Photo report by Greg Aizlewood of Queensland, Australia. Part 1 at the October meeting was exciting so don't miss Part 2. Please bring plants for Show and Tell.

ON SYMBIOSIS

by Robert Kopfstein

(Reprinted from Robert Kopfstein's "The President's Corner" in the Bromeliad Blade, April, 2015, Newsletter of the San Diego Bromeliad Society. Robert consistently produces well-written, thought-provoking articles. Ed.)

Consider symbiosis. The word is derived from two Greek roots that mean "together" and "life," and in biology it signifies two or more organisms that mutually coexist. Not only do they live together, but they depend one on the other for their very existence. A prime example is lichen, a combination of a fungus (ascomycetes) and certain green or blue green algae. This duo has been so successful that you can find lichen almost ubiquitously, from tropical climates and deserts to the arctic - reindeer moss is a staple without which children in the West would have to do without all those goodies they receive on December 24, (that is unless Santa would locate another food source for Dancer, Prancer, and the rest of that herd).

Tree frog living in a Neo.

Bromeliads too exhibit symbiotic traits. Those that are epiphytic most often live in concert with other plants, trees, shrubs, cactus. The lithophytes may use rock as a substrate, but they do not cling to the rocks alone. If you visit bromeliads in habitat you will find that most often the tree branch or the rock has been previously colonized by lichens and moss. This biotic substrate allows the bromeliad seeds the necessary moist "cushion" to germinate, and it provides protection for the tiny seedlings to survive until they are large enough to fend for themselves.

Once the bromeliads are large enough, they too are the site of symbiotic relationships. The so-called "tank type" broms trap water, and these little reservoirs not only provide essential water for birds, mammals, and reptiles that live high in the forest canopy, but they are home to frogs and insects – alas, including mosquitos. If you grow any of the tank bromeliads in your garden you have likely observed the variety of critters that soon make themselves at home in your plants.

Years ago when I first began to grow large neoregelias I was perplexed as to why the leaves near the center had elongated scratches; the smaller neos seemed immune to this problem. Then one day I noticed that the neighborhood birds were using my "big horse neos" as a birdbath. The scratches came their frequent ablutions.

Some tillandsias – especially the ones with bulbous bases are myrmecophiles; they provide a home for ants, who are safely tucked away in the dry shelter of the leaf bases. In turn, the plant has its own built in security force. Heaven help the hapless collector who might try to dislodge the tillandsia. The ants attack—stinging—and the collector, if he or she is wise, will best do a hasty retreat leaving the plant unmolested.

This concept of symbiosis apparently caught the attention of author Terry Pratchett, who writes mostly fantasy fiction. In 1998, he published (Harper Collins) "The Bromeliad Trilogy", a series of three short connected novels telling the story of a group of nomes (not gnomes), little people who have been stranded on Earth for many, many generations. Apparently their exploratory spacecraft became separated from the mother ship. They eke out a miserable existence in a meadow until they decide to move on, ultimately winding up in a British department store. Then to their surprise they encounter another group of nomes, who can remember no other existence other than inside the store, and who have never had to deal with "outsiders."

In effect the trilogy is an extended metaphor for the human condition. Using a simile of frogs that know no other world other than the bromeliad that acts as their minuscule universe, the nomes face catastrophe when they discover that their miniscule universe, the department store, is to be closed and then demolished. While the book is entertaining it raises several very serious issues that we humans face today. Our bromeliad -- or department store -- is obviously in trouble: the Earth is facing climate change, global warming, pollution, gross overpopulation (no need to go on).

Perhaps we have forgotten that we live in a symbiotic relationship with nearly everything that surrounds us, and every symbiotic relationship, if it is to succeed, has to work both ways. Each participant must work to the benefit of the other. ❑

WHAT'S IN A NAME?

(from Florida West Coast B. S. Newsletter, 11/13)

In the last newsletter a picture of an Aechmea cultivar was identified by its parent's names (*Aechmea chantinii* x *A. fulgens var discolor*) and not its cultivar name ('Filip van Onsen'). Derek Butcher, past Bromeliad Registrar for the Bromeliad Society International, noted that and wrote to say the following regarding the use of the parents' names to identify the plan:

"PLANTS HAVE FEELINGS, TOO, and resent being identified after their parents. They like their own name just like humans. So *Aechmea* 'Filip van Onsen' was perturbed to see a photo of himself under his parents names. Mind you *A.* 'Fia' could also have been worried because one may have quoted the wrong mother... In 1979 Dutrie created *A.* Filip van Onsen by crossing *Aechmea chantinii* with *A. fulgens v discolor*. In 1990 or thereabouts Deroose created A. 'Fia' by crossing *A. fulgens v discolor* with *A. chantinii*. There is also a possibility that some Floridian grower has done the same cross but has not bothered to claim his/her work or checked what had happened before and just identified it by its parents."

A. 'Filip van Onson' BCR

A. 'Fia' BCR Cathcart

From Bromletter, Journal of the Australian Bromeliad Society, May-June, 2006

ANCIENT TECHNOLOGY

After digging to depth of 10 metres last year near the ancient city of Novgorad, Russian scientists found traces of copper wire dating back 1000 years and came to the conclusion that their ancestors already had a telephone network one thousand years ago.

Not to be outdone, in the weeks that followed American scientists dug 20 metres and headlines in the US papers read: "US Scientists found traces of 2000 year old optic fibres of Maya and have concluded that their ancestors already had an advanced high-tech digital telephones 1000 years earlier than the Russians."

One week later the Greek newspapers reported the following: "After digging as deep as 50 metres, Greek Scientists have found absolutely nothing. They have concluded, therefore, that 3000 years ago their ancestors were already using wireless technology."

COMPREHENDING I.T. PEOPLE

Two Info Technology guys were walking across the park when one said "Where did you get such a great bike?" The second I.T. guy replied: "Well, I was walking along yesterday minding my own business when a beautiful woman rode up to me on a bike. She threw the bike to the ground, took off all her clothes and said: 'Take what you want'."

The first I.T. guy nodded approvingly. "Good choice; the clothes wouldn't have fitted anyway." ❑

NEWS and NOTES

HOLIDAY PARTY - Our annual holiday party will take place **December 21st** starting at 6:30 pm, in Michael Riley's house. Your spouse, significant other and family are welcome to come. Michael's incredible walls crammed with epiphytes have many new additions, so **SAVE THE DATE!** You will receive a reminder and a note about voluntary food contributions next month.

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