

## Snails dine at desert dust depot

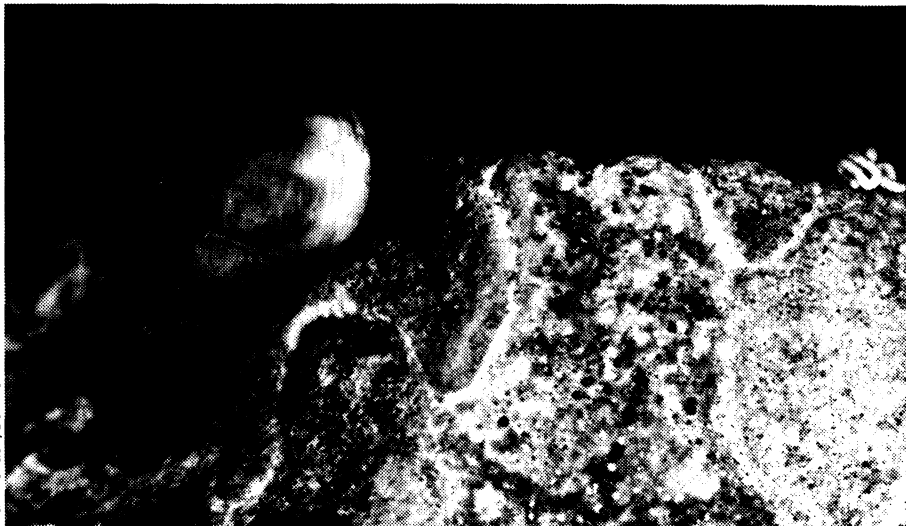
Winds from the Arabian and Sinai peninsulas sweep across the limestone rocks of Negev Desert Highlands in Israel, depositing dust in their wake. Long considered a major source of soil formation in the Negev, these winds apparently are not the only significant contributors. Researchers are finding that in the sands below, two species of snails may be equally responsible for soil formation.

Although plant-eating animals have been known to affect their ecosystems through overconsumption of a resource, such as overgrazing, these snails have a significant regulatory impact despite the small amount they consume, according to a report in the May 29 *SCIENCE* by Clive G. Jones of the Institute of Ecosystem Studies in Millbrook, N.Y., and Moshe Shachak and Yigal Granot of the Mitrani Center for Desert Ecology in Israel.

The two species, *Euchondrus albulus* Mousson and *Euchondrus desertorum* Roch, are found throughout the desert at a rate of 21 snails per square meter and feed seven months out of a year during seasonal dew formation. The lichens they feed on, known for their toughness and low digestibility, grow under the rock surface at depths between 1 to 7 millimeters. Called endolithic lichens, they are cryptogams that don't bear seeds or flowers, and are dominant in limestone in extreme environments. The arid desert terrain these hardy lichens and snails call home is a hilly region some 5,000 square miles large and covered mostly by rock.

Videotapes of lab experiments showed the snails foraging in short side-to-side motions for about 20 minutes, leaving behind a white trail in the process. Depths of the trails varied, say the researchers, possibly because the snails might rebrowse trails for the lichen that grew there within 48 hours of when they made their first feeding pass. "We don't know how often they rebrowsed a trail," says Jones. "We expect it's fairly frequently." The scientists also observed small piles of limestone-colored feces that showed a calcium content similar to that of the upper layers of rock and lichen, supporting the theory that the snails were not only disturbing the rock for food, but also ingesting and redepositing it as waste.

Based on observations of foraging behavior of 10 snails per stone in the lab, researchers estimated that the snails removed about 7 percent of the surface area of the rock to a depth of 1 mm per year. Field observations produced somewhat lower results: removal of 4 percent of the surface area of the rock to the same depth per year. On the basis of these estimates the researchers conclude that



White lines on rock show foraging behavior of *Euchondrus desertorum*, one of two species of snails found to contribute heavily to soil formation in the Negev Desert Highlands.

the foraging snails "weather" the desert at a rate of about 0.7 to 1.1 tons per hectare per year.

To find the impact of soil formation caused by wind deposition, the group measured dust levels from 10 stones each month during the dry season in an area of the highlands with low snail density.

Through this method, they estimated about 0.4 ton or more per hectare per year. But dust deposition is difficult to measure, and other estimates place this figure much higher. Either way, the dust deposition caused by snails is at least as great as that produced by wind, according to the study.

— K. Hartley

## Natural selection: Bird seeds of change

A legacy of the 1983 El Niño is granting evolutionary biologists the rare opportunity to test the central tenet of their field: the theory of natural selection. As part of a long-term study that began in 1973, these scientists are monitoring how El Niños and other climate shifts forced changes within a population of finches on the Galápagos islands.

Two researchers report in the June 11 *NATURE* that the eight months of extraordinarily heavy rainfall during that El Niño led to the differential survival of smaller birds for the two subsequent years. Earlier, parts of this study had demonstrated that periods of drought promoted the survival of larger birds with big bills. These swings in the population not only prove that environmental forces can shape the population of a species, but also show that the direction of evolution can change or reverse, often quite rapidly, says Peter R. Grant of Princeton (N.J.) University.

Grant and H. Lisle Gibbs of the University of Michigan in Ann Arbor have been observing the species *Geospiza fortis* on the island of Daphne Major, which measures roughly 3/4 mile by 1/2 mile in area. Daphne Major and the other Galápagos islands are particularly well-suited to studies of natural selection because they provide isolated populations of birds that live in a variable climate, says Grant. The birds, commonly known as Darwin's finches, also possess physical traits that



Large ground finch with big bill.

are highly inheritable, such as weight and bill size.

For most of the year, the finches subsist on seeds of varying size and hardness. During lean years of little rainfall, the birds deplete the supply of small, soft seeds that require more rainfall, and then must turn to the harder, larger seeds that remain. Because large birds with bigger bills are the only ones able to crack open the hard seeds, a greater number of large birds survived through the dry years of 1977, 1980 and 1982.

The 1983 El Niño allowed Grant and Gibbs to observe the reverse of this process. Rains from this climatic upheaval pounded the tropics of the eastern Pacific and dropped 1,359 millimeters of rain on the Galápagos from December 1982 through July 1983. Normal yearly rainfall ranges between 50 and 100 mm.

As is natural with the onset of the

annual rainy season, the birds began to build nests and mate during the first weeks of the rain. However, during an El Niño, "they breed like crazy. . . and keep on going until the rain stops," says Grant. In 1983, the birds produced eight broods, as opposed to a normal one or two. As well, record numbers of seeds grew on the island.

The researchers propose that smaller birds were more adept at eating the small seeds that dominated the post-El Niño food supply, and this led to their increased survival rates in 1984 and 1985.

The observation of the relationship between finch size and rainfall is unique, writes biologist Jon Seger in an accompanying editorial. The finch study is the first to demonstrate that the natural ecology has forced a population in two opposing directions at different times. Seger, from the University of Utah in Salt Lake City, also writes that "if such strong and constantly changing patterns of selection should turn out to be the rule for many species . . . then we are probably far from understanding the processes that maintain heritable quantitative variation in natural populations." — *R. Monastersky*

### Not an ant-idiote

Medical students at Tulane University School of Medicine in New Orleans arguably went beyond the call of duty when they tested the validity of an old folk remedy recently. In what they believe to be the first controlled clinical study of the effectiveness of meat tenderizer to relieve insect stings, 22 of the med school's more stoic students allowed themselves to be stung on the forearms by imported fire ants.

As reported in the June *JOURNAL OF THE AMERICAN ACADEMY OF DERMATOLOGY*, half the sting sites were treated with meat tenderizer dissolved in a few drops of water, while plain water was applied to the other sting sites. The tenderizer contained papain, an enzyme that breaks down protein and has long been considered to be an anti-inflammatory effective against the pain-producing proteins in insect venom. But the study showed that "there is no significant difference between treatment with meat tenderizer and treatment with placebo," as measured by changes in blood flow at the sting sites and by student reports about itching and pain.

However, one member of the team notes, fire ant venom contains little protein compared with some other insect venoms, and further studies would have to be performed to see if the tenderizer is effective against wasp or bee stings.

So far, there are no reports of volunteers for that study. □

## Low-dose caveat for schizophrenia

Low doses of antipsychotic drugs — as little as one-tenth of conventional doses — have recently been touted as an effective way to improve the condition of many schizophrenic patients while decreasing the risk of drug-induced movement disorders such as tardive dyskinesia (SN: 11/10/84, p.297). But according to a report in the June *ARCHIVES OF GENERAL PSYCHIATRY*, the low-dose approach also increases the risk that schizophrenic symptoms will worsen, particularly during the second year of treatment.

The implication for psychiatrists, say Stephen R. Marder and his colleagues of West Los Angeles Veterans Administration Medical Center, is that low doses of antipsychotics, also called neuroleptics, are useful but should be prescribed only if a patient can be closely monitored for eventual symptom flare-ups that can lead to a return of full-blown schizophrenia.

The researchers followed 68 men who had been diagnosed as schizophrenic for more than 10 years. Each subject received an injection of the long-acting neuroleptic fluphenazine decanoate every two weeks. In about half the cases, a conventional dose was used; the rest of the men were given one-fifth the conventional dose.

During the first year of treatment, about two-thirds of both groups of patients displayed no significant worsening of symptoms such as disorganized thinking, hallucinations, hostility and suspiciousness. In the second year, the condition of the conventional-dose group remained steady while symptoms were kept in check for only about one-third of the low-dose patients.

When as much as twice the original dose was administered after the first signs of a flare-up, say the researchers, a substantial portion of both low- and conventional-dose patients improved. At the end of two years, higher drug levels eased the symptoms of about two-thirds of the conventional-dose patients whose condition had worsened, and the success rate was slightly less for the low-dose patients.

Patients given the higher dose reported more restlessness and discomfort in the first six months of treatment, note the investigators, and six of them dropped out of the study.

The researchers conclude that "it is unlikely that there will ever be a simple formula" for selecting the best neuroleptic dosage for individual schizophrenics.

— *B. Bower*

## No threshold to lead's learning effect

For years studies have been linking childhood learning problems with body levels of lead in the range of 20 to 35 micrograms per deciliter of blood. When two new studies over the past year reported related effects in developing infants and toddlers at even lower levels — 8 to 10 µg/dl — scientists began to wonder whether infants might be more vulnerable to lead's neurotoxic effects than previously believed (SN: 5/2/87, p.277). Now a Scottish study suggests that *any* body burden of the metal risks diminishing the cognitive ability and learning skills of children.

The new study, reported in the May 30 *LANCET*, involved 501 Edinburgh schoolchildren aged 6 to 9 years. Their mean blood-lead level was 10.4 µg/dl — roughly half what the Atlanta-based Centers for Disease Control now deems "excessive." After accounting for 33 possible confounding variables, the study found a 5.8-point differential in score results between the least and most lead-exposed children on the British Ability Scales, a test measuring cognitive ability and educational attainment.

Against a mean score of 100 for children in general, this differential is "a small effect," according to University of Edinburgh epidemiologist Mary Fulton, one of the study's authors. However, she notes, a lead effect "is definitely there, is statis-

tically significant" and extends down into the lowest-exposure group. Moreover, she told *SCIENCE NEWS*, compared with previous reports of neurological deficits linked to lead, "it's a larger effect than other studies have found."

Three factors her study identified as more influential than lead were a parent's verbal ability, a parent's nonverbal mental ability and the child's interests, such as playing with others and reading. Together, the effect these three could have on the score — 23.5 points — is considerably greater than any contribution attributable just to lead.

Nevertheless, Scotland is already actively working to reduce exposures to environmental lead, Fulton notes. "Our study indicates that this should be continued and perhaps even be stepped up," she says.

The Edinburgh study "is an important confirmation" that asymptomatic levels of lead can be neurotoxic, says lead researcher Herbert Needleman of Children's Hospital in Pittsburgh. And, points out Ellen Silbergeld, a lead toxicologist with the Environmental Defense Fund in Washington, D.C., the finding that these effects occur at blood-lead concentrations well below 10 µg/dl suggests that at least 88 percent of all U.S. children — who also fall into this range — may be suffering similar effects.

— *J. Raloff*