



sonorensis

Arizona-Sonora Desert Museum Newsletter • Vol. 6 No. 2 • Fall 1984

Tropical Sonora

A look at tropical life 150,000 years ago and today.

FOSSILS I HAVE MET

When the Desert Museum was in its early stages this writer was called upon to build another outdoor Museum on a ranch 65 miles northwest of Santa Fe. Investigations showed that an absolutely empty plain would be the best location. As with the Desert Museum, our objective was to inform people of the local animal and plant life and also the geology and related subjects of the immediate area. One of the first things I learned was that the museum would be in the center of one of the largest dinosaur quarries in America. The place was Ghost Ranch, New Mexico. This disclosure prompted plans which were to include fossils of animals long gone with those of the present such as mountain lions, black bears, deer, antelope, and many others. Of course, we also were to exhibit local plant life and build some conservation exhibits to show how overgrazing on such areas causes severe erosion. These things we did.

Soon, we were also engaged with pick and shovel excavating some of the fossils nearby, including *Phytosaurus*, a crocodile-like reptile which occupied the region when it was covered with water millions of years ago. One of the rarest of all dinosaurs had been discovered on the ranch previously by Dr. Edwin H. Colbert of the American Museum of Natural History. It was a relatively small dinosaur which had hollow bones and thus was considered to be of some relationship to birds. This creature was known as *Coelophysis*. A complete cast of the skeleton of this animal was presented to us by the American Museum for exhibit after the scientists there had completed their studies and restoration.

Nearby the museum, a huge dam was built by the Bureau of Land Management known as the Abiquiu Dam to hold water from the Rio Grande River. During the course of excavation of this structure bones of the extinct bison and several other animals of the period were found and we exhibited some of them.

It seems that the more we can learn about the creatures who lived here in the past as well as today, the better informed we shall be concerning an understanding of some of the life our earth has sustained over the eons. The Desert Museum from the beginning has been noteworthy for its display of the living creatures found in Arizona and Sonora. It was this objective that was responsible for the establishment of the institution which, today, is known throughout the world as an exemplary example of having achieved its goal. *W. H. Carr*

sonorensis Museum News

DAVIS ON "TODAY SHOW"

Desert Museum Director Dan Davis was interviewed by NBC Producer Ned Judge for a segment on NBC's "Today Show." The interview was shown the morning of Friday, July 13th.



ON THE COVER.

Lush canyon streams such as this in the Rio Fuerte drainage attest to the tropical possibilities of southern Sonora. Photo by Howard Lawler.

PRESIDENT'S REPORT

The Arizona-Sonora Desert Museum probably boasts the largest membership of any private, non-profit organization in Arizona. Certainly our size of some 15,000 has to put us right up there with the best of them. But when one considers the dimensions of the Tucson area's burgeoning population, to say nothing of the population within Arizona as a whole, our percentage figure would appear to be slipping. The Museum seems not to be growing in numbers of members in proportion to the growth of Pima County. We have even been told that one of Tucson's larger department stores has 90,000 credit card customers, or 75,000 more people on its mailing list than we have on

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DIRECTOR'S REPORT

It is ironic that the nation's economy is reported in better shape than a year ago, but visitation to the Desert Museum is down by 7%. Last year at this time we began fiscal 1983-84 well ahead in all categories by which we measure the Museum's financial well being. We begin fiscal 1984-85 with nearly \$100,000 less than what we had to work with a year ago. We are not in a crisis situation, (although I sometimes feel it always seems that way) but we are going to have to do a couple of things to be sure the Museum remains financially healthy to avoid having to take drastic steps later. First, as you may have assumed, we must increase annual dues. General and Individual membership dues will increase by \$10.00 per year and Student memberships by \$5.00 per year as of January, 1985. We're sure you'll agree your ASDM membership is still a bargain however, espe-

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TWO MUSEUM EMPLOYEES PROMOTED

Longtime Museum staffers Christopher Helms and Janice Hunter have been appointed to new positions by Director Dan Davis. Helms becomes Development/Public Affairs Officer beginning October 1, assuming the responsibility for ASDM fund raising in addition to Public Affairs; Hunter became Curator of Education as of September 1, a position unfilled for six years.



Chris Helms
Development/Public Affairs Officer



Janice Hunter
Curator of Education

Helms has been with the Museum for six years as Public Affairs Officer. He was the key staff member responsible for the "Uncage Our Cats" campaign. Helms has been the Editor of *sonoransis* from its inception and is the author of "The Sonoran Desert." Hunter has worked for the ASDM for seven years as the Museum's Environmental Education Specialist in charge of the Van Program and other educational programming for children. Three years ago the Museum library was added to her responsibilities. Her new position will encompass these duties and the administration of the Docent Program.

MORE EARTH SCIENCES EDUCATIONAL PROGRAMS

Exciting, new Earth Sciences Weekend Specials are offered again this year, ranging from an exploration of our own caves to a Halloween visit into the past worlds of ancient "monsters." We have expanded the program to include ages six through adult.

The fee for members is \$3.00 per program for each registrant. In addition to the \$3.00 fee payable in advance, non-members should be prepared, upon arrival, to pay admission prices to the Museum for those programs on the Museum grounds (\$5.00 for adults, \$2.25 for 13 to 17, 75¢ for 6 to 12).

How to register.

Send a letter with:

1. your name, address, and phone
2. names of registrants
3. title of program
4. check to ASDM for applicable fees

and mail to:

Arizona-Sonora Desert Museum
Earth Sciences Center
Route 9, Box 900
Tucson, Arizona 85743-9989

Your registration will be confirmed through the mail. All programs begin and end at the Museum entrance by the Lizard Enclosure.

JOURNEY TO THE CENTER OF THE EARTH

Ages 6-8, limited to 15 registrants. Saturday, September 29, 10:00 a.m. to Noon.

This program will give youngsters a closer look at how caves form and what is hidden inside. They will be taught the importance of cave conservation and what cave exploration (spelunking) is all about. The program will be held on the Museum grounds.

MONSTERS THROUGH THE AGES

Ages 8-12, limited to 15 registrants. Saturday, October 27, 10:00 a.m. to Noon.

A Halloween Special will include a discussion of some of the early life forms on Earth. Of course, it will cover the dinosaurs and the large animals that roamed the Earth during the last Ice Age. The program will be held on the Museum grounds.

VOLCANOES OF THE SONORAN DESERT REGION

All Ages. Sunday, November 4, 10:00 a.m. to Noon.

There is a close relationship between the dynamic history of volcanoes in the Sonoran and today's landscapes. Explore those early

beginnings, and the rocks, minerals, and other natural phenomena associated with volcanism. The program will be held on the Museum grounds.

GEOLOGY IN THE FIELD

Ages 15-17, limited to 15 registrants. Saturday, December 15, 8:00 a.m. to Noon.

This is the only program that will be held away from the Museum grounds. Just a short drive from the Museum entrance will take us to a dry wash filled with the kind of geology you would only read about in books.

GALAPAGOS ISLANDS AND AFRICA TRIPS PLANNED FOR 1985

One facet of our fund raising efforts this year was sponsorship of two wildlife conservation safaris to Kenya. The trips were a great success and because of members' interest and enthusiasm, we are planning two similar events for the coming year. One will be a journey to learn the fascinating biology of the Galapagos Islands off the coast of Ecuador, and will take place early in 1985 (probably in February). The other is an African Safari to Kenya and Tanzania which will take place in July. If you are interested in either of these ventures, please let us know by letter or phone (602-883-1380, ext. 237) and we will supply additional information as it becomes available. Each trip can only serve a limited number of participants, so act now!

ON-GROUNDS INTERPRETIVE ACTIVITIES THROUGH THE END OF THE YEAR

As you know, docent and staff guided tours of the Museum and interpretive activities have been offered to Museum members and visitors on a regularly scheduled basis for sometime. So you can better plan your visits to the Museum through the end of the year we thought it would be useful to provide you with the following schedules of regular daily tours and animal demonstrations and some special interpretive programs created by Interpretive Naturalist Rich Dulaney. All of these programs are free for members and visitors who pay admission.

Regularly Scheduled Activities

Guided Tours. 10:00 a.m., 11:00 a.m., and 1:00 p.m. These tours leave the Entrance Patio area and cover many of the outside displays. Tours last 1 1/2 hours.

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TROPICAL SONORA



By Howard Lawler, Curator of Small Animals, ASDM and Tom Van Devender, Ph.D., Research Scientist, ASDM

Rancho la Brisca

Rancho la Brisca is a picturesque stream canyon in north-central Sonora, Mexico about 55 miles south of the United States border and about 18 miles north of Cucurpe. Its tiny Rio Santo Domingo is a tributary of the Rio San Miguel-Rio Sonora Rivers which drain southwest into the Gulf of California. At an elevation of 3300 feet, the local vegetation is a mixture of Sonoran Desert, desert-grassland and oak woodland. The canyon supports a lush gallery forest of willows, walnuts, velvet ash, netleaf hackberry and Fremont and Sonoran cottonwoods.

It is in an area rich in history. The ruins of the Spanish-Indian silver mine at Real de Saracachi established in 1680 four miles to the south near Rancho Agua Fria record the earliest Spanish entry into Pimeria Baja. In the late 1600's and early 1700's, the Jesuits under the leadership of Father Eusebio Kino established an extensive series of missions in what are now the States of Sonora and Arizona. The short-lived mission of Dolores was established on a tributary of the Rio San Miguel in 1687. In 1767 the surviving Jesuit missions were taken over by Franciscan missionaries. For the next century, the entire area in-

If one were to visit the tropic deciduous forests of southern Sonora in the dry season (left) it would be difficult to believe the explosion of vegetation (upper right) brought on by the summer rains.

cluding la Brisca was the scene of Apache raids on European and Indian settlements alike.

During a 1975 survey for archeological sites in central Sonora for the Centro Regional del Noroeste of the Instituto de Antropología e Historia in Hermosillo, Richard White discovered a pocket of dark, mineralized bones in a small deposit perched about 45 feet above the present streambed. Under a permit from the Instituto de Geología in Mexico City bones exposed by rains were collected occasionally for the next eight years and were deposited after study in museum collections in the Instituto de Geología and at the University of Arizona.

The fossils discovered in this area were studied and analyzed at the University of Arizona and clearly showed a change in climate over the past 150,000 years, a blink of the eye geologically speaking.

Herpetologist Lawler and paleoecologist Van Devender collaborated on the following article to compare the present faunas in the Rancho la Brisca area to those which existed thousands of years ago. It may be a clue to changes taking place right now.

Rancho la Brisca eventually yielded the fossil remains of 45 animal species providing us with a sketch of the fauna of about 150,000 years ago.

But what would Rancho la Brisca look like if we could travel back in time?

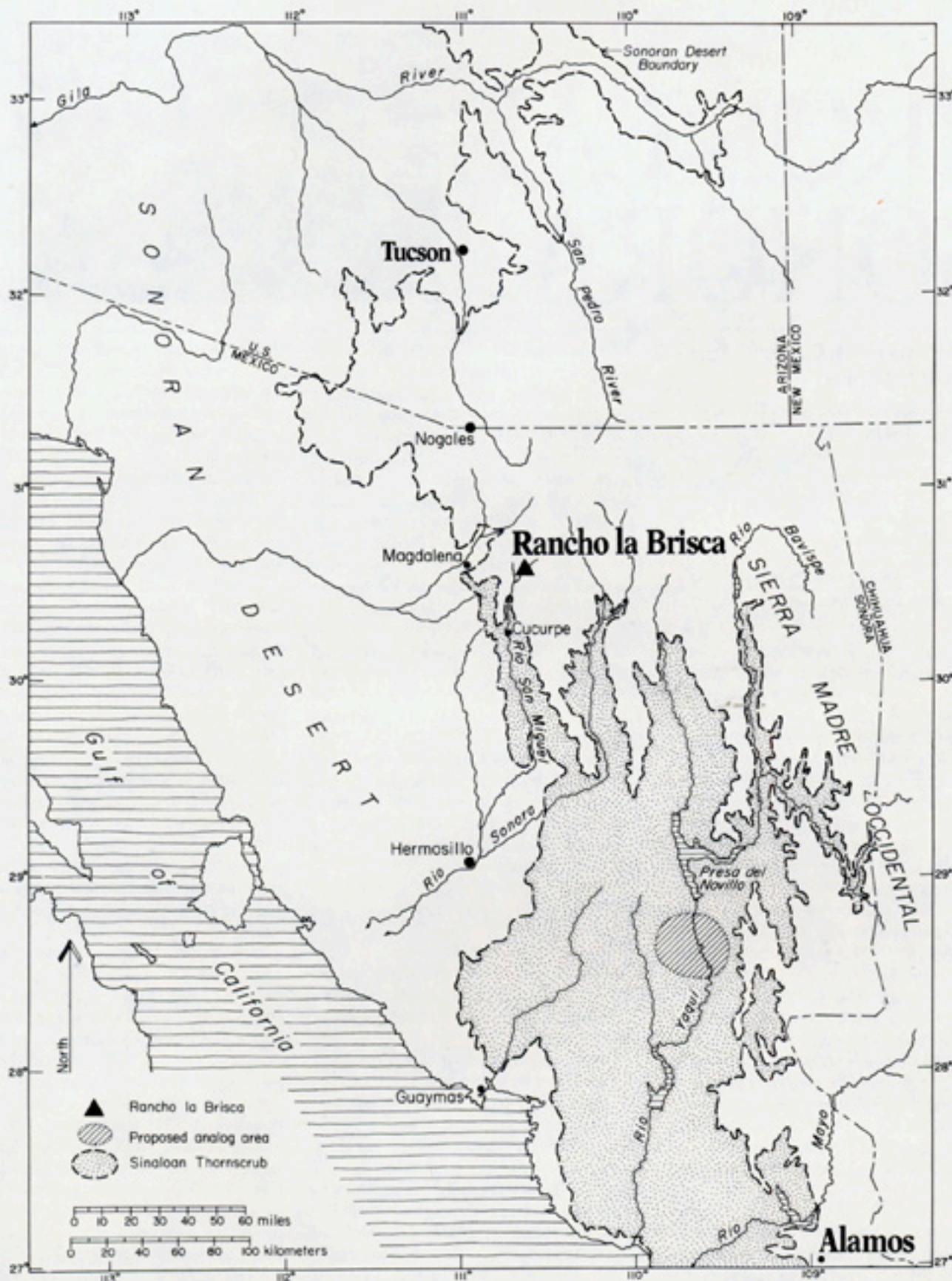
A dense gallery forest of cottonwoods, willows and probably sabino (*Taxodium mucronatum*) filled the canyon. In the middle of the canyon, which was not so deep as today, a clearing in the trees marked the edge of an area where water surfaced—a cienega or marsh. The la Brisca cienega was probably larger and held more water in the dry season because of greater rainfall. Late summer or early fall tropical storms—the chubascos—probably flooded the canyons and scoured the cienega more often

than today. The trees and permanent pools of water made it a haven for wildlife. Occasional white-fronted parrots may have visited along with a myriad of other birds, including an extinct owl previously only known from tar pits at Rancho la Brea and McKittrick, California. Waterfowl used the pools.

The most dramatic animals to be seen would be the large extinct mammals. Family groups of Columbian mammoths lived in the area, and, especially during the dry season, used the cienega. Their mucking around probably kept the aquatic vegetation down and the pools more open. (In Africa today, elephants shift the vegetation to relatively open savannah with their ruthless treatments of trees and shrubs.) Herds of small and large horses, bison and camels came in to water. Mule deer and the diminutive four-horned antelope were less conspicuous. The abundance of grazing mammals surely attracted predators and scavengers. The giant Pleistocene jaguar (*Felis onca augusta*) or the American lion (*Felis atrox*) may have lurked in the shadows. The California condor or its giant relative, the teratorn (*Teratornis merriami*), as well as the turkey and black vultures and the caracara scavenged the predators' scraps.

We would also probably see many small animals. Sonoran mud turtles (*Kinosternon sonoriense*) and leopard frogs (*Rana pipiens*-group) were probably abundant, while the large Yaqui sliders (*Pseudemys scripta yaquia*), an aquatic turtle, were less common. Fish in the pools probably included Opata suckers (*Catostomus wigginsi*), longfin dace (*Agosia chrysogaster*), Gila topminnows (*Poeciliopsis occidentalis*) and their all female relatives, a parthenogenetic topminnow (*P. monacha-occidentalis*). During the summer rainy season the cienega was probably deafening at night due to breeding choruses of many different frogs and toads.

For some of these smaller animals, especially the fish and amphibians, this is the first time that their bones have been recovered as fossils.



Fossil evidence from Rancho la Brisca suggests that the tropical climate of the Alamos, Sonora, area once extended at least 275 miles further north.

The bones of many fish and amphibians never had been before recovered as fossils.

Most are from small animals that live in or near water. Sonoran mud turtles and leopard frogs are by far the most common bones in the deposit. The kinds of animals, the excellent preservation of delicate small bones and the fine clay sediment with some coarser gravels suggest that the bones were preserved in an ancient cienega similar to the modern one near Rancho Agua Fria four miles south of Rancho la Brisca. An especially interesting facet of the fauna is that some of the amphibians including the little Mexican toad (*Bufo kelloggi*), the Sinaloa toad (*B. mazatlanensis*), the burrowing treefrog (*Pternohyla fodiens*) and especially the black-eared frog (*Leptodactylus melanonotus*) suggest that the climate was much warmer and wetter than today. Similar climates are found today in areas of tropical deciduous forest along the Rio Yaqui east of Hermosillo.

Assigning a relative age to the la Brisca fauna took a bit of sleuthing. The combination of mammoth, horse, camel and bison together suggested that the fauna was deposited in the younger portion of the Pleistocene, the time of Ice Ages. Vertebrate paleontologists have named this the Rancholabrean Land Mammal Age after the Rancho la Brea tarpit fauna. Dr. Charles Reppening of the U.S. Geological Survey has inferred that the bison crossed the Bering Strait from Siberia to enter North America about 150,000 years ago. Many large animals in North America including mammoth, horse and camel became extinct about 11,000 years ago. The northward expansion of subtropical animals places the la Brisca fauna in a warm climate when continental glaciers were absent. Taken together, the evidence suggests that the la Brisca fauna represents the interglacial period just prior to the last Ice Age: the Sangamon Interglacial. This interglacial was named for soils that were found between glacial deposits near Sangamon, Illinois. The significance for us is that there have been times in the past when subtropical and tropical animals, plant communities and climates expanded beyond their present limits into grassland and

woodland habitats to the north and probably into the Sonoran Desert itself to the northwest. The affinities between the Sonoran Desert in Arizona and Central Sonora and the more tropical areas to the southeast have reason to be so strong.

Tropical Animals of la Brisca Today

The amphibians in the Rancho la Brisca fauna are probably the best indicators of past environments because of their different ways of coping with dry environments. They have various adaptive strategies for preventing the loss of vital body moisture during extended periods of drought and for completing their water based reproductive cycles.

Most treefrogs in the family Hylidae climb in trees or on rocks well above the ground. The burrowing treefrog (*Pternohyla fodiens*) is unusual in having adapted for burrowing into moist soil. Its fossorial nature is revealed by enlarged spadelike tubercles on the hind feet, although it has retained the adhesive toe discs typical of treefrogs. The skull is heavily ossified and may serve as a plug to the burrow which is constructed by digging backwards in typical frog or toad (anuran) fashion. As the dry season approaches the frog digs deeper until it is completely covered by soil. It becomes motionless with the limbs folded tightly against the body. Then over the following weeks an amazing process begins. The outermost layers of the epidermis, the stratum corneum, are gradually shed forming a near-waterproof cocoon. This cocoon so reduces the rate of evaporative water loss that the treefrog is able to endure the lengthy drought period without critical desiccation. Throughout this period the frog is inactive and does not change its position until the next warm rains permeate the shallow burrow, softening the cocoon and stimulating emergence.

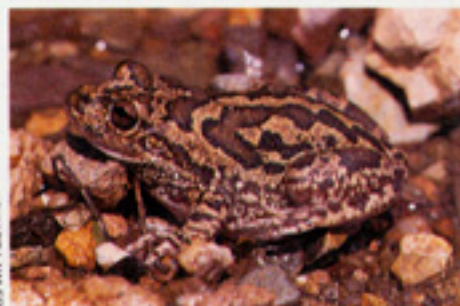
The desert spadefoot toad (*Scaphiopus couchii*) has met this challenge in another way. Capable of consuming all of its annual energy

needs in a few short weeks during the monsoon season, the spadefoot burrows deeply into the soil until it reaches suitable moisture. Because it remains mobile during this dormant period it may go deeper if necessary in its quest for soil moisture and proper temperature.

It is possible that these different strategies reflect the type of climate in which these animals evolved. Spadefoots and true toads evolving in a temperate climate would need to burrow deeply to avoid freezing temperatures. The burrowing treefrog on the other hand, derived from tropical ancestors, is a shallow burrower. The fossorial treefrogs probably evolved from an ancestor similar to the Mexican treefrog (*Smilisca baudini*) in response to increased aridity during the formation of the Sonoran Desert. The burrowing treefrog reaches the northern limits of its subtropical range in Pima County, Arizona. The presence of the fossil bones of the black-eared frog (*Leptodactylus melanonotus*) at Rancho la Brisca is the best evidence that the paleoclimate was once wetter and warmer than today. Most of the New World frogs in the family Leptodactylidae occur in tropical or subtropical regions. These frogs have developed unique reproductive adaptations which help prevent desiccation of the eggs and insure survival of the young. The black-eared frog lays its eggs in masses of foam on the ground in or near water. The female produces a fluid which she whips into a meringue-like froth. The eggs are fertilized by the male as they are laid in the foam. The female then emits more froth, kicking it into a foam-like mass which dries, forming a water resistant membrane. This structure helps protect the eggs from desiccation and possibly some predators until they hatch. The slender tadpoles are aided by rainfall in wriggling through the foam to reach the water.

Another leptodactylid frog represented in the fossil record at Rancho la Brisca is the barking frog (*Hylactophryne augusti*). This unusual frog, named for its dog-like call, is found today in Sierra Madran and thornscrub habitats

The evolutionary affinity between the Sonoran Desert and the tropical areas to the south appears to be strong.



from southern Arizona to Oaxaca, Mexico. It is a secretive species usually inhabiting damp caves, limestone crevices and abandoned mines. The conspicuous skin fold on the belly and its peculiar gait, with the body held high off the ground, distinguish it from other frogs. The barking frog lays its eggs in the moist soil beneath logs and rocks where the tadpoles complete their metamorphosis within the egg and emerge as tiny froglets. Hearing its nocturnal call on a rainy summer night along the Ruby Road in the Pajarito Mountains or in Madera Canyon in the Santa Rita Mountains would be a special event for an Arizona naturalist.



A number of snake and lizard species reach the northern limits of their tropical range in southern Sonora. Several of these are displayed periodically at ASDM. The vine snake (*Oxybelis aeneus*) ranges from tropical South America to southern Arizona where it is known from a few localities in Santa Cruz County. Here it is primarily a riparian species inhabiting trees, shrubs and entanglements of vines. Its slender shape, narrow pointed head and brown color render it highly cryptic in its natural habitat. Vine snakes remain motionless for long periods of time enabling them to ambush their lizard prey, immobilizing it with a mild venom conducted by grooved rear fangs. They occasionally prowl about on the ground with head held high. Several ideas have been offered to explain their peculiar habit of holding the tongue protruded and rigid when hunting or disturbed. Perhaps the most plausible explanation lies in the possibility that the tongue serves



Rancho la Brisca has yielded fossils of many animals. Among them are (from top to bottom) the burrowing tree frog, the black-eared frog, the desert spotted box turtle and the barking frog.

as a focal point for their binocular vision enabling them to direct their feeding or defensive strike more accurately. This behavior also exaggerates their vine-like appearance.

Another tropical inhabitant of southern Sonoran thornscrub is the beautiful barred racer (*Dryadophis cliftoni*). This snake genus is widely distributed throughout the tropical Americas and only a handful of specimens of this rare species have been taken in Sonora. Little is known of its habits although it is arboreal in captivity, feeding readily on lizards.

Brightly colored fossorial snakes abound in the New World tropics. They are represented in the Alamos area by the Sinaloan milksnake (*Lampropeltis triangulum sinaloae*) and the highly venomous Mexican West Coast coral snake (*Micruis distans*). A smaller harmless red, yellow and black snake occasionally encountered is the filetail ground snake (*Sonora aemula*). This secretive burrower is extremely variable in the arrangement of the colored triad rings which resemble those of the coral snake. The smooth shiny scales of the body are in sharp contrast to the rough keeled scales of the posterior and tail. The function of these rough scales is unknown but it has been suggested that they may provide additional leverage as these small snakes push beneath rocks.

Nearly all of the reptile fossils recorded from Rancho la Brisca are from species living there today. The box turtle bones are not identified to species but are probably those of the desert box turtle (*Terapene ornata luteola*). This species is widely distributed through the central U.S. and Chihuahuan Desert region of northern Mexico. It is a turtle derived from semiaquatic pond turtle ancestors and reflects this origin in its marked predilection for activity during and after thunderstorms. It is a grassland turtle inhabiting gently rolling treeless plains with scattered low brush.

An omnivore with a preference for beetles, caterpillars and grasshoppers, captive box turtles have demonstrated remarkable agility in

catching and eating the tadpoles of spadefoot toads. This suggests that this turtle may be an important predator on spadefoot larvae. Captives have also been observed eating tiny bits of stone which may aid in digestion by grinding chitinous insect parts and coarse vegetation. These box turtles are opportunistic feeders, often scavenging carrion or glutting themselves on plant material which is seasonally abundant.

A much rarer box turtle is found to the south. The Sonoran spotted box turtle (*Terrapene nelsoni klauberi*) is as enigmatic as it is rarely seen. Records for this form are concentrated in southwestern Sonora with one southern record in Sinaloa and the northern record about 11 km. north of the junction of the Rio Moctezuma and Rio Bavispe. Its preferred habitat is still in question since few specimens have been actually collected by scientists. The habitat has been described as desert scrub and thornscrub below 3500 feet. Whether this turtle occurs above 3500 feet in oak-savannah habitat as does its nearest relative, the Nelson's box turtle (*Terrapene nelsoni nelsoni*), remains to be confirmed. Nelson's box turtle is known only from one locality in Nayarit, Mexico.

The evolutionary origin of the Sonoran spotted box turtle group is somewhat puzzling. Comparison of features such as the elongate shell, keeled carapace and flaring shell margins suggest a close relationship to the eastern box turtle group (*Terrapene carolina*). This would support a south-to-north evolutionary pathway for box turtles in western North America. However the fossil evidence contradicts this theory by demonstrating a north-to-south radiation. The more plausible fossil record thus suggests the desert box turtle as the probable ancestor of the spotted box turtle group.

Almost nothing is known about the biology of the Sonoran spotted box turtle. Studies are ongoing at the Arizona-Sonora Desert Museum to gain more knowledge of its habits and behavior. At the ASDM one can see probably the only living specimen on public display any-

where in the world and compare it to the desert box turtle.

Among the lizard species occurring in Sonora, none is a better tropical indicator than the Mexican bark anole (*Anolis nebulosus*). This entire group of iguanid lizards is distributed almost entirely in tropical or sub-tropical areas of the New World. The most familiar member of this group is the American anole or "chameleon" commonly sold as pets. Many members of this group are capable of subtle changes in color, often from brown to green. This is not done primarily to match their surroundings as is often assumed, but rather is reflective of mood or stress. The anoles have a dewlap, a brightly colored flap of skin under the chin most prominent in males, which serves as a social signal when defending territories or attracting a mate. The presence and display of the dewlap is considered to be a behavioral precursor to the pushups and head bobs so typical of more advanced lizards in the iguana family.

The fossils at Rancho la Brisca have given us clues to the existence of a very different environment there not so long ago in a geologic sense. It is evident that we can neither fully appreciate nor understand the origins of the Sonoran Desert fauna without some insights into the inhabitants of the adjacent and overlapping thornscrub biome.

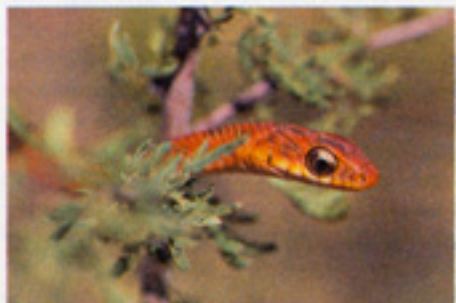
Alamos

The turbulent history of Alamos reads like the his-

Climatological factors, such as temperature and precipitation, limit the northern distribution of (from top to bottom) the Sonoran spotted box turtle, the barred racer, the Mexican bark anole, the vine snake and the file tail ground snake.



HOWARD LAWLER



HOWARD LAWLER



HOWARD LAWLER



C. ALLAN MORGAN



HOWARD LAWLER

Alamos is a naturalist's paradise.

tory of Mexico itself. In 1533, a mere eleven years after the Spanish Conquest of Mexico, Diego de Guzman passed through the site of Alamos. Other notable Spanish explorers who passed through Alamos were Alvar Nuñez Cabeza de Vaca in 1536 and Vasquez de Coronado in 1540. At that time the local Yaqui and Mayo Indians called the area Calimaya. The discovery of fabulously rich silver deposits at la Aduana, led to the establishment of Real de los Frailes (now Alamos) by 1685. Incidentally, Padre Kino stopped in Alamos in 1687 to raise money to establish missions in northern Sonora including Dolores. That same year Tarahumara Indians came down out of the Sierra Madre to raid the Alamos area.

Eventually Alamos became part of Nueva Vizcaya in the Territory of Sinaloa. After Mexico won its independence from Spain in 1821, Alamos was in the state of Occidente which included Sinaloa and Sonora. Finally in 1831 the states were split and Alamos became part of Sonora. Many exciting things happened there in the next century; however, the occupation of Alamos by Pancho Villa and his followers for a month in 1915 during the Mexican Revolution must be considered the highlight. Today Alamos is a charming quiet pueblo that has been maintained and renovated by its citizens with the help of American residents.

The Rancho la Brisca fauna suggests that the climate of north-central Sonora has been tropical in the past. The term tropical usually brings up images of jungles behind Puerto Vallarta, the lowlands along the Amazon River or Hawaiian beaches. How can Sonora or Arizona be considered tropical?

The northern boundary of the Sonoran Desert in Arizona roughly coincides with the northern limit of the saguaro, which is killed when temperatures remain below freezing for more than a day. Between Tucson and Guaymas, Sonora (about 400 miles), the vegetation and climate gradually shift from temperate desert, grassland and woodland to Sonoran Desert

and to subtropical Sinaloa thornscrub. Along this gradient the legumes and columnar cacti (like saguaro) gradually increase until the Sonoran Desert becomes thornscrub. On the southeastern boundary of the Sonoran Desert the winters are frost-free. Further south the summer rains increase as thornscrub increases in height and eventually becomes tropical deciduous forest. Thus Arizona and Sonora do indeed have subtropical and tropical climates.

Tropical deciduous forest reaches its northernmost position in North America in southern Sonora. The lovely old silver mining town of Alamos has been a focal point for the study of tropical animals and plants in the area for ASDM and the University of Arizona. It has served as a base of operations for visiting biologists over several decades. Its rich cultural history and location amidst the Sinaloa thornscrub biome make it an appealing site for tourists and scientists alike. Many important museum specimens list Alamos as the locality of collection. In the early days as now, zoologists surveying the fauna of an area relied heavily upon native collectors for help in procuring voucher specimens. Sometimes it was difficult or impossible to obtain a precise locality for such specimens. In these cases the nearest town or village was often recorded as the locality, and Alamos has served that purpose.

Alamos is located about 20 miles inland from the Gulf of California at 1275 feet elevation. It receives most of its 25 inches per year rainfall in the summer with a dry season of at least six months. In comparison, similar amounts of rainfall support temperate ponderosa pine or mixed-conifer forests above 6000 feet on mountain tops in the Santa Catalina, Graham and Chiricahua Mountains of Arizona.

Alamos is a naturalist's paradise. The first impression of the town is one of stolen glimpses of colorful ornamental flower gardens in secluded patios of spacious haciendas along cobblestone streets. Occasional banana and mango trees are seen and royal palms and bird-

of-paradise surround the square. The Sierra de Alamos which looms above the pueblo is clothed in a fine tropical deciduous forest that harbors many unusual plants including cycads, bromeliads and orchids. The coral bean which we know as a shrub in the desert-grasslands of southern Arizona becomes a 25 foot tree.

To the southeast it is easy to view other tropical plants and animals along the Rio Chahuajqui as it winds toward the Rio Fuerte of Sinaloa. The most prominent tree along the river is the sabino or Mexican bald cypress (*Taxodium mucronatum*). Enormous wild fig trees can be found in rocky side canyons. The Mexican cichlid (*Cichlosoma beani*), belonging to a family of tropical fishes found in the New World and Africa, lives in the river. Many colorful birds can be seen including magpie jays, squirrel cuckoos, white-fronted Amazon parrots and occasionally military macaws. Indigo snakes (*Drymarchon corais*) and spinytail iguanas (*Ctenosaura hemilopha*) are conspicuous reptiles. The tiny villages along the river are of palm thatched houses with earthen floors.

The ranges of some of the plants and animals found near sea level near Alamos extend into southern Arizona. Most of them are sandwiched between 4000 and 6000 feet elevation by the heat and drought of the lowlands and the freezes of the mountains and live in desert-grassland or oak woodlands. Several interesting snakes including the green ratsnake (*Elaphe triaspis*), the vine snake (*Oxybelis aeneus*) and the Mexican hooknose snake (*Gyalopion quadrangularis*) reach their northern limits in this area. The populations of these northern tropical outliers are not continuous and can be isolated. The feather bush (*Lysiloma microphylla*) in the Rincon Mountains and the barking frog in the Santa Rita and Pajarito Mountains are examples of northern isolated populations that may well have moved north during more tropical periods - perhaps during the "la Brisca interglacial."

PRESIDENT Continued from page 2
ours!

That is wonderful for the department store. It is a less than positive commentary on the status of our own health.

Too many people forget, or have never known, that we have no sources of public funds for our support. We must rely entirely on gate receipts, sales, gifts, grants, extra help from our incredible corps of volunteers, and, above all, on memberships if we are to continue to be the world-famed natural history educational institution we have become.

Because members are the backbone of the Museum, we are going to launch a drive to strengthen this vertebral column. We want, and need, more members. We are hoping that each of you will bring in at least one new member to add to our ranks. Should everyone cooperate, we would go to 30,000 - as we should - in very little time.

Although the advantages of membership are obvious to those of us who read *sonorensis*, some of you may not be aware there is an added incentive to become a recruiter. For every membership you bring in, you get the same number of guest passes for yourself that the new member gets. For example, should you be responsible for having a friend or acquaintance buy a family membership, and if that individual either verbally or in writing informs the Museum's staff that you were the person who persuaded him or her to join, you will be mailed four additional guest tickets for your own use. Similarly, should you buy memberships for friends as gifts, you will be given the same number of guest passes they receive. What could be a better bargain than that? Those guest passes are always welcome when you bring friends and relatives from out-of-town to the Museum.

So let's make this the year of "every member bring in a new member." Your friends will love you for it and our Museum will continue its exhibits and programs whose quality is second to none.

Bernard L. Fontana
President, Board of Trustees

DIRECTOR Continued from page 2

cially since with the dues increase you'll be receiving *five guest passes* with a General membership and *three guest passes* with an Individual membership. Secondly, we're

going to launch an Arizona membership campaign to increase the Museum membership significantly. With many new members who we know will be as generous as you have been during Annual Giving we feel confident we'll have the money we need to continue to maintain the standards you expect.

On a more pleasant note, it has been a very exciting and dynamic summer at the Desert Museum for members and staff. Ground was broken for the Mountain Habitats in June. At this writing the project is a little behind, but proceeding well. Given no surprises, we hope to be dedicating it by Fall 1985. There have been two significant staff changes over the summer. Public Affairs Officer Christopher Helms has been appointed Development/Public Affairs Officer, assuming fund raising and membership development in addition to his other responsibilities; and Environmental Educator Janice Hunter has been appointed Curator of Education, a position which has been vacant for six years. I have the utmost confidence in the success of both of these key staff members.

Some sixty ASDM members travelled to Kenya, East Africa this summer on an 18-day trip which benefited the Mountain Habitats project in addition to fulfilling the dreams of many of the participants to visit Kenya. As one of those participants, I can tell you that it was one of the most incredible trips I have ever taken. I never dreamed so many animals existed in one place at one time. Everyone appeared to have a wonderful and unforgettable adventure in Kenya. We'll give serious consideration to a similar trip if enough members express interest.

The summer classes, special summer interpretive activities and Special Events during the summer provided hundreds of children and adults with unique opportunities to learn more about our Sonoran Desert region. That is why we are here. I hope you'll participate in some of the events you'll read about in this issue. *Dan Davis, Director*

INTERPRETATION Continued from page 3

Live Animal Demonstrations. 9:30 a.m., 10:30 a.m., and 1:30 p.m. Using various desert reptiles, invertebrates and small mammals, these demonstrations explore how animals survive in the Sonoran Desert.

Live Great-horned Owl Demonstration. Daily at 10:30 a.m. A chance to see the owl up close is the special treat of this program. How owls capture prey and survive in the desert is woven into the interpretive story. Talk meets

at Beaver/Otter area in middle of grounds.

Special Programs: October-December

Interpretive Naturalist Rich Dulaney will be conducting the following special interpretive events. Except where noted, programs begin on the Entrance Patio. Please let us know by post card or phone call to Interpretive Naturalist Rich Dulaney-883-1380, Ext. 275- that you will be attending any of these programs. Send your card to ASDM, Route 9, Box 900, Tucson, AZ 85743-9989. Give us your name, address, phone number and the programs you plan to attend.

Understanding Birds. Tuesdays in October, 3:00 p.m.

Using live birds on exhibit, plus many hands-on learning artifacts, we will explore the fascinating world of birds. Bird flight, coloration, and how the Museum cares for birds will be discussed on these Tuesday afternoon interpretive features.

Saguaros in Jeopardy. Tuesdays in November, 3:00 p.m.

Why do we see fewer and fewer of the mature saguaros on the Museum grounds? This interpretive feature will look closely at many of the dead or dying saguaros on the Museum grounds. There have been over 30 mature saguaros die at the Museum in the last year.

What do Small Mammals do in Winter?

Tuesdays in December, 3:00 p.m.

Several species of small rodents live on the Museum grounds outside of our displays. Although their activity pace slows during the shorter days and with the cooler weather, the animals are fascinating to learn about. How these animals live and function will be discussed.

Halloween Animals. Saturday, October 27 and Wednesday, October 31, 10:00 a.m. to 12:00 p.m.

Owls, bats, spiders, and many other animals associated with night prowling near the end of October will be featured during these two days. Live animals will be displayed and myths and legends will be discussed. This program will meet in the Ocotillo Ramada.

The Last Day of the Year. December 31, 1984, 9:00 a.m. to 12:00 p.m.

A special tour of the Museum grounds will highlight the many changes which took place during 1984. Come explore behind the scenes of the animal exhibits and see our progress at the Mountain Habitat project. Did you know we still have vampire bats off exhibit? Explore and learn about some of the activities at our Plant Department greenhouse.

A CALENDAR OF

Special Events FOR Members

FALL/WINTER 1984-85

There are lots of rewarding activities brewing at the Museum these days for members and guests who want to take to the field to encounter nature in places of exceptional beauty in the Sonoran Desert Region. For example, our new desert island expedition, Navigating the Cape, in southern Baja California is tailor-made for the naturalist adventurer. Or closer to home, take a time machine tour into Tucson's geologic, archaeological and historic past in our Man and the Land in the Tucson Basin day trip to arrive at a totally new perspective on our modern urban presence in the desert. For those with tight schedules we've added another one-day workshop, Creative Landscaping with Desert Plants to help in planning our own human habitats.

If you have friends or neighbors new to the desert, be sure to introduce them to these eye-opening field events offered through the Desert Museum!

Martha Ames Burgess, Program Coordinator

OCTOBER

CREATIVE LANDSCAPING WITH DESERT PLANTS

A full day practical workshop

Saturday, October 13, 9:00 a.m. - 3:00 p.m.

After the tidal wave of interest in this important workshop last spring we wanted to make it available again at the first opportunity. With temperatures cooling into fall it is time to think about landscape planting in the desert.

In this idea-packed workshop you will learn from leading desert landscape designers how to adapt drought-tolerant plants into your own landscape for color, shade, screening, cover, and accent. The day is designed to introduce you to many wonderful plant options both through slides and a tour of the Desert Museum plantings. You then take over and

with personalized instruction and guidance will design your own landscape!

So many fringe benefits come with a desert garden. As a nature lover you'll be pleased to find that you can attract new forms of wildlife such as butterflies, hummingbirds, quail or lizards by planting the appropriate food source or shelter. What's more, your desert garden can "go on vacation" when you do—no more expensive plantsitters!

Fee of \$18.00 (\$23.00 for non-members) includes attentive expert instruction, Plant Department staff guides, materials for hands-on learning, tracing paper, an information packet and refreshments. (You may bring a sack lunch or eat at the ASDM restaurant.) Workshop meets promptly in the ASDM Education Classroom at 9:00 a.m. Some preplanning is necessary for getting the maximum out of this workshop. Please bring with you a preliminary sketch of your house and yard on graph paper ($\frac{1}{8}'' = 1'$), a triangle rule, a ruler with $\frac{1}{8}''$ measure, note pad, pencils, and erasers. Wear work clothes, hat and walking shoes. It's an inspiring step toward a waterwise lifestyle.

BARRANCA DEL COBRE BY TRAIN & TRAIL

A nine-day expedition into Mexico's Sierra Madre
Saturday-Sunday, October 20-28

Prior announcements in *sonorensis* for this exciting trip have filled our expedition roster. At this writing we are maintaining a waiting list for this event and an interest list for future trips to the Barranca, so get in touch with the Special Events Office if you are interested. We feel this is an important natural history tour and we hope to sponsor one every two years. The public is cordially invited to the expedition Pre-View meeting and slide presentation on Tuesday evening, October 2, in the Desert Museum Education Classroom from 7-9 p.m. to learn more about the culture, geology, botany and wildlife of the remote Sierra Madre area we'll be visiting.

NOVEMBER

DESERT HARVEST BAZAAR

Saturday and Sunday, November 17 and 18
9 a.m.-4 p.m.

The rich scent of native foods cooking over a mesquite fire fills the air. The sound of traditional music mingles with the excitement of children grinding beans on a metate or watching a desert cartoonist draw a perky roadrunner. In the autumn sun a Mayo Indian potter carefully molds his field-collected clay

into an ancient and useful form, and a Papago woman coils the yucca fiber she has gathered to shape a basket her grandmother taught her to make 75 years ago.

This is the Harvest Bazaar, after five years a Tucson tradition. For those who love and appreciate the Sonoran Desert it is the ideal place to have a day of enjoyable learning and superb shopping. There couldn't be a better place to find gifts which express a sense of our desert home than at this festive event.

Our array of gift-potted Cacti and Succulents and our assortment of Gems, Minerals and Fossils will be more exciting than ever. The new hobbyist and the rare specimen collector alike will be pleased. And so will their pocketbooks, because bargains will abound! After last year's rapid sell-out of the "fossil finders kits" we have resupplied with enough for all. There will even be fossil hunting and



identification demonstrations.

Everywhere you look there will be something new to see, to try, to sample, to learn. Many talented artisans will be here this year to share their secrets in demonstrations of their craft. Come see the weaver carding her cotton fiber, spinning and dyeing her wool with native weeds. Taste a cup of delectable prickly pear punch. Browse the Natural History Book Nook for the latest in great reading. Watch a craftsman fashion a beautiful collage out of desert debris he has salvaged from the jaws of a bulldozer. And discover seeds with which to grow your own garden of nutritious native foods.

There's a 10% discount on everything to ASDM Members. Bring your friends, the scout troop, the club, the whole family! It's fun, it's educational, and it's a great way to support the Museum.



MARTHA SUJESS

Bahia Agua Verde, B.C.S., is but one of the many desert coves populated with unusual flora and fauna that may be explored on the "Navigating The Cape" expedition.

DECEMBER

MAN AND THE LAND IN THE TUCSON BASIN—PAST, PRESENT, AND FUTURE

A one-day field tour

Saturday, December 1, 1984

8:30 a.m.— 4:00 p.m.

Tucson has always been an important "people place," a very desirable place to live. For thousands of years! But for most of us Tucson is a very recent home. There is so much to learn and to know about the rich natural desert surroundings, about the different cultures which have called this valley home, and about the geologic processes that formed the valley and are still actively shaping it.

Nothing about nature is static although we humans try to confine its processes by containing waterways, putting in riprap, and soil stabilization. But nature has and always will continue to change the face of the land.

With this one-day intensive tour the Desert Museum salutes the Arizona Historical Society's Centennial by tracing the prehistory and history of our valley through its fascinating geological, historical, and ecological changes, and the effects of man as each new culture and lifeway touched the land with increasing impact. On the trip we will see firsthand the rocks that poured out as molten lava nineteen million years ago, areas where now extinct mammoths walked, petroglyphs and sleeping circles made by ancient Hohokam farmers and structures built by Mexican padres, Chinese farmers and Anglo entrepreneurs. With the past in perspective we will then look at our modern living patterns and contemplate the wisest paths to follow in our future interactions with the land.

Fee of \$20.00 (\$25.00 non-members) covers expert instructor/guides, a learning packet, transportation to interpretive sites in the Tucson Basin, and refreshments. Bring a note pad, pen, sack lunch, hat, and walking shoes. Group size is limited so be sure to sign up soon if you are interested. We will meet at 8:30 a.m. at Tumamoc Hill near St. Mary's and return by 4:00 p.m.

Be prepared for some active walking, and come armed with questions for our team of geologists, archaeologists and ecologists. It's the kind of field trip which will be just as enriching for the long term resident as it is for the newcomer.

JANUARY

NAVIGATING THE CAPE, BAJA CALIFORNIA SUR

An eight-day educational cruise from La Paz to Magdalena Bay

Saturday through Saturday, January 19-26

Scenery in the southern Sea of Cortez is some

of the most picturesque on Earth. Imagine expansive tablets of pink, buff, and black volcanic rock starkly clad with odd shaped elephant trees, wispy white trunks of *palo blanco* trees reminiscent of a Chinese tapestry, and desert strangler figs grappling for a firm hold on the cliff faces. Imagine steep island canyons dropping into azure and aquamarine coves, sea stacks and sea arches echoing with the guttural bark of sea lions, or an underwater garden of sea fans and corals where brilliantly colored fish play hide and seek through slanting shafts of sunlight.

Scenery on southern Baja's Pacific side is more subtle, subdued, bleak and shrouded often in mysterious but life-giving fog. It is the cooling effect of the chilly Pacific and occasional fog which help sustain the sparse but fascinating life of the Magdalena Desert such as the strange spiny caterpillar-shaped creeping devil cactus or the rare Margarita century plant known only from one island.

Serendipitous encounters with unusual animals or plants is probably one of the most stirring aspects of an extended expedition of this kind. The many species of seabirds and shorebirds we will see is sure to be an amazement and a thrill. And as for daily explorations ashore it is a budding botanist's dream. But one of the most inspiring of all natural encounters one might ever ask for is to see a great whale close at hand. We've timed our expedition in the hopes of meeting the California gray whale as it returns to its winter calving and breeding "grounds" in Bahía Magdalena.

Our trip begins with a flight from Tucson to La Paz and gets underway when we board the modest but well equipped 80' natural history expedition vessel, *Don José*. Each day en route we will visit a new island or remote part of the peninsula coast such as Isla Cerralvo and Cabo San Lucas. Culminating the trip we will spend two days exploring the dune, mangrove and lagoon habitats of Magdalena Bay by foot and by skiff. We go ashore at the fishing village of Lopez Mateos and return overland to La Paz by bus.

Expedition fee of \$1195.00 (\$1225.00 for non-members), covers round trip air fare to La Paz, one night double occupancy lodging in La Paz, all meals and 4-person cabins for seven days on the *Don José*, experienced naturalist guides and a complete learning packet. A deposit of \$200.00 holds a place on a first come basis. There is a \$25.00 discount for those who pay in full by October 1, 1984. Group size is limited to a pleasant 20 persons. As of this writing there are plenty of spaces, but please register soon if you are interested. The public is invited to the trip PreView meeting at ASDM Education Classroom on Tuesday, January 8, 1985, from 7-9:00 p.m.

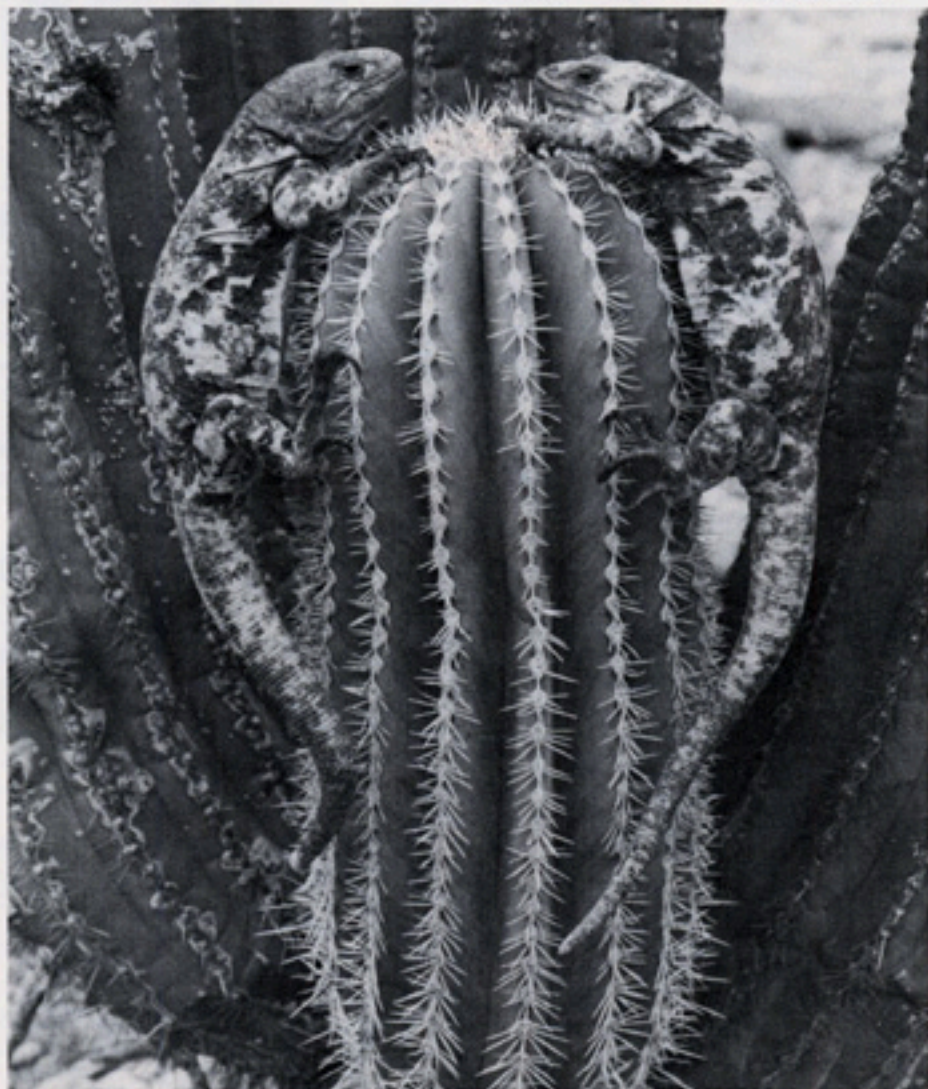
FOR PLANNING AHEAD

DESERT WATCH Spring 1985

A research trip to study little-known habits of the endangered chuckwalla of San Esteban Island, Sea of Cortez.

graphing chuckwalla behavior and making exacting biological measurements in a field laboratory setting.

The expedition fee will cover your part in meals, boat charter, transportation from Tucson and a contribution toward this important research in which Curator Howard Lawler and the Desert Museum Small Animal De-



San Esteban chuckwallas, the objects of study on the "Desert Watch" expedition, appear unharmed by the spines of their cardon cactus mount.

We are all stewards of every species on planet Earth and for the first time the Desert Museum is opening its important stewardship efforts to the general membership by sponsoring a working expedition. It is an expedition in which you the participant can take much pride, for you will be contributing entirely new data to the small body of knowledge about this rare giant among lizards, which may mean a better future for the San Esteban chuckwalla. It will be a very fulfilling learning experience but will involve lots of difficult dirty work, long hours sitting silently making observations, taking explicit notes, photo-

partment staff are major investigators. Plans are in the making for a nine-day camping expedition in April or early May, 1985. An important ingredient in determining if this sort of field work is for you is a self-evaluation. Educational background is really of low consequence. Other factors such as willingness, enthusiasm, precision, stamina, and flexibility may figure more importantly in the success of such a venture into basic biological research. If this kind of experience is for you, please check the box on the registration form and we will send you more detailed information as it becomes available.

Special Events Registration

REGISTRATION AND RESERVATION INFORMATION: Registrations are accepted by mail only and are processed in the order that they are received. Please fill out the form below and mail with a separate check for each event. If one of your chosen events is filled we will return the appropriate check. Notice will be sent confirming your reservation. Please call us if you do not receive your confirmation within 10 days. When a trip deposit is sent, the balance is due one month prior to the trip date. CANCELLATIONS AND REFUNDS: All cancellations must be received in writing. Due to administrative planning costs and mailings, the charge for cancellations is \$4.00 for amounts under \$20.00, and 20% for events over \$20.00. No refunds can be made within seven days of any day event, or 14 days of an overnight event. ANY ACTIVITY MAY BE CANCELLED BY ASDM if the minimum number of participants is not met. We reserve the right to refuse service to anyone in the interest of the group if necessary.

FALL/ WINTER 1984 REGISTRATION FORM (clip and mail)

EVENT	DATE	FEE PER PERSON	NUMBER OF PERSONS	AMOUNT OF CHECK
Creative Landscaping with Desert Plants	October 13, 1984	\$18.00 (members) \$23.00 (non-members)*	_____	\$ _____
Barranca del Cobre by Train and Trail	October 20-28, 1984	\$1150.00 (members) \$1170.00 (non-members)**	_____	\$ _____
Desert Harvest Bazaar	November 17 and 18	Free and open to the public		
Man and the Land in the Tucson Basin	December 1, 1984	\$20.00 (members) \$25.00 (non-members)*	_____	\$ _____
Navigating the Cape, Baja California Sur	January 19-26, 1985	\$1195.00 (members) \$1225.00 (non-members)**	_____	\$ _____

I wish to be put on an interest list for Desert Watch Research Expeditions (check box)

To help purchase books and specialized equipment for the Members' Special Events Field Program, I enclose my tax deductible contribution of \$ _____

TOTAL AMOUNT ENCLOSED AS SEPARATE CHECKS \$ _____

* Non-members fee includes price of ASDM gate admission.

** Non-members fee includes price of one year's individual membership.

QUESTIONS? Call Martha Burgess or Pattie Fowler at 883-1380, extension 205/274.

SEND A SEPARATE CHECK FOR EACH EVENT PAYABLE TO: Arizona-Sonora Desert Museum
AND MAIL TO: ASDM Members' Special Events Office, Route 9, Box 900, Tucson, AZ 85743

NAME(s) _____ MEMBERSHIP # _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

TELEPHONE (home) _____ (work) _____

The more the merrier...with your help.

The Desert Museum needs to increase its membership. And we're asking you to help. Furthermore, for your trouble here's an offer that's hard to beat:

For every membership you purchase as a gift, or for every membership you are instrumental in creating, the Desert Museum will give you as many Guest Passes as come with that membership.

That's not a bad deal. But remember, ask us, by phone or mail, to send you your well-earned reward.

Thanks for your help.



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