

# TEXAS

PARKS & WILDLIFE



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## OUTDOOR NOTEBOOK

Texas springtime means bluebonnets. They snarl traffic while people stop to look, they enthrall artists by growing in large, waving colonies and they delight natives and surprise visitors. And to most people every bluebonnet that grows is the Texas state flower. Actually, the state flower is *Lupinus subcarinosus*, a species that grows in a fairly small area along the coast. Most of Texas is splashed with *Lupinus texensis*, shown above,

so nearly everyone concludes that all bluebonnets are the state flower. There are two other bluebonnets, which grow in West Texas. They are all in the genus *Lupinus*. The word derives from the species name for wolf because many people believe that lupines devour the soil. But they really enrich it with nitrogen. The popular name, of course, was given the flower because it resembles the bonnet worn by pioneer Anglo women.



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Dedicated to the conservation and enjoyment of Texas fish, game, parks, waters, and all outdoors.

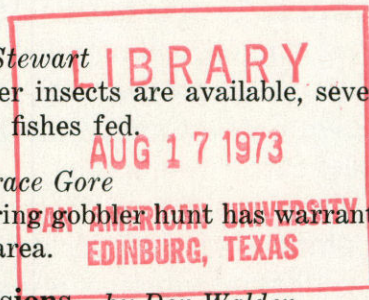
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# TEXAS PARKS & WILDLIFE

**Cover:** The cattle egret, *Bubulcus ibis*, is of Old World origin. It was first reported in Texas about 1955, and it bred here in 1958. It is almost always around cattle, eating insects the cattle kick up, and can be found near pastures, fields and marshes. Photo by Perry Shankle, Jr.



# MATADOR WILDLIFE MANAGEMENT AREA

Once a small portion of the huge Matador Land and Cattle Co. Ranch, Matador Wildlife Management Area retains much of the Old West flavor of Northwest Texas' rugged, rolling hills.

Now the more than 28,000 acres along the Pease River's forks in Cottle County, are used for wildlife research instead of beef cattle production.

This is not to say, however, that there are no cattle on the state area. Indeed, determining the effects of grazing on wildlife production is one of the major research efforts underway here.

In existence as a research area for 11 years, the land is ideally suited to benefit the West Texas sportsman and rancher alike. Annual public hunts offer hundreds of sportsmen opportunities for recreation, and the research programs instruct landowners in better wildlife management techniques for their own property.

A wide variety of game is found on the area, and some of the best quail and wild turkey habitat in Texas can be seen here. Most research is centered around these two species.

The main game species on the area is the bobwhite quail; but scaled (blue) quail, mourning dove and the Rio Grande turkey are found in abundance, along with a few white-tailed and mule deer. Numerous non-game species include the coyote, bobcat, badger and raccoon. Many other types of birds, reptiles and small animals are seen frequently by visitors enjoying the rough-hewn beauty of this scenic ranchland area.

Land management efforts are aimed at reflecting the land use which is typical for this region of Texas. Area personnel are responsible for determining livestock stocking rates to fit research and management needs.

Long-term leasing arrangements were developed with private beef producers on a competitive bid basis for the grazing of livestock. The lessee then pays for each animal unit grazing on the area. This leasing arrangement provides a fair basis for payment, especially when animal unit adjustments are necessary.

In addition to research, the physical development of the area itself commands considerable attention from the as-





by Don Davis, Wildlife Biologist

Don Davis





signed technical personnel. These men are responsible for the maintenance and care of 18 windmills, 45 watertubs, three domestic water wells, 70 miles of roads, 65 miles of fences, two grain fields, several buildings, 12 miles of phone lines and various equipment and supplies for the operation of the 44-square-mile area.

Research, however, is the main reason for the area's existence. This important activity receives most of the available manpower. Numerous wildlife investigations on the Matador area have been completed and more are in progress.

Research projects, such as determining what effect various brush control practices have on quail populations, may eventually yield valuable information to the rancher interested in maintaining huntable quail numbers.

This study deals with three methods of brush control which will be used in a four-pasture section of the area. One pasture containing 870 acres has been strip-cleared, leaving 50- and 150-foot strips of mesquite brush every quarter of a mile. Another 978-acre pasture is being mechanically cleared, leaving brush only in the draws. Still another pasture of 1,253 acres has been sprayed with the herbicide 2,4,5-T. A fourth pasture containing 2,450 acres will be used as a "check" for comparing with the other pastures.

These brush control methods, combined with dates of quail population densities, vegetative trends, quail movement and grazing of livestock, will be utilized to formulate recommendations for brush control practices which are compatible with both wildlife and livestock in this Rolling Red Plains land resource area.

One interesting sidelight to the brush study is the use of various dyes to determine quail movement between pastures. A different color dye for each of the four pastures is applied to trapped quail immediately before the public quail hunt each fall. These quail are colored red, violet, orange or green. This does more than just provide interesting discussions among visiting quail hunters. It provides valuable data to the biologists involved in the study.

In fact, five of the orange-dyed bobwhite quail made an unexplained move of approximately 50 miles from where they were trapped and released. Not usually considered mi-

gratory, these birds were killed in January 1970 by two different hunters on two different occasions but in the same general area south of Chillicothe.

Another research project under investigation is the employment of varying rates of livestock grazing to determine grazing effect on vegetation, quail population, hunter harvest and beef production.

Three large pastures totaling more than 20,000 acres are being used in this study. After a base period of moderate grazing, a 6,000-acre pasture will be heavily stocked, while a 5,000-acre pasture will be lightly stocked and a 10,000-acre tract moderately stocked. The resulting information will be utilized to establish sound game and range management recommendations.

Thirty miles of vegetative transect lines furnish data with which to evaluate quail habitat response. Intensive records of vegetative density, composition, height, cover and grazed condition are taken each 100 feet along these lines.

As in the brush study, early morning quail covey counts are used to obtain bobwhite population trends. Whistling bobwhite coveys are counted on clear, still mornings at daybreak. These counts, projected for number of birds per covey and hearing area of the personnel making the counts, yield an estimate of bobwhite populations.

Another interesting research project which has been under study on the Matador area is an investigation of factors influencing wild turkey reproduction and survival. Turkey trapping, banding and wing color marking, along with roost counts, landowner interviews and turkey nest observations over a four-county area were employed to help determine reproduction and survival on a turkey population along the Pease Rivers.

The public quail hunt held each year is used by wildlife biologists in gathering valuable information for both quail research projects. Also, it affords many Texas hunters an opportunity to hunt two outstanding game birds—bobwhite and scaled quail.

During the 1969-1970 hunting season quail hunters enjoyed the most successful season in 10 years. Some 300 hunters found 781 coveys of bobwhites and 89 coveys of scaled quail. They bagged 1,659 birds. This is an average bag of almost six birds per



hunter. Slightly more than 90 percent were bobwhites.

Through research management areas such as the Matador, the Texas Parks and Wildlife Department strives to develop information on land use which will provide recommendations for the various species of wildlife involved and at the same time represent continuously profitable livestock management. \*\*





*An important project on the Matador area is the study of factors influencing wild turkeys. In the photo above, turkeys are trapped for banding and wing color marking. The bands and colored wings will aid biologists in future identification of birds to determine reproduction and survival of the turkey population.*



# Stoneflies

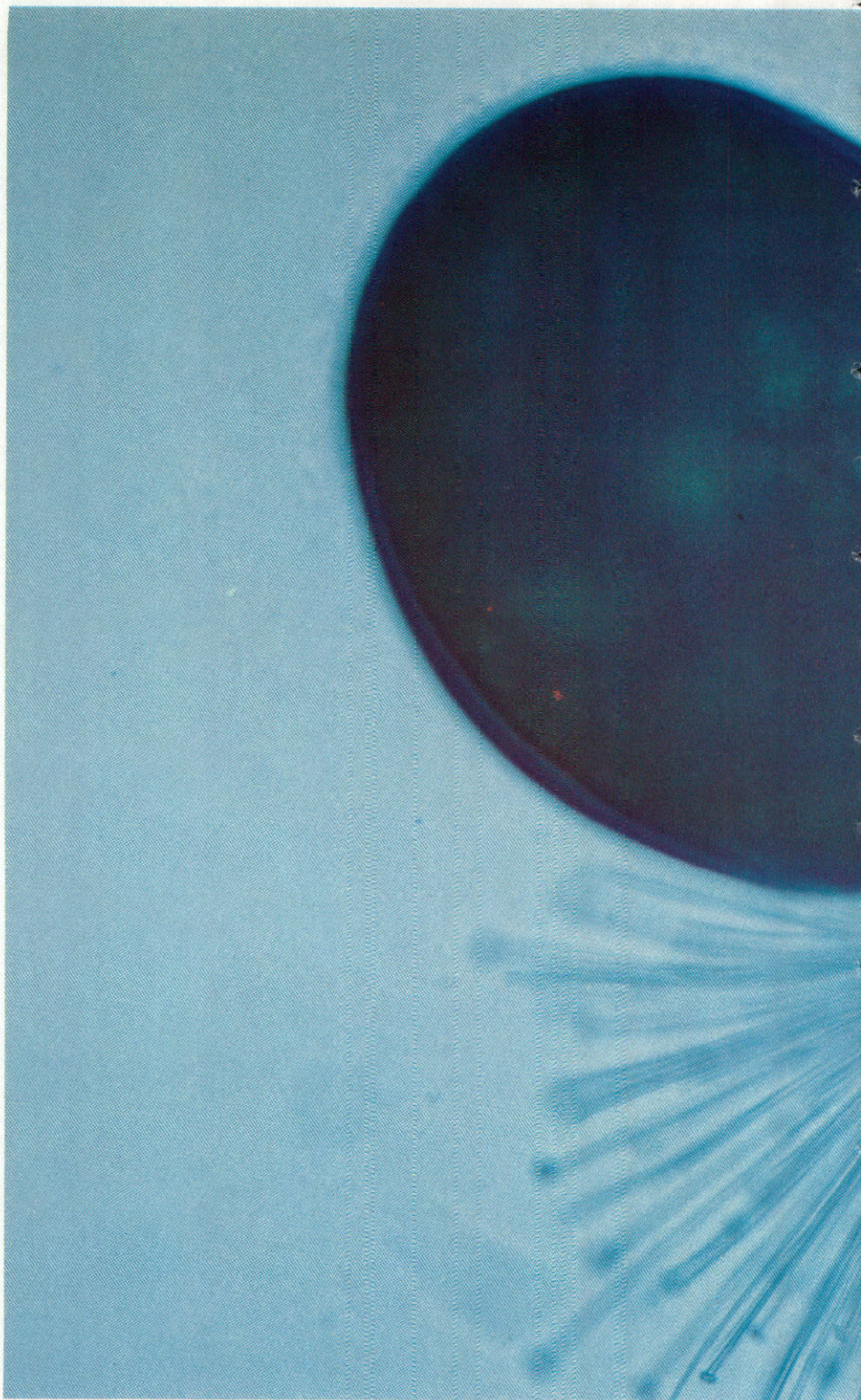
Photography and article by  
Dr. Kenneth W. Stewart  
Biology Department,  
North Texas State University

Stoneflies constitute one of the least known, yet ecologically most important groups of aquatic insects. The name of the order, Plecoptera ("Plecos"—folded; "ptera"—wing), refers to the wide, longitudinally folded hind wings of adults. The order is one of the smallest in the insect world, encompassing approximately 1,200 species, about 260 of which occur in North America.

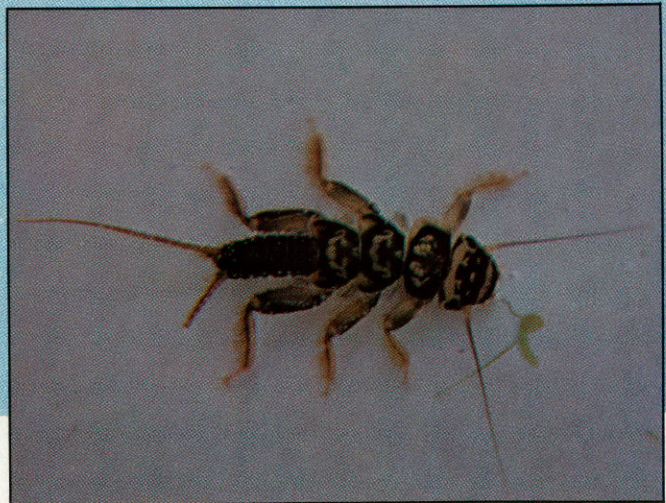
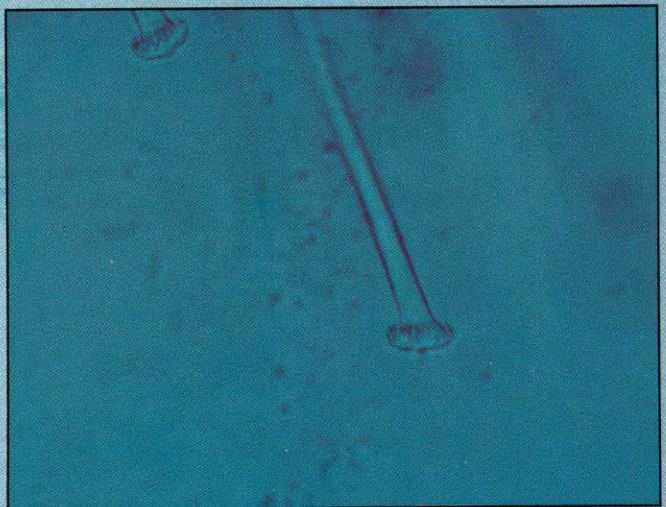
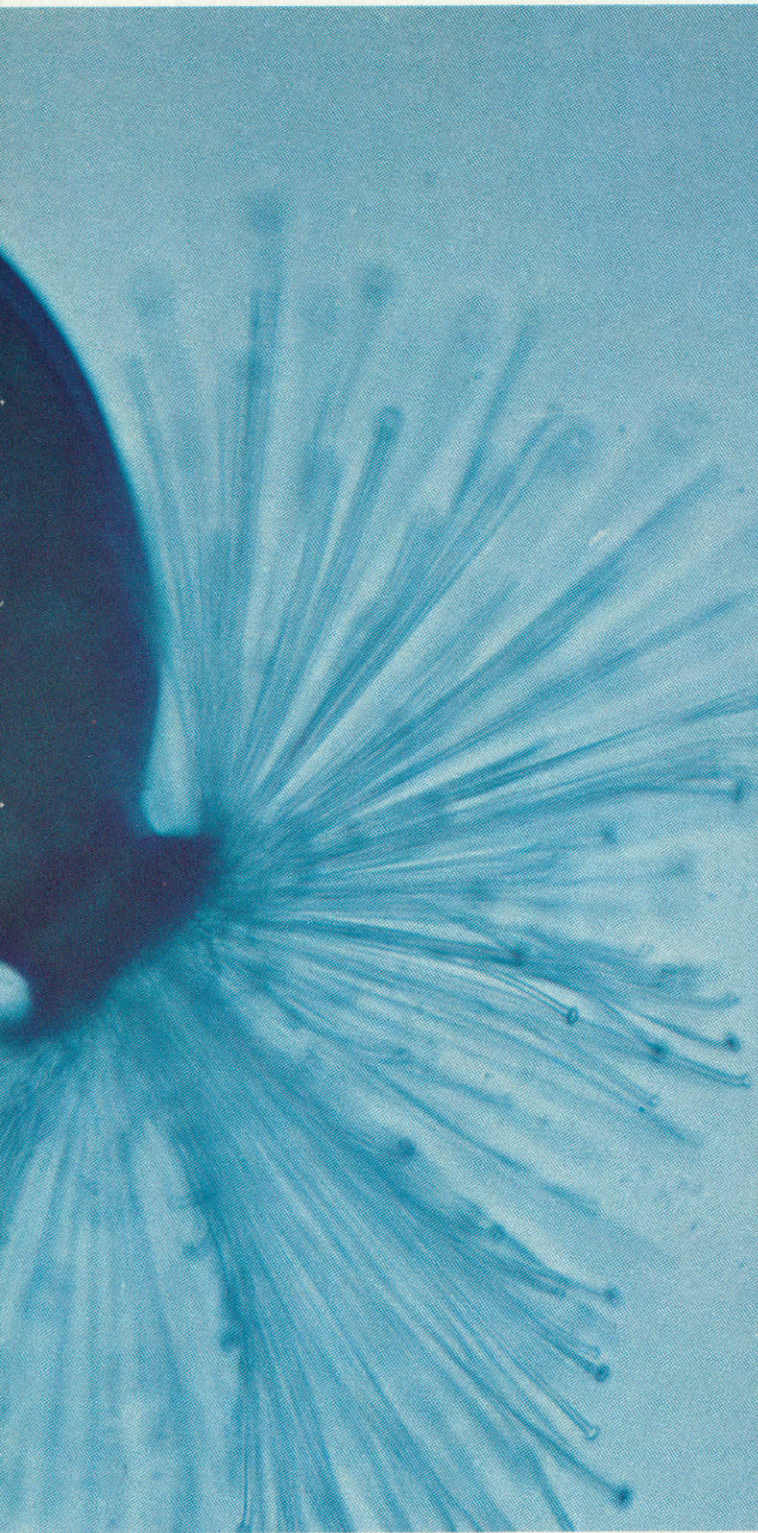
The nymphs of a few species are able to occupy the wave-swept, gravel-bottomed shallows of cold northern lakes, but most stoneflies are restricted to relatively unpolluted, clear, cool running water. These requirements are met in smaller, spring-fed streams in Texas throughout the year, and in many of our larger creeks and rivers from late fall to spring. Modified stretches of rivers below the dams of many of our reservoirs also are stonefly habitats.

Because of these requirements, the majority of species are associated with trout and smallmouth bass streams. However, several stoneflies have adapted to survive even in intermittent streams which provide suitable conditions for only a portion of the year. In these species, the eggs and nymphs aestivate ("rest" from activity and development) when water temperatures are too warm.

Only eight stonefly species are recorded from Texas in the scientific literature. However, over the past four years the Aquatic Entomology Research Team at North Texas State University has increased this number by seven species. Three of these—*Isoperla irregularis*, *Zealeuctra arnoldi* and *Zealeuctra hitei*—are known only in Texas. The remainder, found



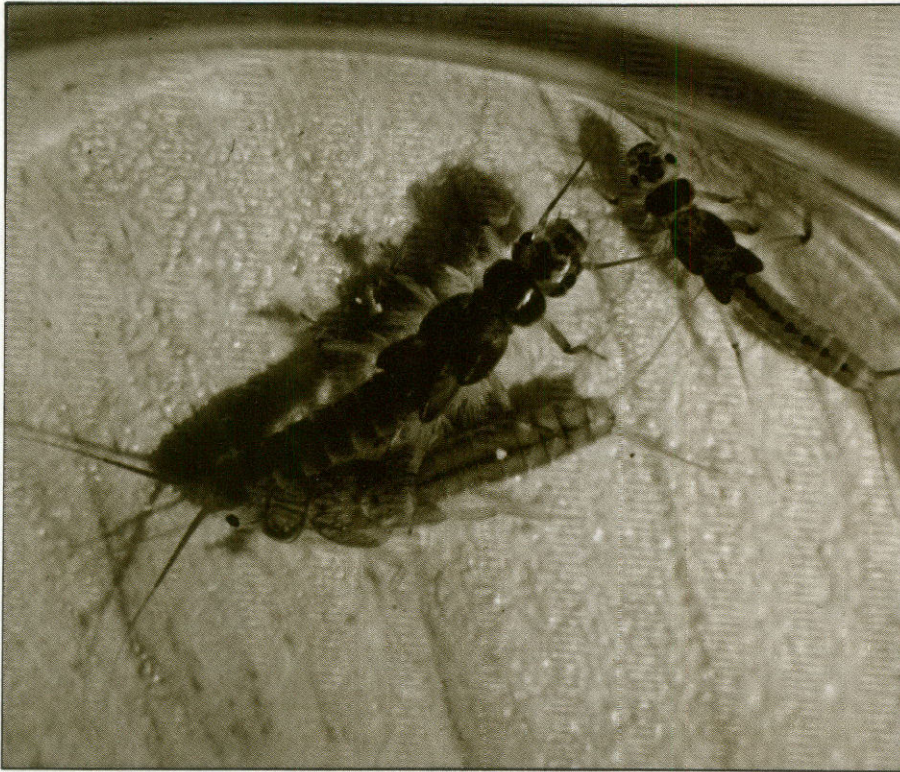




*Most stoneflies inhabit running streams, and the aquatic stages must be protected from being swept away by the current. Eggs of many species have a system of filaments with flared tips, shown in the inset, which lodge in crevices in the rocks. The egg of *Perlesta placida*, a Texas species, is about 1/50th of an inch long. The nymph of a *Neophasganophora* sp. above illustrates the flattened body and legs, which enable it to live in crevices out of the current.*

*This is the third installment in an eight-part series on aquatic insects. Next month the caddisflies will be discussed.*





mostly in Central and East Texas, are characteristically Eastern United States and Mississippi Valley forms.

We have made several expeditions to the Davis, Guadalupe, Van Horn and Chisos mountains searching without success for species known to occur in the Rocky Mountains. Arid conditions and lack of suitable streams in the Trans-Pecos region have apparently prevented many mountain stoneflies from coming into Texas. The only typically prairie species in the United States was collected near El Paso in 1939.

Adult stoneflies can be collected in every month of the year in Texas. Species are often classified ecologically as "fall and winter" or "spring and summer," according to the time of their emergence and mating. It is surprising to most people to learn that there is a group of insects in their adult stage only during the coldest months of the year. Our five species in the genera *Allocapnia*, *Taeniopteryx* and *Zealeuctra* clearly fall into this category. Our species in the genera *Isoperla* and *Hydroperla* (*Isogenus*) emerge in the early spring, beginning in March. The remainder of Texas species are adults from late spring through the summer. Adults of winter species feed on algae, but spring and summer species generally do not feed.

In addition to the expanded, folded

hind wings, adult stoneflies usually have two stout cerci ("tails") and elongate, many-segmented antennae. The males of some of our small winter-emerging species have only very short, one-segmented tails.

Adults may be either diurnal or nocturnal in mating. The female drops or dips eggs into the water while in flight or releases them into the water after alighting upon the surface or while crawling on stones or debris at the water's edge. Females of a few species submerge themselves during egg-laying.

Eggs of stoneflies are usually adapted to prevent their being swept away by water currents. Some have sticky, gelatinous outer layers or crowns which adhere to substrates, and others possess long filaments with holdfasts, which lodge in crevices between gravel or debris.

Nymphs of stoneflies are usually either flattened or elongate. The flattened species live in crevices between mineral or vegetable substrates and are not affected by water currents. Elongate and cylindrical nymphs, such as *Zealeuctra*, occupy crevices in gravel riffle substrates. Texas species of *Zealeuctra*, *Hydroperla* and *Neoperla* are found almost exclusively inhabiting gravel or rocky riffle bottoms. *Perlesta placida* is found in both mineral and debris substrates, and the remainder of our species are usually inhabitants of

debris, such as submerged masses of leaves and twigs, or leaves piled up on emergent objects or limbs of trees overhanging into the water.

The common name "stonefly" is somewhat of a misnomer for the majority of our Texas species; most might more appropriately be called "debrisflies."

Nymphs may be either carnivorous, omnivorous or herbivorous. The herbivorous and omnivorous species perform a major function by converting energy and nutrients from algae and other green plants into animal tissue; omnivorous and carnivorous species transfer energy and nutrients to higher carnivores, such as other insects or fishes.

Studies have demonstrated that



stoneflies are important as fish food. They are probably most important in cool trout and bass streams, but large populations in some Texas streams suggest a potential value that has yet to be assessed.

The nymphs and adults of larger species of stoneflies are used as bait for bass, trout and other game fishes and are copied in the making of artificial nymphs and flies. Artificial stonefly nymphs are fished submerged and floated down riffles into the pools below. Artificial dry and wet flies bearing the angler's names "stonefly," "perlid," "willow" and "sally," patterned after adult stoneflies, serve as effective lures for stream game fishes. The size and



color of these should correspond with the seasonal emergences of particular stonefly species. Many avid fishermen even examine the stomach contents of the fish they catch and attempt to copy the organisms they find.

One of our Texas species, *Perlesta placida*, has a bright yellow body and gray to smoky wings. An angler encountering an emergence of these in April to July would probably be rewarded by fishing with a "yellow sally" or "gray hackle, yellow body." On the other hand, one might encounter greater than average success fishing East Texas streams during December to March with small black flies mimicking our winter-emerging stonefly species. Other specific names



Gills, when present, are located in tufts about the bases of the legs, around the mouth parts or at the tip of the abdomen between the cerci. There are always two claws at the tip of each leg. Mayfly nymphs, with which they are most easily confused, usually possess three cerci, always have gills along the sides of the abdomen and have a single claw at the tip of each leg.

As with mayflies, the narrow tolerances of immature stoneflies for oxygen, water temperature, industrial wastes, pesticide residues and silt load give them considerable importance as biological indicators of immediate and past chemical and physical conditions of streams.

As a group, stoneflies are considered "clean water" insects. However, between species there is considerable variation in oxygen and pesticide sensitivity. We need a species list which correlates the oxygen tolerance and sensitivity to various other chemical and physical conditions to an index of degree of pollution. Such a list will require a tremendous research effort, but until it is available, the over-generalized group or community index classification will continue to be misinterpreted especially by inexperienced and armchair environmentalists.

It is not safe to assume that freshwater streams devoid of stoneflies or other clean water organisms are

polluted with industrial, sewage or pesticide wastes. Many aquatic habitats are devoid of certain species because of natural conditions. Knowledge of the historical distributions of species, their occurrence in specific streams, tolerances to both natural and artificial conditions and seasonal life histories is necessary before their proper application as pollution indicators can be assumed.

The absence of clean water organisms or of those known to be more sensitive to certain conditions may indicate a polluted habitat and suggest a comprehensive assessment to determine the exact cause and source. On the other hand, it is generally safe to assume that prolific populations of clean water organisms indicate relatively clean water.

One of the basic problems in understanding the ecological relationships of stoneflies lies in the lack of correlation, at the species level, of nymphs with adults. Fewer than one-half of the approximately 260 North American species are known in the nymph stages. The detailed life histories are known for only a handful of others.

So not only are stoneflies important natural food for fishes, they are becoming increasingly important as indicators of the cleanliness of our waters, so vital to fishermen and everyone who enjoys the outdoors. \*\*

for artificial flies patterned after adult stoneflies include "golden stone," "little yellow stone," "early brown stone," "Bird's stonefly," "sofa pillow" and "California salmon fly."

Stonefly nymphs receive oxygen through their body covering or through fingerlike gills. Both types inhabit cool, clear streams where dissolved oxygen content is high or saturated. Forms with gills have been observed doing "push-ups" when placed in still or low-oxygen water. In this way, they move more water and dissolved oxygen over body and gill surfaces.

Stonefly nymphs possess two long, segmented cerci as do most adults.



*Nymphs of stoneflies have long antennae, cerci or tails and gills. The adult is recognized by its folded wings, illustrated by Hydroperla (Isogenus) crosbyii, which is dis-*

*tributed over Central Texas. Stoneflies have low tolerance to pollution, and aquatic biologists sample stonefly populations to determine whether the water may be polluted.*



# Outdoor Books

by David Baxter



**CACTI OF THE SOUTHWEST** by Del Weniger; University of Texas Press, Austin and London, 1970; 249 pages, \$25.00.

Indian corn, potatoes, tobaccos, tomatoes and cacti—what does this strange combination have in common? These are native Americans, even more American than apple pie, and they have all enjoyed success as emigrants throughout the rest of the world.

Early explorers of the New World could not have missed cacti as they made their way across the Southwest in search of fabled gold. Cacti were easy to transport to Europe because they remained hardy while other plants shriveled and died on the long voyages.

Early botanists faced a problem of what to call these thorny plants from America. There were no words in the classical languages to describe them. The Greek word, *kaktos*, meaning thistle, was adopted because of the spininess of both plants. The categorizing does not stop here. It has been supposed that the cactus is related to the rose family because of the flower, or to the lily family because plants such as yucca bear similarities to the cactus.

Del Weniger knows what a cactus is. He explains what a cactus is and how it has modified to a harsh environment in a very short time. He explains cactus in terms of its main problem: water. Conservation of available water is responsible for modifications in the plant. Each adaptation of the cactus enables it to survive in a harsh environment: succulent stems instead of leaves, spines to protect its water from thirsty desert animals and flowers that bloom only in the heat of the day and wilt before the night brings predators to feed on the delicate petals.

Mr. Weniger prefaces his remarks about each genus with a general key to identification of cacti. He then devotes 200 pages of narrative to the specific genera, including descriptions of the plants—stems, flowers and fruits—and the ranges of the plants. He wisely limits his comments on the location of

cacti to general areas. This prevents bands of cactophiles from converging on a ranch to dig up the species for their collections and leave none to grow in the wild.

Eleven genera are described by Mr. Weniger in simple language and with a minimum of Latin polysyllables. One of the chapters discusses the genus *Lophophora*, the sacred plants of many Indians and popularly known as *peyote*. Drug hysteria in America is actually saving these little cacti from extinction since the 1938 Federal Food, Drug and Cosmetic Act prohibits the sale or use of *peyote*.

Excellent color photographs made by the author and his associates illustrate major species. The photography is as professionally done as the text.

Del Weniger is assistant professor of biology at Our Lady of the Lake College in San Antonio.—David Baxter

**THE WOLF** by David Mech; The Natural History Press, Garden City, N.Y., 1970; 384 pages, \$9.95.

By sweeping aside centuries of fiction and prejudice, David Mech presents the first accurate picture of one of nature's most highly romanticized creatures—the wolf.

With rare insight gained through his years of study of the now famous wolves of Isle Royale National Park, the author has tried to provide the public with insight into the mechanisms that affect this mightiest of North American predators. Even though the author is somewhat biased toward the wolf, his scientific style aids him in presenting an accurate picture for those who are willing to wade through the pages of facts to gain insight.

His studies, and those which he cites, present a picture of the wolf not as a wanton killer of small wild creatures, but rather as an animal designed in nature's manner to feed upon other animals. He explicitly shows how this

selective culling of herds aids the herds through the removal of older and weaker animals. When one finishes the chapters on predator-prey relationships, it will be easy to understand that the wolf is not intentionally picking the old and the weak—it is just that they are more susceptible to his way of life.

Throughout the book, Mech strikes down old notions of the ferocity and danger of wolves, and his chapters on socialization present a picture of the wolf as a creature that is understandable and admirable.

This book is not recommended for those who want light reading, because of the seriousness of the author and the scientific manner in which it is written. For those who really would like to know this animal, it will however, be worthwhile for them to see the scientific facts as they are presented.—

Dennis Russell

**GEOLOGIC AND HISTORIC GUIDE TO THE STATE PARKS OF TEXAS, Guidebook 10** by Ross A. Maxwell; Bureau of Economic Geology, The University of Texas at Austin, December 1970, 197 pages, \$3.00.

This guidebook is designed by the Bureau of Economic Geology as part of their popular series to complement the regular scientific and technical reports. It is a discussion of all the state parks open to the public at the time of publication. As the guidebook's title suggests, each state park's history and underlying geology is briefly discussed. Fossils and geological time periods represented are mentioned.

Chapters on each park are prefaced by an introduction on the physiography and geology of the State of Texas. This guidebook is an excellent companion piece to another of the Bureau's publications, *A Guidebook to Texas Fossils*. The prospective rock hound and fossil collector should be warned, however, that collecting in state parks is prohibited.

The text of the guidebook is well done and scientific jargon is explained. Three supplementary maps are included which show the location of state parks in relation to the major physiographic features of the state, a chart of time and rock units in Texas and the parks in the respective formations plus a block diagram of the geology and topography of Palo Duro Canyon State Park.

The guidebook is available by writing the Bureau of Economic Geology, University Station, Box X, Austin, Texas 78712. The price of the book plus the 4½ percent sales tax should be included. An index of other publications from the bureau is available for the asking.—David Baxter



## PHOTO AND ART CREDITS

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# Long Shots, Short Casts

*compiled by Neal Cook*

**Advance of Technology:** Temple officials in Kyoto, Japan have announced that a 917-year-old bell in a Byōdōin Temple possibly has rung for the last time. Because of heavy damage to the bell by polluted air, it will have to go into storage to protect it from the environment.

**Billboards Banned:** The 460 million acres of land administered by the U. S. Bureau of Land Management will be more attractive in the future thanks to a recently passed regulation. The new regulation forbids billboards and similar commercial displays on BLM lands except within 50 feet of the business advertised.

**Beauty Below?:** Evidence of man's seemingly limitless potential to pollute was confirmed by the research vessel of the School of Marine and Atmospheric Sciences at the University of Miami. The vessel was trawling for fish in the five-mile-deep Puerto Rico Trench, and although they caught a fish from record depths, they also netted paint cans, fruit-juice cans, pieces of aluminum, empty bottles and flashlight batteries.

**High-Priced Noise Protection:** A study sponsored by the Los Angeles Department of Airports and Sound Abatement Coordinating Committee demonstrated how much soundproofing of homes near airports was necessary to allow verbal communications inside. The test involved three stages of soundproofing with only the second and third stages adequate to protect against the noise. Stage one modifications cost \$3,410 per house; the second stage, \$5,260; and the third stage, \$10,441.

**Bottle Breakthrough:** The Vistron Corp., a subsidiary of Standard Oil of Ohio, has announced a new plastic bottle that may help solve the nation's solid waste problem. The bottle, made of Barex 210, is as transparent as glass, one-fifth as heavy and burns to a crumbly ash when lighted. The bottle burns at 1,000 degrees F., and its smoke does not change the chemical nature of incinerator smoke. The Federal Food and Drug Administration has approved the material for food and beverage containers.



# Springtime Gobblers

Mention spring turkey hunting at the sporting goods store or to the neighborhood gathering of creek-bank philosophers, and most likely the discussion will be brief.

Most Texas hunters under 40 do not know enough about gobbler hunting in the mating season to talk about it. In fact, last year Texas had its first spring gobbler season since 1940. The season was open in Kerr County. During the eight-day hunt, approximately 150 gobblers were harvested.

It may seem ironic that Texans were denied this excellent recreational opportunity for 30 years—in the top turkey state of the nation! But there are a few points to consider. Although Texas once supported two million turkeys, the population had dwindled to about 95,000 in 1928. In 1945, only 100,000 Rio Grande turkeys existed on overgrazed ranges, and the Eastern turkey was virtually gone. Landowners took notice of the shortage of birds, and turkey management evolved into strict conservatism and protection. This mood prevented any liberalization of seasons and bag limits.

During the last decade the trend in turkey numbers has been up. Wild-trapped turkeys have been transplanted to suitable habitat over most of the state. A tremendously successful hatch occurred in 1968, and the statewide turkey population soared to over one-half million birds. This increase, coupled with biological data supplied by department personnel, paved the way for more liberal seasons, which included spring gobbler hunting.

The annual harvest of turkey during the fall season varies from 18,000 to 24,000—about five percent of the population. Biologists have established that, barring unusual circumstances, 25 percent of the population can be harvested annually. Turkey, like quail, cannot be stockpiled. The status of the population at any time is directly proportional to the quality of the habitat. When times are good, populations flourish; when drought and food shortage prevail, coupled with occasional outbreaks of disease, these flourishing populations can decline sharply. Legal hunting has little to do with the annual ups and downs in turkey numbers. The technical whims of our agricultural genius, along

Tate Pittman



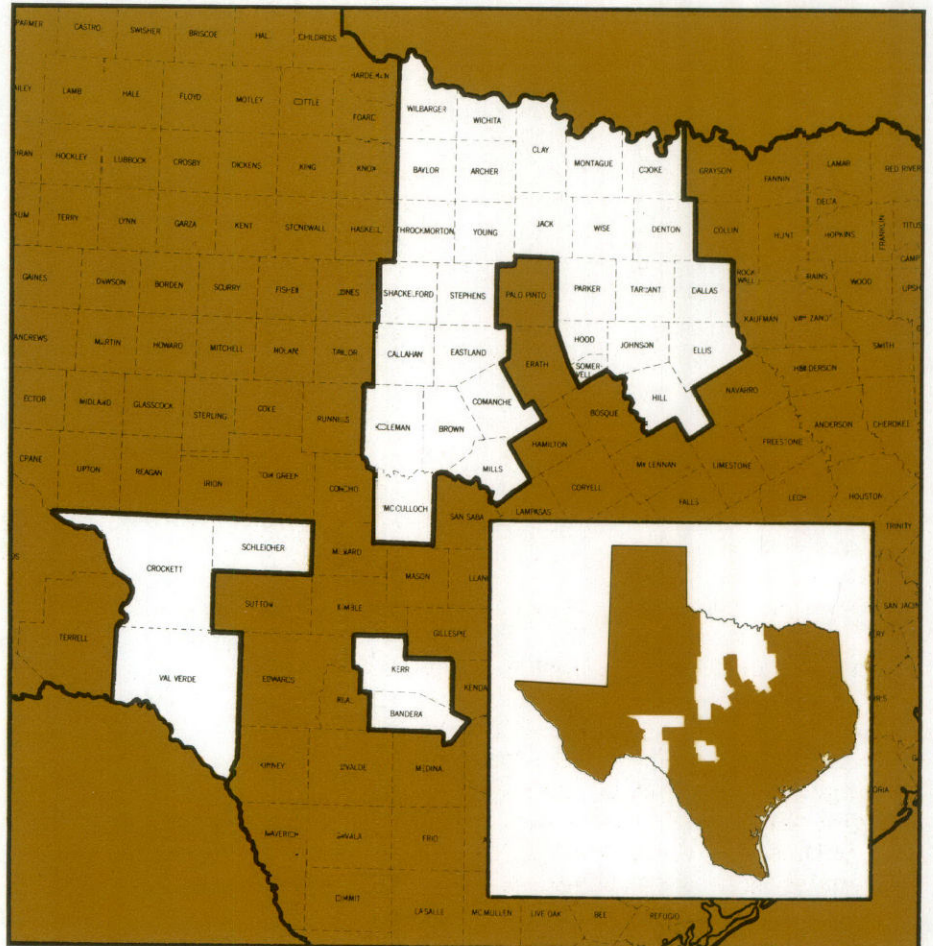








*There is an open season on turkey gobblers from April 24 through May 2 in the white counties. During that time, one turkey gobbler may be taken. It is an excellent time to get an extra gobbler, and those with experience can try out their turkey calls.*







with land use, play a bigger role in turkey population dynamics.

The present point of view leans toward harvest regulations which increase the hunting of America's most prized game bird. Texas is not alone in supporting spring gobbler hunting. Arkansas, Louisiana, New Mexico and Oklahoma have spring seasons. Alabama, Georgia, Florida, Oregon, Ohio, North Carolina, Kentucky, Missouri, Tennessee, Pennsylvania, West Virginia, New York and Mississippi also have had much success with spring gobbler hunts. The results are generally the same in each state—increased hunting opportunity at a time when other hunting seasons are closed and a minimum number of gobblers harvested during the short season.

Many hunters have been heard to admit that they had rather kill a turkey gobbler than the biggest deer in Texas. This is reflected by the fact that the price of some spring hunting leases in Kerr County went to three figures per gun.

Stalking and shooting a wary old gobbler is no cinch. Several methods of hunting can be used on most Texas turkey range. The hunter can conceal himself in a blind where gobblers are known to range. In this hunting he may use a full-choke shotgun with No. 2, 4 or 6 shot or a small caliber rifle with solid jacket bullets. The .222/20-gauge over-under is a good combination for this type of hunting.

In rolling hilly country, the hunter can stalk

the gobbler. As in deer hunting, the hunter must use utmost caution during his stalk, pausing for extended periods to view the landscape for turkey. The hunter must see the gobbler before it detects the hunter's presence. Binoculars are necessary for this type of hunt, and the gobbler will probably be killed at a range too far for the shotgun.

A small caliber center-fire cartridge such as .22 Hornet, .222 or .223 Remington or a .22 magnum—all with a solid jacket bullet—is a good caliber for turkey. The hunter who is a good shot can use a larger caliber with solid jacket bullets, but he must hit the bird in the head or neck or high in the back to avoid ruining the thing he has come for—a tasty turkey dinner.

Many old-time turkey hunters from other states will readily give this advice. If you do not know how to use a turkey call effectively, leave it at home. And, if you use a call, use it sparingly. An old gobbler doesn't like a babbling hen any more than we men like . . . but back to turkey hunting.

To paraphrase an old saying, don't count your turkey before he is shot. Some hunters may consider spring gobbler hunting a poor sport. They may think that a tom turkey, with the mating sap rising in him and hens all around, will not be normally cautious. But do not be fooled. One old-time turkey hunter once remarked that he was convinced of one thing—that unhatched tom turkeys must lie in their shells thinking of ways to outsmart spring hunters. \*\*





*Located in southeast San Antonio, San José Mission State and National Historic Site is administered by the Texas Parks and Wildlife Department in cooperation with the Archdiocese of San Antonio, the National Park Service, the San Antonio Conservation Society and the County of Bexar.*



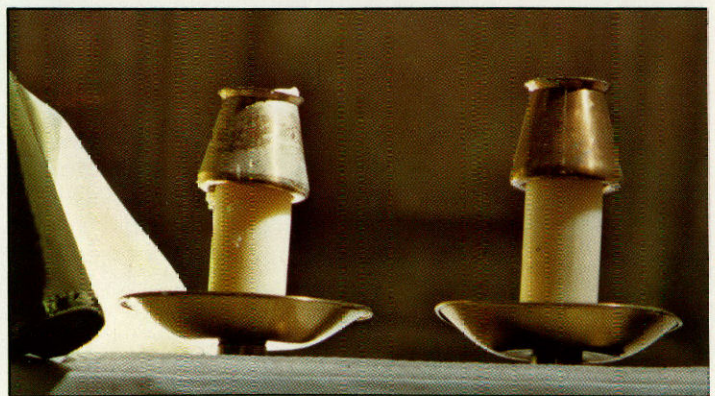
# SAN JOSÉ, Queen of the Missions

A legend tells of a young man who came from Spain to the New World, promising to return and marry a beautiful girl of Castile. Months passed, and she waited until a priest came to tell her that her lover had died in a battle with Apaches near San José Mission. When she heard this, she asked for permission to come to the New World, but it was denied her. And when the bells were being cast for San José, she tore off her ring and the cross from around her neck and cast them into the molten metal so that something of hers could be near his grave.

This is part of the legacy of romance that surrounds San José, a legacy generated by the character of people who could leave familiar surroundings to come to a land where languages, customs and tribes were not only unfamiliar but almost unknown. With this atmosphere surrounding it, *Mission San José y San Miguel de Aguayo* is a serene place where one can feel the pulse of history.

When the Spanish burst into the New World, the Indians knew nothing of European civilization. The Coahuiltecan in South Texas dressed in breechcloths or nothing and moved about as berries ripened or small game became plentiful. They had no villages and almost no social structure.

But the Spanish saw peaceful Indians as their best defense against the marauding Apaches who were boldly invading Mexico, and, more than that, Spanish priests saw Indians as a ripe field







## SAN JOSÉ

of converts, ready to be plucked. These aims, best fulfilled by a system of teaching the arts of European civilization, were among the reasons for the establishment of the Southwest missions.

San José was begun in 1720. It was moved several times, but by the 1770's it was called the "Queen of the Missions," a name that has been used for two centuries. While the British colonies on the east coast of America were beginning to resent heavy taxation, the mission was at its height of wealth and importance, but, with 350 people living inside its walls, it was probably a noisy, somewhat dirty, possibly smelly preview of conditions in modern cities. In separate places the Indians were being taught carpentry, weaving, leather work and academic skills like reading, writing, music, art and Spanish. Others practiced with their muskets. In the 1760's there were about 110 Indian defenders of the mission, 45 of whom could handle muskets.

The mission ranch was 25 miles away, but steers waited for slaughter near the granary. Outside the walls, Indians tended the fields.

European culture had not converted the Indians completely, and some often slipped away for a *mitote* — a chanting, pagan dancing and drinking ceremony in the woods. The priests could not stop them and the next morning the Indians returned to the Christian part of their double life.

*The sunlight streams through Rosa's window and bathes the floor of the sacristy.*













# SAN JOSÉ

Today, San José is a pause in history. The dome and bell tower of the chapel are seen rising above the mesquite trees much as they might have appeared to Indians driving cattle in from the ranch. Inside the walls a few people amble through the reconstructed buildings, feeling the atmosphere of Indians and missionaries. A priest walks across the plaza reading a book and stops to talk to visitors.

The chapel, one of the most beautiful in the northern chain of missions, reflects the faith of Spanish America with wooden statues and the simple designs painted in the interior. And in the still air the bell chimes, for the chapel now lives as a parish church.

They say that on still days, in the corridors of the church, rustling of priests' garments can be heard mingled with the urgent penance prayers of Indians long dead — Indians who had refused Christianity and the European life style. But the storytellers around San José have given them a second chance to convert. So in walking the halls and pathways, remember that the ghosts are still around.

*The architecture and decoration of San José is among the best of the Spanish colonies. Simple lines in the apartment in the top photograph reflect the life of the missionaries, and the painting on the outside of the chapel is reminiscent of churches of Mexico. The granary, which was the first chapel, is one of the few buildings in the hemisphere with flying buttresses.*





**R**aising earthworms in a backyard worm bed, when properly managed, can be an interesting and profitable hobby—especially for youngsters. A backyard worm bed can provide a surprisingly large number of worms, and it will assure a ready supply of fish bait all during the year.

Almost any kind of container will work, including barrel halves, wash-tubs, old garbage cans and wooden boxes. Specially constructed concrete beds also have been used. For most beginners, a standard number three washtub is a good selection. This container, measuring about two feet in diameter and 12 inches in depth, can produce as many as 3,000 worms per year.

Begin by cutting a two-inch drain hole in the bottom side of the tub and cover the hole with screen wire. To assure a good bait supply during the summer, it is a good idea to begin the operation in the early spring. Earthworms are simple creatures, but they need more than just a container full of dirt. They require the right type of soil (also called compost or bedding), the proper amount of moisture, shade in the summer, protection from freezing in the winter and food. The compost can be prepared by mixing one-third part manure, one-third part topsoil and one-third part peat moss. The manure should be well rotted, and the peat moss should be wetted before mixing with the topsoil. The soil should not be sandy.

Prepare the tub by placing a layer of leaves or hay in the bottom. Add one pound of cornmeal to the compost and mix thoroughly before pouring the mixture into the tub. Fill the tub to within about four inches of the top and remember not to pack the compost. Then cover with a burlap bag and water the mixture only with the amount of liquid the compost will readily absorb. The bed is now ready for the brood worms.

The most popular worm probably is the "red wiggler," a small but active species which reproduces throughout the year. When placed on the bedding, they will quickly burrow out of sight. They may be purchased from bait dealers or commercial worm farmers. About 200 of them will start a good backyard operation. Feeding is a simple matter, as the worms will eat almost anything. They consume table scraps, coffee grounds, chicken mash, cottonseed meal, cornmeal, let-

# HOW TO BUILD A WORM BED



by Dwane Smith  
Inland Fisheries Biologist

tuce, celery, cabbage and kitchen fat. Any combination of these items can be used, but when using chicken mash, place it in a trench or bands. If too much is used at one time, it will sour. Cornmeal should be sprinkled on top of the compost and worked carefully below the surface. Feeding at one-week intervals is usually adequate. After the feed has been put on the bed, replace the burlap bag and sprinkle with water, being careful not to make the compost soggy.

Worm eggs should appear about two weeks after stocking adult worms. The worms should mature in about three months to a harvestable size. Do not water for a few days before harvesting. With a spading fork, dig out some of the bedding and

place on a board or table. Leave it in a pile for a few minutes to allow the worms to congregate at the bottom. Remove the top portion and pick the worms out of the remaining portion.

Repeat the process until most of the harvestable worms are removed. Leave a few adults in the tub for brood stock. Replace the bedding and brood worms in the tub. Some of the smaller worms can be put in another tub to be fattened or the entire operation can be started again to have a continuous supply. The compost should be completely replaced each year. The old bedding may be used to enrich the soil of flower beds or gardens. As the worm beds become crowded, others can be prepared until the desired amount of production is reached. \*\*



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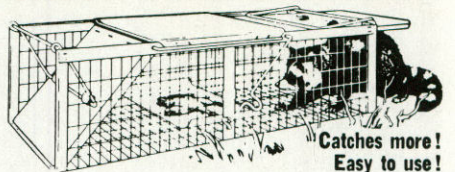
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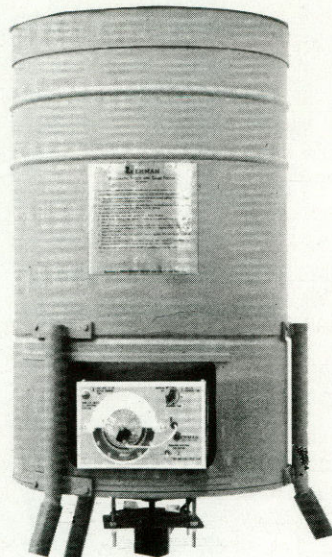
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Once abundant and important to wax-using industries,

# Candelilla

is fast being depleted by smuggling and overuse.

by W. R. Long Information Officer, San Angelo

The candelilla, *Euphorbia antisyphilitica*, is a waxmaking plant common to the Big Bend area of Texas. A native plant, the candelilla was widely used in the Trans-Pecos at the turn of the century. The wax is still in demand today, raw wax being worth around 25 cents a pound in the United States and less in Mexico.

The species is found growing on gravelly limestone ledges and slopes of the Big Bend, and occasionally on igneous rocky peaks and ancient beds of lava. Wax exudes from diminutive pores and forms a gray coating on the stems. The small leaves of candelilla fall off early and are seldom seen. An observer must look closely to see the tiny, purple blooms that form in clusters on each stem in late spring and early summer.

Predominately a plant of semiarid regions, candelilla is occasionally found in parts of the Hill Country. Growth in less arid conditions is more luxuriant, but wax production declines. Candelilla is a highly specialized plant. The specially adapted leaves and development of protective wax coatings are thought to be evolutionary adaptations to aid survival in an arid environment. These not uncommon desert-plant adaptations control losses of plant fluids to the dry, desert air. The popular notion that candelilla produces more wax in dry periods may indeed be supported by scientific fact.

Crude wax from candelilla is white but with refining becomes yellowish tan and has a sweet odor. It is valuable as an extender wax and is used as a chewing gum additive and in carbon paper. Early natives of the Trans-Pecos used the wax for candles and the stems for thatch on houses and porches. Occasionally stems were bundled and placed between upright poles to make walls for a house and they served as prized chinking for rock and adobe walls. Over the years the wax was used in the manufacture of shoe polish, automobile and floor

waxes and phonograph records. Candelilla wax is malleable and water-resistant. During World War I it was in high demand as sealing wax and for waterproofing munitions and electrical appliances. As the species name—*antisyphilitica*—indicates, extracts of the plant were once considered a remedy for venereal diseases.

Wax plants are harvested primarily in the winter by pulling roots and all from the ground. Recovery of the species is slow, and it often takes 20 years for remaining roots to produce another harvestable plant.

Once the plant is gathered, it is tied into bundles and often must be transported over terrain where modern vehicles cannot operate. The burro and wooden saddle are typical of candelilla movement to rendering plants.

The rendering site is usually located near a running stream. A metal vat is sunk into a dirt bank with a firebox beneath. Only a few inches of the vat extend above the ground. A

water and sulfuric acid mixture in the vat is boiled, and into this solution goes the entire plant. As the wax separates from the stems and rises to the top of the water, it is skimmed off and placed in storage barrels.

Whereas candelilla was abundant in the Big Bend at the turn of the century, and the remains of rendering vats can still be found throughout the area, living candelilla plants are more difficult to find today. Authorities in the Big Bend National Park are concerned that the plant may completely disappear from the park if harvesting is continued.

And, although most of the wax rendering is done today in Mexico, one source of supply is candelilla smuggled across the border from the United States.

Certainly, if this species once so important to early day Texans is to survive and flourish again, harvesting must be halted and the candelilla allowed to reproduce in its own, unhurried way. \*\*





by David Baxter

# BLUEGILL

**P**ound for pound, the bluegill is one of the spunkiest little fighters ever to take a hook. The average size of the bluegill is less than half a pound, but it fights like a fish three times the size.

*Lepomis macrochirus* is known by a variety of popular names: bream (pronounced "brim" in the South), copperhead, sun perch and pond perch. As with many fish, the bluegill's color depends on water conditions, but it is usually dark greenish-olive on the back with a purple iridescent cast and chainlike, transverse bars of greenish hue. The cheeks are iridescent blue, and the gill cover is black. The belly varies from a reddish copper to a brilliant scarlet. In the spawning season, the male has a brilliant copper belly and vertical bands of the same color on the body. The female remains her usual drab self and grows round with eggs. An underwater view of the bluegill makes it a drab khaki with blue-green fins and forehead.

The bluegill is a member of the sunfish family, Centrarchidae, which includes crappie and black bass. There are about 25 species in the family, and their differences in size,







HELEN SLOAN YOUNG.



habitat and diet enable them to flourish in a great variety of waters. Not all members of the family are large enough to interest anglers, but the excellent food qualities of the smaller species has led to the name "panfish." The Texas record for the bluegill is a three-pound four-ounce fish caught in 1966.

Sunfishes are easy to transplant. Once found only in North America, bluegills can now be caught in France. Bluegills in North America are widespread from Minnesota to Lake Champlain, to Florida and Texas.

All members of the family Centrarchidae have spines in the anal fin. The bluegill can be distinguished from its relatives by a black ear flap and a rather indistinct black spot at the rear of the dorsal fin. This species differs from the green sunfish in having a smaller mouth, longer pectoral fins and no bright green spots on the gill cover. It lacks the red margins on the tip of the gill cover of a redear sunfish. Bluegill often hybridize with both green and redear sunfish and the offspring are difficult to recognize.

A schooling fish, the bluegill is at home in streams, rivers and lakes. It prefers protected areas around brush, water lilies and weed beds. In spawning it does not keep its nest separate from others but forms a colony. In shallow water, the male prepares the nest, a small depression on the bottom usually one to two feet in diameter and six inches deep. The nest is clearly visible by the rim of silt and debris around the hollow. Building the nest takes several days.

In Texas, the bluegill usually matures and spawns after the first year of life. Spawning usually takes place in late spring and early summer, depending on water conditions and locality. The brightly colored male entices one or more females to deposit their eggs in his nest, and then he chases the females away. The eggs are kept clean by circular motions of his tail and hatch approximately 30 hours after the female lays them. Newly hatched fish are about one-tenth of an inch long. The male guards the eggs until they hatch and continues his vigilance over the fry for several days.

The female lays from 12,000 to 65,000 eggs depending on the size of the fish. An average of 18,000 fry hatch. All carnivorous fish feed on

the bluegill, and cannibalism by the males guarding the nests is common.

A bluegill-bass combination has been used by numerous farmers to stock their tanks. The bluegills eat small invertebrate life, and the bass feed on the bluegills. If the bluegill population is not checked, it will multiply in incredible numbers. An overpopulated pond means stunted bass and bluegill.

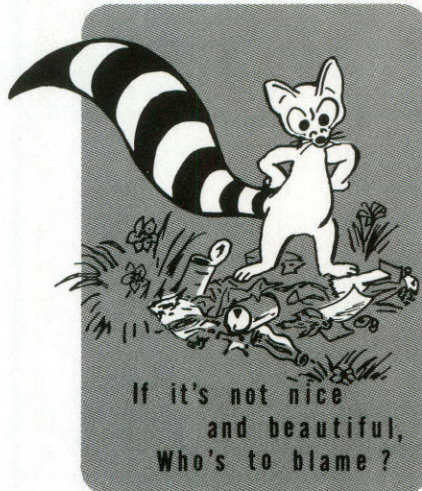
Growth rate of the bluegill depends on population balance and food supply. The average size of bluegills will be from six to nine inches in waters with balanced populations, but only three inches in a crowded pond. Turbidity is detrimental to growth and reproduction. Water temperatures between 60 and 80 degrees are best for growth.

The bluegill will eat almost anything it can get in its mouth. Favorite foods are crickets, grasshoppers, small minnows, fish eggs and earthworms. Carp and freshwater drum compete with bluegills for insect and plant material, and fingerling bass compete for forage fish less than one inch in length. Water level may have more effects on changes in the bluegill food supply than that of the bass. Plants are eaten by bluegills and are often the dominant food in the summer months.

Tagging experiments show that the bluegill does not move long distances. Tagged fish have seldom been found to move more than one mile from point of tagging to point of recapture.

Many of the same parasites which plague other freshwater fish bother the bluegill: fungi, bacteria, larval molluscs, worms and crustaceans.

The bluegill is a prolific spawner



and unfortunately feeds on the spawn of other fish and destroys the nests of many bass. This often hurts fishing. There are lakes in the state which contain little more than bluegills, all stunted. In lakes like this, removal of a majority of the bluegills, regardless of size, will actually produce larger fish. \*\*

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# TUTOR'S TALES

## "FOSSILS"

BY DAVID BAXTER

Images in stone, fossils are records of prehistoric plants and animals. The skeleton of a gigantic dinosaur, petrified trunk of an ancient tree or shells of marine creatures from vanished seas are familiar to every museum visitor.

There are several different means of fossilization: actual preservation, mineralization, replacement, carbonization, molding, casting, imprinting, tracks, coprolites and incrustation.

Several conditions must be present before a fossil can be formed. The organism must be rapidly buried in sediment, as in the case of marine life, so bacteria will not cause it to decay. Some land dwelling creatures have been buried under volcanic ash, and this accomplishes the same thing as burial in sediment. Hard body parts leave behind the best fossils although soft insects are sometimes molded in hardened resin. And of course, for mineralization to take place, water high in mineral content must be present.

**Actual preservation** is rare, but it will occur when bacteria action and deterioration are stopped by ice or seepages of oil. Preservation occurs in "recent" deposits, those of the last million years.

As skeletons lie in soil with water high in mineral content, the porous bone matter fills with minerals without being altered in shape. This action makes the fossil heavy and stonelike and is referred to as **mineralization**.

**Replacement** is one of the most common means of fossilization. Animal substance is dissolved and replaced by a different type of matter such as quartz or calcium carbonate. Carbonization is different in that all organic matter is reduced to carbon or coal. This type is common with fossil plants.

Take a good look at some building stone next time you are downtown. If it is limestone, chances are it will have the forms of little shells embedded in the rock. This is an example of **molding**. Seashells become embedded in the muddy bottoms of seas and are dissolved by water. This leaves a cavity the size and form of the actual object. Some of these natural molds are filled with minerals, such as quartz, and produce **casts**. Thin objects molded in this manner produce **imprints**.

Have you ever been to Dinosaur Valley State Scenic Park or visited the Memorial Museum at the University of Texas at Austin? If so, then you've seen **tracks** of the prehistoric reptiles which roamed about Texas. These tracks were left in soft mud. When the mud hardened into rock, clear footprints were left.

**Coprolites** are fossilized excrement and usually contain undigested parts of animals, such as fish scales. They tell us much about the diets of early animals.

Leaves, sticks and bones in the mineralized water of caves may form fossils; these are called **incrustations**.

The earth is more than three billion years old. Geologic time is the framework of the history of the earth as represented in its layers of rock. There are five eras of geologic time, each with a characteristic type of life.

Scientists who study the eras of geologic time and the fossilized animals which inhabited them are called **paleontologists** (Greek **palaios**, ancient; **ontos**, a being; **logos**, word; **istes**, one who does).

Study of fossils as they occur in rock deposits will tell us much about the environment of that particular time. This branch of science is called **paleoecology**—the study of ancient environments. Clusters of sea animals in a rock show us that the tides of the sea brought enough food to this area to support a large population of marine life and that these animals were social and did little moving about for their food.

By looking at the fossil teeth of the plant-eaters, a paleoecologist can tell whether the animal fed on forest plants or grassland plants. Teeth of the horse show an increasing complexity from primitive, simple teeth for feeding on forest leaves to complex molar teeth adapted for chewing grasses.

Relationships between meat-eaters and plant-eaters are evident in fossils: a skull of a Pleistocene buffalo with two large holes in the top could indicate that it was killed by a blow from the two teeth of a saber-toothed tiger.

Types of fossils indicate the distribution of land and sea in the past. Marine fossils have been found at elevations of 20,000 feet in the Himalayas. Coral reefs are common in the limestone of northern Indiana and indicate the presence of an inland sea or bay like Hudson Bay.

Since most animals and plants can live only in specific climates, the presence of their fossils indicates the type of climate in that area at the time they lived. Palm fossils in North Dakota show that the area was milder than in modern times. Fossil musk-ox, a cold climate species, in Arkansas indicates colder climates in ancient times.

Fossils record life from age to age. The oldest rocks bear only fossils of simple types of life which are often extinct. More and more complex types of life are found in successive ages and show that life has been a gradual development. The rocks of each geologic age bear distinctive types of fossils and make it possible to recognize rocks of the same age in different parts of the world. With this information, scientists can correlate events and work out the history of the earth as a whole.

Now that we have discussed the different types of fossil-



ization, eras in which they are found and the significance of fossils, how do we go about collecting fossils? A visit to a local museum or college will give information as to the best locations for gathering fossils. Quarries are good places to collect because they expose large areas and cut through several geological formations. Road cuts and embankments also expose different geological time periods. Streambeds and gullies are excellent because water washes rock and soil from fossils.

Fossil collecting requires only a few inexpensive tools. All that are necessary are road and topographic maps, a mineralogist's pick, a cold chisel, a small shovel and several paper or cloth bags to store specimens. A guide to the fossils of a particular area is also necessary. For beginners, **The Fossil Book** by C. L. Fenton and M. A. Fenton is available at most public libraries. It is well illustrated, easy to read and comprehensive. The best guide available for more advanced collectors is **Texas Fossils**, Guidebook Number Two, by William H. Matthews, published by the Bureau of Economic Geology, University of Texas at Austin. This guide is available from the Bureau of Economic Geology, University Station, Box X, Austin, Texas 78712, at one dollar a copy.

Fossil hunting is hands-and-knees work. Some fossils are too large to be removed from the surrounding material. Chisels can be used to remove the material by carefully hitting away from the specimen. Small specimens should be cleaned under a large magnifying glass so that details can be seen. Particles of rock should be removed with a large needle.

Specimens can be displayed in anything from cigar boxes to expensive metal trays and storage cabinets. Each box or tray must be labeled to give the name of the fossil, period in earth history, formation, name and location. Much of this information must come from the guidebook.

Now that we've got all these fossils, how do we classify them? Many fossils are similar to living plants and animals, and classification is similar to that of modern organisms.

The system of **binomial nomenclature**, which simply means "two names," is used by scientists. The two names are the Greek or Latin genus and species of the fossil; for example, *Homo sapiens* is the binomial nomenclature for man.

Texas has excellent fossil hunting. There are 12 different periods of geological time represented in the state, from the recent deposits along the coast to ancient Precambrian rocks in Mason and Hudspeth counties. \* \*

*Texas fossils represent millions of years of geologic time. Lower photo on page 30 is a fossil of fern and seed fern leaves from Jack County. They are from the Pennsylvanian Period of the Paleozoic Era and are 270 million years old. These prehistoric ferns are approximately the same size as modern ones. Upper photo, page 30, shows *Cumminsia aplatus*, an extinct solitary coral from the Pennsylvanian Period. The nickel-sized coral are found in San Saba County and are estimated to be 295 million years old. The large photo, page 31 shows silicified fossils in a block of Edwards Limestone about twice the size of a basketball and found in Travis County. These animals lived 110 million years ago in the Cretaceous Period of the Mesozoic Era.*







Photography by Leroy Williamson





# Letters to the Editor



## New Record Rack

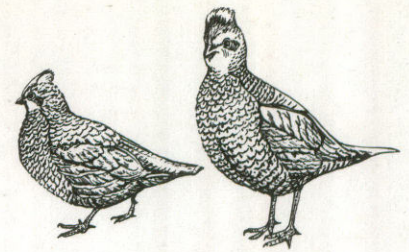
On the "Letters to the Editor" page of the February issue, we said that a deer taken by C. P. Howard was considered to be the state record for typical white-tailed deer as scored by Boone and Crockett Club of North America. David M. Dailey of San Marcos pointed out our error and drew a new record

to our attention. This record whitetail was taken by Dailey's grandfather, Basil Dailey, in 1903 on the Blackaller Ranch in Frio County.

The new Texas record was entered in the 1966-1967 Big Game Competition sponsored by the Boone and Crockett Club and scored 192 2/8 points. The world record rack in the 1964 Boone and Crockett record book scored 202 points and was killed in Minnesota. The Texas trophy has 16 points with an inside spread of 22 6/8 inches. Its main beams are 27 2/8 and 27 3/8 inches. This huge rack is now on display at Lone Star Brewing Company's "Hall of Horns" in San Antonio along with the first-place, non-typical antler described in the February issue.

Another typical white-tailed deer taken in Texas that deserves attention was killed in 1949 by Henderson Coquat in Webb County. This trophy has 13 points with an inside spread of 27 inches. The main beams are 25 6/8 and 25 3/8, and the trophy scored 183 7/8 in Boone and Crockett competition.

Just how these trophies rank on a nationwide basis is unknown as this year's results showing scores of deer received in 1968, 1969 and 1970 have not been announced.



## Reader Appreciation

Just a short note of appreciation for your marvelous magazine. The copy is always interesting plus being informative—a sometimes difficult combination to achieve.

You should also get an A+ on your layout, and our whole family marvel each month at the photography.

Thank you for the continued quality.  
Mrs. Travis Houston  
Dallas

## Nancy McGowan

Many people have written within the past few months concerning Nancy McGowan, whose artwork appeared in the magazine for many years. Nancy left the department last year to concentrate full-time on freelancing her work. We purchased art from her for several months until it was decided that it would be advantageous to have someone on the staff preparing our artwork. Nancy, who recently became Mrs. James G. Pruitt, is keeping very busy with her freelancing, and we wish her all of the success in the world.

## Subliminal Slipup

In "Tutor's Tales" for February, we mistakenly called the process of sublimation, sublimination. Sublimination means the use of techniques which fall below the threshold of stimulation. We meant sublimation, the change of a gas into a solid without ever being a liquid. To err is human, to forgive, sublime.

## BACK COVERS

**Inside:** Turkeys have always been elusive, but with a spring season open, hunters will have another chance to get one. Photo by Leroy Williamson.

**Outside:** Squirrelfishes, family Holocentridae, are distributed worldwide and can be found around shallow tropical reefs. During the daytime they hide in cracks and crevices, but at night, they come out to forage. They make a sound which, some people say, can be heard out of the water without amplification. Photo by Bill Reaves.

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