



Ninety million years separate three fossil *Linuparus* lobsters from their modern relative, the one with antennae. In comparing them, paleontologist Gale Bishop, left, and zoologist Austin Wil-

liams discovered that time and distance have barely changed them. They were found thousands of miles apart.

## These Look-Alike Lobsters Span 90-Million-Year Era

By JOY ASCHENBACH

National Geographic News Service

WASHINGTON — Sometimes you don't have to get your feet wet to look for lobsters. Instead, you put on cowboy boots and head inland to cattle and sheep ranches in the northern Black Hills.

Lobsters in South Dakota? There are hundreds lying out there on the open range—bits of tails, legs and bodies hardened into clay-like nuggets barely distinguishable from the dry, cracked earth. They're 90-million-year-old fossilized remains from the time when South Dakota was a sea bed, when the ancient Gulf of Mexico reached north into Canada. It's a different version of "surf and turf."

These lobsters aren't edible, of course. But other members of their genus, *Linuparus*, are still crawling about the oceans today, though only in waters thousands of miles away, in the South China Sea and the Indian and Pacific oceans, off Africa and Australia.

### From Time Of Dinosaurs

"*Linuparus* is a rare living fossil. It was around with the dinosaurs and it's practically unchanged throughout a tremendous span of time," says paleontologist Gale A. Bishop, who has spent two summers on the South Dakota range picking up the black fossilized pieces that ranchers call "spider rocks."

*Linuparus* lobsters are not the famous big-clawed American lobsters found off the New England coast. They have no claws and are harvested primarily for their tail meat. They belong to the family popularly known as spiny or rock lobsters, which inhabit tropical and warm temperate waters.

"It's incredible to be able to still see such primitive lobsters alive today and possibly have the chance to study the biology of something that lived millions of years ago, to see how they eat, mate, and live," says Bishop.

Why did *Linuparus* lobsters, like horseshoe crabs, for example, survive so long unchanged, and why are they found today only in the South China Sea and Indo-Pacific region? No one yet has the answers.

Bishop believes in starting at the beginning—when the lobsters first crawled along the sea bottom. They are known to have existed in both North America and Europe (about 130 million years ago) to the Early Eocene, about 50 million years ago.

In western South Dakota, Bishop has discovered a

"lobster zone" along a narrow 54-mile-long strip of land. To collect the thousands of 90-million-year-old fragments, he and field assistant Brian Meyer covered at least five miles a day on foot. The research is supported in part by the National Geographic Society.

### Pieces In A Puzzle

A professor of geology at Georgia Southern College in Statesboro, Bishop is gluing together the pieces of these 3-D jigsaw puzzles in his campus lab. A single foot-long lobster may have broken into 30 pieces or more. He has about 400 at least partially complete lobsters from South Dakota.

Fossilized *Linuparus* specimens also have been found near Dallas, Texas, in northern Mississippi, and along the Chesapeake and Delaware Canal. All of these areas were under water when the North American landmass was split in two by the western interior seaway.

The ancient lobsters in North America lived in shallow waters in the oozy, soft sea bottom, probably on a diet of shellfish.

Today *Linuparus* live in a similar muddy environment, but in much deeper waters at depths of 250 to 1,000 feet, says zoologist Austin B. Williams of the National Marine Fisheries Service. Williams is collaborating with Bishop in comparing the fossils with the only three *Linuparus* species still known to exist. There are 27 extinct species.

Because of the depths at which they now live, today's *Linuparus* lobsters are more difficult to reach than their 90-million-year-old ancestors on dry land. A very small amount get caught with the 400 million pounds of lobsters that make up the world's average annual catch, says Williams. They show up primarily among frozen lobster tails from Japan.

To observe their behavior would require the use of a camera-equipped submersible. Bishop and Williams theorize that the lobsters still look and live so much like their ancestors because their habitat, though deeper, probably has not changed, and their food resources have remained stable.

Whether the lobsters migrate to the Indo-Pacific from North America or were always there is not known.

At this point, Bishop has seen more fossilized lobsters than live *Linuparus*. And he has yet to taste a morsel of sweet *Linuparus*.

## It's Time To Make Plans For Shopping For Holidays

You'll have more time to enjoy the season if you get a headstart on baking, say food and nutrition specialists at North Carolina State University.

It isn't necessary to do all of the baking ahead of time. In fact, some of the products will have a better taste if they are frozen unbaked.

Spices and condiments in unbaked doughs and batters lose their flavor in freezing, especially those in moister types of dough. This means unbaked frozen doughs can't be kept in the freezer as long as the baked products, but unbaked doughs will also take up less space.

Pastries heavy in fat, such as pies, tarts, filled rings and rich cookies, come through freezing well baked or unbaked. To freeze whole pies, brush the inside of the bottom crust with shortening to prevent sogginess.

Fruit pies freeze better unbaked. Leave the slit or prick of the top until it's baked. The best pie fillings for freezing are fresh fruit, mince-meat or squash.

Chiffon will freeze if it has a half cup of whipping cream in the filling for an 8-inch pie. Custard and cream pies don't freeze well, and any pre-cooked filling that contains starch should be thoroughly cooked before freezing. Fillings for unbaked pies should have one and

a half times more tapioca or cornstarch than usual. If fruit will brown, add powdered ascorbic acid to the filling.

Pie crusts may be frozen in cubes, but either baked or unbaked pie shells are more convenient although they take up more freezer space.

Cookie dough and baked cookies may both be frozen successfully, especially those high in fat and low in moisture. Baked cookies should be cooled and packed in rigid containers with tight-fitting lids. Thin cookies will thaw in minutes; bar cookies in opened containers take an hour.

Cake batter may be frozen, but this is not recommended because the flavor and degree of

rising after freezing is unpredictable. Unfrosted baked cakes freeze the best. Frosted cakes tend to become soggy. Spice cake is the least satisfactory if stored over six weeks, because the spice flavors change in the freezer.

The frosting can be made ahead of time and frozen separately. Frostings and fillings made from uncooked confectioner's sugar and butter mixtures freeze well. Candy-type frostings are good if frozen no more than 3 to 4 weeks. (If you try to keep them frozen longer, they will crack.) Egg-based, boiled or brown sugar icings freeze poorly and become sticky or grainy when thawed.

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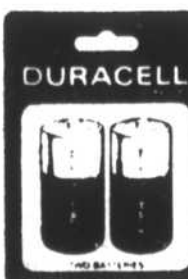
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