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The Columbus Dispatch
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"It's a grasp at immortality, if you will. Those collections will forever be identified with me."

TIM BERRA | Ohio State University ichthyologist

Berra's collection of 260 species of rare fishes has been adopted by the Smithsonian Institution.

LEFT TO RIGHT: smooth toad fish, estuarine stonefish and pouched lamprey

SMITHSONIAN INSTITUTION

A LEGACY PRESERVED

Smithsonian takes over OSU biologist's rare fishes collection

By Spencer Hunt | THE COLUMBUS DISPATCH

No roads lead to Tim Berra's favorite fishing spot on the Adelaide River.

The Ohio State University ichthyologist uses a small boat to get to the spot, 50 miles upstream in a remote section of Australia's Northern Territory.

It's a muddy, brackish stream known for dangerous tidal surges that can raise the water level as much as 20 feet during the dry season, when temperatures hover in the 90s.

Glyphis sharks glide through the water, but they are nothing compared with the crocodiles that can leap from the river and drag down unwary animals and, sometimes, people.

Uncomfortable? Yes. Dangerous. Most definitely.

But it's the only place on Earth where Berra can catch *Kurtis gulliveri*, or nurseryfish, a bizarre creature that uses a hook that juts from its forehead to carry

See **LEGACY** Page **G2**

Berra, and a glyphis shark, on the Adelaide River in northern Australia

COURTESY OF TIM BERRA

▶ To see a list of the fishes donated to the Smithsonian, go to Dispatch.com/science.

OUTLOOK | TRENDS SHAPING OUR WORLD

FAMILY DINNERS EAT AWAY AT DRUG ABUSE

Teenagers who have frequent family dinners are much less likely to drink alcohol and use drugs, the National Center on Addiction and Substance Abuse reports. It doesn't seem to matter what food is served, the researchers said; the value appears to be in the interaction and in the attention parents give their children. Teens who said they had family dinners but that there were distractions, such as cell phones, also had higher rates of substance abuse. Fifty-nine percent of teens said they have family dinners at least five times a week.

NATIONAL PARKS FUNDING URGED

The bipartisan National Parks Second Century Commission says spending on national parks should be increased by at least $700 million over the next several years. In addition, the panel urged President Barack Obama to appoint a panel to promote the 100th anniversary of the National Park Service in 2016. Interior Secretary Ken Salazar said Obama will seek $100 million more for the parks next fiscal year — in line with the group's request.

SAUDIS UNVEIL COED UNIVERSITY

Saudi Arabia has inaugurated its first fully integrated coed university, and its ruler, King Abdullah, declared the institution a "beacon of tolerance." The King Abdullah Science and Technology University, in Jeddah, breaks many of the country's social taboos by allowing men and women to take classes together.

INDIANS MAY SPUR TEXAS GAMBLING

The Chickasaw Nation of Oklahoma, which runs one of the biggest Indian casinos in the U.S. just across the Texas border, is poised to take possession of Lone Star Park, a bankrupt horse-racing track in Grand Prairie, Texas. Gambling proponents think that may prompt the legislature to alter the state's constitution to allow casino gambling.

AFRICA SETS GOAL FOR MALARIA FIGHT

Malaria kills an estimated 1 million people in Africa each year. The 20-member African Leaders Malaria Alliance hopes to eradicate nearly all malaria deaths by 2016. The overwhelming majority of victims are children younger than 5 and pregnant women. With an estimated 500 million annual cases, Africa accounts for 86 percent of all cases and 91 percent of all malaria deaths worldwide, President Jakaya Kikwete of Tanzania said. The international community has donated $3 billion to the project.

— From wire reports

THE INSIDE STORY

War-deaths coverage is tough duty

Our community buried two soldiers last weekend.

Both men were killed while on patrol in Baji, Iraq, when their vehicle was hit by an explosive.

The first funeral was on Friday for Staff Sgt. Shannon M. Smith. The second was on Saturday for Spc. Zachary T. Myers.

BENJAMIN J. MARRISON

If you read the stories about their funerals, you might have wondered why they seemed uneven — more details and better story-telling photos for one soldier than the other. I felt that way when I read them. This column will explain what happened.

Numerous troops from central Ohio have died in combat in the past few years, and we have tried to cover each the same. We seek to profile them, tell about their families, explain how the deaths occurred, and cover the funerals.

We do this for three reasons.

First, they are news.

Second, we feel an obligation to tell their stories. After all, they died in combat on behalf of the United States of America.

Third, years from now, when the widows or widowers tell their children and grandchildren about them, they can point to newspaper stories to help them understand. The pages will become keepsakes.

Sometimes, though, we face challenges in our effort to treat each the same. The funerals of Smith and Myers illustrate this.

We knew Smith's family was not keen on coverage of his death. The night his death became public, our phone call to the family home was not well-received.

Such reaction is understandable. It is difficult to imagine being in that position and having to deal with such grief, let alone the media. For the record, we dread contacting family members after a death. But it's the only way we can ensure accurate information and provide the community with a sense of what it has lost.

Because we still wanted to pay tribute to Smith, we planned to cover his funeral.

Aware of the sensitivity, reporter Dana Wilson contacted the funeral home to seek the family's consent. The funeral home cleared it, telling Wilson that we needed to be discreet and not interview the family.

Wilson and photographer Jonathan Quilter went to the service, but Quilter was barred entrance, as were television crews. Quilter found a position on a nearby road and waited with dozens of other people for the funeral procession.

Wilson sat down at the service and quietly took notes. She wrote a complimentary story about Smith and his 12-year military career. It contained little information about him personally — his hobbies, his talents, his joys — because it simply wasn't available to her.

Wilson was disappointed that her story about Smith didn't give readers the same level of detail that reporter Mike Wagner provided in his coverage of Myers' funeral.

The photos from Smith's funeral focused on the community: hundreds of flag-waving people standing along the road, saluting the soldier as the hearse passed by.

Coverage of Myers' funeral included photos from the service and details about Myers, including poignant messages that family and friends wrote to his young daughter so that she will better know her father. Wagner and photographer Courtney Hergesheimer captured the emotion of the day and the essence of a young man.

This column in no way suggests that the Smiths did anything wrong. We absolutely respect the right of any family to bar cameras from a service and limit media access. They lost a loved one and have the right to privacy.

The result of keeping the media away is that details about the man who died also remain private.

Benjamin J. Marrison is editor of The Dispatch. *You can read his blog at Dispatch.com/blogs.*

bmarrison@dispatch.com

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ON THE WEB
To read about the latest research, go to **Dispatch.com/science**

An ichthyologist's favorite fish tales

OSU biologist Tim Berra is at Charles Darwin University in Darwin, Australia, continuing his research. We asked him to send us his favorite fish stories.

Galaxias maculatus

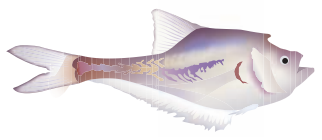
Many ichthyologists thought that its Southern Hemisphere distribution reflected continental drift — that the fish moved within the drifting continents.

However, I did some genetic experiments that showed gene flow to all the widely disjunctive populations. This species has a marine larval phase in which the oceanic currents transport the larvae around the world so that genes from the Australian populations end up in South American populations, thereby preventing the South American populations from becoming a separate species.

Galaxias vulgaris

I collected in nearly every river system of South Island in New Zealand. When the specimens were studied in detail, using molecular techniques, what was originally considered as one species was actually discovered to be five species that occupied different gene pools.

They are nearly impossible to tell apart by physically looking at them, but their genetics revealed that they did not interbreed.



***Kurtus gulliveri* (nurseryfish)**

This bizarre species of freshwater fish is found only in northern Australia and southern New Guinea. The males have a hook on their heads and carry the egg mass on these hooks like a bunch of grapes.

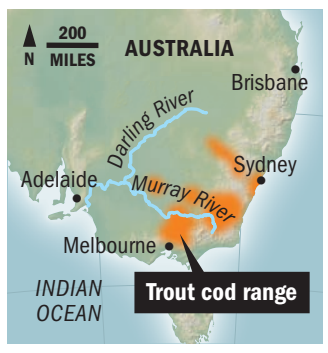
I am attempting to do DNA paternity analysis to show that the male carrying the egg mass is actually the genetic daddy of the embryos he is carrying.

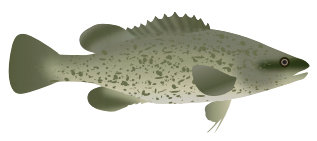
***Lepidogalaxias salamandroides* (salamanderfish)**

This fish, smaller than its scientific name, is found only in a limited coastal region of southwestern Australia in highly acid isolated, freshwater pools that dry out during the heat of summer. Fish need water. Where are they when the pools evaporate?

I received a clue during an unusual summer rain. A previously dry pool received 8 mm of rainfall overnight, and I caught fish when I pulled my net the next morning.

I began digging in the sand of dry pool bottoms and eventually found the fish sitting in damp sand on top of the water table, anywhere from an inch to 2 feet below the surface. I borrowed a firetruck from the local village and released 700 gallons of water. I caught fish immediately.





***Maccullochella macquariensis* (trout cod)**

This was my first Australian study. Murray cod is the most important game fish in Australia's largest river system.

It can get very large, nearly 200 pounds. Over the years, fishers have caught a smaller cod that looked a bit different. Some said it was a juvenile Murray cod, others said it was the female Murray cod.

After chasing this fish all over eastern Australia for 18 months, I had collected enough specimens to show that there were two species of cod — Murray cod and a trout cod.

Trout cod are an endangered species but are being breed in captivity and released to the wild. Had I not shown that they were a separate species, they might not have received help to survive.

LISA MERKLIN, TIM MEKO
DISPATCH GRAPHICS

***Prototroctes maraena* (Australian grayling)**

This freshwater fish occurs in southeastern Australia. There was no information on its life cycle when I began my studies.

By collecting in the Tambo River throughout the year, I was able to show that this species spawned during a one-week period in April in fresh water, and that the larvae are swept downstream where they grow for six months.

They then migrate back into the mid-reaches of the river. This species has a strange odor. I isolated the specific molecule from its skin using a gas chromatograph and mass spectrometer, and it turned out to be exactly the same chemical as in cucumbers.

LEGACY

FROM PAGE G1

its own eggs around like a bunch of grapes.

"I have made a career out of studying really weird fishes," said Berra, who is back in Australia to again cast his nets in the Adelaide.

• • •

During his 37 years of research, much of it spent in Australia, New Zealand, New Guinea and Chile, Berra has built an impressive collection of fishes.

This collection, pickled and preserved in ethanol-filled jars, grew over the years, filling up and taking over the shelves in his office and laboratory on the OSU-Mansfield campus.

But on Sept. 3, it disappeared. Berra donated the entire collection — 260 fish species — to the Smithsonian Institute.

He calls the decision "bittersweet." His collection might be gone, but his work will live on, providing other researchers a chance to study rare specimens.

"It's a grasp at immortality, if you will," said Berra, 66. "Those collections will forever be identified with me."

Officials at the Smithsonian's National Museum of Natural History consider the "Berra collections" a precious addition to the world's largest catalog of fishes.

The 4 million specimens cover more than 80 percent of the world's 28,000 known species. Berra's collection includes several species that are scarce among the Smithsonian's shelves.

• • •

Diane Pitassy, a Smithsonian biologist and museum specialist who traveled to Mansfield to catalog and transport Berra's fishes, points to the little-studied nurseryfish as an example.

"It is not necessarily a rare fish in the wild, but given its distribution in areas remote to the U.S., it is rare in our collection," Pitassy said. "In this case, we have less than 20 specimens of the species."

Berra's collection includes 17 jars of nurseryfish, each of which contains multiple specimens that are still being counted. Researchers will be able to borrow specimens in much the same way that they would take books out of a library.

"The ability to look at as many samples as possible is very important," Pitassy said. "It allows (biologists) to better assess variation within and between species."

The fishes are pickled in formaldehyde. After about a week, the specimens are washed and placed in a solution of about 70 percent ethanol.

"You store the specimen that way forever," Berra said. "I've borrowed things that were 150 years old, and they were still in good condition."

The Museum of Biological Diversity at Ohio State contains 1.5 million fishes representing 1,100 species. Most are, or were, found in Ohio and the Midwest.

"We're primarily a regional collection," said Marc Kibbey, associate curator of fishes.

That makes the Smithsonian a more logical home for the objects of Berra's studies. It's also a more prestigious institution to donate to, Kibbey said.

• • •

Many biologists want to discover and name new species of fishes, but Berra said he prefers to study known species that researchers know little about.

He has had 66 scientific papers on fishes published and has written five books about evolution and Charles Darwin. He split his time between research, field trips and lecturing at Ohio State from 1972 until he "retired" in 1995. He is currently a professor emeritus.

Berra has spent a total of seven years in Australia on research expeditions supported by Fulbright fellowships, the National Geographic Society, the Columbus Zoo and Aquarium and the Museum and Art Gallery of the Northern Territory in Australia.

Since his retirement, his work also has been supported by universities in New Zealand and Chile, where he worked as a visiting professor. The work is not cheap; it costs about $5,000 just to get to Australia, which has become a magnet for Berra.

"It's sort of the last frontier for scientific exploration on land and in water," Berra said. "It's been isolated as an island for well over 50 million years, maybe more like 80 million years.

"The critters there have evolved in isolation."

• • •

A good example is *Lepidogalaxias salamandroides*, or salamanderfish.

They are found in small, isolated pools that evaporate during the summer in southwestern Australia. When the water evaporates, the salamanderfish burrows into the dirt, where it stays alive in the submerged water table.

Berra dug out the fish to prove his theory, then borrowed a firetruck to fill the pool. When he did, the fish emerged.

"It was like *instant fish*," he said. "Just add water!"

But it's the nurseryfish that has garnered most of Berra's attention. Before Berra's, the most recent study of the fish was published in 1914.

Berra has had 10 papers on it published in the past eight years, providing the first modern and detailed analyses of its anatomy and feeding and breeding habits.

A 2002 study, published in *Environmental Biology of Fishes*, found that the skin around the hook is hardened and "stratified" to work like an adhesive. It keeps the eggs stuck to it as the fish swims about.

• • •

After the Smithsonian analyzes the collections, which includes some mammals, other researchers will be able to borrow the specimens.

Fish researchers study gills, fins and spines to compare the evolution of one species against those in the same fish families. Researchers also use CT and MRI scans to look at a fish's internal makeup, including organs and bone structure.

Because dissection isn't allowed, Berra knows things about nurseryfish that others won't, unless they, too, face down crocodiles and high tides.

"You can pan-fry them in a little butter and they're just wonderful," he said. "But I hate to eat my data."

shunt@dispatch.com

COURTESY OF TIM BERRA

Tim Berra

Age: 66

Hometown: Bellville, Ohio

Marital status: Married to Rita M. Berra

Education: Ph.D. in biology from Tulane University in 1969

Work history

- 1969-72: professor of biology, University of Papua New Guinea
- 1972-95: professor of evolution, ecology and organismal biology Ohio State University
- 1992: Visiting professor, University of Concepcion in Chile
- 1996: Visiting professor, University of Otago in New Zealand
- 2001 to present: Research associate, Museum and Art Gallery of the Northern Territory in Darwin, Australia

Research: Published 66 scientific papers and five books: *Charles Darwin: The Concise Story of an Extraordinary Man*, *Freshwater Fish Distribution*, *A Natural History of Australia*, *Evolution and the Myth of Creationism: a basic guide to the facts in the evolution debate*, *William Beebe: An Annotated Bibliography*

Other honors: Fulbright fellowships recipient: 1969, 1979, 2009

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BIOLOGY

Closing in on a genetic 'fountain of youth'

Humankind has long sought the "fountain of youth."

Recent research suggests its discovery might be close at hand, even while we try to grasp the possible costs of drinking from it.

STEVE RISSING

Physiologists have known for many years that drastically cutting calories eaten by test animals might extend their life span. The effect occurs in laboratory populations of mice and monkeys and controlled studies of humans.

Calories must be cut by 30 percent to 40 percent, or 800-plus calories for the average adult, before any effect occurs.

One hypothesis for this effect suggested it must occur through a large number of independently acting genes. Otherwise, if just a small number — or even a single gene — caused the effect, natural selection should be able to favor it.

Recently, however, biologists are finding that a single gene might indeed cause the effect. This finding is one of the many coming from the current revolution in gene sequencing.

This has brought us the Human Genome Project as well as the fly, worm and monkey genome projects, among others.

In the case of the restricted-calorie diet, comparisons of these genome projects provide two surprising insights. The diet effect seems to be controlled by very few genes or a even single gene, and the gene is equivalent in animals as different as mice and humans.

The gene, called sirt, controls the production of proteins called sirtuins in cells. Exactly how sirtuins work is unclear.

Biologists know sirtuins help control cellular energy reserves and that restricted-calorie diets activate them. A number of experimental drugs undergoing clinical tests also can activate them.

Those tests offer hope that we might someday administer sirtuin-activating drugs to patients who get the restricted-diet benefit without going on the restricted diet itself.

To some, this seems like a "fountain of youth," one that sprays gold. Indeed, GlaxoSmithKlein just purchased the company leading this research for $720 million.

How can we explain a single gene having so much effect on the lifespan of so many different animals? Shouldn't natural selection already have favored individuals with more active forms of this gene?

Demonstrating the existence of genetic variance *not* favored by natural selection in wild populations of plants and animals has become something of a cottage industry in biology.

Agricultural breeders excel in this, pushing the limits on the size of turkeys and the sugar content of corn beyond anything ever seen in nature. Now we learn that changes in the frequency of single genes also might extend longevity.

From an evolutionary perspective, however, life is a series of trade-offs. A gene associated with longevity in lab animals, but not increasing in a natural population, might carry some hidden cost not so easily recognized.

Geneticists won't even know to look for such costs until the gene is discovered and characterized. The sirt gene might well fall into this category.

The Human Genome Project, completed in 2001, has spurred discovery of genes such as sirt. Now that we know they exist and have learned some of their effects, we need to understand all of those effects — the benefits and the costs — before we plunge into the "fountain of youth" that they might promise.

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