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The Killifish Quarterly

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Editor
Charles A. Nunziata
6530 Burning Tree Dr.
Seminole, FL. 34647
33777-4615
727-393-3757
epiplaty
@tampabay.rr.com

Treasurer:
Hugh Moore
7440 Mariana Drive
Sarasota, FL. 34231
941-924-4271
hughm@comcast.net

Secretary
Brian Skidmore
11915 Sugar Tree Dr.
Tampa, FL. 33625
813-269-0553
ichthyskid@cs.com

Internet Services
Meeting Notice
Species Maintenance
Mike Jacobs
518 63rd. Ave. S.
St. Petersburg, FL. 33705
727-867-6140
mjacob2@
tampabay.rr.com

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Editor's Notes:

Welcome to the second quarter 2012 SKS journal. We continue behind schedule by some six months. And after multiple promises to catch up, we will just leave it as a commitment to catch up as best we can in 2013.

In a new feature, we start off with a short introduction to one of our out of state members, Gary Pack, a generous friend and colleague of the SKS. The SKS is blessed with several out of state members who add richness and diversity to our club. Look for more member profiles like this in upcoming issues.

There follows a continuation of an ongoing discussion about the use of salt in the killifish aquarium. And although this discussion will continue for years to come, we fill in a few of the blanks with respect to perceived advantages and disadvantages. For the detractors, there are some myths exploded and for the adherents, a bit of justification, but only in specific circumstances. Given the principal of "all things in moderation", it appears that the use of small amounts of salt neither helps nor hurts very much. However, adding large quantities is never justified.

An except is included from the newsletter of the Blue Gularis Study Group, recently inaugurated by the A.K.A. Killifish Conservation Committee, featuring the various populations of this most magnificent species. Regrettably, none of the wild populations were reported in the recent survey of A.K.A. members, and although this des not mean that they do not exist at all, they are undoubtedly rare and potentially endangered in the U.S. hobby. The danger to the long term survival of Blue Gularis populations in the wild is also highlighted, and supported by a summary of a 2010 article on oil pollution in Nigeria.

We have added a few summaries of recent conversations among SKS members, a lively group that is prone to extended chatter about all aspects of the hobby. The first of these discusses the use of hot packs for shipping fish, an appropriate topic for the winter months. The second recounts an interchange about the fish we caught during our recent collecting trip to the Florida panhandle and Mobile Bay, Alabama.

Dubbed the "Mystery at Fort Morgan", the details are not nearly as dramatic as the title implies. It relates to the challenge that fish identifications in the field always present, even for the most experienced among us.

Chas

Contents

Photos: Mark Binkley, Francisco Falcon, Peter McGuire, NANFA archives, Gary Pack, Tony Terceira, www.killiclubdefrance.org. Jui -Pin Paul Wu

Maps and Graphics: Charlie Nunziata

Titles are hyperlinked to each article. Place cursor on the title, press the CTL key and left click the mouse.

Gary Pack — A Midwest member

Quoting Mike Jacobs: "I will tell you from experience, my growing up in Indiana for 25 years, that watching farmers work, is unreal."

Well Gary Pack, one of our out-of- state members is a farmer and a very successful one at that. He also can raise some excellent killifish as evidenced by the many awards he won at the 2012 A.K.A. In fact, he won so many awards at the last convention that we were going to get him a chair next to the podium.

Ever generous, Gary sent some of those beautiful killies for our September auction. More importantly, he also sent a batch of wonderful and delicious corn from his farm. The prized food was carefully prepared by Mike and Lydia Jacobs for our members, and each of us thoroughly enjoyed the unusual meeting treat.

Mike reports: "Gary was on a well deserved vacation during the week of our meeting. The corn is done for the year and it's almost too cold in the northern states to fish, but it's perfect Musky catching weather in Northern Wisconsin. He told me the same thing last year, but sent a great picture this year.

That folks, is a Musky. They say it takes 5,000 casts to get a Musky to hit a lure. I don't know the truth in that statement but that's what they say. I think that fish will take 1st. place in the "Any Native Fish Class" at the next AKA convention."

Obviously, Gary is pretty good at catching fish as well as raising them. Perhaps someday we will get Gary down to Florida to catch the little guys we go after. No 5,000 casts for them, just a good pair of shoes.

Thanks Gary from your SKS brothers and sisters. You made our September 2012 meeting a special one.

Ed: Gary is one of several out of state members of the SKS, making our club an truly national enterprise. Thanks to you all for your continued support.

Above: Gary Pack and his prized catch.
Mid: Irrigating the corn. Below: Looks like a giant hose spooler. All photos supplied by Gary Pack

Salt in the Killifish Aquarium

Charlie Nunziata

Some time ago, SKS member Mike Jacobs discussed the issue of using salt in the killifish aquarium. It is common practice among many killifish hobbyists to add varying quantities of de-ionized salt directly to the aquarium when changing water. This is done for a number of reasons, the validity of which is the subject of this article. These include the prevention of *Oödinium* , colloquially known as "Velvet disease", a disease that has terrorized the killifish hobby for many decades. In addition, it is thought that salt also reduces bacterial counts and therefore can be used therapeutically as an element of normal killifish maintenance. Lastly, when used with fry, the added salt is thought to keep the newly hatched Artemia alive significantly longer, resulting a continuous source of live food during the critical first few days of life.

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Let's first examine these assertions individually:

Salt as an anti-bacterial agent:
Although salt is lethal to some bacteria and essential to the life of others, it does reduce populations of bacteria commonly found in aquariums. A salt solution is hyper-osmotic to these bacteria, and through osmosis, will cause the bacteria cell to excrete all of it's water in an attempt to equalize the solution, thus causing the cell to die. As a result, salt is marketed as an anti-bacterial agent.

As a temporary bactericide, especially in the confines of a small hatching container, a trace of salt would appear to be beneficial. If proper maintenance regimes are observed, primarily regular water changes, bacterial counts in the aquarium should remain below problematic levels without the addition of salt.

The use of salt in many commercial fish stores is most likely a reactive attempt to match the high doses used by their wholesalers. Some chain stores put a container of salt in each aquarium, regardless of the species. That of course presents the buyer with the problem or reconditioning the fish to the less salty environment of their home aquarium. These hobbyists are largely unaware of the issues in play and do not match the salt content in the store water before introducing fish. As a result, losses are common some weeks later, and these unexplained losses often discourage new hobbyist.

Disease Control and the dinoflagellate *Oödinium*
Quoting the website:
www.practicalfishkeeping.co.uk/

"Salt has been used for decades as a cheap and effective treatment against many diseases, particularly protozoan infections on pond fish such as *Chilodonella*, *Trichodina* and *Costia,* but also some other pathogens, such as gill and skin flukes." And "…. some old school methods claim light and salt will treat and cure velvet, this has been proven false along with the assumption that it is a parasitic algae. This parasite is more resistant to higher salt levels than ich, *Ichthyophthirius multifilis.* [It] uses chloroplast to produce nutrients via chlorophyll and light when a host is not available or to supplement nutrients derived from the host." Chloroplasts are organelles, a specialized subunit within a cell, that conducts photosynthesis. Chloroplasts capture light energy, then stores and uses it via photosynthesis. The conclusion drawn here is that salt in moderate quantities and light alone will not kill *Oodinium*. In the article, "Velvet - Oodinium pilularis, By Shirlie Sharpe, http://freshaquarium.about.com/cs/disease/p/velvet.htm, the role of salt is simply to ease the labored breathing caused by destruction of gill tissue by the parasite, and not as a treatment for the parasite itself.

Keeping newly hatched Artemia alive longer:
An obvious conclusion since Artemia is a salt water creature. Commonly, when salt is added to the fry rearing tank, it will extend the life of newly hatched brine shrimp, the preferred food for rearing young killifish considerably, allowing fry to feed almost continuously, promoting growth, and reducing contamination.

For the killifish hobbyist, the use of salt in appropriate situations can be of value, but it is unlikely to be beneficial when used in large quantities of in small quantities for long periods of time. Positions taken by hobbyists however run the gamut from those who never use salt at all, to those who add substantial amounts. Most hobbyists who do add salt as a common practice when changing water, do so in very small amounts, barely changing if at all the conductivity of the tank. Their successes over the years would imply, anecdotally, that such practice does not produce salt levels in their tanks that materially stress fish.

There is a school of hobbyists that add substantial amounts of salt at each water change, and in addition to continuously stressing the fish, these relatively large additions of salt can cause problems when transferring fish to tanks with low salt content.

Lastly, some people over time graduate from a adding a few pinches of salt when changing water to larger and larger quantities, eventually reaching unhealthy conditions.

It is always recommended to test the conductivity of the water new fish arrive in, and make appropriate adjustments to bring the new arrivals slowly to your water conditions. A good conductivity meter is essential to the conditioning process, so invest in one that is accurate and will last.

The question ultimately is whether too much salt in the water of freshwater fishes negatively impacts the efficiency of the osmoregulation process. In a simple definition, osmoregulation is the process by which fish maintain a balance between salt and other mineral levels within and outside their bodies.

The process is based on osmosis; the ability of certain dissolved materials to pass through a semi-permeable membrane, from a mineral-rich fluid present on one side to a less mineral-rich fluid present on the other side. The minerals from the stronger fluid will pass through the membrane until fluids on each side of the membrane are bal-

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anced.

The skin of freshwater fish acts as a semi-permeable membrane, and will pass minerals from the higher content side, typically the higher salt content internal fluids of the fish, to the surrounding water, which typically has a much lower salt level. Actually, the difference in levels is best kept quite high for the health of the fish so that osmosis is almost always from the body of the fish into the surrounding water. Materially increasing the salt content of the surrounding water alters the efficacy of this process, potentially causing problems especially if the result is higher than normal residual salt in the tissues of the fish.

On the other hand, certain minimum salt levels are necessary to carrying on many body processes, so the loss of salt through the skin must be replenished by the fish. Replacement salt must be taken in from the surrounding water. The gill is the structure in the osmoregulation process that accomplishes that. Its specialized tissues have the ability to secrete, absorb, transport and exchange gases and solutions, regulate ions, balance the acid-base relationship and excrete waste.

The excess water taken in by the fish and its waste toxins are expelled through urination. Fish urinate copious amounts in order to properly maintain the process in balance. There is a cascading effect as osmoregulation tends to not work so well when the fish are stressed or diseased. For example, the fish find it difficult to get sufficient salts from the water and may have problems getting rid of their excess water if their osmoregulation system is compromised. Respiration typically increases to bring in more water and the salt in it. That is why diseased fish often appear to “breathe” rapidly.

Countering this issue is the basis for the therapeutic use of aquarium salts. Adding salt to the water when fish are stressed increases their salt intake in each respiration, making it easier for them to maintain the higher salt levels their bodies require. The principle is much the same as a saline drip for hospital patients.

When the addition of salt to the aquarium becomes dangerous is determined more by the degree of change from one level of conductivity to another than to the overall salt level itself. It is exposure to radically different salt levels that can result in osmotic stress, or worse, osmotic shock.

Stress is described as an internal hormonal response caused by external factors that forces the fish to move out of its normal state, so that internal resources are redirected to regain normal equilibrium. Osmotic stress is the stress induced in a fish trying to compensate for any dysfunction.

Physically, it is the permeability of the mucous membranes, that if eroded or otherwise damaged, allows infections to arise. Contaminated water, radically different water chemistry, and injury to the skin or gills can all upset the balance and rate of exchange across the membrane. Consequently. levels of cortisol, a stress hormone, rises throughout the fish, affecting all its life functions including reducing its resistance to disease.

Osmotic stress occurs when a fish is gradually exposed to mineral levels in their water which are too high or too low for the species. Irregular water changes for example, can gradually change water chemistry over time. Osmotic shock is a severe form of osmotic stress and results when these changes are sudden and severe. The osmoregulation process can deteriorate rapidly, and in the extreme, the flexibility of cartilaginous structures can be damaged, disabling body structures and even fracturing fins. Severe infections and death often result.

The most susceptible species are those that evolved or have adapted to live in high mineral environments. These species, when subjected to low mineral conditions experience significant disruptions to the osmoregulation process because of the differential in osmotic pressure across the membranes.

For reasons that are beyond the scope of this short article, species evolved in low mineral content water appear much more able to withstand changes to high mineral water without the same level of osmoregulation disruption. This is the basis of the common notion that it is less dangerous to move fish from low to high density conditions.

Given the conflicting issues raised, the use of salt in the killifish aquarium does not appear to have many benefits other than to keep brine shrimp alive longer, and the nominal ability to reduce certain bacterial counts. However, high levels of salt will present problems when moving killifish to much lower density water as stress will certainly occur. In the extreme, osmotic shock, often fatal and always damaging to the fish, may occur as well.

Historically, many successful killifish hobbyists have added small amounts of salt to their aquariums without apparent harm. So the controversy will no doubt continue. Some have gone overboard however, making testing a prudent necessity. Adding a note about your conductivity to the shipment would be good practice for everyone. It would forearm potential recipients to any potential conditioning issue, a good thing for all concerned.

Blue Gularis Locations

Charlie Nunziata: Excerpted from the Blue Gularis Newsletter, (1:1) November, 2012

Blue Gularis Populations

The wild populations strains listed in killifish literature include:

From Cameroon: Fungé, Loé and Ndian River.

From Nigeria: Lagos, Sapele, Warri, Niger Delta, Port Harcourt.

Although listed as a species of least concern by the IUCN, it is likely that specific and perhaps distinct populations of *Fundulopanchax sjoestedti* are threatened by the political and, economic and environmental issues in the countries where they are found. See the following article on pollution in Nigeria.

In addition to the known populations that are now or were once in the killifish hobby, there are two mixed strains of *Fundulopanchax sjoestedti* . The mixed strains include the common aquarium strain in the U.S., and the so-called "U.S.A. Blue, or the shorter "Blue" strain seen in European listings.

There are also several commercial importations, designated as "CIxx", "CI" for commercial import, and the "xx", usually the code for the date of importation. These are virtually impossible to track down as they are commonly mixed with the available aquarium strains.

Lastly, we have enigmatic Dwarf Red Gularis, a population of what appears to be a distinct species of unknown origin. According to an early JAKA article by Al Mikkelsen, "The first small or dwarf red Gularis were brought into this country by Ron Jue in 1969." The Study Group is attempting to gather additional information about the origins of this form.

Aquarium Strain Defined: For our purposes, we define an aquarium strain as a species that consists of two or more distinct populations, or a group whose lineage cannot be reliably determined. Early importations into the U.S. were not isolated, regardless of whether locations were actually known at the time. And each additional importation was simply mixed with the population then in the hobby. This continued mixing resulted in the total loss of population identities, even in the unlikely event that they were ever known.

The Study Group assumes that there are at least two common aquarium strains, and a high probability that there are many more. In fact, populations in Europe, South America and Asia may be combinations of different populations, or the same populations in different proportions. This is a knot that cannot be untied.

Selective Breeding: Exceptions occur when a species is isolated and fixed to breed true so that it acquires its own designation. We see most often when selective breeding produces a fixed color variety. Among *Fp. sjoestedti* for example, there have been claims of an Orange and Red forms, the latter most often applied to the Dwarf Red species.

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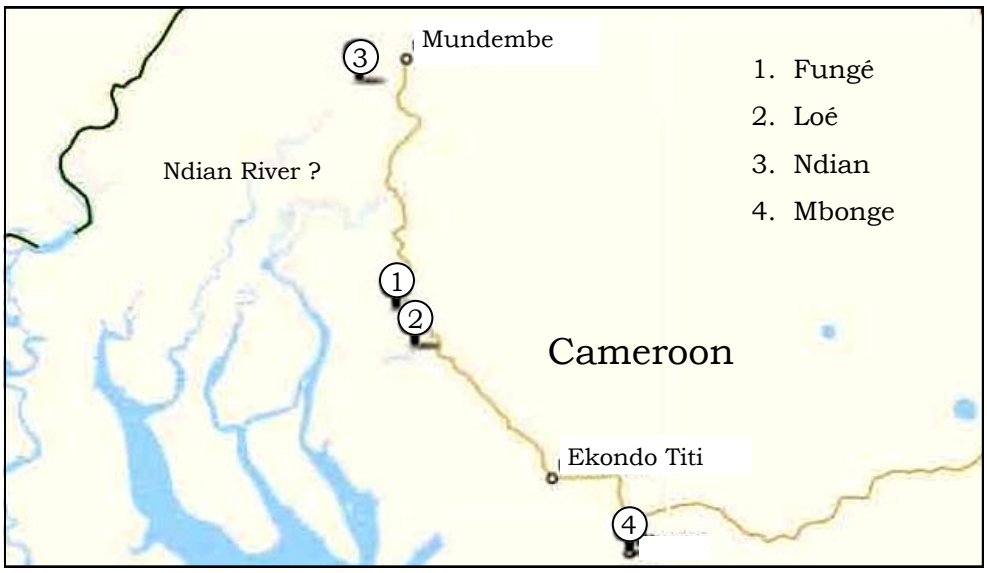

The issue of population names found in literature is important. Some may not be valid, or do not accurately represent a known population. Valid or not, until definitively known, populations must not be mixed.

The aquarium strains and the various populations are reviewed, but commercial imports and color varieties are not included due to lack of reliable source information. Likewise, color forms need to be demonstrated as fixed before inclusion.

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But it is not at all certain whether such color varieties continue to exist and if they do, whether they have been kept pure and reproducible. For the time being, the Blue Gularis Study Group does not consider color varieties as part of KCC maintenance program.

There have been very few importations over the years and that situation is unlikely to change, at least in the short term. Unfortunately a recent availability study confirms that the new populations that have come through the U.S. hobby have on balance not been successfully integrated. This is confirmed by a recent survey of A.K.A. members where only the aquarium strains and the Dwarf Red Gularis were reported. And although this does not necessarily mean that the wild populations are no longer in the American hobby, If they do, they are undoubtedly rare.

The two recognized aquarium strains in the U.S., are the common aquarium strain, and the European-based aquarium strain known as “USA Blue”, sometimes truncated simply to “Blue”. This designation has been appearing on internet sites and in European listings. Anecdotally, it is said that a shipment of the American aquarium strain was sent to France back in the 1980’s and has since been isolated as a distinct strain in Europe.

If this is true, then it would represent the aquarium stain that existed in the U.S. during that period, and if kept isolated, would be different than the aquarium strain we now have. We assume that our domestic populations have gone through an additional 30 years of mixing, and now most likely include populations that were not available in the 1980’s. All conjecture of course.

Cameroon: [See map] The three known locations in Cameroon are located fairly close to each other. The towns of Fungé and Loé are less than 10 kilometers apart, and the Ndian River is located some distance North of those towns. The Langton “Wild Collections of Killifish,1950-2003 includes a 1981 collection near Fungé, between Ndian and Mbonge, a rather large area as shown on the map.

The Loé and Fungé populations appear quite different from the Nigerian populations; see photos on page 9. Although photos are notoriously unreliable for purposes of identification, the differences these photos appear to present are significant enough to warrant further discussion.

The location of the Ndian River, a designation that has appeared in literature, could not be specifically identified although it is expected to be the river that flows near the town of Ndian. Photos of the Ndian River population could likewise not be located, however the type local for the species is “a rivulet near to the waterfall of the Ndian River, western Cameroon.” The Ndian River population, may in fact be the nominal species. Additional work will be required to confirm these observations.

Nigeria: The Nigerian forms are all located in the southern part of the country and in an arc from Lagos near the sea and inland through Sapele, Warri, to Port Harcourt, all on the vast Niger Delta.

It is likely that this enormous range may well harbor more populations, and the multiple collecting sites noted in the IUCN listing supports that notion. Note that aside from Lagos, all the other populations are on or in the vicinity of the Niger Delta, an enormous expanse that terminates the Niger River at the Atlantic.

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It is defined by the Nigerian government as extending over approximately 70,000 km², making up 7.5% of Nigeria's land mass. Obviously, any population designated as the "Niger Delta" is too imprecise to be definitive.

Port Harcourt: Port Harcourt is located at the center of the Niger Delta region, and on the Bonny River. The site referenced in Fishbase is located within the city proper, but there are numerous water resources in the immediate area that no doubt hold populations of Blue Gularis as well.

Warri: Warri is on the banks of the Niger Delta and is a major port and oil refinery region. The pollution from inappropriate oil related operations have been reported as particularly problematic in this region, but there is precious little information on its impact specifically on Blue Gularis populations.

Sapele is an export port city on the Niger Delta, and on the Benin River just below the confluence of the Ethiope River and Jamieson River. This is not the region noted in the Fishbase Ouémé River, reference, but is rather a great distance from that river which defines the border between Nigeria and Benin. The reported Sapele region oil contamination comes primarily from faulty pipelines and has already killed a large quantity of aquatic life in the Ethiope river.

Lagos: Lagos is a major city, largest in Nigeria and the second largest in Africa. As in the Niger Delta reference, the general term "Lagos" is difficult to pin down as a particular population. It sits on islands in the Lagos Lagoon, and on the adjacent mainland. It is not part geologically of the Niger Delta region and lies quite a distance from that feature.

Oil pipelines in the region largely account for petrochemical pollution. As a major port, commercial tropical fish exports are big business, with many dealers operating in the Lagos region, several of which advertise killies. But it is unlikely that these exports are local catches, making any "Lagos" designation suspect.

The overarching problem of oil contamination does not bode well for the long term prospects of fish populations in the southern tier of Nigeria. In addition to Blue Gularis, other killifish in the Niger Delta and vicinity include *Fp. arnoldi, Fp. gularis, Fp. filamentosus, Fp. powelli, and Fp. spoorenbergi,* all of whom are negatively impacted. See the following article summary for a better understanding of how serious the problem of oil contamination can be.

Nigerian Oil Pollution: A Cautionary Tale

Charlie Nunziata

Ed: The enormous precautions the United States and other countries take in the safe extraction of oil and gas is well known. But even with the policy of clean production and the highly safe technologies we employ, we nonetheless experience the occasional spill, resulting in further efforts to improve our techniques. Other countries, both modern and developing, do not hold pollution, and the damage it can do to fragile habitats, in high regard. Policies are weak or non-existent, and corruption in high offices rules the process.

Damage to the overall environment and the fragile ecosystems in which our killifish live has and will continue to affect our ability to secure wild specimens. As the habitats decline, so will the importations and with no overarching ethic to conserve in these countries, many species will decline and some will certainly be lost.

The Blue Gularis stands as a poster child for this problem because it is primarily found in Nigeria, perhaps the country with the worst ecological history, and one steeped in corruption that has put their environment and people at risk.

The summary of an article that appeared in 2010 illustrates how these practices can affect the prime habitats of killifish, and in this particular case, the Blue Gularis. Of course, the specific spill reported is not traceable to specific Blue Gularis populations. It does however imply the general overarching disregard for aquatic as well as terrestrial environments, and supports the urgency we believe is warranted in conserving this species in the hobby. We have used portions of this article to illustrate the point. To manage the size of this article, passages that do not relate to our interest in this issue were eliminated. For the full article, see:

http://www.guardian.co.uk/world/2010/may/30/oil-spills-nigeria-niger-delta-shell

Nigeria's agony dwarfs the Gulf oil spill.

John Vidal, The Observer, Saturday, 29 May, 2010

The Deepwater Horizon disaster caused headlines around the world, yet the people who live in the Niger delta have had to live with environmental catastrophes for decades.

We reached the edge of the oil spill near the Nigerian village of Otuegwe after a long hike through cassava plantations. Ahead of us lay swamp. We waded into the warm tropical water and began swimming, cameras and notebooks held above our heads. We could smell the oil long before we saw it

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– the stench of garage forecourts and rotting vegetation hanging thickly in the air.

The farther we travelled, the more nauseous it became. Soon we were swimming in pools of light Nigerian crude, the best-quality oil in the world. One of the many hundreds of 40-year-old pipelines that crisscross the Niger delta had corroded and spewed oil for several months.

Forest and farmland were now covered in a sheen of greasy oil. Drinking wells were polluted and people were distraught. No one knew how much oil had leaked. "We lost our nets, huts and fishing pots," said Chief Promise, village leader of Otuegwe and our guide. "This is where we fished and farmed. We have lost our forest. We told Shell of the spill within days, but they did nothing for six months."

That was the Niger delta a few years ago, where, according to Nigerian academics, writers and environment groups, oil companies have acted with such impunity and recklessness that much of the region has been devastated by leaks. In fact, more oil is spilled from the delta's network of terminals, pipes, pumping stations and oil platforms every year than has been lost in the Gulf of Mexico.

On 1 May this year a ruptured ExxonMobil pipeline in the state of Akwa Ibom spilled more than a million gallons into the delta over seven days before the leak was stopped. Within days of the Ibeno spill, thousands of barrels of oil were spilled when the nearby Shell Trans Niger pipeline was attacked by rebels. A few days after that, a large oil slick was found floating on Lake Adibawa in Bayelsa state and another in Ogoniland.

With 606 oilfields, the Niger delta supplies 40% of all the crude the United States imports and is the world capital of oil pollution. The situation is now worse than it was 30 years ago. Nothing is changing.

It is impossible to know how much oil is spilled in the Niger delta each year because the companies and the government keep that secret. However, two major independent investigations over the past four years suggest that as much is spilled at sea, in the swamps and on land every year as has been lost in the Gulf of Mexico so far.

One report calculated in 2006 that 50 times the pollution unleashed in the Exxon Valdez tanker disaster in Alaska has been spilled in the delta over the past half century. There were more than 7,000 spills between 1970 and 2000, and 2,000 official major spillages sites, with thousands of smaller ones still waiting to be cleared up.

Shell, which works in partnership with the Nigerian government in the delta, says that 98% of all its oil spills are caused by vandalism, theft or sabotage by militants and only a minimal amount by deteriorating infrastructure. These claims are hotly disputed by communities and environmental watchdog groups. What is certain is that the scale of the pollution is mind-boggling. Oil spills and the dumping of oil into waterways have become common due to the lack of laws and enforcement measures within the existing political regime.

Worse may be to come. One industry insider, who asked not to be named, said: "Major spills are likely to increase in the coming years as the industry strives to extract oil from increasingly remote and difficult terrains. Future supplies will be offshore, deeper and harder to work. When things go wrong, it will be harder to respond."

Ed: All this does not bode well for our killifish which often lie in regions of the world where the irresponsible extraction of natural resources can and will affect long term survival and availability. This all heightens the need to conserve what we have, it may be all we have in the future.

SKS

An oil-soaked field in the Niger Delta above, and a contaminated stream habitat, near Port Harcourt below.

Photos of various Blue Gularis populations

Fp. sjoestedti Fungé www.killiclubdefrance.org

Fp. sjoestedti Loé Peter McGuire

Dwarf Red Gularis Francisco Falcon

Fp. sjoestedti USA Blue Photographer unknown

Fp. sjoestedti U.S. Aquarium Strain Tony Terceira

Fp. sjoestedti Warri Peter McGuire

Fp. sjoestedti Niger Delta Jui-Pin Paul Wu

Fp. sjoestedti Sapele Photographer unknown

Heat Packs and Breather Bags
An SKS E-Mail Discussion

There follows a summary of e-mail interchanges between members of the SKS regarding the use of heat packs and fish shipments in breather bags.

Joe Scanlan, (Alabama) posed a question to SKS members that asks whether it is safe to ship fish in breather bags along with oxygen operating heat packs used to keep the shipment warm in cold weather. He also requested a source for the recommended packs.

Tony Terceira, (Rhode Island) responds that he has used heat packs with breathable bags without problems. "I generally tape the heat pack in the top of the shipping box, cover it with a few layers of paper towel. There are 60 hr. packs available at www.kensfish.com".

Tony notes that he seldom ships Priority in the winter from New England. "I go to Wal Mart and buy the 24 hour hand warmers. I suppose they are in most sporting goods stores, and use those. I am not shipping fish that really need a constant temperature above 74°F, so they work quite well."

Joe Scanlan: "Thanks Tony. I am shipping Nothos to NY and my real concern is that these heat packs will cook them; I have a really well insulated styro box. My other concern of course is that [the heat packs] will use up all the oxygen and the fish will suffocate. So either I cook them or suffocate them. Maybe I should use a standard thin walled box? In either case it will be a new adventure for me."

Mike Jacobs joined the conversation:

He relates that he too has shipped in the winter with heat packs, but did not consider the expiration time of the pack; typically 24, 36, 48 and 72 hours unless he thought the shipment would take several days to reach its destination.

"Having said that, one day many years ago I had 2 heat packs left over and I started thinking that the one brand I had used felt hotter than the other brand. I opened and activated them. One did get much hotter than the other; the hotter one was shorter-lived."

Mike provided some product data he obtained from Joe Vargas, a noted cichlid breeder who often ships large quantities of fish:

<u>Heat Packs:</u>

Little Hotties 18 hour Hand & Body Warmer, states 135°F. average temperature.

Grabber Mycoal 24+ hour Ultra Warmer, states 124°F. average temperature.

American Pioneer International, 30+ hour UniHeat, states 100°F. average temperature.

He notes that pattern whereas the lower the average temperature, the longer the pack lasts, and recommends the 72 hour unit because it never gets the container hot enough to damage the fish.

Mike states that "I too got away using other packs 90% of the time when I was shipping. Now that Joe V. has done the research I would never send a shipment knowing that the 18-24 hour heat packs get to 124-135 F. Spend the extra $1 or $2 for the longer lasting pack."

Everyone agrees that it is best to tape the heat pack to the top of the Styro and put something between the heat pack and the fish, 2 to 5 layers of paper is said to be sufficient.

Tony wraps it up:

He states that www.kensfish.com sells heat packs that do not generate high heat. The brand, Uniheat is listed for use in sending fish and other animals.

"Price at Ken's as I recall are pretty cheap, I think $1.65 for 72 hours, and he has many sizes."

Words or wisdom from your SKS members to those planning to ship to the frigid North this winter. In the bad old days, winter shipping was always problematical.

In fact, the A.K.A. Code of Ethics, paragraph 4, states that the seller does not guarantee live shipment between November and March. Shipments during those months is completely at the risk of the buyer unless otherwise arranged between the parties.

Reference: www.uniheatpack.com/

SKS

Mystery at Fort Morgan

Reported by Charlie Nunziata

After the recent "Fall Fling" collecting trip, a few of the SKS members discussed the collection from Fort Morgan, a barrier island of Mobile Bay, Alabama. This site is on open water and tidal. The area between the road and the shore floods either regularly during tides or periodically when the tides are higher than normal. Several small salt water pools remain among the sharp and thorny vegetation; some isolated, and some with direct connection to the main body.

We caught a number of species at this site, and a few weeks after, several members engaged in a discussion as to what we had found. There follows a summary of those discussions and the conclusions finally drawn by the group. The participants included Ken Normandin, Dr. Joe Scanlan, Doug Stuber and Charlie Nunziata. The two main questions that arose were whether we collected *Fundulus jenkinsi* or *Floridichthys carpio* at this site.

Background: Joe Scanlan, the only member of the team that had an intimate knowledge of this region, had noted that he had never caught either *F. jenkinsi* or *Floridichthys carpio* at this site, and that the most likely place to find *F. jenkinsi* is on Dauphine Island, located slightly to the west across the mouth of the bay.

Fundulus jenkinsi: A *Fundulus* was found by Ken Normandin in one of the isolated pools, and although small and difficult to identify in the field, we hoped that it might be the elusive *Fundulus jenkinsi.* Joe and ken took these fish home and Joe later posed the identification question.

Those participating examined the public record including the internet photos and several book references. After Ken examined his specimens, he stated that several showed well defined dark bars on the body, a characteristic shared by both *F. jenkinsi* and *F. pulverous*, a *Fundulus* also found in this region. Ken also noted that some specimens showed a spot on the dorsal and were most likely *F. pulvereus.* Joe agreed and suspected that he had 4 *F. pulvereus* and perhaps one young *F. grandis,* and, unfortunately, no *F. jenkinsi.*

I chimed in with the opinion that it might be better to look at body morphology rather than body patterns which tend to vary with condition, size and the examiner's perception.

The drawings by Joe Tomelleri that appear in Fishes of Alabama, Boschung and Mayden, 2004,

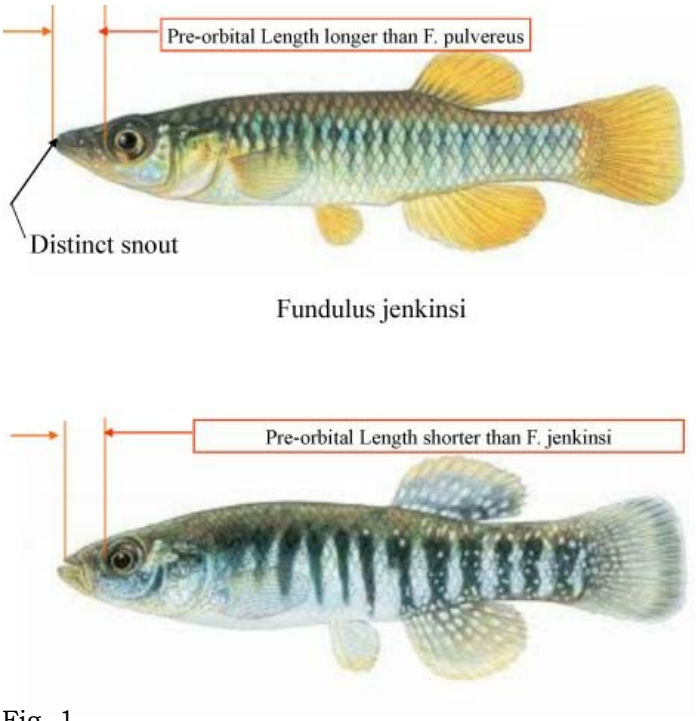

Fig. 1.

Continued on page 13.

Mystery continued from page 12.

Smithsonian Inst. should make the identification process easier. The most striking morphological characteristic I saw in these renderings is the shape of the head and jaw. The upper jaw of *F. pulvereus* is much shorter than the bottom jaw, with the lower jaw protruding and slightly curving up to form the front of the fish. The upper jaw of *F. jenkinsi* is nearly as long as the upper jaw and meets it, forming a distinct snout. Although I didn't look it up, I'm sure the pre-orbital length, the distance from the forward edge of the eye socket to the end of the upper jaw is much greater in *F. jenkinsi* than it is in *F. pulvereus.* This characteristic should be noticeable in the live fish when viewed in profile. See Fig. 1.

Quoting Joe, "The more I look the more I see. Also note the flat nose appearance to *F. jenkinsii.* Today I have some fair photos that confirm that I have to look elsewhere if we are to find *F. jenkinsi.* Ken thinks that the pictures I sent represent 1 male *F. pulvereus* and a female! He may be correct as I have seen no pictures of female *F. pulvereus*. Then I have 4 females and should be able to get some eggs. For the record, the fish we collected out of the mud at Fort Morgan is *Fundulus pulvereus*. It was great while the dream of catching *F. jenkinsi* lasted. I am determined to make a trip to Dauphin Island soon to look for them." Of course, Doug Stuber immediately volunteered another trip to go get them.

Floridichthys carpio: Joe had advised the group that he had never caught *Flor. carpio* at Fort Morgan, so the mystery was more related to why that was so since the habitat is similar to that of Tampa Bay were the species is common, and Mobile Bay is clearly within this specie's range. In literature, *Flor. carpio* is listed from southeastern Florida through the Gulf of Mexico to the Yucatan and Honduras. The recognized subspecies, *Flor. carpio polyommus* is thought to range from the coastal habitats of the Yucatan Peninsula and south.

The collected specimens were small and stressed in the field, basically showing an overall silver color with very faded markings. After getting them home however, it was quickly evident that the species we caught were *Cyprinodon variegatus*. And although the differences between the species is evident after more than a causal glance, misidentification between *Cyp. variegatus* and *Flor. carpio*, is not unknown, especially in young, uncolored fish.

The website of the Smithsonian Marine Station at Fort Pierce, http://www.sms.si.edu/irlspec/florid_carpio.htm makes a point of this; *"Floridichthys carpio*, are characterized by a single, spineless dorsal fin, abdominal pelvic fins, squared or rounded caudal fin and a scaly head. The body of *F. carpio* is short, deep and chubby, with convex dorsal profile (Robins & Ray 1986). Darker irregular bands are present on the lower sides, and the lack of a dark spot at the base of the first dorsal fin ray differentiates this killifish from similar species. It may be mistaken for the sheepshead minnow, *Cyprinodon variegatus*. This species is similar in shape and coloration, and may be found inhabiting the same areas as *F. carpio*. The dorsal surface of *C. variegatus* is less concave, and the irregular dark bands extend over most of the side (Robins & Ray 1986). A dark spot is present at the base of the first dorsal fin ray, which is especially prominent in young individuals. Males have a dark edged caudal fin, and females have an ocellus, or eyespot, on the rear of the dorsal fin. At a maximum length of 7.5 cm, sheepshead minnows also grow slightly larger than goldspotted killifish."

Definitively, when viewed in profile, *Flor. carpio* is convex between the dorsal insertion and the head, while Cyp. variegatus is concave in this region.

As to the reason for not catching this species at the shore in Fort Morgan, I noted that we never caught *Flor. carpio* in Tampa Bay at the beach, but rather off the beach at low tide where we seined quantities onto newly exposed sand bars. It was about mid tide when we were at Fort Morgan, and it may be possible to seine this species at low tide, especially if some small sand bars are exposed.

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Cyp. variegatus Photo by Mark Binkley

Flor. carpio NANFA Gallery