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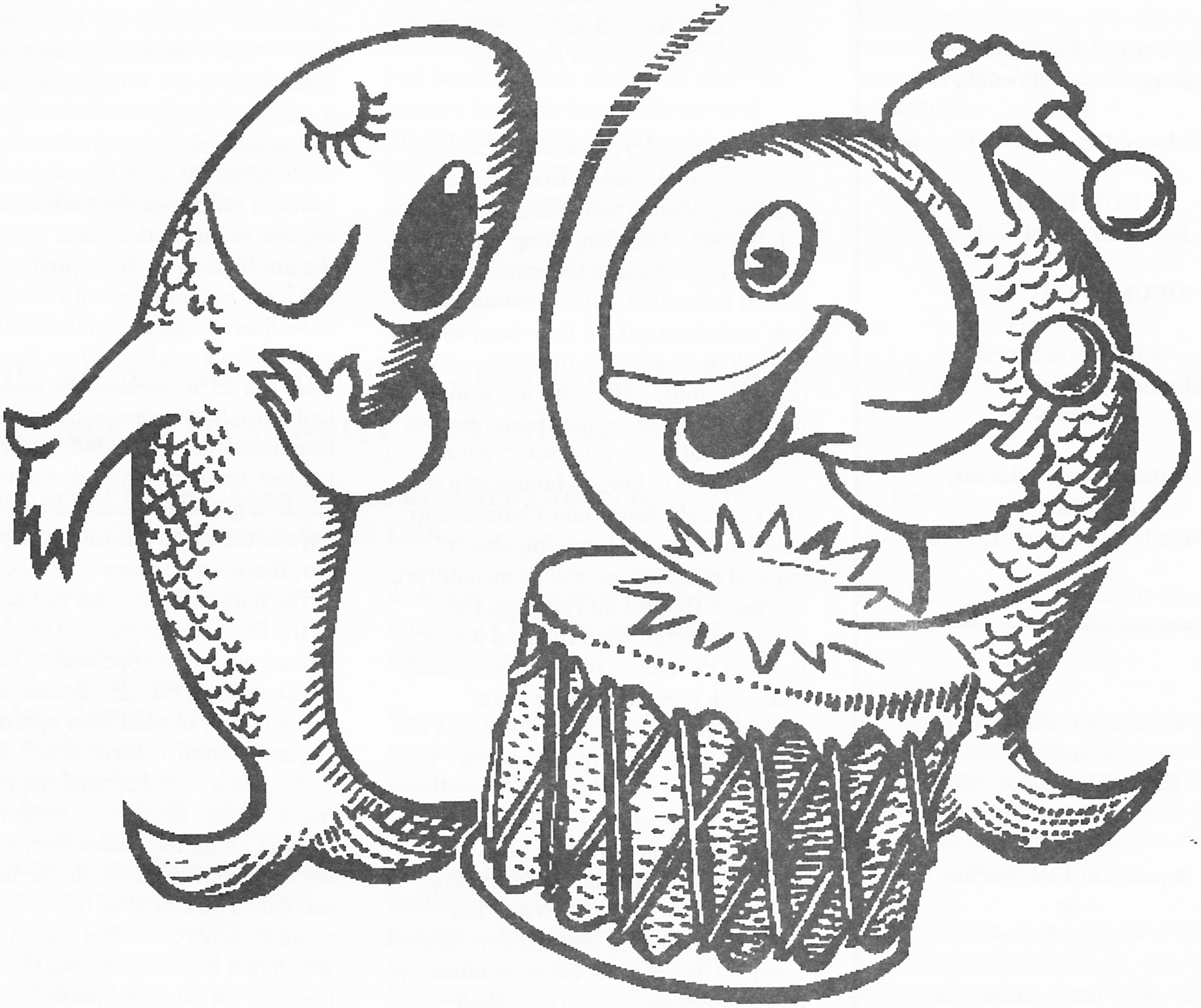

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A reported case of head and lateral line erosion (HLLE), potentially caused by a bacterial infection in a marine angelfish *Pomacanthus semicirculatus*

by Jay Hemdal, Curator, Toledo Zoo/Aquarium

The following is a report of a situation where an acute external bacterial infection of a juvenile angelfish apparently resulted in the development of dermal erosions typically associated with HLLE. This material is presented both as a means to relate some of the treatment methods utilized by the Toledo Zoo Aquarium, as well as to document this unusual incident.

A Koran Angel, *Pomacanthus semicirculatus* was purchased from a local marine specimen wholesale company on 1 July 1989. This fish, along with other species purchased at the same time was placed into a 600 gallon quarantine system and observed for four days, as all the fish acclimated to the aquarium and began feeding. After this adjustment period, a 14 day copper treatment was begun (SeaCure, Aquarium Systems, Mentor, OH). Due to failure of a test kit (Dry-Tab, Aquarium Pharmaceuticals, Chalfont, PA) possibly due to expired reagents, as well as misinterpretations of the test kit readings, the copper concentration reached 0.4mg/l towards the end of the treatment, and some fish perished before water changes and carbon filtration could reduce the concentration of copper. During this interval, the angelfish exhibited symptoms of copper toxicity; rapid breathing, poor coloration, lack of feeding response, and disorientation. It was decided to move it to another aquarium, where it appeared to fully recover. After a week, the quarantine system was deemed safe, (Less than 0.05mg/l copper) and the angelfish was moved back to the quarantine system, where it remained in good health until 21 September 1989.

At this time, we discovered what appeared to be an acute bacterial infection involving the anterior portion of the fish. Its eyes were cloudy, the pectoral fins were ragged and bleeding, and the entire head and nape had a white cast to it. The fish was moved to a 20 gallon aquarium, and a treatment was initiated.

This consisted of twice daily one hour baths in the following solution; 3/4 gallon of synthetic seawater, 1/4 gallon of freshwater, and 250mg tetracycline HCl. We hoped that the lowered salinity of the bath would cause the fish to ingest the water containing the antibiotic as it attempted to establish ionic equilibrium with the solution, as well as mitigate the interference that calcium ions might have on the antibiotic. On 25 September the symptoms had virtually disappeared, so the treatment was concluded. On 27 September, the fish relapsed, and it was decided to give the specimen another five days of the same treatment. By 2 October, there was no sign of a reoccurrence of the bacterial infection on the exterior of the fish. In the place of the bacterial lesions was what appeared to be a classic case of HLLE. Behind each eye was a deeply eroded area approximately 10mm by 4mm. More superficial erosion was noted around the external nares. Other discolored areas were present along the lateral line, diminishing in magnitude towards the fish's midsection. The extent of this erosion more closely resembled that of a fish which had been developing the symptoms for an extended period of time (Other angelfish have been noted to take up to six months or more to develop lesions equal to that exhibited by this fish in two weeks). By 16

October, (Two weeks following the last day of treatment) the lesions had diminished to negligible proportions, another unexpected turn of events.

One might be led to believe from this case, that HLLE-type lesions may also be caused by bacterial infections, and are not just nutritional or environmental in origin as generally proposed. Two points however, clouds this diagnosis: Some people have implicated high concentrations of ionic copper in the culture water of fish which develop this syndrome (Various hobbyists - per. comm.). Although the fish should no symptoms of HLLE immediately following the copper poisoning episode, it might still be just coincidental that the symptoms appeared during the bacterial disease and subsequent treatment. Secondarily, it is possible, (But in the author's opinion, unlikely) that the treatment regime itself caused the HLLE. In any event, nutritional deficiency alone can clearly be ruled out as the sole cause of the erosion in this case due to the abrupt onset of the symptoms, and the subsequent spontaneous healing of the lesion with no apparent change in the animal's environment and diet.

ADDENDUM

On 20 September, due to apparent good health, the angelfish was placed on exhibit with a mixed group of tropical Pacific fishes. On 30 September, the fish was seen with the following symptoms; rapid breathing, cloudy eyes, blotchy color, and eroded pectoral fins. These symptoms were similar, but not identical to those exhibited by this fish in the previous two disease episodes. Attempts were made to capture it, but it was not until 1 November, that the fish had become weak enough to allow its capture from the heavily decorated exhibit tank. A diagnostic formalin bath was performed (264 ppm of formalin in seawater for 45 minutes). This dip-water was decanted for microscopic study. As it turned out, a microscope was hardly required to determine the trouble, for at the bottom of the container were approximately 100 dead trematodes, ranging in size from 0.5 to 3 mm in length. Cursory microscopic examination of these flukes showed a strong similarity to *Benedenia melleni*. After the angelfish had undergone the diagnostic bath, it was removed to a treatment tank, and the formalin bath outlined above was called for daily for seven days. Throughout this latest problem, the symptoms of HLLE shown by the fish ceased improving, and perhaps even worsened to a small degree. This could of course, be due to the probable presence of a moderate secondary bacterial infection at the sites of tissue damage caused by the trematodes.

Simple chemical control of ammonia and other toxic substances in freshwater and saltwater.[1]

by John Farrell Kuhns, AquaScience Research Group, Inc., 1100 Gentry Street, North Kansas City, Missouri 64116 USA

This paper represents results of laboratory and field tests of a proprietary, commercial, chemical product (AmQuel™, Kordon, division of Novalek, Inc., Hayward, California, USA) for its ability to control and detoxify ammonia and other toxic substances in both freshwater and saltwater. The product proved to be a reliable ammonia control and detoxifier in (1) new and unconditioned aquarium systems, (2) conditioned aquarium systems, and (3) shipping of live aquarium fishes and invertebrates. It was also demonstrated to be effective for removal of chlorine and chloramines from tap water.

Un contrôle chimique simple de l'ammoniaque et d'autres substances toxiques dans l'eau douce et l'eau de mer.

Cet exposé présente les résultats de véri fications de laboratoire et d'applications pratiques d'un produit chimique de propriété, commercial (AmQuel™, Kordon, succursale de Novalek, Inc., établie à Hayward, Californie, USA) en ce qui concerne sa capacité de contrôler et de désintoxiquer l'ammoniaque et d'autres substances toxiques dans et l'eau douce et l'eau de mer. Ce produit s'est démontré un agent sûr de contrôle et de désintoxication de l'ammoniaque en ce qui concerne:

(1) les systèmes nouveaux et inconditionnés d'aquarium (2) les systèmes conditionnés d'aquarium , et (3) le transport par voie maritime de poissons d'aquarium vivants, ainsi que d'invertébrés vivants.

Son efficacité s'est également démontrée dans l'élimination du chlore et des chloramines dans l'eau de la ville.

INTRODUCTION

The culture, maintenance, and transportation of aquatic organisms is often

[1] Presented at the 2nd International Aquariology Congress, February 18th, 1987, Monte Carlo, Monaco

complicated by the presence of toxic substances in the water. These substances can be present in the water supply or can originate in the water due to the presence of the animals being cultured, maintained or transported. Included among these substances are (1) hypochlorous acid, HClO, its anion, hypochlorite, ClO^- (these are commonly known as "free available chlorine"), and the chloramines: monochloramine, NH_2Cl, dichloramine, $NHCl_2$, and nitrogen trichloride, NCl_3 (these are commonly known as "combined available chlorine") which are found in some municipal water supplies and in water contaminated with municipal and industrial wastes, and (2) ammonia, NH_3, which is most often the result of metabolic activities of the animals being kept in the water and from the mineralization of their wastes and other nitrogenous substances by microorganisms in water.

The control and detoxification of substances initially present in water to be used for the culture, maintenance or transportation of aquatic animals is known as "conditioning" the water (Kuhns and Borgendale, 1980). In aquariculture, attempts at conditioning are most often targeted against free and combined available chlorine (Axelrod, et al, 1967; Kuhns and Borgendale, 1980; Riehl and Baensch, 1987). While the chemical conditioning of water for chlorine is quite simple and efficient, many commercially available products have been shown to be incapable of complete dechlorination when used as directed (Kuhns and Borgendale, 1980). In addition, while the detoxification of free available chlorine is relatively simple, the use of dechlorinating agents for the treatment of water containing chloramines (chloraminated water) is problematical. The common dechlorinating agents like thiosulfates, $S_2O_3^{-}$, and sulfites, SO_3^{-} fail to have any effect on the remaining amine portion when the chlorine is reduced. The proposed use of granular activated carbon (GAC) for the dechlorination of water, too, has been demonstrated to be unreliable in some cases (Mitchell and Cech, 1983), and small amounts of remaining chlorine, when present in water with otherwise non-lethal levels of ammonia, were demonstrated to be the cause of toxic reactions in channel catfish.

The control and detoxification of ammonia in aquarium systems has, until fairly recently, been restricted primarily tothat ammonia of metabolic origin. The methods used have been related to filtration: biological nitrification (Loiselle, 1985; Spotte, 1979), removal with zeolites (i.e. clinoptilolite) (Jorgensen, S.E., et al, 1976; Loiselle, 1985), removal with cation-exchange resins (Johnson and Sieburth, 1974; Turner and Bower, 1983), and removal with polymeric filter media (Turner and Bower, 1983). The value of these methods are limited and all but biological nitrification are restricted to freshwater applications. The minimum capacity of "fisheries grade" clinoptilolite, for instance, is 25 mg of the ammonium ion, NH_4^+ per gram of the zeolite (Kuhns, 1984). This is an extremely low capacity when compared to the ammonia producing potential of heavily populated systems.

The control of toxic metabolite accumulations in closed shipping containers of fishes and other aquatic invertebrates has received much attention (Amend, et al, 1982; Bower and Turner 1982; Hamid and Mardjono, 1979; Johnson, et al, 1984; Nemoto, 1957; Norris, et al, 1960; Robertson, et al, 1987). The published studies, to date, have dealt primarily with species cultured for human food purposes and for the aquarium hobby trade. In 1960, Buxton (1962) presented a paper at the first International Congress of Aquariology, in which the main thrust of the reported research was one of searching for ways of reducing mortality of exported, wild-caught fishes. Due to the global concern of species diversity loss, the transportation of live, wild-caught aquatic animals, whether for scientific study, educational display or for the aquarium hobby trade, without due health considerations should looked upon as an unethical practice.

This paper reports on and reviews the use of a unique, commercially available water conditioning product to control and detoxify ammonia, chloramines and chlorine in freshwater and saltwater aquarium and aquaculture systems and in water used to transport aquatic animals. The product, AmQuel™, is a patented, aqueous solution of an inorganic substance (Kuhns, 1987). It is distributed exclusively by Novalek, Inc. (2242 Davis Court, Hayward, California 94545, USA) to the consumer aquarium trade through its Kordon division and to professional aquarists and aquaculturists through its AquaVet division.

Laboratory tests (Kuhns, 1987; Kuhns and Borgendale, 1980) have shown that application of the product, at the rate of 5 mL per 37.85 L (1 teaspoon-full per 10 U.S. gallons), to typical municipal water containing free-available chlorine (hypochlorites) is as efficacious as the more commonly used thiosulfate-containing water conditioners or dechlorinators. In addition the product has been demonstrated to be similarly useful in the destruction and detoxification of chloramines; this process is referred to as dechloramination (Kuhns, 1987). In this regard, the product is unique among water conditioners. Rather than simply breaking the chlorine-to-ammonia bonds in the chloramines by dechlorination, as with thiosulfates, and subsequent removal of the ammonia by a different method (i.e. filtration of the treated water with clinoptilolite (Blasiola, 1984); the AmQuel™ reacts with both the chlorine and amine portions of the chloramine molecules. A recent survey of aquarists participating on an international computer video text service (FISHNET on CompuServe Information Service, Columbus, Ohio, USA) indicates that the product has become a standard treatment for water used in aquaria (Aquaria/Fish Forum, 1988). A simple verification of the product's ability to completely dechloraminate, in a short period of time, can be made as follows: (1) draw fresh tap water from a source known to contain chloramines, (2) test a sample of the water with a suitable chlorine test kit (i.e. DPD kit from Hach Chemical Company, Loveland, Colorado, USA) and a salicylate-ammonia test kit (Kordon) to determine the actual levels of chlorine, chloramines and ammonia (3) treat the water with with a standard use-dilution of the product, (4) mix the water with stirring or aeration, (5) allow 5 to 10 minutes for the reaction, (6) re-test a sample of the water.

The primary utility of the product has been in the control of ammonia accumulations in closed, recirculating aquarium systems and in shipping containers. The product functions by reacting directly with that portion of the total ammonia (NH_3 + NH_4^+) present in the free, or un-ionized, form (NH_3). Free ammonia is recognized as being the most toxic of the two forms (Spotte, 1979). This means that the product is of greatest utility when the actual NH_3 concentration approaches or exceeds toxic thresholds. The efficacy of the product, therefore, is most evident in water with high total ammonia and in water where:

(1) the pH is greater than 7.0,

(2) the salinity is significant (brackish to seawater), and

(3) the temperature is higher (i.e. tropical species aquaria). Due to the chemical equilibrium:

$$NH_4^+ <===> NH_3 + H^+$$

even ammonia in cold, freshwater systems with pH less than 7.0 is effectively controlled.

In the survey mentioned above, respondents indicated that they routinely relied upon AmQuel™ for the control of transient ammonia levels in both new and established aquaria. In addition, one respondent who collects Central American fishes for scientific study indicated that the product has become a standard accouterment on all collecting trips. In a recently published paper Robertson, et al, (1987) stated, "(a)mmonia accumulation was reduced or totally eliminated with addition of AmQuel™, depending on the dosage used". They clearly demonstrated that the product was of value in the control of ammonia in shipping bags. A major supplier of goldfish in California (USA) reports that they add 9.75 mL of the product in each 14 lb (approximately 6.35 L) of water. They then pack 1,000 (= 3 to 4 lb (1.4 to 1.8 Kg)), 1 in (= 2.5 cm) standard length (feeder) goldfish (*Carassius auratus*) or 300 (up to 7 lb (3.2 Kg)), 2 in (= 5 cm) standard length (large feeder) goldfish in each 14 lb of the treated water for shipping (Benjamin, 1988). Research is currently being conducted which will determine the extent to which ammonia control with the product, both with and without added pH buffers, will influence survivability of species shipped in treated water. Robertson, et al (1987), found that with the various *Peneaus* species tested that carbon dioxide control in the shipping water was of greater significance to survivability than ammonia control. In the shipping of fishes and other aquatic animals it is common to use antibiotics to control the growth of microorganisms, anesthetics to restrain the fishes and buffers for carbon dioxide control. Of the commonly used antibiotics (i.e. neomycin, nitrofurans, and sulfa drugs) none are known to be incompatible with AmQuel™, however, some dyes (i.e. malachite green and methylene blue) may be decolorized by the product. The product can also be used with the common anesthetics (i.e. quinaldine and tricaine). Due to its ability to react not only with ammonia, but with primary and secondary amines (RNH_2 and R_2NH) AmQuel™ is incompatible with amine-based buffers like tromethamine (TRIS). Robertson, et al (1987) reported that while ammonia control or elimination was achieved with the product that carbon dioxide appeared to be the major limiting factor in shipping *Penaeus* species. It is apparent, therefore, that when using AmQuel™ alone in an otherwise unbuffered system, that the removal of the ammonia results in a system with little or no alkali reserve, and the use of a a compatible buffer is indicated.

The use of AmQuel™ has created some concomitant problems with water testing. In particular, it has been determined that when tracking ammonia reduction with an ammonia specific-ion electrode (SIE) that the usual technique of making the test sample alkaline with 10 *N* sodium hydroxide, NaOH, solution results in erroneously interpreted readings. It has been found that the substances formed when the product reacts with ammonia are completely non-toxic and stable at pH's usually encountered in aquarium environments (6.0 to 9.0). At extremely high pH (> 12) the reactants are unstable and may release ammonia. The use of SIE's for the direct determination of free ammonia in water samples without added NaOH solution has been demonstrated to be a reliable method (Kuhns, 1987). The use of Nessler's reagent in testing water treated with AmQuel™ also presents problems. The product, which is a moderate reducing agent, causes the reagent to decompose and free mercury is precipitated resulting in false high ammonia readings. A number of different brands of salicylate reagent test kits have proven to be highly reliable, and these are recommended for routine ammonia determinations in AmQuel™-treated water. In addition to ammonia testing, it was recently discovered that dissolved oxygen (DO) tests based upon the Winkler method and the azide modification thereof are unreliable when used to test treated water. In a series of previously unreported experiments it was shown that while these chemical methods indicated a total and immediate reduction in DO, that dissolved oxygen meters indicated no change in the DO levels.

There has also been concern from some aquarists that the use of the product in new systems would "short circuit" the proper establishment of biological filtration. In reality, the product has proven to be of value in the control of rising ammonia levels, even in new systems with large or fluctuating animal populations, while normal establishment of biological ammonia oxidation is achieved. It was determined that the reaction products of AmQuel™ with ammonia were metabolizable by the usual chemoautotrophic bacteria (*Nitrosomonas* spp.)

totrophic bacteria (*Nitrosomonas* spp.) (MacFarland, 1985).

Tests have indicated that the product is non-toxic to a wide variety of freshwater and saltwater fishes and invertebrates, even when used at ten times the labeled use-dilution. Invertebrate species tested for evidence of toxic reactions include American lobsters (*Homarus americanus*), hermit crabs (diogenids), shrimp (*Stenopus hispidus* and *Penaeus* spp.), *Daphnia* spp., *Octopus bimaculoides*, gastopods (muricids and *Planorbis* spp.), anemones (*Condylactis gigantea* and *Bartholomea annulata)*, bristle worms (*Nereis viridens*), and sea urchins (*Lytechinus variagatus*). Fishes from all major freshwater and saltwater families, including sharks have been similarly tested under many different conditions, and no toxic reactions have been reported.

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Caulk is Probable Cause of Death in Two Captive Personifer Angelfish

by Warren W. Pryor, Australian Adventure Curator Fort Wayne Zoo,3411 Sherman Boulevard, Fort Wayne, IN 46808
and Kevin J. West, Ph.D., Chemistry Department, University of Wisconsin, Whitewater, WI 53190-1790

ABSTRACT
Two specimens of *Chaetodontoplus personifer* died of starvation due to impacted intestines. The material responsible for intestine blockage was shown to be Dow-Corning 795 Building Sealant, by IR analysis. This material was used to glaze the window of the display, and was used in decoration of the exhibit containing the fish.

INTRODUCTION

Display Description. The Great Barrier Reef Tank (GBR) of the Fort Wayne ChildrenUs ZooUs Australian dventure opened to the public in June 1987. It is an epoxy coated, poured concrete tank with four chambers, containing a total of about 68,000 L of artificial seawater (Instant Ocean). Filtration is prima~ily by bacterial filtration on sub-gravel filters and airlifts. Decorations in the display are fiberglass coral replicas. The main public viewing pane is a large acrylic panel, held in place with Dow-Corning 795 Building Sealant (caulk). This caulk was also used to fill gaps in the fiberglass decorations.

Animals. Many species of tropical marine fish have been successfully maintained in the display; however, *Chaetodontoplys personifer* (Spot-faced Angelfish) seemed to have much lower survival times than other species in the display, and gross necropsy revealed emaciated conditions and gut contents almost entirely of a black, rubbery material.

Purpose of Study. This study was conducted to answer one question. What was the rubbery substance obstructing the intestines of the skinny, dead fishes? Chemical analysis was called for here.

METHODS

The gut contents of two dead *C.. personifer* appeared consistently black, rubbery and almost solid (Aquarium Necropsies #17 and #23). The only material used in construction of GBR matching that description was Dow-Corning 795. Dow-Corning Chemistry Lab was, therefore, contacted for a method to verify the identity of the substance from the fishes guts. Infrared spectrophotometry after first burning the caulk to a white ash was suggested (Larry Carbary, per. comm.).

A small amount of 795 caulk was squirted from a fresh tube onto a card, and was allowed to cure in the air for seven days. This provided the standard against which the unknown could be compared. Gut contents of a C. personifer which died 16 June 1988 in GBR (Aquarium Necropsy #17) provided the unknown material. Both samples were heated over a gas burner in porcelain crucibles until only a white residue remained. The residue was then mixed with potassium bromide (KBr) and a pellet was made. Infrared absorption characteristics of these pellets were analyzed using a Beckman AccuLab 3 IR.

RESULTS

Necropsy revealed black, rubbery material in the guts of the *C. personifer* that died in GBR during 1988. One sample was run on IR against a known sample of Dow-Corning 795 caulk Figure 1 shows a remarkable match between the two patterns of IR absorption for the standard 795 caulk and for the gut contents. There are at least six major peaks that reasonably match in terms of shape, position and intensity. Peaks numbers 3, 4, 5 and 6 represent various silicon-carbon moities (Silverstein, et al. 1981). Partial digestion in the fish gut, aging in seawater and contaminating organic matter all probably contributed toward small discrepancies in peak intensities and a bit of noise between 1,700 and 2,400 wave-numbers. This is strong evidence that in at least one specimen of C. personifer, the gut was full of 795 caulk. It is reasonable to assume that the other specimen contained the same substance.

DISCUSSION

The results of this study provide a chemical link between a construction material and the gut contents of two *C. personifer*. Evidence indicates that Dow-Corning 795 caulk caused intestinal blockage and eventual starvation of the fishes. It is likely that specimens of another resident species, *Zebrasoma flavescens* (yellow tangs), were also victims of the same disorder, however, no records were made of specific necropsies. Although 795 caulk was shown to be the probable cause of death in this case, its use as an aquarium construction material should be continued. About twenty species of tropical marine fish have been successfully maintained in GBR, unaffected by this material. This may be because *C. personifer* (and *Z. Flavescens*) may spend more time picking at the decorations than do other fishes. It may also be that the unaffected species are better equipped to void 795 caulk once it is consumed. There is evidence that much of the caulk in the tank, especially where it was used in decoration, has been bitten off by fishes. The bottom of the display is frequently covered with small bite-sized fragments of caulk.

There are three recommendations that proceed from this study. Avoid the excessive use of 795 caulk in displays intended for *C. personifer* and probably *Z. flavescens*. When applying 795 caulk, keep the surface flat to make biting by fishes difficult. Use 795 caulk only for sealing windows (for which it is very good) and avoid using it for decoration.

Other materials, such as epoxy based putties, are better suited to that purpose.

ACKNOWLEDGMENTS
Thanks to the Fort Wayne ChildrenUs Zoo and Indiana University - Purdue University at Fort Wayne for facilities and equipment to conduct this study. Thanks also to aquarists Beverly Walker-Hunt and Gary Stoops, Jr., volunteer Melanie Poe, and to typist Judy Bennett.

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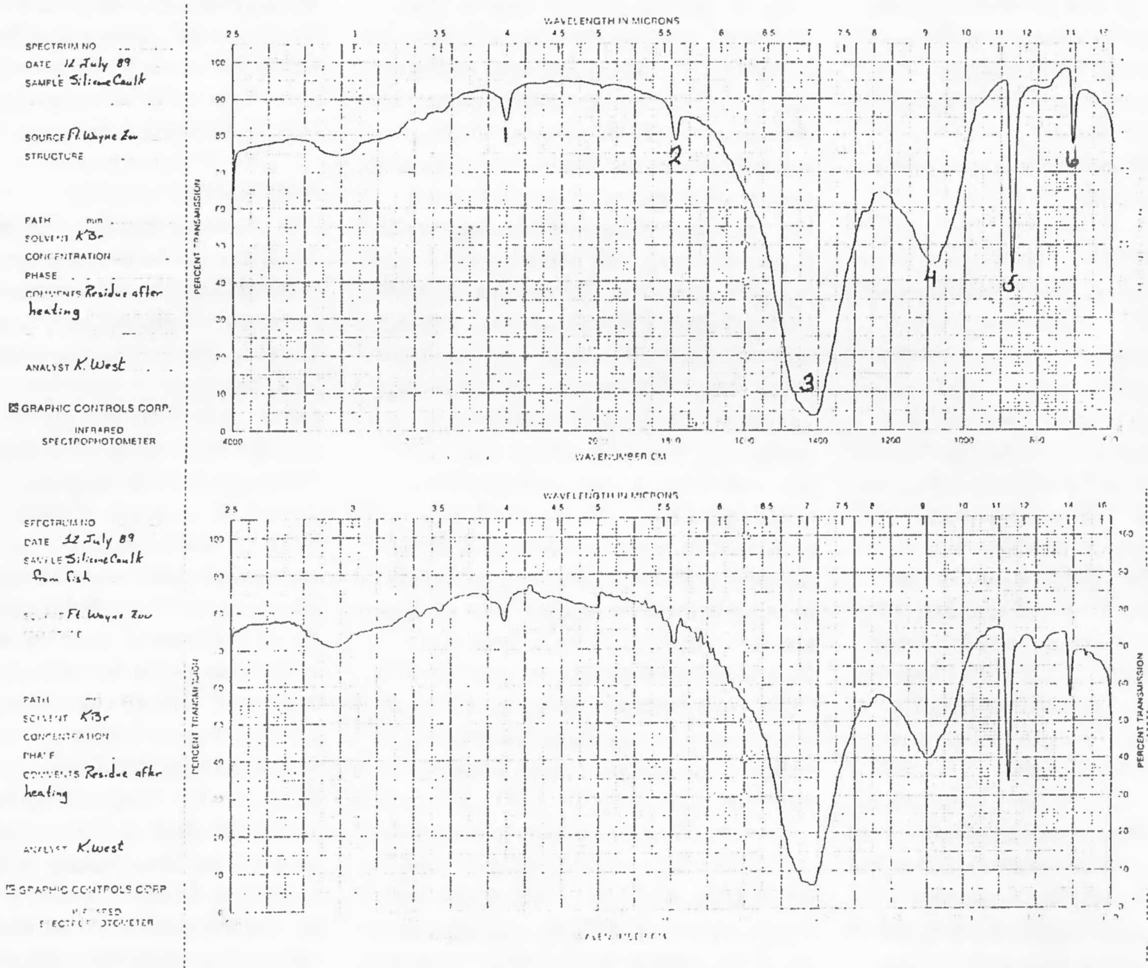
Figure 1. Infrared spectrophotographs of (A) Dow-Corning 795 Building Sealant and (B) gut contents of a dead *Chaetodontoplus personifer.*



Bonnethead sharks born at Sea World

by Daniel LeBlanc, Director, Public Relations

Twenty (20) bonnethead shark pups (*Sphyrna tiburo*) were born at the Shark Exhibit at Sea World of California on 24 October 1989. The pups were born to a female bonnethead who also gave birth to 16 pups in 1987 and to 20 pups in 1988.

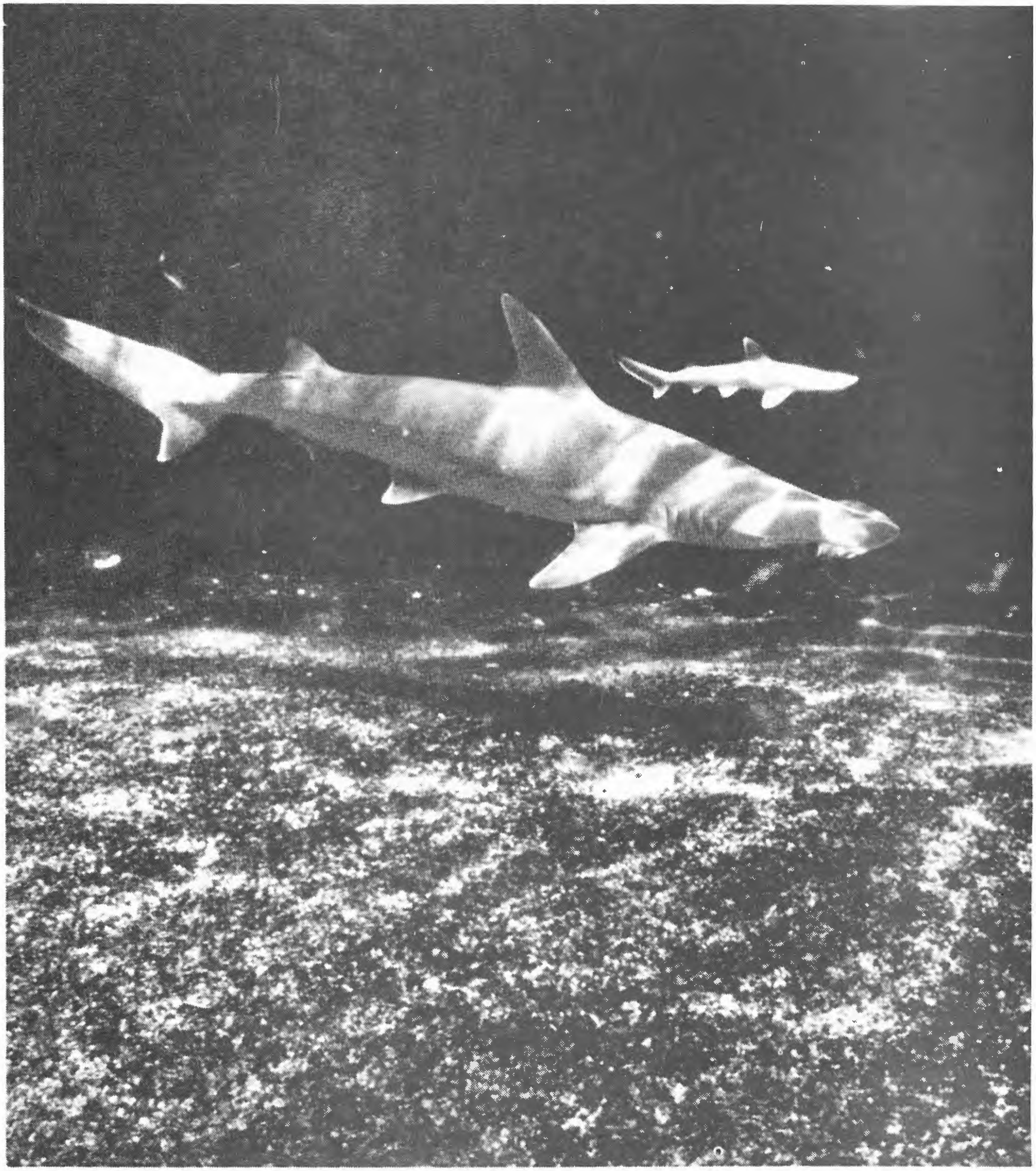
As of 6 November 1989, 16 of the pups remain alive and in good condition. Their initial food of preference was krill (*Euphausia superba*), and they are now starting to eat other foods including pieces of shrimp and fish.

Bonnethead sharks are the smallest of the nine species of hammerheads. They inhabit inshore coastal waters, bays and estuaries. They range from San Diego to Peru on the West Coast and from New England to Brazil on the East Coast. Bonnethead sharks are live bearers (rather than egg layers). Pups are born on late summer and early fall.

There are usually 4 - 20 pups in each litter. Adults may reach 5 feet in length. Pups measure from 8 to 12 inches. For further information, contact:

Mike Shaw
Curator of Fishes
Sea World of California
1720 South Shores Road
San Diego, California 92109
(619) 222-6363, ext. 2412

BONNETHEAD BIRTHS . . . Sea World of California's Shark Exhibit has several new inhabitants. On Tuesday, October 24, 1989, twenty bonnethead sharks were born at the marine life park. The eight-inch long pups are the offspring of a female bonnethead shark who has given birth for three consecutive years. The pups, pictured next to the adult bonnetheads, could reach as much as five feet in length.



Recent Progress of Aquarium Working Group at CBSG Meeting

by Les Kaufman,New England Aquarium Central Wharf Boston, Massachusetts 02110-3309; (617) 973-5200

I am writing to report on the progress made by the Aquarium Working Group at the recent CBSG meetings in San Antonio, Texas. This meeting marked a turning point in efforts by aquariums and aquatic zoos to assume their place in the battle to save the diversity of life earth. Our principal recommendations are summarized in the accompanying document, but I wish especially to direct your attention to the background and summary statements. It is time for aquariums to consider the place that pro-active conservation has in both their immediate and long range plans.
It is time to make tangible commitments in staff, space, and program funds.

Our recommendations cover a broad range of concerns. Most aquariums rely on public education as the primary avenue toward conservation, but we agreed that propagation also has an important role to play in the aquarium setting. This is especially true for endangered freshwater fishes, for which captive breeding, field research, and restoration of natural populations are all highly feasible. To this end, our first major task it to gain official recognition for the three Species Survival Plans now proposed for freshwater fish faunas: Lake Victoria fishes, desert fishes, and Appalachian stream fishes. Completion of the studbooks for these faunas awaits written commitment of space from participating institutions. If you are already a fish SSP participant, please let me know as soon as possible how much space you are planning to allocate to the captive breeding program over the next two years. The data we need are best expressed in terms of the number of tanks, their volumes, and which of these are located on exhibit (limited access, requiring interpretive graphics and education programming) or in service areas (unlimited access). If you are not as yet a participant, please drop me a line to let me know which items in our proposed action plan your institution would be most interested in pursuing. On behalf of the Captive Breeding Specialist Groups, I very much look forward to hearing from, and working with you.

Open letter to all Midwest public aquariums:

I am interested in forming a loose association of public aquariums in the midwest region. The intent is for it to serve as an informal information network. The primary means of disemination would be by holding meetings at various facilities on a rotating basis. The next meeting is tentatively scheduled for a Saturday this fall, in Toledo, Ohio.

The only requirement to attend is that you be a full time employee of a public aquarium, and that for any specimen transfers, that you are authorized by your institution to arrange them. One of the topics for the next meeting is a demonstration of FISHNET, a computer data base, message board system. If this proposal interests you, please contact:

Jay Hemdal
Curator of Fishes
Toledo Zoological Society
2700 Broadway
Toledo, Ohio 43609
(419)385-5721
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SHARKS DOWN UNDER

25 February - 1 March, 1991
TARONGA ZOO, SYDNEY
P.O. Box 20 Mosman 2088 NSW
AUSTRALIA
Phone: (02) 969-2777
FAX: (02) 969-7515

SHARKS DOWN UNDER will draw together shark experts from around the world to focus on conservation issues and current biological knowledge concerning sharks and rays. Emphasis will be on animals of the Indo-Pacific region and the problems associated with that area.

This Conference, the first of its kind to be held in Australia, will foster a better understanding of the complex biological, ecological and behavioral aspects of sharks and rays.

It will provide an opportunity for Australian and international shark researchers, captive managers, marine biologists and naturalists to make public their current work on sharks and rays.

The Conference program has been largely prestructured but, depending on the response to the Conference, smaller symposia on specific subjects can be arranged to run concurrently. Preconference presentations by shark experts from Australia and overseas are being organized for the general public. If requested, film, video and slide presentation sessions can be organized in addition to the conference presentations.

Planned excursions include diving with a colony of sharks in their natural environment, diving around Sydney, offshore trawling trips and visits to various aquariums in the Sydney region. A conference dinner and other social events will be included in the program.

If you are interested in more information, please send your name, organization, address, phone, FAX number, and if you would like to present a paper to: John West, Shark Conference Organizer, Taronga Zoo Aquarium, PO Box 20 Mosman 2088 Australia

J. L. Scott Aquarium hosts annual kids fishing rodeo

by Jerry Corcoran

For the second year the J. L. Scott Marine Education Center and Aquarium has sponsored a "kids" fishing rodeo. Although there are several other fishing rodeos in the area, the kids rodeo is designed to teach sportsmanship and conservation. Each fish is weighed, measured, tagged and then returned to the water.

Errol White, assistant curator of the center, initiated the rodeo and has recruited local businessmen as sponsors of the event. Each child receives a "goodie" bag with several items donated by the sponsors. In addition there is a hot dog roast for both the children and parents.

Mr. White has also been able to get some assistance from scientists from the Gulf Coast Research Laboratory, parent organization of the Center. Along with personnel from the Center they tag each fish under the watchful eyes of the young fishermen.

Several fish are retained for display in an aquarium at the Center, where the participants can visit at a later date to assure themselves that the tagging does not do permanent damage to the fish. They are also given a short lecture about the necessity for gathering scientific information. Tagging is only one way the information is gathered.

The success of this endeavor can be judged by the fact that there were over two hundred participants this year. Future rodeos are scheduled for early September each year and an increase in participation is expected.

This is one of the many programs the Center has instituted to teach conservation to the local people.

Suggested research protocol for estimation of seawater ingestion by marine teleost fish (*Halichoeres bivittatus* Bloch) based on urinary output.

by Thomas A. Frakes, Vice President, Aquarium Systems, Mentor, Ohio

ABSTRACT

Urinary output of a marine teleost (*Halichoeres bivittatus*) is to be collected using a latex sack. The amount and concentration of the fluid compared to the ambient concentration in the aquarium will be used to estimate fluid ingestion. This information will be beneficial in calculation of therapeutic long bath dosages for medications that must be absorbed orally and where injection is not practical. Also the method may be used to measure treatment excretion rates.

INTRODUCTION

The question of seawater ingestion and urinary excretion are often considered in regards to uptake of trace nutrients and chemotherapeutics. All biologists are taught that marine fish drink water and many assumptions are made based on this without actually quantifying the amounts ingested. The idea of measuring urinary output and degrees of concentration is a reasonable approach to determining the amount of seawater taken in. Methods such as dividing and aquarium with a plate fitted with a hole through which the test animal is inserted halfway are cumbersome at best. Differential volumes and concentrations cannot be measured accurately because of the minute density changes that occur during a reasonable test period. Further, the stress of confinement could drastically alter a fishes metabolism, breathing, drinking and excretory functions.

The following criteria for a test procedure were decided on:

1. The method should allow collection of just the urine without mixing with seawater. This will allow for measurable results in the shortest possible time.
2. The organism must be allowed reasonably normal freedom of movement to reduce stress during testing.
3. The equipment shall be safe, preventing injury to the fish.

METHODS AND MATERIALS

To meet the criteria stated, careful selection of equipment and test organisms was required. A commercially available molded latex tubular sack with a sample collection tip was selected. This tube has proven barrier characteristics and great elasticity to provide a safe but sure seal about the fish. For a selection of a fish, a wrasse (*Halichoeres bivittatus* was chosen for its lack of sharp spines in the posterior area, torpedo shape closely matching the collecting device, name, and the ability of this species to skull about using just its pectoral and pelvic fins without assistance from its caudal fin. A specimen of 20 to 30 cm length (8-12 inches) is suggested as it will closely match the size of the latex sack.

PROCEDURES

To begin, establish a bare aquarium (100L or larger) with clean seawater (natural or artificial) and aerate using one airstone to provide oxygen and mixing. Add any treatments that are to be monitored and collect initial samples. Next place collecting device on the test specimen. Using moist hands, grasp the test organism gently by firmly just behind the head. If it is moving about too much, avoid unnecessary handling as it may only serve to fruther excite it. Grasp the latex sack, that is in a rolled up state, and, being careful to exclude air and water, roll it on to the extended end to about the middle. Then release the wrasse into the aquarium. Initially, much darting and thrusting may be observed after entry into the test chamber due to the excitement of being handled, however, it will soon calm down. Depending on the purpose of the trial, the test could run from 30 minutes to several hours. Once the test is completed, the wrasse is caught and the receptacle is carefully removed avoiding contamination of the collected fluid. The fish is returned to a holding tank for recuperation and the sample and final water sample are analyzed for differences in chemical concentration.

RESULTS

Because of a lack of supply of suitably sized organism (*Halichoeres bivittatus*), the trial testing of this suggested procedure has been delayed. However, feelers are out so, hopefully the consummation of this experiment will occur soon. This protocol is being released somewhat soon in the hope that other researchers with access to appropriate sized *H. bivittatus* would be able to push forward.

ACKNOWLEDGEMENTS

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