

DRUM AND CROAKER

Number 2

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HARK -- Pray thee note

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I. AQUARIUM SYMPOSIUM

The 1958 Aquarium symposium at the Bloomington, Indiana meetings of the American Society of Ichthyologists and Herpetologists was held Tuesday evening, August 26, in the Education Building of the University of Indiana. Approximately 150 people attended the four-hour session during which ten papers were presented. Since the final list of topics was different from that previously circulated, the corrected list is presented below:

1. HINTON, Sam, Scripps Institution of Oceanography.
Longevity among aquarium fishes.
2. WOOD, F.G., JR., Marineland, Florida.
Comments on keeping the pilot (blackfish) whale in captivity.
3. KELLEY, William, Cleveland Aquarium.
Relative performance of different depths of filtrant in sand filters.
4. ATZ, James, New York Aquarium, N.Y. Zoological Society.
Principles and practices of water management in public aquaria.
5. HERALD, Earl S., Steinhart Aquarium, Calif. Acad. of Sciences. Cinematographic review of the external features of various U.S. Aquariums.
6. GRAY, Captain William, Seaquarium, Miami, Florida.
New field collecting techniques.
7. BRAKER William, Shedd Aquarium, Chicago.
A preliminary report on Shedd Aquarium's new collecting car Nautilus.
8. BRAKER, William, Shedd Aquarium, Chicago.
Problems of damage and repairs to salt water concrete tanks.
9. NEWMAN Murray, Vancouver Public Aquarium, Stanley Park, Vancouver, B.C.
New exhibition methods at the Vancouver Aquarium.
10. ATZ, James, New York Aquarium, N.Y. Zoological Society
The first year of operation of the New York Aquarium (color film review)

NOTE: The third paper listed above (Bill Kelley) is abstracted on Page 15 of this issue of DRUM AND CROAKER.

ANNOUNCEMENT OF THE 1959 AQUARIUM SYMPOSIUM

The 1959 conclave - the fourth annual aquarium symposium is scheduled for the Wayland Vaughn Aquarium at La Jolla, California. Sam Hinton has accepted the dubious distinction of acting, as official "house mother" for the aquarists, and preliminary indications are that it will be a terrific meeting.

The tentative date is the evening of Thursday, June 18, 1959, 7:30 P.M., in the Vaughn Aquarium. As in the past, the symposium will be a portion of the national meetings of the American Society of Ichthyologists and Herpetologists, which are scheduled between Wednesday, June 17, and Friday, June 19, with field trips on Saturday and Sunday. This time the Ichs and Herps are meeting in conjunction with the western division of the American Association for the Advancement of Science. Headquarters for the meetings will be San Diego State College, about eight miles east of San Diego. Some of the meetings will probably be held at the San Diego Zoo, and at the Scripps Institution of Oceanography of which Vaughn Aquarium is a part. We hope to be able to schedule housing for aquarists at one place -- perhaps a motel -- but more on that later.

Before or after the meetings there are other aquaria in the area you will wish to visit. In fact, all of the staffs of the following will be expecting to see you, so don't fail them. About 100 miles north of San Diego is Marineland of the Pacific; ten miles north of there is the Redondo Pier Aquarium, then Hermosa Beach Aquarium and another ten or fifteen miles, the new Pacific Ocean Park. If you can make it to San Francisco (another 420 miles), we would also like to see you at Steinhart Aquarium.

Please send in the title of your talk to Editor Lee Finneran as soon as possible. DON'T WAIT TILL THE LAST MINUTE.

II. NEWS FROM THE AQUARIUM WORLD

1. Caracas, Venezuela

Chris Coates advises us that the plans for the new aquarium in Caracas have gone down the drainpipe. Perhaps this is just as well, since the plans included some innovations to which the fish would object.

2. Cairns and Brisbane, Australia

Correspondence and plans for aquaria in these two areas indicate that we should expect some new displays of Barrier Reef fishes before long. To our knowledge, the only aquarium in Australia at present is the Taronga Park Aquarium at the zoo in Sydney.

3. Noumea, New Caledonia

Present emphasis at Dr. Catala's aquarium is upon anemones and other invertebrates brought up by skin divers from depths of 100 to 200 feet. Some of these are phosphorescent and under black light make a spectacular display.

4. South Africa

Plans are underway for a new aquarium at New London, site of the capture of the first coelacanth. A recent issue of "Aquarist and Pond Keeper, June, 1958, vol. 23, no. 3, P. 52, tells of an oceanarium of 300,000 gallons now completed at Durban. Dr. David Davies, formerly of the Scripps Institution of Oceanography, has returned to South Africa as Director of Fisheries and as such will also be concerned with the operation of the Sea Point Aquarium in Capetown.

5. Shimonseki, Japan

The new Shimonseki Aquarium is the largest in Japan, and it operates in conjunction with the Shimonseki College of Fisheries, which sent its new Fisheries Training Ship Koyo Maru on a training cruise to the Pacific Coast in December, 1958. San Francisco, San Diego and Honolulu were ports of call. Dr. Reizo Ishiyama was the ichthyologist aboard in charge of the 40 fisheries trainees. The curator of the Shimonseki Aquarium is Mr. Yutaka Mukoyama.

6. Curacao Netherlands Antilles

Plans are underway for a marine biological institute with a research and exhibition aquarium included.

7. Marineland Florida

The first pigmy sperm whale in captivity started its sojourn at Marineland September 2nd. Forced feed schedule of herring, kept Curator Wood in the tank a good part of the time -- what I mean is that Curator Wood feeds normally -- it's the whale that requires the force feeding.

Marineland has recently developed mobile porpoise demonstration tanks. Porpoise and equipment moved by truck to New York for the Florida Preview 1959 in the New York Coliseum.

Another first was chalked up by Marineland on October 3rd with a complete photographic record of the caesarian section birth of a six-pound baby sand tiger shark from a 250-pound mother.

8. Seaguarium, Miami, Florida

A brilliant color illustration on the November 1958 issue of the Aquarium Journal is of the Bahaman Pigmy Angelfish, Centropyge argi. Craig Phillips, curator for Seaquarium, tells of the rediscovery of this very rare fish during their field collection program.

Feeding of the sharks in the shark channel continues to awe the visitors. A pilot blackfish caught in the Bahamas survived for a short time.

9. Cleveland, Ohio

Before the Bloomington meetings a group of itinerant aquarists descended upon the Cleveland Aquarium and there discovered why other aquaria have had difficulty in obtaining the rare African and South American fresh water fishes. Cleveland has most of them! Despite an unimposing, exterior to the building, the Cleveland Aquarium contains many ingenious display techniques which are entirely original. Kudos to Director Kelley and his staff.

10. Toledo, Ohio

Anyone who has paddlefish naturally wishes to hold on to them. Curator Harold Wasko, of the Toledo Aquarium, had to replace the glass in their paddlefish tank. So as to avoid moving the fish, a special cofferdam was built in the tank between the fish and the glass. Then the water in the section between the cofferdam and the glass was pumped out and the repairs made to the glass.

11. New York Aquarium

Sadness reigns -- the beluga or white whale obtained from Alaska died of gastritis. Olaf, the walrus, continues to be the star attraction. During the winter season the Aquarium will be open for five days of each week.

12. Washington, D.C. Aquarium

Much activity here with revamping of displays and new designs. George Messerly, the new director, offers albino EB fingerling trout on an exchange basis. Note that although the Aquarium is in the basement of the Commerce Building, it is operated by the Fish and Wildlife Service.

13. Shedd-Aquarium, Chicago

The new railway collecting car, the Nautilus, is about ready to go into operation with many new innovations. We will be hearing more about it in the future.

14. Dallas, Texas

The Dallas Aquarium, located in Fair Park Civic Center, celebrated its 22nd birthday June 6, 1958. Built as part of the Texas Centennial Celebration of 1936, the Aquarium has four 1000-gallon tanks, nine of 2000 gallons, four of 3000 gallons and one 1500-gallon tank. The tropical tanks consist of two of 75 gallons, four of 50 gallons, 12 of 30 gallons, 4 of 17 gallons and 16 of 8 gallons. Open every day of the year except Christmas, and admission is free. Jeff W. Moore is the superintendent; address: 963 Rustic Circle, Dallas 18, Texas. Their most recent attraction is an arapaima of about 12 inches length.

15. Hermosa Beach, California

The McBrides having moved from Hermosa to Pacific Ocean Park at Santa Monica, the Hermosa Beach Aquarium was closed for several weeks. It is now open again under new management with Sam Baker as the curator. The operators under new lease are Mrs. Frances Hofer and Mr. Fred Salatino.

16. Marineland of the-Pacific

Bubbles, the educated pilot whale still continues to be the stellar attraction. The demonstrations in the new stadium pool, which opened during the summer, have been well received by the public. Marineland has been cooperating with the University of California in hydrodynamic investigations of mechanics of porpoise swimming. The recent contribution of MacFarland and Norris is abstracted in another section of DRUM AND CROAKER.

A new fish transport unit is being built. It is designed primarily for the transport of large specimens, such as sharks, sawfish and tarpon. It will be constructed of insulated, fibreglassed plywood. The tank itself will be 14 feet long, by 8 feet wide and will hold in excess of 17,000 pounds of sea water.

16. Marineland of the Pacific (cont.)

The water will be recirculated by a detachable water conditioning unit. This unit will be powered by a diesel generator which will operate a pump calculated to recirculate the entire tank volume every ten minutes. A separate circuit will operate a diatomaceous earth filter at 50 gallons per minute. Scale strainers and a heat exchanger will be provided. Evaporative cooling will be provided by means of two large stainless blowers which will force air through cascading water from an overhead spray aeration system.

Aeration will be provided through a pipe arbor which runs through a compartment over the main water volume. Twenty-four stainless jets will spray the water upward. The water will cascade downward and enter the tank uniformly over its surface through a perforated sash damping cover. Water depth is being kept low, and circulation rate high to insure constant water exchange over each part of the tank. A rotation can be induced at will in the water volume or eliminated if necessary.

This unit will weigh about 26,000 pounds overall and will be fitted to be placed either on shipboard or onto a flatbed truck. It is hoped that the unit will allow transport of a wide variety of species from collecting sites in Texas, Mexico and in the Pacific Islands.

17. POP: Pacific Ocean Park Santa Monica, California

Marine demonstrations at this new installation just opened this past summer include a fabulous dry-land aquarium in which models of aquatic animals are moved realistically by hidden wires and mechanisms. In addition, there is an octagonal tank of 80,000 gallons with viewing windows of 6 x 6 ft. plate 221 inches thick. Also for top viewing there are two large circular pools, on one containing porpoise and other containing the only two beluga or white whales in captivity. Two smaller pools are in between the larger tanks. One contains a trained elephant seal, and the other is used for various acts put on as a part of the SEA CIRCUS. The beluga were obtained in Alaska along with one which went to the New York Aquarium but subsequently died. Ross, Darcy and Art McBride are in charge of operations at the sea circus.

Adjacent to the Sea Circus is a large tank containing two of Mr. Martine's diving bells. They have proved to be highly popular.

18. Steinhart Aouarium, San Francisco

The rehabilitation bond issue having been passed, most of the activities of the Aquarium staff revolve around the preparation of the final plans.

On the biological side we now have a 6-months longevity record for caesarian section bat sting rays. We have attempted this many times in the past but were never able to keep them longer than two months. The secret seems to be in keeping food on the bottom of the tank for most of the day.

19. Seattle, Washington

Renewed interest has developed in the past few months over a public aquarium with research facilities attached.

20. Vancouver, British Columbia

Newest item here is an 80-page guide book containing over 100 illustrations of aquatic plants and animals, including local and exotic forms. Curator Murray Newman is the author. It sells for \$0.75.

The Aquarium now has burbot on display that were located at night by means of a sniper scope - an infrared searching device. Having located the fish, it was then a simple matter to run a beach seine through the area.

III. PEOPLE

ALVIN SEALE, master aquarist, died at his home in Watsonville, California on July 28, 1958 at the age of 87. In his lifetime he had traveled throughout the world in search of fishes. He supervised the construction of two aquariums - the Manila Aquarium, built in one of the bastions of the old walled city, and then later, in 1922 and 1923, the Steinhart Aquarium. After construction of the latter, he remained at Steinhart for twenty years as its first superintendent. He is the only aquarist ever to ride a bicycle half way across the country - in this case to enroll as a student at Stanford under David Starr Jordan. Ichthyologists and Aquarists alike mourn the passing of this great man.

JOHN C. PEARSON, longtime director of the Fish and Wildlife Service Aquarium in the basement of the Commerce Building in Washington, D.C. retired June 30, 1958. His address is Box 101, Atlantic Beach, via Beaufort, N.C. The new director of the aquarium is GEORGE MESSERLY, a former hatchery man of considerable experience.

BRANDY SIEBEMALER, curator and operations manager of the Gulfarium at Fort Walton, Florida, has left that organization.

SAM BAKER is the new curator at the Hermosa Beach Aquarium.

JAMES ATZ had been cursed with a ten-year ultimatum as the maximum time available to submit his doctorate thesis - he made it with one-half hour to spare. By way of celebration, Jimmie states that all drinks at the next symposium are on him.

IV. LITERATURE REVIEW

The Control of pH by buffers in fish transport
by William IT. McFarland and Kenneth S. Norris;
California Fish and Game, vol 44, Pt 4, pp 201-310; 3 figs. Oct. 1958

Occasionally a paper is published which is destined to become one of the bulwarks in the aquarium field, and this paper may be so considered. Below we have copied the summary of the paper. Items 5, 6 and 7 are especially pertinent. If you do not have a reprint, and wish to have one, we suggest you write to either of the authors, McFarland at the Texas Institute of Marine Sciences at Port Aransas or Norris at Marineland of the Pacific, Marineland, California.

- (1) Chemical buffers are of importance in the control of acidity changes (expressed as pH) during fish transport resulting from respiration and accumulation of waste products.
- (2) A biochemical buffer, tris-hydroxymethylaminomethane (tris buffer), has been found valuable for pH control, both in closed and open system fish transport.
- (3) Inorganic buffers either caused heavy precipitation of salts in sea water or buffered outside the optimum pH range for marine fishes.
- (4) Methods of application of tris-buffer in transport are discussed.
- (5) A closed system experiment was carried out in which a constant pressure of O_2 was maintained over a volume of water containing a known weight of experimental fish (*Fundulus parvipinnis*). The lengths of time to 50% mortality for buffered and non-buffered groups were determined. Periodic water samples were tested for pH, O_2 concentration, turbidity, inorganic and organic nitrogen. The most highly buffered group lived 2.84 times as long as the longest-lived control group.
- (6) The interactions of CO pH and alkalinity are discussed. A theoretical model relating the effects of metabolism upon pH, alkalinity and free CO_2 is developed. The model suggests that lethal limits will be rapidly reached if the weight of fish transported exceeds 25-50 grams per gallon in a closed system.

(7) The interreactions of CO₂, pH and O₂ in relation to respiration of fishes are discussed. The correlation of high CO₂ concentrations and low pH levels with mortality is possibly due to the effects of these variables upon the ability of fishes to utilize oxygen.

(8) In open transport systems pH is shown to decline, while CO₂ increases, even during the use of aerating devices. Tris-buffer stabilized these factors in actual transport.

Aeration in aquaria by A.L. Downing (Water Pollution Research Laboratory, Stevenage, Herts),
The Aquarist, vol 23, no. 3, pp 47-51; 14 graphs, June, 1958.

The graphs and discussion in the meaty article are quite good, which the summary, reprinted as follows, does not entirely indicate.

1. In all circumstances it is beneficial to aerate aquaria, since this tends to maintain low concentrations of carbon dioxide and concentrations of dissolved oxygen close to the saturation value; that is, neither too high nor too low.
2. Replacement of water is useful in the same way as aeration and it also serves to remove waste metabolic products, which may be quite an important function in some circumstances.
3. It seems unlikely that carbon dioxide will be the "critical respiratory gas" unless there are fishes present which are particularly sensitive to it in relatively low concentrations. In the normal way the concentration of carbon dioxide will tend not greatly to exceed the oxygen deficiency, and from the known toxicities of the two gases it would seem that most fishes would be in distress from lack of oxygen long before carbon dioxide became toxic. On the whole it would seem more appropriate to regard oxygen as the critical gas. However, there is no doubt the presence of carbon dioxide increases the toxicity of low oxygen concentrations.
4. Whereas the addition of a limited number of plants to an aquarium may be beneficial, it seems likely that, in many cases, this benefit is due as much to the provision of a more natural habitat for fishes and possibly to their utilization of some metabolic products, as to their influence on the oxygen and carbon dioxide concentrations. A heavy growth of plants is likely to prove a source of danger because (a) they may cause too high a degree of super-saturation in an unaerated aquarium or (b) the incidence of a very dull day when natural illumination is being relied on, or some other restriction in the rate of photosynthesis - for instance, limitation in the supply of carbon dioxide - may ultimately lead to lethal low concentrations of oxygen at night, or (c) lethal night-time

concentrations of oxygen may occur-anyway in the normal course of events in a heavily populated aquarium with a fairly high rate of aeration, or (d) the water may become too alkaline, owing to absorption of carbon dioxide, particularly if there is continuous artificial illumination.

5. A large number of decaying plants are undesirable because the resulting biochemical demand for oxygen may reduce the oxygen concentration to lethal values.

To summarize these conclusions, it-seems that with respect to the respiratory gases, the ideal aquarium should be one in which there is vigorous aeration, fairly rapid replacement of water, a limited number of healthy plants and not too many fishes.

V. SPECIAL NOTES:
More on Lindane Insecticide for Argulus Treatment

Robert Dempster
Steinhart Aquarium
California Academy of Sciences

In the last issue of DRUM AND CROAKER, Keith Kreag included a note on the use of lindane for fish lice. Since we had not tried this at Steinhart Aquarium, we decided to give it a whirl and were literally dumbfounded at its effectiveness. However, the stuff is lethal and so one must be very careful in computing the dosage. One part in ten million seemed to do the trick for us in a period of 20 minutes to one-half hour. Apparently the eggs are not vulnerable to the insecticide, for juvenile lice reappear about a month after treatment. Successive treatments will apparently take care of this reinfection.

Suggestions on Air Shipment of Fishes

If you have a very valuable fish which you are shipping on exchange to another aquarium, there are several things that can be done to make sure it arrives in good condition.

1. Do not feed for two days before shipment to make sure they have a clean digestive tract; large fishes such as sharks and eels should be starved for three days. Regurgitated food or excessive fecal matter in a salt water shipment usually means that you lose all of the fishes in the container.

2. Check with the airline for the temperature of the cargo compartment on the flight you intend to use. Some airlines have identical planes - one with a temperature-controlled cargo compartment and the other without. In a non-temperature controlled compartment the air temperatures are often below freezing. If a transfer is involved en route from one airline to another, ask the local manager to send a teletype ahead to advise the manager at the changeover point that he is carrying the crown Jewels. Otherwise your shipment might sit on the dock at the changeover point for a couple of days. Tropical fish usually travel with a 150 - 200% surcharge on the normal rate but some kinds of invertebrates travel at lesser rates. Check the individual airlines to see what their rates are (you may need to ask for a copy of their regulations).

3. Pre-oxygenate the water in the double plastic shipping bag for 15 minutes by bubbling oxygen through a small airstone. This is very important on a lengthy trip because it increases the volume of dissolved oxygen four or five times above the normal saturation point. Then place the fish in the container. The air over the water surface is entirely expelled by pressing on the plastic bag. The bag is then blown up tight with oxygen, sealed off and placed in a cardboard carton for shipment, and rushed to the airport. Send a collect telegram advising flight number and time of arrival.

R.D.

Steinhart's Blennies Do Not
Like Living in Glass-Houses

Donald A. Simpson
Steinhart Aquarium

In one of our tide-pool animal small display tanks are a number of eel-like Blennies from the Pacific Coast (Gunnels, Pholidae if you want to be fussy about it). Knowing their proclivities for hiding in the rocks and not wanting to give them enough rocks to hide in (so some joker wouldn't hang the old cliché "invisible fish" on them), we supplied them with short 211 and 3" sections of clear glass tubing. Which they promptly shunned like the plague. So we swapped the clear stuff for opaque black plastic. The verdict? Love that black plastic hideout ! Most of the time two fish get in each tube, leaving a head sticking out of each end. Looks like a two-headed fish to the viewers. Might even make some of 'em take the pledge. The viewers. not the fish?

Semantics in the Fish World

Donald A. Simpson
Steinhart Aquarium

Some years ago we decided that as long as fish "talk" we might as well let the public in on the deal. So we suspended a hydrophone in our Croaker (Sciaenidae) tank, connected it to an amplifier and let 'em have at it. Wasn't too bad except the Croakers' chatter was a bit mixed up with the sound of running water and/or other noises. Main trouble was the hydrophone (Navy surplus) kept springing leaks and generally pooping out with annoying regularity. So we got the Croakers' gabble on a record, hooked up a record player (with funds donated by the S.F. Aquarium Society) and put a push button outside the tank (and a phony mike inside). Gets a real play, too, with most of the button pushers scratching their respective noggins because they don't know what the Croakers mean by their chatter.

(Editor's note: Yes, we know Chris Coates' Fish Emporium has push buttons all over the place, but we had 'em before Chris built his joint.)

VI. SHORT ARTICLES

a. Relative Performance of Different Depths of Filtrant in Sand Filters

William E. Kelley
Cleveland Aquarium

A gravity filter design in use at The Cleveland Aquarium employing silica gravel six inches in depth as a filtrant, was demonstrated to the American Society of Ichthyologists and Herpetologists meeting at Higgins Lake, Michigan in 1956. Subsequently, it was suggested that since gravity filters in use at many aquariums employ filtrant depths of three and four feet, a series of measurements should be made of the relative performances of filtrants over a range of depths.

Through the summer of 1958, such measurements were undertaken by the author assisted by Mr. Richard Segedi, Mr. Arthur Goldstein, and Mr. John Watson.

The equipment consisted of a source of contaminated water, filter columns ranging from two inches to four feet in depth, containing silica sand averaging one to two mm in average size and a device for measuring turbidity utilizing a light source, a cell for the filtered water, and a light meter.

Organic contaminants ranging in particle size from suspensions of mulm and plant debris through various infusoria cultures and bacterial blooms to colloidal suspensions of powdered milk were tested in filters of various depths. The range of particle sizes filtered produced these results:

- (1) Particles larger than the sand grains were effectively trapped at the surface of the filtrant.
- (2) Particles smaller than the sand grains but larger than colloidal suspensions filtered with good efficiency with most of the action occurring in the top six inches of the filtrant.
- (3) Extremely small particles such as colloidal suspensions filtered poorly. The small improvement in clarity of the effluent was once again largely effected in the first few inches of the filtrant.
- (4) No consideration was given to possible organic pollutants so completely dissolved as to not affect the clarity of the water.

These test results agree well with filtration as it is understood by other people in the field. Babbitt and Doland's "Water Supply Engineering" says, (28-1) "The common method for the filtration of a public water supply is to pass it through a layer of sand. It has been found by experience that, by passing water through sand, suspended and colloidal material is partially removed, the chemical characteristics of the water are changed and the, number of bacteria is materially reduced. These phenomena are explained on the basis of four actions: mechanical straining, sedimentation or adsorption, biological metabolism, and electrolytic changes," and further "The action in a filter occurs principally at the surface of the sand in the layer of matter deposited thereon."

"Water Purification for Plant Operators" by Norcom and Brown says, (Page 42-43) "However, floe (gelatinous growth) penetration extends the zone of straining action and explains why the top six inches of sand is usually regarded as the true filtering layer."

Since Babbitt and Doland also base filter designs on a flow rate of two gallons per square foot of filter surface per minute, we can establish an optimum configuration for any sand filterbed using the minimum of sand. For example, to obtain a clean flow rate of one thousand gallons per hour, the sand bed of the filter would be six inches deep and have a surface area of approximately eight square feet.

Then why build deep sand filters? In the case of small movable filters designed to serve single aquarium exhibit tanks, there is little merit to deep beds of filtrant which only makes the units bulky and heavy. Unless these small units have backwashing incorporated into their construction, a deep filtrant becomes difficult to clean.

Large fixed filtration systems require more than six inches of sand because it is difficult to rake out a broad layer of filtrant to uniform thickness after backwashing and some additional sand solves this problem simply. These large filters, however, would perform quite well with less than the usual thirty to thirty-six inches of sand depth. Perhaps these deep filter designs were adapted from public water works systems where, despite the low efficiency of the bottom layers of sand, some slight improvement of the water purity is obtained - and after all, we drink their water!

b. The Use of Synthetic Rubber
in Setting Aquarium Glass

Christopher T.V. Coates 'New York Aquarium
Coney Island, Brooklyn 24, N.Y.

The setting of the glass in an aquarium is a problem to which many people have given much thought, with a number of excellent ways of making this water-tight junction between glass and metal, wood, or concrete resulting. All of these, to date, however, have had one or another kind of bug in them, as far as we have been able to discover, and we have always been on the lookout for a simple-to-work, non-toxic, elastic bonding material we could use without trouble.

We have found a substance which we think fills all these requirements.

It is a synthetic rubber which comes in an inactive state ready to be activated whenever required. It sets up flexibly but makes a permanent bond both with the glass and with the framing material. After two years of use in both fresh and seawater, it seems to be completely inert in that we have been able to keep all sorts of vertebrates and invertebrates in tanks assembled with this material.

Our method of assembling the tank is to prepare the frame for the glass of whatever material is most suitable. In some cases it is angle iron, in others wood, and in still others it is concrete. It is not essential to make the frame completely smooth for the material itself will fill in considerable irregularities. The glass is fitted to the frame to make sure it is not too large on

any of the irregular surfaces which may occur along the edge of any glass not edge-polished and then the glass is set aside until the frame is completely cleaned with toluene to remove any trace of grease or oil. The glass is then similarly cleaned, for a distance of at least three inches from the edge, on both sides and along the edge itself.

The compound is then mixed with the activator, using a powered paint mixer. This mixing must be done thoroughly or some of the compound will not set up and will wash out when the tank is filled with water.

After the mixing, with the tank laid on its face so that the frame is down, the framing is covered on all four sides with the mixture. When this has been spread out roughly to about a quarter of an inch thick, the glass is lifted into place, taking care to lift from the center of the underside so that none of the cleaned edges are touched. The glass may then be laid on the compound and pressed home. The overflow of the compound is smoothed around all the edges and overlapped along the inside face of the glass for an inch or so and the whole left to set for one day. At this time any bits of compound which have fallen out of place or run into unwanted areas may still be cut out. The tank is left for another day, after which it is ready for use.

After the second day it is impossible to remove the glass by any means other than cutting the compound out altogether.

In very large tanks, impossible to move, the glass is set in position and then laid down on its back exactly opposite to its final position, but at right angles to it. The cleaning with toluene follows and then the compound is applied directly to the glass, again approximately a quarter of an inch thick. The glass and compound begin to set up, leaving a slightly tacky surface. The glass is then lifted into place and pushed home. The compound is sufficiently set not to run, but is not sufficiently set so that it won't bend with the receiving surface. The glass is held in position for two days by any convenient method and again the tank is ready for use.

Any pin holes which may have been overlooked may be filled with new material which will bond directly to the old.

Our material is called DEL Caulking Compound and is available from the David B. Long Corporation, 220 East 42nd Street, N.Y.C., but it seems to be identical with several other proprietary compounds based on material supplied originally by the Thiokol Corporation.

VII. NEW EDITOR

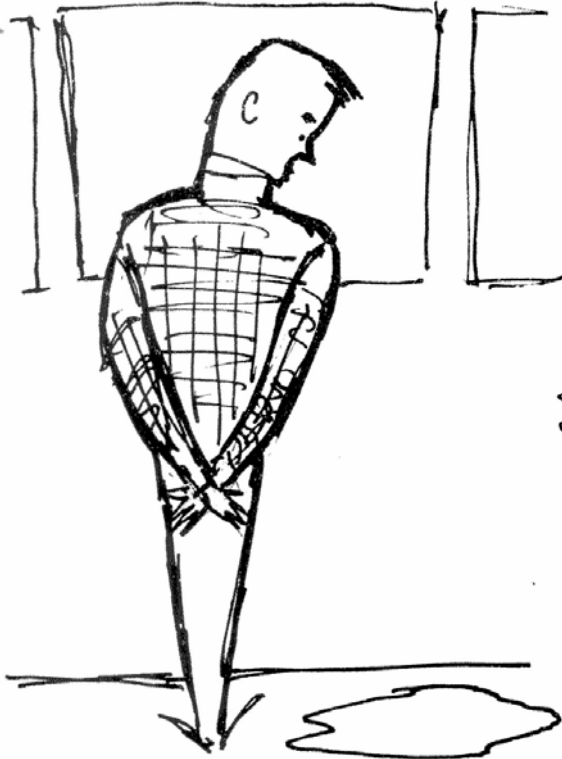
New editor of DRUM AND CROAKER is Lee Finneran, Belle Isle Aquarium, Detroit 7, Michigan. Since Lee will wish to get out an issue of D & C before the June meetings, let him know what is happening at your place. Also, if you wish to discuss your favorite subject in the aquarium world, send him the title of your paper as soon as possible. In turn, he will send it to Ichs and Herps and to AAAS for publication in the official program.

See you at the Aquarium Symposium in June.

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"CORTOONS" BY DICK CORTIMILIA

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GEORGE...

