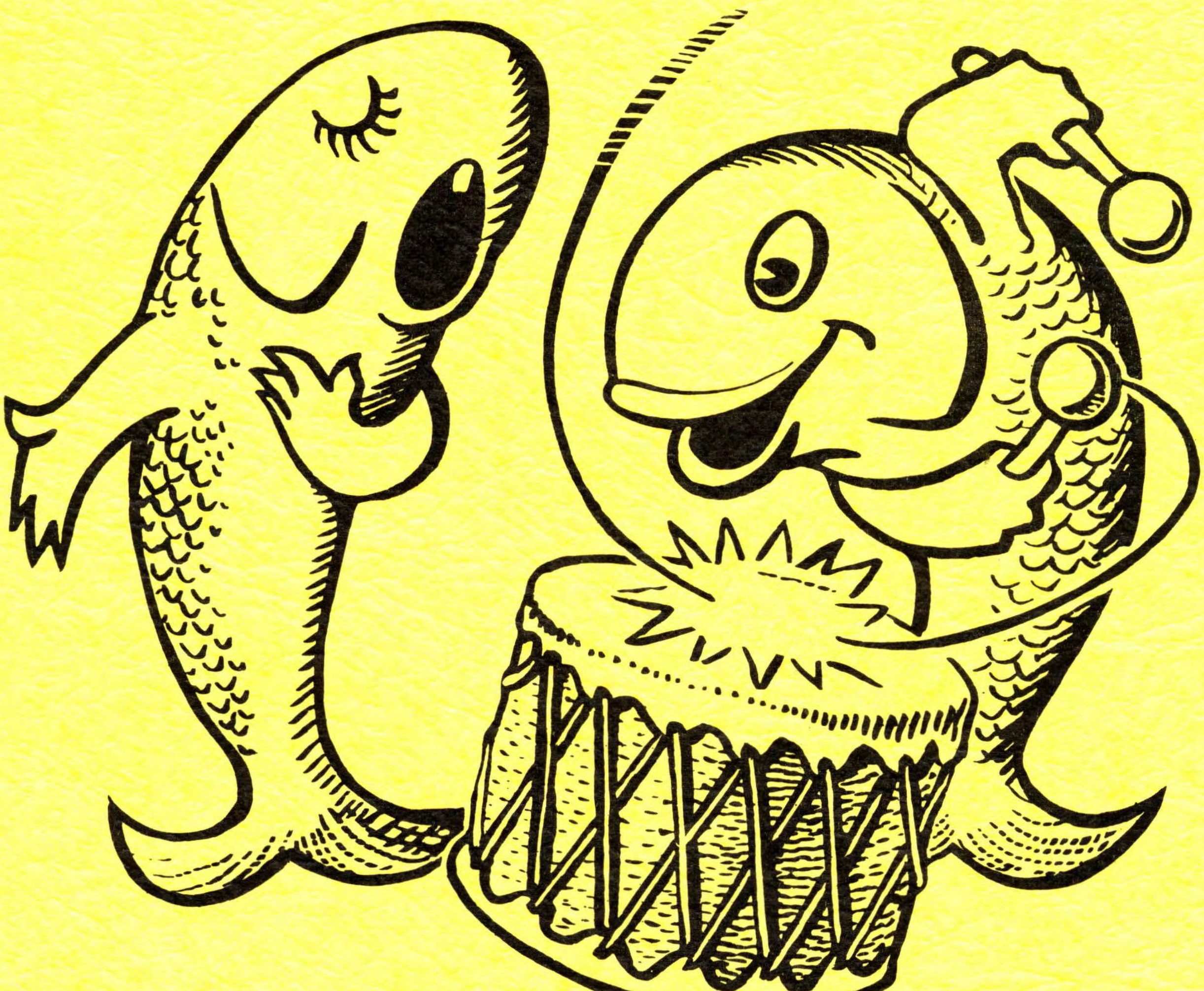
The DRUM and CROAKER

A Highly Irregular Journal for the Public Aquarist



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DRUM AND CROAKER

The Informal Organ

for

Aquarists

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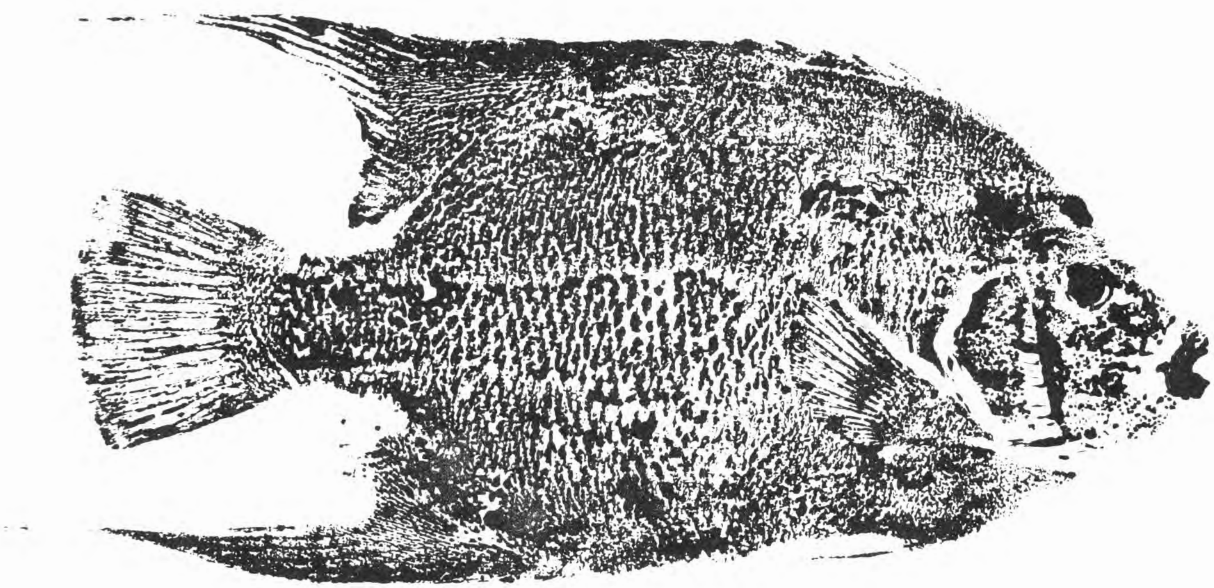
Fish prints (Gyotaku) by Beverly Serrell, Shedd Aquarium.

This issue of DRUM AND CROAKER compiled by Kim Marggraf, Secretary to the Director, John G. Shedd Aquarium.

Prepared by the John G. Shedd Aquarium; 1200 South Lake Shore Drive; Chicago, Illinois, as a service to aquariums generally.

DEDICATION

This issue of DRUM AND CROAKER is dedicated to William Hagen in recognition of his long and valuable service to the aquarium field.



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ON BILL HAGEN'S RETIREMENT

Warren J. Wisby
Director, National Fisheries Center and Aquarium

We are, with this issue of Drum & Croaker, bidding farewell to one of the mainstays of our profession. Bill Hagen retired on May 28 of last year, and he left behind him an enviable record.

Bill has been a prominent part of fisheries management for the 37 years that he has worked for the Federal Government. Prior to his Government service he worked for five summers in the Alaskan salmon fisheries industry while attending and graduating from the College of Fisheries of the University of Washington. His graduate studies were pursued at Cornell University.

He was the first biologist for the National Fish Hatcheries (Bureau of Sport Fisheries and Wildlife) to be concerned primarily with disease and nutrition. His contributions included improved diets, disease treatments, and studies on water temperature.

As regional supervisor for hatcheries in the Western United States he effected improvements in personnel management and hatchery operation and design, and was commended several times for excellent employee relations and for relations with cooperating State Fish and Game Departments.

He was assigned, at the request of two western States, to survey their fisheries facilities, and subsequently submitted recommendations for improvements, most of which were adopted.

As Chief of Salmon Fisheries in the Washington office, he represented the Department of the Interior at the Columbia River Salmon Dam hearings in Congress for several years, resulting in successful presentations to secure required funds.

As Chief of the National Fish Hatchery system he developed closer liaison with research personnel and furthered research designed to improve hatchery operations, particularly in the areas of water quality, nutrition, and disease control. He encouraged the enlargement of personnel training schools and participated in them.

He was the principal originator of the proposal to construct a new National Aquarium in Washington, D.C. During the early planning stages he arranged preliminary design, appeared successfully before committees of Congress for authorization and funds, and has since been fully occupied with detailed planning, personnel staffing, and operational research. The result, to which he contributed in major part, is the proposed National Fisheries Center and Aquarium which can be an educational, recreational, and research center unrivaled in the world.

During the course of planning for the National Fisheries Center a great many requests were received, particularly from foreign countries, for advice on the planning and construction of an aquarium. Primarily as an aid in fulfilling these requests, he wrote and assembled material totaling approximately 100 pages for a publication entitled Aquarium Design Criteria. This publication has been proclaimed by many, including the Director of the Steinhart Aquarium in San Francisco, who stated the publication ".....will prove to be one of the major milestones in the professional aquarium field. On behalf of the entire aquarium community may I offer congratulations on a job well done."

Most of you probably first encountered Bill when he became editor of the Drum & Croaker. As evidence of his belief that the profession needed such a publication, he turned it into a stimulating, often provocative, and always excellent periodical.

We'll all miss Bill, particularly those of us who have worked closely with him. His ability and his dedication can be seen in the record. His unselfishness and his devotion to an idea had to be experienced.

Good luck, Bill, and may you have a long, happy retirement.

AQUARIUMS ARE FOR DIRECTORS

William Hagen *

This may appear to be a strange title to those of you who are directors of aquariums. It will not startle many of those on your staffs.

We are concerned here only with the publicly owned and operated aquariums, although application of the comments might well be made to some of the for-profit aquariums or oceanariums.

Generally there are two types of the public aquarium. One is the independent aquarium, not associated with or combined within a zoo or museum. The other is in connection with a zoo or museum and most often is in a very subordinate position. There are exceptions, of course.

Returning to the title of this piece, it concerns the general lack of personnel training at most aquariums, and the rut that most subordinate employees find themselves in. It is true, however, that many second and third men are quite satisfied with their lot, having no real desire to better themselves, or do not have the education or personality to rise to a Director's slot.

In the early 60's when we were promoting, with quite some success, the National Fisheries Center, opportunities were present for the inspection of all major aquariums in this country and many in Europe. Facts were gathered on water systems, filters and many other critical factors. These data were to guide us in the planning of the Fisheries Center, to avoid the mistakes of others - which mistakes usually were freely pointed out to us - and to attempt to improve upon the good points of these aquariums. Among the items of interest was the personnel setup at each aquarium. A file was made of staffing at most of the aquariums visited.

The study of staffing of aquariums was pointed particularly at the supply of second and third men to determine if there existed a corps of adequately trained aquarists with the qualities needed for advancement to supervisory positions. Quite obviously the search had in mind the up-coming needs of the Fisheries Center. It was not intended to rob these aquariums of their good men by offering the then higher salaries paid by Government. We were sorely disappointed. The survey revealed very few individuals of promise. Certainly, many excellent aquarists, but so few with any training beyond handling the fish in exhibits.

* Retired Assistant Director-Operations
National Fisheries Center and Aquarium

Let us start with the "independent" non-profit aquarium, not associated with a zoo. Here, at the larger of these, The Director usually is a strong character, having good rapport with the public, the press and the city council (or whatever), and usually is an excellent aquatic specialist. He takes care of everything, delegating, as he should, routine duties to the help, who rarely have an opportunity to develop in fields other than fish handling. Often, of course, they are not eager for responsibility.

A subordinate employee who is ambitious and has possibilities for advancement will soon leave if at all possible. Thus, if the Director leaves those responsible for filling the position will search elsewhere for a replacement. The chosen individual probably will come from his position as Director of another, possibly smaller, aquarium. That aquarium will go through the same process. In each such case the search is for outside talent because no one has taken the trouble to properly prepare the in-house personnel.

Passing on to the aquarium within a zoo. Here the position of aquarium Director (if there be such a title) is quite often intolerable for an active and knowledgeable individual, but he may be trapped in the position. Normally the aquarium is entirely secondary in the zoo-aquarium complex, both in budget and recognition. He who is in charge of the aquarium rarely has the opportunity to attend distant meetings of his contemporaries. The Director of the zoo will attend plus, perhaps, curators of one or two zoo sections. It is evident that the man in charge of the aquarium cannot be expected to develop into real supervisory material.

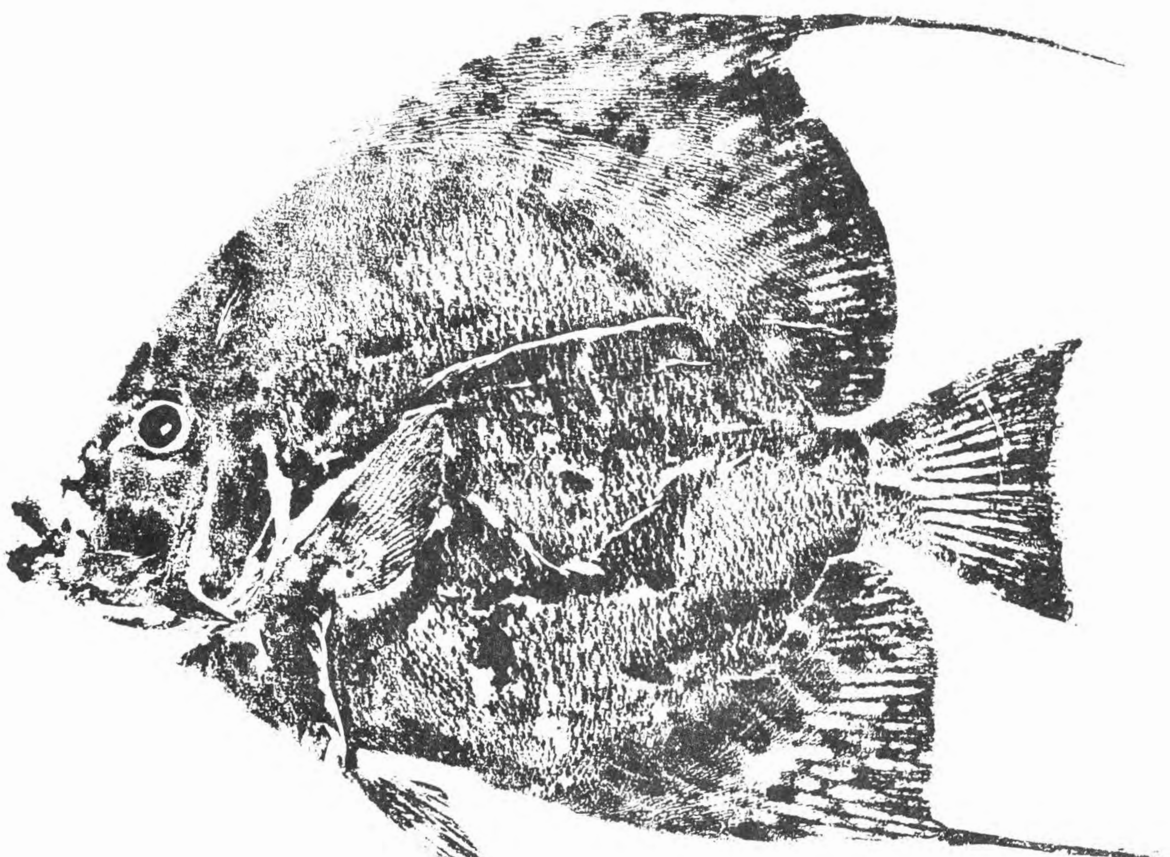
Quite often the tendency of those in overall charge of the zoo-aquarium complex will, if the aquarist leaves, select one of the remaining subordinate aquarists, however qualified, to be head man as the easiest way out, and thus perpetuate dominance by the zoo.

Let's face it. At most public aquariums the Director is personnel and budget officer, purchasing agent, PR man, and most else. Little effort is made to familiarize other employees with the intricacies of administration. Thus, we have the subject of this piece -- no upcoming men to assume the top jobs.

Let it be said that many aquariums are not of a size to warrant trainees, but should train a second man. Not so many years ago two of the top aquariums had no qualified second men. Now one has college graduates as curator trainees, and the other has two capable second men. The director of at least one aquarium gives credit for articles to his subordinates, thus giving them more satisfaction in their jobs.

A top director in any line of work gives his employees credit for jobs well done. He trains at least one subordinate to take over in his absence, thus assuring continuity. These actions reflect favorably upon him, and result in smoother operations and good employee morale.

Having had long experience with programs requiring people, this writer has learned and advocated that "nothing is more important than people," regardless of their position in an organization.



A DRUM AND CROAKER NON-EDITORIAL:

...AND NOW WE HEAR IT FROM A REAL EXPERT!!!*
(or - A little knowledge is a dangerous thing)

Now that there has been a delay in the construction of the huge aquarium in our nation's capitol, it would be an ideal time to redesign the entire project. I have carefully reviewed the present plans for this gigantic ten million dollar plus, "Aquarium" and was not overly enthusiastic about it. To me, it is NOT an aquarium but primarily a marine lab and library with the actual aquarium itself, a very small part of the whole project. Although a great deal of hard work went into the present plans and much of it has considerable merit, the over-all plan should be reviewed and redesigned.

For $10,000,000.00 I could design an aquarium that would have LIVE CORALS AS WELL AS FISH FROM THE OCEANS OF THE WORLD. It could have deep sea specimens displayed ALIVE, it could have cold water fishes from the artic and anarctic displayed alive! A ten million dollar aquarium could have the most colorful and exotic marine fish found in the world today. It could have an authentic coral reef with live gorgonians and corals, schools of grunts and snappers. It could have weekly shipments of rare and exotic gems from the world over. But little of this is presented in the National Aquarium Plans of today. In fact, after reviewing the booklet on the new project, I would say it is basically a display of marine laboratory equipment and experiments. This can be seen in any university today; as can a library. Neither Ellis nor myself were consulted about the huge aquarium to be built with OUR tax dollars; although they did use one of my pictures from Exploring The Reef to illustrate their brochure. The ACTUAL space alloted for live exhibits is just SIXTEEN PERCENT of the total building! The coral reef tank is extremely small compared to the overall plan.

Let's build a REAL AQUARIUM in Washington if we are to expend ten to twenty million dollars. Write your congressmen about it. Now is the time to get the National Aquarium redesigned. Otherwise, we may see a giant building with a few dozen aquariums tucked under one wing. The rest will be libraries and equipment. An aquarium should be JUST THAT and not a display of lab equipment, just as a zoo should contain animal exhibits and not a display of veterinary equipment. There are other places for such displays, such as universities or laboratories where scientific equipment can and should be displayed but as for the National Aquarium, I would recommend a major redesign and make it nine tenths an aquarium and one tenth a display of lab equipment. This is how an aquarium should be.

Reprinted from Salt Water Aquarium, Vol. 7, No. 4 (July-August, 1971); Editorial: "Re-Design National Aquarium", by R.P.L.S.

UPCOMING ASIH MEETINGS

Louis Garibaldi
New England Aquarium

The American Society of Ichthyologists and Herpetologists meetings are to be held in Boston next June and the New England Aquarium has been asked to be a co-host. We have agreed to participate, but I explained to the local committee the present association of the professional aquarists with the AAZPA. It was felt, however, and probably with some justification, that there may still be some aquarists/ichthyologists (those with healthy budgets) who would attend the meeting as well as other researchers who are maintaining live animals for behavioral and ecological work. To provide a platform for these people and in the interest of grouping papers according to subjects or fields of interest Dr. George Myers suggested that a symposium be held entitled "The maintenance of lower vertebrates" with no illusion to aquariums as such or "Behavior and live animal care."

I agree we should all go to one meeting together and it appears that the AAZPA has much to offer. However, I think this symposium at the ASIH is a good thing and may produce many good papers of interest and value to aquarium people. Drum and Croaker could disseminate the fruits of this conference to those who can't attend.

RECOLLECTIONS OF AAZPA MEETINGS IN SALT LAKE CITY
- SEPTEMBER 19-23, 1971 -

Daniel H. Moreno
Director, The Cleveland Aquarium

Since the aquariological papers are a matter of record, I won't go into their content. I was well satisfied with their quality, but keenly disappointed by the failure of four scheduled contributors to attend or present programs.

I think some of the zoo papers were of the highest caliber.

It was my distinct impression that the aquarists were, for the most part, won over by the seriuos dedication, talent, and friendliness of the zoo contingent.

Although rather spontaneous, the aquarium faction did get together for a quasi-official meeting. I believe the following people were present: Jeff Moore, Elmer Taylor, Paul Montreuil, Bill Flynn, Doug Kemper, Don Wilkie, Don Zumwalt, Dave Powell, Murray Newman, Lou Garibaldi, Tom Whitman, Gil Hewlett, Brad Latvaitis, Chuck Farwell, Emanuel Ledecky-Janecek, Bill Braker, and Dan Moreno (Chris Coates was at the aquarium conference but not at this particular meeting).

My most vivid recollections of the discussion revolved around the question as to how (and if) we were to join the AAZPA body. After considerable discussion, not without some differences of opinion being voiced, it was agreed (with a minimum of grumbling, as I recall) that we enter -- with no strings attached. Paul Montreuil was, I believe, "elected" to convey (orally) this information to the AAZPA... which he did.

Don Wilkie argued that "we aquarists" should be allowed to elect our own representatives to the AAZPA committees and board. I had the feeling he wanted the aquarists to become a strongly cohesive body within the AAZPA organization and to speak with one voice.

TO ALL AQUARISTS

At the AAZPA meeting held in Salt Lake City during September, 1971, 19 aquarists from the United States and Canada met and discussed the problem of an annual meeting for aquarists. After considering the possibilities of affiliating with ASIH, AAM, and AAZPA, or going it alone, those present voted unanimously in favor of AAZPA. They also decided that a program committee should be elected annually to plan the yearly symposium, and that this committee should endeavor to survey the aquarists of the USA and Canada each year in order to determine the type of program that the majority prefer and to increase the unity and communication between aquarists.

The program committee for the 1972 meeting is:

Don Wilkie - Chairman
Gil Hewlett - Vancouver Public Aquarium
Lou Garibaldi - New England Aquarium

Don Wilkie was subsequently appointed to the overall AAZPA program committee which is chaired by Mr. Ron Reuther, director of the San Francisco Zoological Gardens.

Gil Hewlett has been appointed to the AAZPA liaison committee. It is hoped that in the future the aquarium member can be chosen by the aquarists rather than appointed by the AAZPA president.

This year's AAZPA meeting will be held in Portland sometime during October. There will be an aquarium symposium, and we are striving for a good turnout of aquarists.

SUGGESTED PROGRAM

This year's committee suggests a three part program:

1. A workshop (probably in the evening) on some particular aspect of aquariology, e.g., Nutrition, disease, water treatments. Since the Western Fish Nutrition Lab is near Portland, nutrition might be a suitable topic.

2. A keynote speaker from outside the public aquarium field, who works in a closely related field, e.g., Dr. John Halver, the director of the Western Fish Nutrition Lab.

3. Papers on aquarium topics. This will include research papers, films, narratives, etc., by any aquarist who would like to participate.

In addition, there would be a brief meeting of aquarists to elect a new program committee. This probably could be held at the conclusion of the workshop session.

ANNUAL MEETING OF AQUARISTS
DEADLINE FOR QUESTIONNAIRE IS 3 MARCH 1972

PROGRAM QUESTIONNAIRE	Yes	No
1) Do you favor the type of program described on the previous page?	___	___
2) Would you prefer to have only "papers"?	___	___
3) Could your aquarium contribute towards an honorarium to pay the expenses of a keynote speaker? (Scripps Aquarium has offered to provide $50.00)	___	___

4) If you favor a workshop, what topic do you prefer?

(Please bear in mind the proposed relationship between the workshop and the keynote speaker)

- Nutrition ________
- Disease ________
- Water Treatment ________
- Collection ________
- Other ________

5) Can you suggest an appropriate keynote speaker?
____

6) Do you plan on attending or sending someone from your organization? ________________________________

7) Would you plan on making a presentation in the "papers" portion of the program? ___ ___
On what topic? ________________________________

8) Do you feel that the aquarist representatives to AAZPA committees should be elected by the aquarists? ___ ___

9) Do you favor affiliation with AAZPA? ___ ___
If no, please explain why. ________________________________
____

10) Other comments: ________________________________
____
____

11) Do you belong to AAZPA? ___ ___

12) Name: ________________________________

Organization: ________________________________

COMPLETE QUESTIONNAIRE AND MAIL TO:

Mr. Don Wilkie
Aquarium-Museum
Scripps Institution
of Oceanography
La Jolla, California
92037

SECOND KILLER WHALE SUCCESSFULLY FLOWN FROM UNITED STATES*

Ramu II, a young female, weighing one ton and measuring just over 12 feet, was recently flown across the Pacific by Qantas to replace the original Ramu at Marineland of Australia in Surfers' Paradise.

Ramu I, flown from the United States in March, died after seven weeks at Marineland.

On board the Qantas flight was Don Golsberry of Seattle, U.S.A., who captured both the whales.

Golsberry, who heads a professional team of whale catchers, followed a well rehearsed pattern when he captured Ramu II in Puget Sound, off Seattle three months ago.

As soon as a "pod" of killer whales is seen entering the salmon-rich waters of Puget Sound, a helicopter takes off and acts as a spotter for two fishing boats.

The boats encircle the pod with a nine-mile net which is slowly drawn in so that the whales are mustered into a tight bunch. A steel anti-submarine net is slipped under the circle to prevent the whales from diving.

Aqua-lung divers then jump from the boats and guide the big whales out of the net. At this stage Ramu II, which was the desired size for the Marineland order, was helped into a sling hanging from one of the boats.

She was carried back to Seattle and later taken to an oceanarium in San Francisco to await her flight to Australia.

Qantas technical men, who were responsible for the successful carriage of Ramu I, took care of all in-flight preparations to ensure that Ramu II was as confortable as possible during the journey.

She travelled in a specially constructed hammock of canvas which was supported in a tubular steel frame. Holes were cut in the canvas to accommodate Ramu II's pectoral flippers.

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* Reprinted from Australian Fisheries, December 1970, Vol. 29, No. 12.

LOSS OF WATER QUALITY IN CLOSED MARINE SYSTEMS

Thomas R. Hablett

I would like to submit a "microproposal" of my Master's Research and see what (if any) response I can get from Drum & Croaker. Being relatively new to the field of "aquariology" I can only assume that my literature search has been all but complete, yet my sources are depleted. Now I am faced with the possibility of duplicating someone else's work. I hope this proposal will solicit response and avoid this possibility.

My studies are all based on the problem of the loss of water quality in closed marine systems. I have found numerous references to changes in quality without quantification nor experimental control, as well as applying corrective measures before the problem source is found. A portion of my studies will be directed at these shortcomings.

The experiment is divided roughly into three classifications. First, I am in the process of using various physical phenomenon on seawater. That is to say, I am seeing what effects physical changes (light, temperature, etc.) have on sea water chemistry. Secondly, using fish for nitrogen waste sources, I am testing the effectiveness of various filtration media. Here I am comparing types of filters, flow rate, media quantity, surface area, composition, etc. - again, monitoring water quality.

The last phase is introducing "naturalness" back into the aquarium system. This would be by having fluctuation in controls which are normally static in aquarium systems, to see if organisms will more readily adjust to such a situation, and act more predictably normal than what is now experienced, thereby giving the researcher a more useful laboratory tool.

I am aware of some of the more recent contributions published in Drum & Croaker as well as other major papers which are too numerous to list. If anyone is interested in shedding a little light on the above subjects, or is interested in my results, I can be contacted at California State College at Fullerton; 800 North State College Boulevard; Department of Biology; Fullerton, California; 92631.

THE DEPLETION OF COPPER IN MARINE AND FRESHWATER ENVIRONMENTS BY ACTIVATED CARBON FILTRATION

Brad Latvaitis
Assistant Curator of Fishes, Shedd Aquarium

Copper is being used at the John G. Shedd Aquarium for the control of algae, prophylactic disease control and specific disease treatment. When using cupric sulphate pentahydrate it is important to make daily water quality analysis determinations so the copper level can be maintained. The copper level is determined through the diethydithiocarbamate treatment as described in Strickland and Parsons (1960).

The copper level must be monitored daily because there is a loss of copper sulphate caused by precipitation with calcium carbonate to form copper carbonate. For every 1.72 ppm of calcium carbonate, 1 ppm copper sulphate is removed from the solution (O'Donnell, 1943). Activated carbon, which is a porous substance whose adsorptive capacity is dependent on the total surfaces within its pores, acts as a mechanical filtrant and removes copper from the water. The following procedures were undertaken to attempt to determine the rate of copper depletion by activated carbon filtration.

Purpose: To study depletion of cupric sulphate pentahydrate in marine and fresh water environments by activated carbon filtration.

Materials and Methods:

I. Six plastic aquariums 18.5"h x 13"w x 12.5"l or 12.8 gallons.
II. Darco 4 x 12 Granular Activated Carbon
III. Two Halvin #18L filters; 8"h x 2.5"w x 8"l.
IV. Two corner filters 3"h x 2.5"w x 3"l.
V. Cupric sulphate pentahydrate.
VI. Instant Ocean artificial sea salt.
VII. D.E.D.T.C. Copper analysis materials.

Procedure:

1. Aquariums #1, 2, and 3 were filled with artificial sea water: ph 8.0, specific gravity 1.025, temp. 77° F.
   a) Aquarium #1 was equipped with a corner filter containing 96 grams of activated carbon (dry weight).
   b) Aquarium #2 received no filtration.
   c) Aquarium #3 was equipped with a Halvin filter containing 390 grams of activated carbon (dry weight).

1) Copper ($CuSO_4 \cdot 5H_2O$) was added to each aquarium.
2) The copper level was monitored at the end of 2 hours, 4 hours and 24 hours.

II. Aquariums #4, 5, and 6 contained freshwater. The above was repeated with #4, 5 and 6 corresponding to #1, 2 and 3 respectively; ph 7.5, temp. 77° F.

Spectophotometer Results:

#1 and #4 corner filters (96 g carbon):

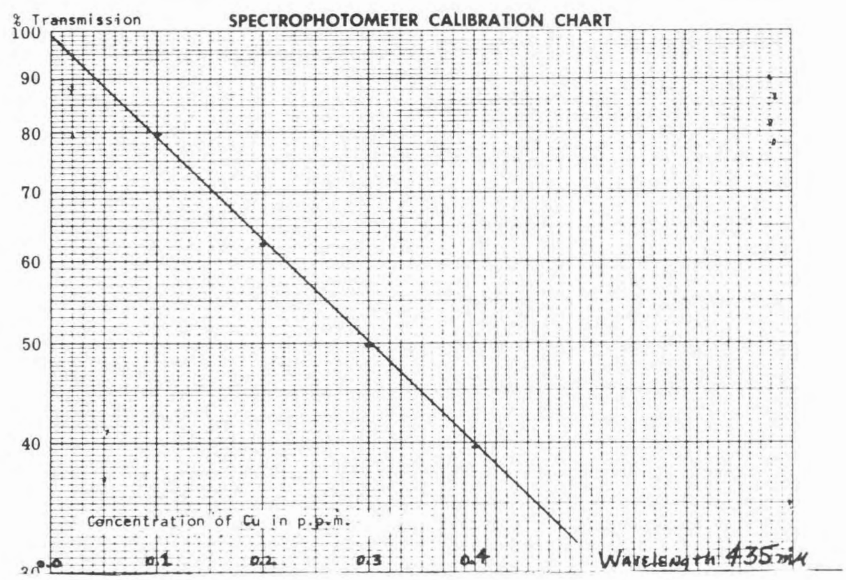
	Light transmission	Cu p.p.m.		Light trnsmsn.	Cu p.p.m.
#1	31%	0.51	#4	38%	0.42
	58%	0.24		57%	0.24
	63%	0.20		56%	0.25
	89%	0.05		81%	0.09

#2 and #5 no filtration:

	Light transmission	Cu p.p.m.		Light trnsmsn.	Cu p.p.m.
#2	36.5%	0.44	#5	45%	0.35
	51 %	0.29		45%	0.35
	51 %	0.29		63%	0.20
	65 %	0.19		63%	0.20

#3 and #6 outside filters (390 g carbon):

	Light transmission	Cu p.p.m.		Light trnsmsn.	Cu p.p.m.
#3	41%	0.38	#6	51%	0.29
	48%	0.32		61%	0.21
	82%	0.08		81%	0.09
	85%	0.07		92%	0.04



Data:

	Artificial Salt Water			Fresh Water		
Corner Filter #1				#4		
filter flow start	20.9 ml/sec	20.9 ml/sec	18.4 ml/sec	23.7 ml/sec	29.1 ml/sec	25.7 ml/sec
" " finish	20.9 ml/sec	18.4 ml/sec	25.7 ml/sec	29.1 ml/sec	11.3 ml/sec	25.7 ml/sec
p.p.m. start	0.51	0.24	0.20	0.42	0.24	0.25
p.p.m. finish	0.24	0.20	0.05	0.24	0.25	0.09
time interval	2 hours	4 hours	24 hours	2 hours	4 hours	24 hours
No Filter #2				#5		
p.p.m. start	0.44	0.29	0.29	0.35	0.35	0.20
p.p.m. finish	0.29	0.29	0.19	0.35	0.20	0.20
time interval	2 hours	4 hours	24 hours	2 hours	4 hours	24 hours
Outside Filter # 3				#6		
filter flow start	32.1 ml/sec	32.1 ml/sec	25.7 ml/sec	30.0 ml/sec	29.1 ml/sec	32.1 ml/sec
" " finish	32.1 ml/sec	25.7 ml/sec	28.1 ml/sec	29.1 ml/sec	32.1 ml/sec	25.7 ml/sec
p.p.m. start	0.38	0.32	0.08	0.29	0.21	0.09
p.p.m. finish	0.32	0.08	0.07	0.21	0.09	0.04
time interval	2 hours	4 hours	24 hours	2 hours	4 hours	24 hours

Conclusion:

The experimentation was undertaken to provide general information on depletion of copper from marine and fresh water environments. It is not useful, nor is it intended for use, concerning specific information on rates of copper depletion with and without activated carbon. Additional data would be necessary to provide specific conclusions.

The following general conclusions can be suggested. Water receiving no filtration will lose approximately 50% of its copper level within 24 hours. With filtration approximating the passing of 30 ml H_2O/sec over 390 grams of activated carbon an 80% depletion occurs within four hours. A 50% depletion occurs within four hours when 100 grams of activated carbon are exposed to water with a flow rate of 20 ml/sec. Water receiving carbon filtration lost 80%+ copper within 24 hours, while no filtration resulted in a 50% loss.

It should be stressed that results are specific for aquariums under the conditions described. Results will vary with water volume, surface area and water quality.

List of References

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Spotte, S. H. *Fish and Invertebrate Culture*. New York: Wiley Interscience, 1970.

Strickland, J.D.H., and Parsons, T.R. *A Manual of Sea Water Analysis*. Ottawa, Canada: Fisheries Research Board, 1960.

IT'S A RARE BIRD...ER...FISH! *

This strange fish, caught recently in the Mississippi river, has been identified by L.M. Page, scientist for the Illinois Natural History Survey, as a male white Amur, or grass carp, of Asiatic origin. It was nearly three feet long and weighed 21 pounds.

Page, shown holding the specimen, explained that it was caught by a commercial fisherman, Paul DeSherlia, of Chester, Illinois, who sent it to the Survey, located in Urbana, for identification. DeSherlia had stated that in 30 years of fishing he never had seen a fish like it.

Page, who had the fish preserved, said it was almost four years old and incredibly fat. He said it is a distant relative of the ordinary carp, and that its kind was released a few years ago in some southern states.

The National Conference on Exotic Fishes, Page said, had recommended that no further releases of grass carp be made in North America until studies are conducted to determine if it does irreparable damage to the habitat of desirable native fishes.

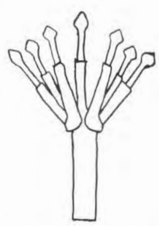
* Reprinted from the Illinois Republican Newsletter.

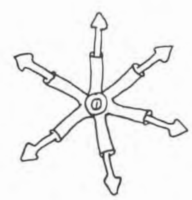
ARAPAIMA DEATHS CAUSED BY PLASTIC PLANTS

Elmer H. Taylor
Curator, New England Aquarium

It would seem to be more than coincidence for two nice large arapaima, in two distant aquariums, (New England Aquarium and the Pittsburgh Aquazoo) to die from what appeared to be a related cause.

The arapaima at the Pittsburgh Aquazoo was found dead from no apparent injury or malady. A plastic multi-fingered base from an artificial plant was found lodged in the esophagus, blocking open the pneumatic duct leading to the air bladder. Flynn is convinced that this was the cause of its demise; <u>Plastic Plants Can Be Deadly</u>, Drum & Croaker, May 1970.





In July our only arapaima jumped from its tanks over a two foot high barricade above the water line, landing on the hard deck below. It was returned to its tank but died two days later. The post mortem indicated internal injuries likely caused from the impact on the floor.

The stomach and the immediate area of the peritoneum were bruised for a length of five inches. Both were discolored with bile, indicating the possibility that bile entered the blood stream, from rupturing of the gall bladder.

While completing this examination we inadvertently dislodged a plastic plant base connector from its throat similar to the one found in the Pittsburgh arapaima.

Although we believe the death of our arapaima was directly attributed to internal injuries caused from jumping from the water onto the floor, I would conclude that the plastic plant lodged in the fish's throat created serious discomfort causing the fish to jump such a height.

THE AGE OF ARAPAIMA

William P. Braker
Director, John G. Shedd Aquarium

On February 7, 1972 what was probably the record captive Arapaima gigas, died after jumping from its 4,000 gallon tank in the John G. Shedd Aquarium. When originally acquired from Fred Cochu of Paramount Aquarium in May 1954, it was eight inches long. Growing rapidly on guppies and shiners, it graduated to chubs, goldfish and carp as it increased in size.

A previous issue of Drum and Croaker (Oct. 26, 1961) carried the following growth record for this fish:

May 4, 1954	8 inches
January 23, 1957	45 "
August 27, 1958	61 "
February 27, 1959	64 "
October 21, 1961	66 "

Recently, because of its size this fish has become more difficult to measure. Because of the risk of injury it was handled only when absolutely necessary. A leaking tank necessitated moving it on February 8, 1968. At that time this fish measured 86" and weighed 194 pounds. Four years later, almost to the day, it was measured after death and found to be 86" long and weigh 195 pounds. There apparently was no growth in the past four years.

This fish has been sent to the Field Museum of Natural History where a mold and cast are being made for permanent exhibit. According to Loren P. Woods, Curator of Fishes at the Museum, the fish was a male.

The Arapaima is native to the waters of northeastern South America. Its closest relatives are Osteoglossum, from the same area, Heterotis from Africa and several species of Scleropages from South East Asia and and Australia.

The name Arapaima comes from the language of the Macusi indians of Guiana, who call it arapaima or warapaima. Its other common name, pirarucu, is from the Tupi indians. Pira is their word for fish and urucu is the name of a bush bearing bright red seeds from which a dye is made. This is obviously in allusion to the glowing red color of adult specimens.

LITTLE-KNOWN FISHES OF THE POTOMAC RIVER

Craig Phillips
National Fisheries Center and Aquarium

VULTUREFISH, Ichthycathartoides cathartoides.

A scavenger by nature, the vulturefish feeds extensively on fidoplankton (floating carcasses of dogs and the like), plus an occasional grapefruit rind to ward off scurvy. It spends most of its time secluded in waterlogged burlap bags and is seldom seen, which is just as well considering its unusually revolting appearance.

POT DARTER, Etheostoma percolator.

Rusty teakettles and old coffeepots which line the substrate of the upper and middle Potomac are used as nesting sites by this fish. It should not be confused with the john darter (E. brickhausi), which prefers cracked bathroom fixtures for this purpose.

FROTHING BUBBLEBASS, Micropterus blooble.

This large bass frequents inlets where drains assure a constant supply of hard detergents. Seldom seen due to surrounding turbulence, it may be located by the wily angler who listens for the gargling sounds that accompany the fish's respiratory efforts.

POTOMAC SPRINGFISH, Mulmophagus spiralis.

Due to the dextrally-twisted spinal column of this fish, it is singularly adapted to hiding in the springs of mattresses and car seats on the floor of the Potomac. Sinistral mutations have been reported, but these usually become permanently screwed up before reaching maturity.

SMOGCHOKER SOLE, Trinectes barfophilia.

Due to low oxygen levels in its native habitat, this fish frequently surfaces to gulp the Washington air, immediately expelling this with a sound that has been described as "Gah--flooey!" Normally feeding on small crustaceans and similar sole food, the smogchoker has recently taken to consuming discarded hippie beads in the vicinity of the tidal basin, leading to the erroneous supposition that most captured specimens are gravid.

NEW LABELING SYSTEM AT
JOHN G. SHEDD AQUARIUM *

EMANUEL LEDECKY-JANECEK
Curator of Exhibits, Shedd Aquarium

Shedd Aquarium's original labeling system designed for the production methods and needs of the early 1930's performed its task well for many years, but was not up to satisfying the needs of the 1970's.

The labels were designed around glass photographic plates. White lettering was arranged on a grooved bulletin board of the type still used for cafeteria menus and outdoor church announcements. This was photographed with portrait view camera directly onto a glass plate.

A film negative of a fish was exposed on another glass plate producing a positive image for a space purposely left blank on the plate with the lettering. The two plates were sandwiched together and placed in front of a milk glass diffuser in a light box. The plate with the picture was occasionally colored by hand with dyes.

Quite a bit was crammed into the little sign: numbers, Roman numerals and color-coded patches. It required the purchase of the Aquarium guide book to decode the information. There was no satisfactory way of handling information not covered by the guide book code.

Furthermore, the glass plates broke easily, the labels glared and we were locked into a stiff, outdated layout with no choice of better typography. But even more serious than the aesthetic and practical consideration was the lack of space and versatility for proper transmission of information. Space allowed for only five labels per tank so there was no way to identify more than five species much less give any information about them.

Old System Revised

Unfortunately, we tackled the problem by thinking about what could be done to improve the existing system rather than determining what was needed in the new system. We wanted to save the cost and inconvenience of changing the 650 individual sign holders.

The problem was turned over to a highly qualified professional display studio, however they had to stay within the same dimensions so that the labels would fit the old sign holders.

* Presented at the American Association of Zoological Parks and Aquarium Conference, September, 1971

The studio did a fine job within the limitation. There was a considerable improvement in the labels' visual appearance: the picture was larger, the layout and typography were updated and additional information was presented in a direct, easily understood way, either graphically or verbally.

However, the studio-designed system took up more space with at least two and as many as three labels to present one species. This would force a sharp reduction in the number of fish we could display. Also, the studio was prohibitively expensive, yet still involved considerable effort and time on the part of the Aquarium for supervising the project and researching the information.

At this point, the Exhibits Department of Shedd Aquarium took over and attempted to overcome some of the objections. We redesigned and refined the studio's label but were still not satisfied.

Entirely New System

The only solution was to rethink the whole problem from scratch and develop a new system which would satisfy our present needs, and hopefully would be adaptable to our future needs. The new system should allow for the identification of at least as many fish per tank as before with space to give more information about them if desirable.

Label production, the routine of daily sign handling, the cataloging, storage and retrieval of information, labels and their components had to be systematized.

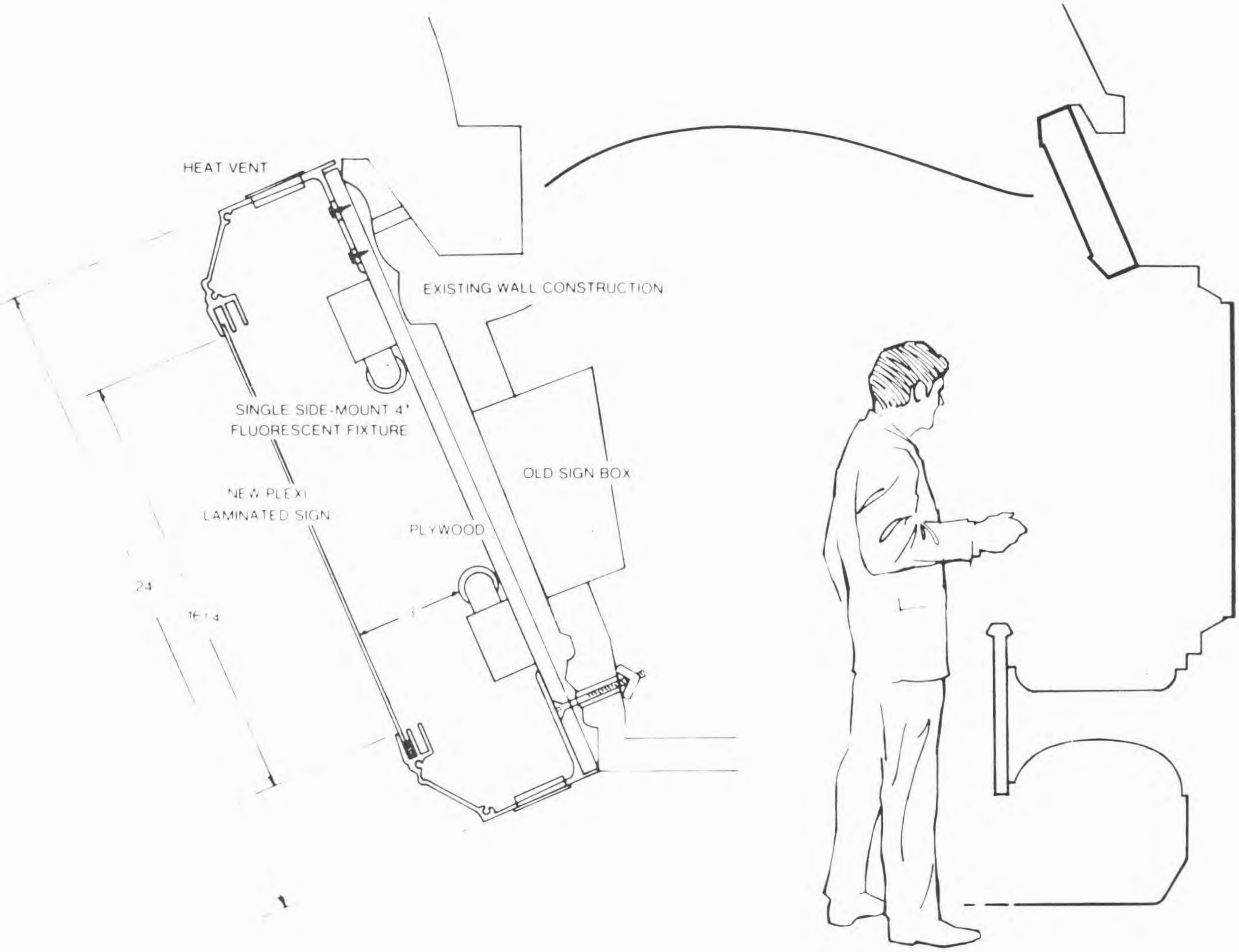
The controversy relating to the location of a label is well known. We retained the above-tank location as the most practical for our situation. The viewing distance dictated a certain minimum size of typeface and picture. The nearest standard size for graphic materials consistent with our needs was the 8' x 10' so we stayed as close to that format as we could in designing the label components. Papers, films and processing equipment are readily available in this size.

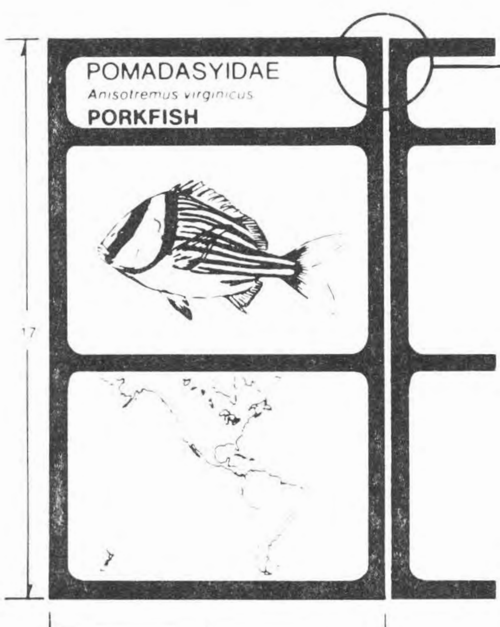
Because of the relative discomfort of looking above eye level, it was decided to keep the information brief and comprehensible at a glance. The more detailed information would be handled elsewhere, either on side panels or in the guide book.

Label--Section I

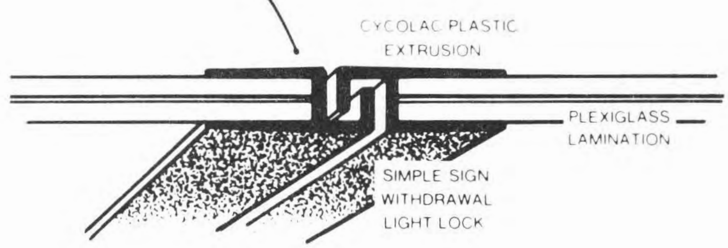
A label with three stacked sections was finally decided upon to give the most basic information.

The first section supplies the family name, the full scientific name and the common name if it exists. This allows the serious student, aquarist, fellow professional or just a more than average interested layman to look up the species for further study. He has all the vital information available in a logical sequence and in standard form.





Example of basic square format. Many variations in positive or negative are possible.



Detail of light lock and attaching joint between adjacent labels.

We started out by setting the names with transfer lettering. This turned out to be a tedious chore. Because of the large number of labels -- 1500 to 2000 -- that we anticipated needing in the next few years, it became necessary to investigate better production methods. We decided that our own facility would give us better control.

There are many lettering and headlining machines on the market and we investigated most of them. We narrowed the field down to two: the Omega Staromat and Addressograph-Multigraph Headliner #810. The Staromat is a wonderfully creative tool that can enlarge and reduce letters so that only one font is needed in a particular typeface. However, it is slow and has other drawbacks which make it impractical for routine production. We chose the Headliner. To date, we have found nothing that could handle the job better.

In the beginning, there was one problem: We needed a truly opaque label film so that even with the planned level of illumination, overlaps and tape could not be seen through. We learned about 3M Super Black, a relatively new film, exposed by U.V. and processed in daylight with only one chemical. It is absolutely opaque and will not fade.

Label--Section II

In most cases, there are more than one fish per tank and it is necessary to connect a particular name to a particular fish. We felt that photographs would make identification easier for a visitor and since color can be a major factor in identification, we chose to use full color transparencies. The identification transparency became section two of our three-part label.

I use the Mamiya RB 67 camera, a versatile piece of equipment which combines some features of a large-format view camera with the ease of handling of roll-film cameras. Our lighting consists of three electronic flash units with model lights mounted on special counterbalanced Luxo arms for quick positioning. The arms are supported on vertical telescopic rods. These are part of a cabinet on casters into which equipment can be stored and locked. The cabinet has electric outlets for the lights and its own 25-foot retractable cord.

If the fishes are small, they are moved to a special photo tank. Sometimes a plexiglass restricting frame is used inside the photo tank to inhibit the movements of particularly active fishes. Neutrally colored and textured fiberglass diorama, is used for others. Large fish are photographed in the exhibit tanks. Background panels are inserted to eliminate distracting features of the exhibit landscaping.

I use high-speed daylight Ektachrome film. The 6X7 cm transparency is enlarged to 8" X 10" on Cibachrome film.

The photo lab guarantees Cibachrome will not fade for three years. Ciba Chemical Company claims their film will not fade in five years. We are keeping track and will hold the lab to the guarantee to replace them if fading does occur.

Label--Section III

The picture and the identifying names together make a square 10" X 10". It is the only information given for a species in our Coral Reef where label space is at a premium.

In the galleries, however, the third section of the label presents information in different forms: range map, diagram, written descriptive paragraph or a second photo showing sexual or juvenile differences in form.

The over-all size of the label is 10" wide by 17" high. To facilitate paste-up, we had a three-window card mask die cut made. The mask can be easily modified by cutting or overlapping to give us a variety of formats. Yet for the sake of uniformity, repetition of some design details are adhered to.

Label Materials

We use 1/16" white plexi as a diffuser and 1/16' gray tint plexi as front glazing. The tint not only cuts the glare without disturbing the color balance appreciably, but also blocks out the sign when the lights behind it are turned off. This makes the taping and other imperfections invisible.

The mask with its components is placed between the two pieces of plexiglass. This sandwich is held together by a plastic strip to which we added an extra groove that holds the sign together and provides a light seal.

Additional Information

If we need to present information that requires more space than that available on one label, we can now use any length, just as long as the height is 17". We will stock a small supply of double and triple width pieces of plexi which should take care of most of our needs. If necessary, we could conceivably go to 8 feet without a seam.

For example, in addition to the three-section label for each species in a given tank, there will be another label with a location number so visitors can be directed to a particular exhibit. This label will be somewhat larger and carry general information about the tank as a whole along with specifying the type of water and temperature. For this, we will use not only a color code for fast visual reference, but also write it out so that the meaning of the strip is clear without having a decoder.

Label Holders

New label holders were needed to accommodate the new size labels. Some prototypes of holders submitted by outside design firms were heavy, very expensive and had light leaks around the hinges. They were difficult to open for sign changes.

Instead of a box unit, we decided on a continuous strip. No glazing or diffuser was needed as these were incorporated into the label itself.

The channel into which the sign is to be inserted is part of an aluminum extrusion. It was designed to complement the brass work around the tank frames and attaches directly to the wall. Its depth houses the lighting, a double strip of fluorescent lights with individual ballasts and light switches. Nothing has to be opened, yet signs are easy to remove with a glazier's suction cup.

Maintenance

In order to get signs up quickly and be ready with new signs when a collecting trip returns, we are anticipating our needs and building up an inventory. We are filing information on fishes we are likely to get, and photographing those that we do have.

To protect the fruits of our labor, the Exhibits Department has taken the responsibility of replacing, filing and storing the signs. We bought a library step ladder with locking casters and equipped it with a place for labels, replacement fluorescent tubes and a suction sup.

When a sign is needed or has to be removed, a note giving name and location is left in our mail slot. Chances are that the needed sign components are in the file and can be assembled and installed immediately. If the components are not in the file, it is put on the list to be made at the earliest convenience.

NOTES FROM STEINHART AQUARIUM

Earl S. Herald
Associate Director, Steinhart Aquarium

The sole blind dolphin from the Indus River in the Steinhart collection succumbed July 9, 1971, of a heavy liver infection of the liver fluke Cyclorchis campula (Cobbold 1876), originally described for this animal. The sole surviving animals at the moment are two in the collection of Dr. Pilleri in Bern.

Aquatic biologist Tommy Tucker has just returned from Okinawa and two years of Marine Corps duty. His spare time was spent in diving on the reefs in the area -- tough duty.

Dr. Evelyn Shaw, formerly curator in the Department of Animal Behavior at the American Museum, has changed marital status and now as a San Francisco resident has joined the staff of Steinhart Aquarium as Research Associate. Her current studies deal with the surfperch family, Embiotocidae.

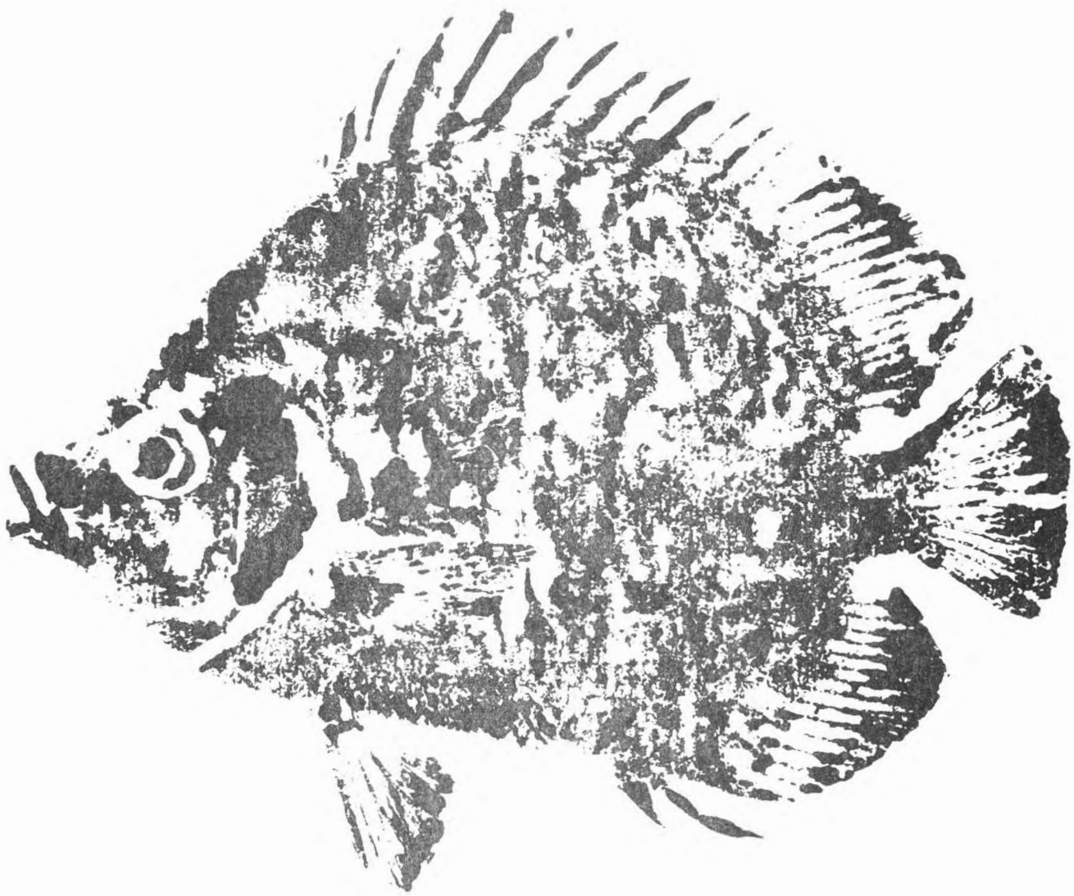
Supervising aquatic biologist Glenn Burghardt and aquatic biologist (marine) Lloyd Gomez have just returned from Japan and a visit to 21 aquariums and museums in 21 days. Their report indicates that the Japanese are moving ahead of other parts of the world in many phases of aquarium exhibition.

Steinhart Aquarium is cooperating in the pupfish endangered species program with a colony of 8 mature and two subadult Devil's Hole pupfish, Cyprinodon diabolis, provided by federal and state authorities. The most difficult problem facing us at the moment is attempting to synthesize Devil's Hole water which is extremely high in boron among other things. Al Castro is the Aquarium's tropical fish biologist who is in charge of this phase of the program.

In an attempt to provide qualified professionals for the aquarium field Herald and the Aquarium staff are giving a course through San Francisco State College -- a graduate seminar on aquatic animals in captivity. Karl Switak, supervising herpetologist, is instructing a University of California Extension Division course on amphibians and reptiles in captivity, and Glenn Burghardt is scheduled to give a U.C. Extension course in February on the care of freshwater and marine fishes in captivity.

In the dead fish department, the Jordan collection of Stanford University has been moved to the Academy. This collection, together with the Vanderbilt collection received two years ago and the original Indiana University collection, gives the Academy the world's second largest reference collection. If you have a dead fish problem and cannot solve it in your area, i.e. fish classification, some of the people here might be able to help.

Steinhart Aquarium, through the Janss Foundation, has been very interested in the Revillagigedo Islands, located 220 miles due south of Cape San Lucas at the tip of Baja California. The second trip this year is now in progress.



RESEARCHERS AT THE SHEDD AQUARIUM

Donald Zumwalt
Curator of Fishes, Shedd Aquarium

The first successful rearing of alewives at the Shedd Aquarium has made possible the conclusion of valuable research by Jon Stanley (University of Wisconsin, Milwaukee) and Peter J. Colley (U.S. Fish and Wildlife Laboratory, Ann Arbor). Their study, "Effects of Temperature on Electrolyte Balance and Osmoregulation in the Alewife (Alosa pseudoharengus) in Fresh and Sea Water", published in the October 1971 transactions of the American Fisheries Society, concludes that, "mortalities of the alewife in the Great Lakes might be related to osmoregulatory failure from acute exposure to cold, but not to heat", which suggests that the mass summer die offs of alewives observed in Lake Michigan might have been brought about when sudden temperature drops (upwelling) occurred.

Two masters theses are presently under progress at our facility. One is being conducted by Brad Latvaitis, (Shedd Aquarium assistant curator of fishes and graduate student of Eastern Illinois University). He is determining the toxic effects of "treflan" on the Fathead minnow (Pimephales promelas). This is supported by Eastern Illinois University and the Shedd Aquarium.

The other thesis, being carried out by Fred Binkowski, a graduate student from the University of Wisconsin at Milwaukee, is a study to determine the effects of temperature shock on oxygen consumption of the alewife (Alosa pseudohorengus). This research is supported by National Science Foundation and the University of Wisconsin Sea Grant Program.

The aquarium facilities are also being used to hold research specimens for Northwestern University, University of Chicago Medical School, University of Illinois - Circle Campus, Argonne National Laboratory, and the Illinois Institute of Technology.

NOTICE!!

For the well heeled aquarist who is bored with titrating salinities (known among afficianados as brownfingering), or for those who cannot get janitorial to sweep up the broken glass which is all that remains of the last hydrometer in the place.......

1 (one) Salinity refractometer, temperature compensated, refractive index 1.3330 to 1.3730, salinity 0-160 o/oo.
Cat. no. 10419.

American Optical Corporation
Scientific Instrument Division
Buffalo, N.Y. 14215

The instrument is rugged, cylindrical, 6 inches long, one inch wide, easy to handle (is your mind wandering?), and can read to .5 ppt with a little practice. One drop of solution is required for analysis. Direct reading. No calculations. Only extras needed are an eyedropper and a Kleenex.

Sound terrific?

Price?? \$217.00 (Gawp!!!)

Farfal Knarby
Assistant to the
part time Custodian
Marine Resources Program
Skidaway Institute of Oceanography

THE CONSTRUCTION OF AN INEXPENSIVE SYNTHETIC ENVIRONMENT FOR COLD WATER, MARINE ORGANISMS

Warren W. Burggren
University of Calgary, Canada

The maintenance of cold-water marine animals has been largely restricted in the past to those individuals who have had access to the large-scale and expensive equipment of a university or established aquarium. Smaller cold water marine units have been available from biological supply houses at a cost from eight hundred dollars and up. Even for the least expensive commercially produced units with a fifty gallon capacity, the price is still sufficiently high to exclude the majority of serious students of marine life or enthusiastic aquarists. The purpose of this paper is to describe the construction of an inexpensive refrigerated aquarium suitable for the maintenance of cold water marine organisms. The aquarium system to be described in this paper was constructed in thirty man-hours at a cost of under one hundred dollars. The tank has a fifty gallon capacity and efficiently maintains a water temperature of thirteen degrees C. Unlike much of the scientific apparatus which is constructed on a "shoestring" budget, this cold water marine tank is not only highly efficient at its designated task, but is also aesthetically pleasing. Patience, perseverence, and adherence to the format of construction outlined in this paper should provide the builder with a fine and efficient cold water marine tank.

The cold water tank can be subdivided into essentially three functional units: these being (1) the aquarium, (2) the refrigeration system and its controls, and (3) the filtration system. There are some problems which will arise during construction which are not related to these components, but the bases of the cold water marine tank rests on these three areas.

THE AQUARIUM

The salt water aquarium is subject to certain environmental factors which are foreign to the fresh water aquari and these factors should be taken into account when choosing a proper aquarium. The most important consideration in the selection of a suitable marine aquarium is corrosion resistance. Most people who have spent any time about salt water will testify to the extremely corrosive effects of brine in contact with metals. In a marine aquarium, salt water can not only result in the destruction of an untreated metal frame, but corrosion can release toxic materials into the aquarium water. This problem can be avoided in one of several ways.

First, a suitable aquarium can be constructed entirely of wood and glass. Wood aquari however, are subject to warpage and may be less aesthetically appealing. Second, the aquarium can be formed of fibreglass or clear plastic sheeting. This method of marine aquarium construction is becoming increasingly popular but special skills are needed for satisfactory results and plastic sheets are also susceptable to surface scratching. The third method of avoiding the corrosion problem, which is delt with in this paper, deals with the conventional glass and metal-framed aquarium in which the frame has been specially treated. The aquarium to be used in the construction of a cold water marine tank should have either an iron or stainless steel frame. Copper or bronze frames should be expressly avoided as should any pumping devices which contain these metals. (Many marine forms, such as lamellibranchs and their larvae, are very sensitive to minute amounts of copper (Lutz et al - 1959). A used aquarium which leaks or is otherwise conventionally unsuitable is actually preferable to a new aquarium, as the glass and putty will have to be removed later from the frame anyway. While the actual capacity of the tank is up to the reader's discretion, in the author's opinion, the expenditure of time and money justifies at least a fifty gallon tank, while the size and weight of a tank larger than one hundred gallons presents special problems that are beyond the scope of this paper. For the cold water marine system described in this paper a fifty gallon tank was selected which had several cracked panes and was obtained very cheaply. With the aquarium came a wooden stand constructed of "two-by-fours" and standing about one and one half meters high at the top.

The first step in the preparation of the aquarium is to remove all glass, putty and paint from the frame. It is essential that the frame be stripped to the bare metal either with a paint scraper or fine sandpaper. The aquarium frame should be cleaned thoroughly and then given two coats of rust inhibiting paint. Following this at least two more coats of a highgrade marine enamel should be applied according to the manufacturers specifications. When painting, particular attention should be paid to the lower surface of the upper lip of the frame as the combination of salt water spray and atmospheric oxygen render this area particularily succeptable to corrosion. If an overhead reflector or other metallic cover is used, it should also be subjected to the paint treatment described. It should be mentioned that a small area of metal exposed to salt water (such as exposed by a tiny paint chip or a small untreated area) will corrode much faster than would the same small area in a large exposed metal sheet. For this reason, all painting should be done most carefully.

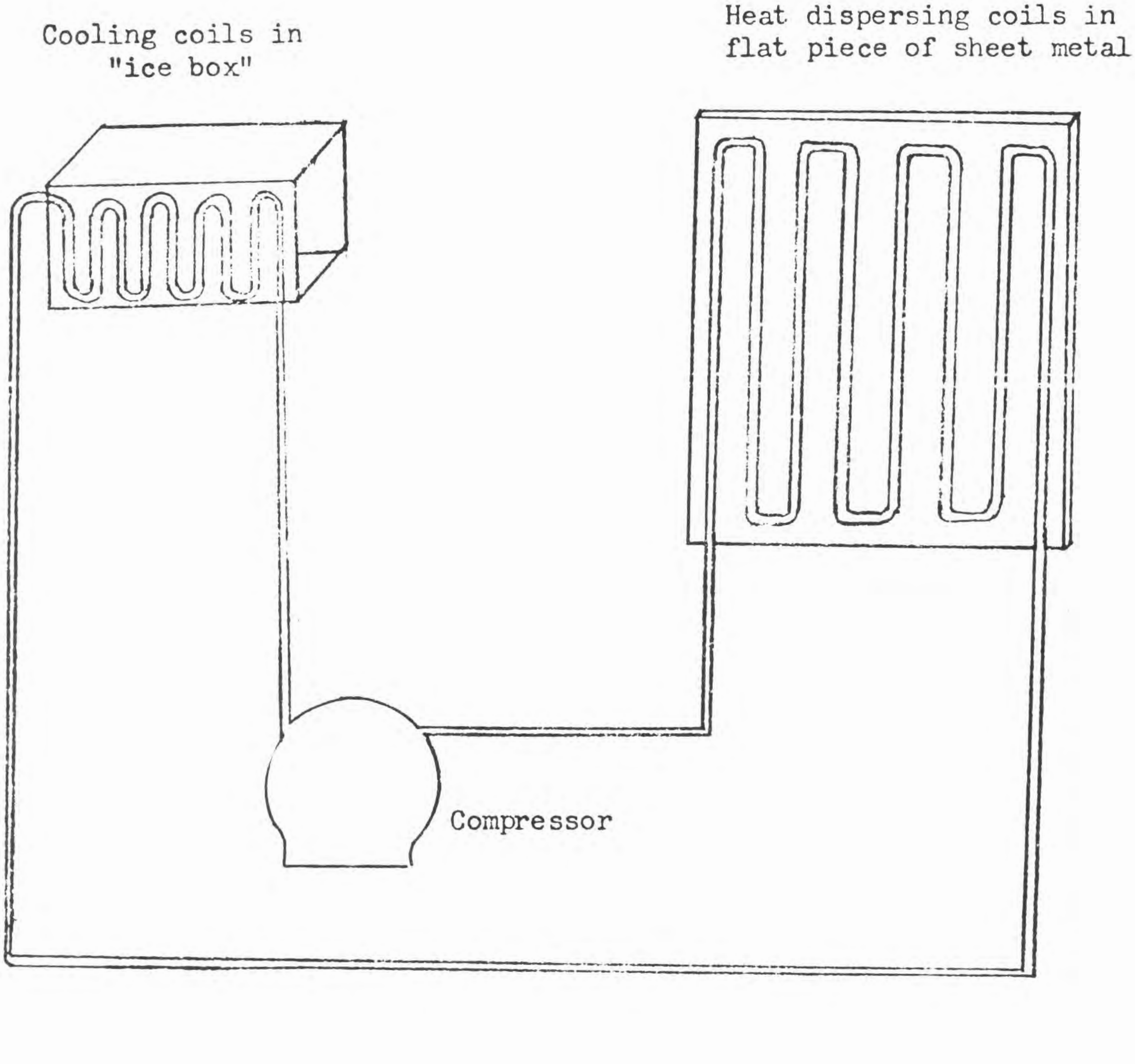
Once the frame has been properly prepared, attention is turned to the glass for the aquarium. For delicate physiological work, such as fertilization experiments, only the best grades of glass should be used. Also, if photography or observation through low powered microscope is to be pursued, the cheaper grades of glass which are often discolored and of uneven thickness should be avoided. (The bottom was poured with concrete, as will be described later.) The glass should be set in the frame with any one of the several tar-derivative aquarium puttys on the market, used according to directions.

THE REFRIGERATION SYSTEM AND ITS CONTROLS

Commercial refrigeration systems consisting of a thermostat, a compressor, cooling coils with freon refrigerant, and heat disperser coils, are expensive and probably contribute the main expense of the commercially available cold water marine tanks. The refrigeration system (excluding the thermostat) was taken from a decrepit refrigerator which was purchased as a "mechanics special" from an appliance store. An ideal purchase would be a refrigerator that had been superficially mistreated but is still in good working condition. The compressor and connected coils should be removed from the refrigerator cabinet. Extreme caution should be used to ensure that none of the copper coils are broken, kinked, or highly distorted. The freon in these copper tubes, in both gaseous and liquid state, is under a pressure of approximately three atmospheres. Besides being a toxic gas, the recharging of the compressor would cost a substantial amount should the copper coils be broken. Conventionally a refrigerator compressor has the main body of cooling coils situated about a cooling box, the "icebox" while the heat dispersing coils are usually inlaid in a flat piece of sheet metal.

The form of refrigeration unit diagrammed can be conveniently utilized in the construction of a refrigerated marine tank in the following manner. A shelf is constructed within the four legs of the stand about half way down from the top. Upon this shelf is placed the compressor. Along the back two legs of the stand the heat dispersing coils are placed: the "icebox" with the cooling coils is incorporated into the bottom of the aquarium so as to expose the chilled surface of the box to the water in the aquarium. This is done by pouring a portland cement bottom into the aquarium. This step is a very crucial stage of construction, bringing together the aquarium itself and the refrigeration system and must be carefully done.

Firstly, a masonite sheet form is placed in the bottom of the frame. A hole is cut in this sheet and the metal box containing the cooling coils is pushed through the hole from below to the extent that the plate will just be exposed when three to four centimeters of cement are poured onto the form. Also, a plastic tap with a small check valve should be included in the masonite form before pouring to serve as a drain after the cement is poured.



A SCHEMATIC DIAGRAM OF THE REFRIGERATION SYSTEM

High quality cement with coarse gravel chips should be mixed according to directions. About one and one half Centimeters of cement is then poured onto the masonite form in the bottom of the aquarium. At this point window screen and iron rods (coathangers are suitable) are laid into the concrete to enhance the strength of the aquarium floor. The cement is then poured to three to four centimeter depth, kept moist and allowed to cure undisturbed for one week. As the concrete cures, it will shrink minutely and so separate from the glass sides of the aquarium. To remedy this, a flexible silicon aquarium putty, of which several brands are commonly available, should be used to seal the gaps which have formed between the cement and the glass. The author also applied the silicon putty to all of the inside seams between the glass and the frame as an extra insurance against both corrosion and leakage.

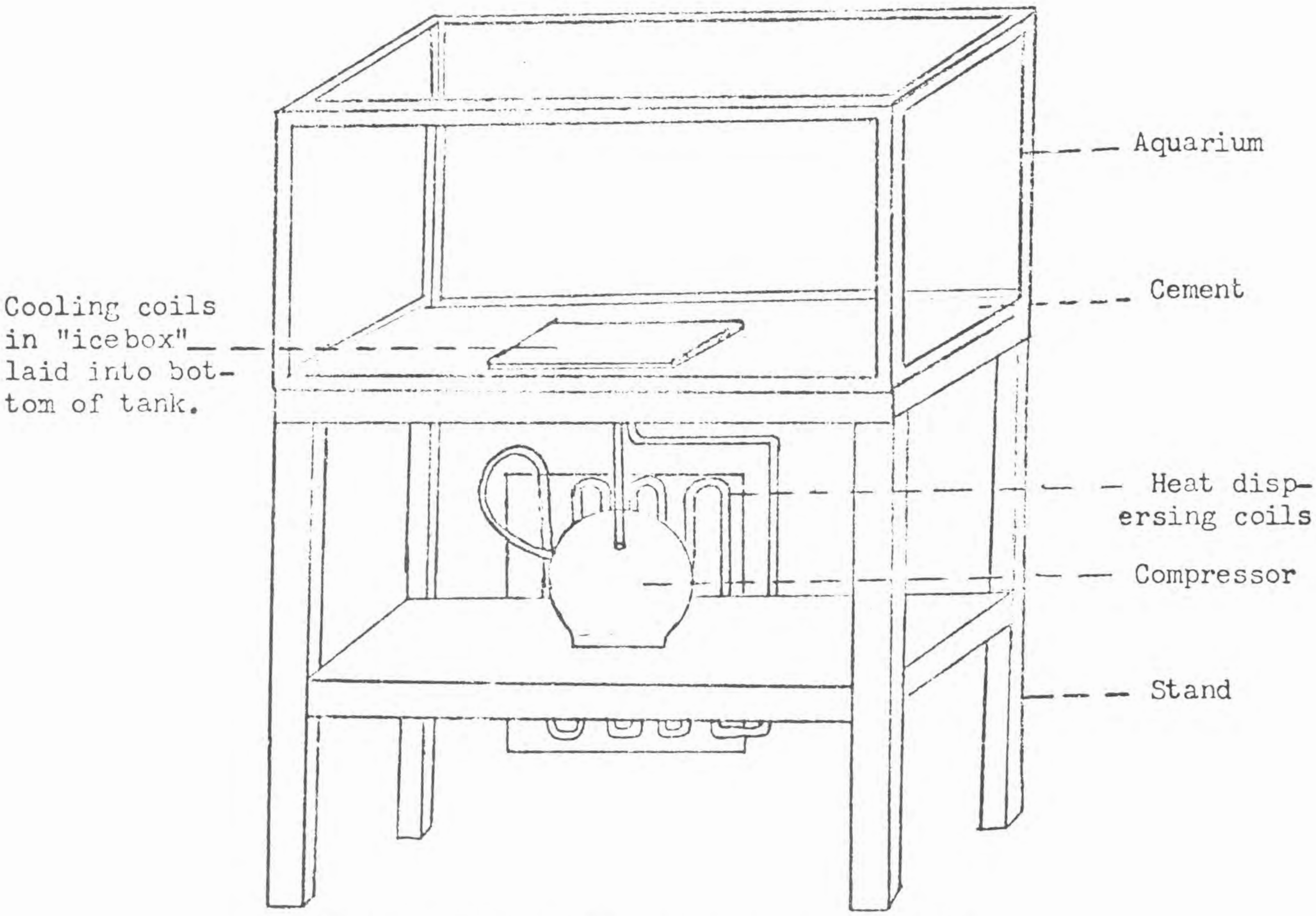


DIAGRAM OF REFRIGERATION SYSTEM IN POSITION

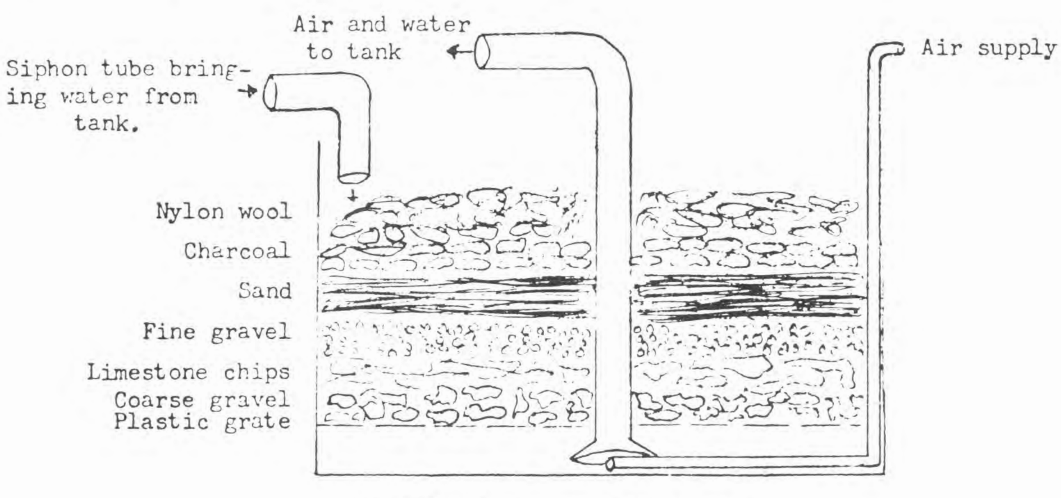
There is a high possibility of substances which will either drastically effect the pH of the water or prove to be toxic, dissolving out of the concrete. Therefore, the aquarium floor should be treated with two coats of the same marine enamel used earlier to treat the frame. At this point of construction, the aquarium is a functional refrigerated marine tank, but there is as yet no means of temperature regulation. The original thermostat from the refrigerator will have at the best, a three degree Centigrade degree differential. While some intertidal marine organisms can tolerate frequent three degree Centigrade degree fluctuations, the majority of marine organisms would quickly succumb to such an erratic thermal environment. For this reason the original refrigerator thermostat is discarded and a high quality thermostat with a one half to one degree Centigrade differential should be purchased. The system built by the author utilized a temperature control with a cadmium-plated air bulb, a one and one-half meter return tube, and a temperature range from minus five degrees to thirty five degrees Centigrade. I cannot overemphasize the importance of incorporating a dependable, low differential thermostat into your refrigeration system. It is conceivable that the air bulb of the thermostat (thoroughly painted with marine enamel) can be included in the concrete floor so as to protrude through it and into the water. In the particular tank being described, the bulb was simply hung over the side of the frame in one corner at the top.

THE FILTRATION SYSTEM

There exists a dilemma in regard to a choice of filtration for marine tanks. If an extremely efficient diatomaceous earth filtration system is constructed and if water returning to the system is sterilized with ultraviolet light, then there is only a minimal chance that there will ever be a harmful bacteria bloom in the aquarium. With a filtration system such as this, however, it is extremely difficult to keep filter feeders of all types. If one makes a filter which is not as efficient at removing microscopic particles, then filter feeders will flourish but the chances of a bacteria bloom are significantly increased over the more efficient system mentioned first. The author chose to build a less efficient (and also less expensive) filtration system in order to be able to keep filter feeding organisms.

This means more extensive control of feeding and a generally closer watch on the tank must be kept. If the first type of filtration is chosen by the reader, a water pump for a high flow is recommended. If the latter type of filtration is chosen, air pumping devices are sufficient.

The filter box constructed by the author is fifty centimeters long, fifteen centimeters wide and twenty centimeters high. It was constructed of plywood which was glued together and then coated with marine enamel. The design for filtering is basically the same as for many of the smaller aquarium filters. Air is pumped to the bottom of the box and is then allowed to bubble up a central tube and into the tank, drawing water through the filter material and up the tube into the tank with it. There should be a plastic grate fine enough to contain fine gravel about two centimeters off the bottom of the box through which the return tube protrudes. On this grate should be a layer of coarse gravel, followed by a substantial layer of crushed seashells or limestone chips. This layer makes for a very effective means of buffering the marine system (Valenti-1968). Next, there should be a layer of fine gravel and on top of this a subcharcoal can be placed. Finally, a layer of nylon wool can be included at the top. Nylon wool does not break apart as does glass wool. It is possible that fragments of glass wool can be eaten by fish or other organisms and therefore jeopardize their existence. Herald, Dempster, Waters, and Hunt (1962) presented two basic concepts of filters: regardless of filter depth most of the filtering takes place in the top four centimeters, and the best organic filter is a very dirty one, that is biologically active. For this reason, cleaning of filters should be delayed as long as possible, perhaps once every four months (Valenti - 1968). If possible, a small incandescent light should be placed over the box. This will encourage the growth of algae in the box. They are highly efficient in destroying toxic nitrogenous wastes produced by some marine organisms.



AN EFFICIENT INORGANIC FILTER

It is advisable to install an "undergravel filter" in addition. These filters not only contribute extra filtration, but also circulate water over the exposed cooling coils in the bottom of the tank, thus rendering the refrigeration system more efficient. It is worth noting that a fine gravel would be more suitable for a substratum than would sand, as a layer of densely packed sand tends to act as insulation between the water and cooling coils.

A large number of details have been omitted from this paper: lighting, aeration, evaporation control, etc. Many of these factors will vary greatly with individual variations in construction and the organisms to be kept. It is hoped that an enthusiam for the keeping of marine organisms in a synthetic environment can be spread to those individuals who have been unable in the past to indulge in this fascinating practice. The following list of books and papers should help to solve many of the problems which could arise during the course of construction or maintenance.

Atz, J. 1964 — Some principles and practices of water management for marine aquariums, pp. 3-16. In: Sea Water Systems for Experimental Aquariums.

Herald, E. — R. Dempster, C. Walters, M. Hunt, 1962 Filtration and ultraviolet sterilization of sea water in large closed and semi-closed systems. Communications les Congres International d' Aquariologie, B. pp 49-61.

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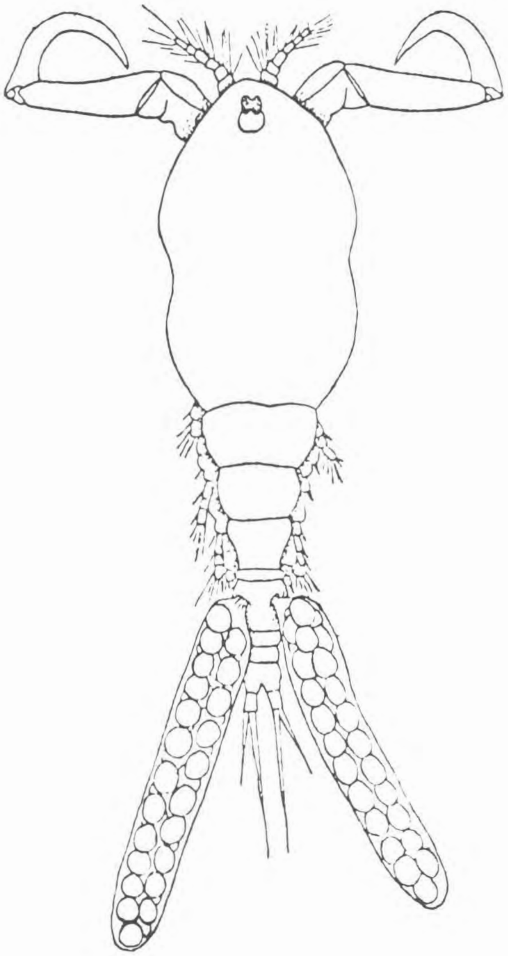
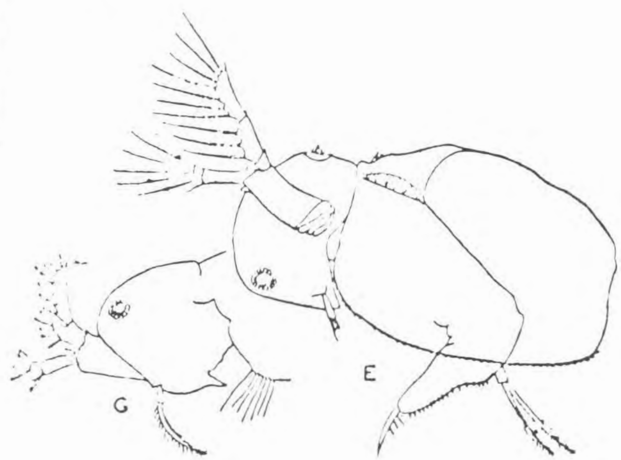
Valenti, R. — The Salt Water Aquarium Manual, Aquarium Stock Company, New York, 1968

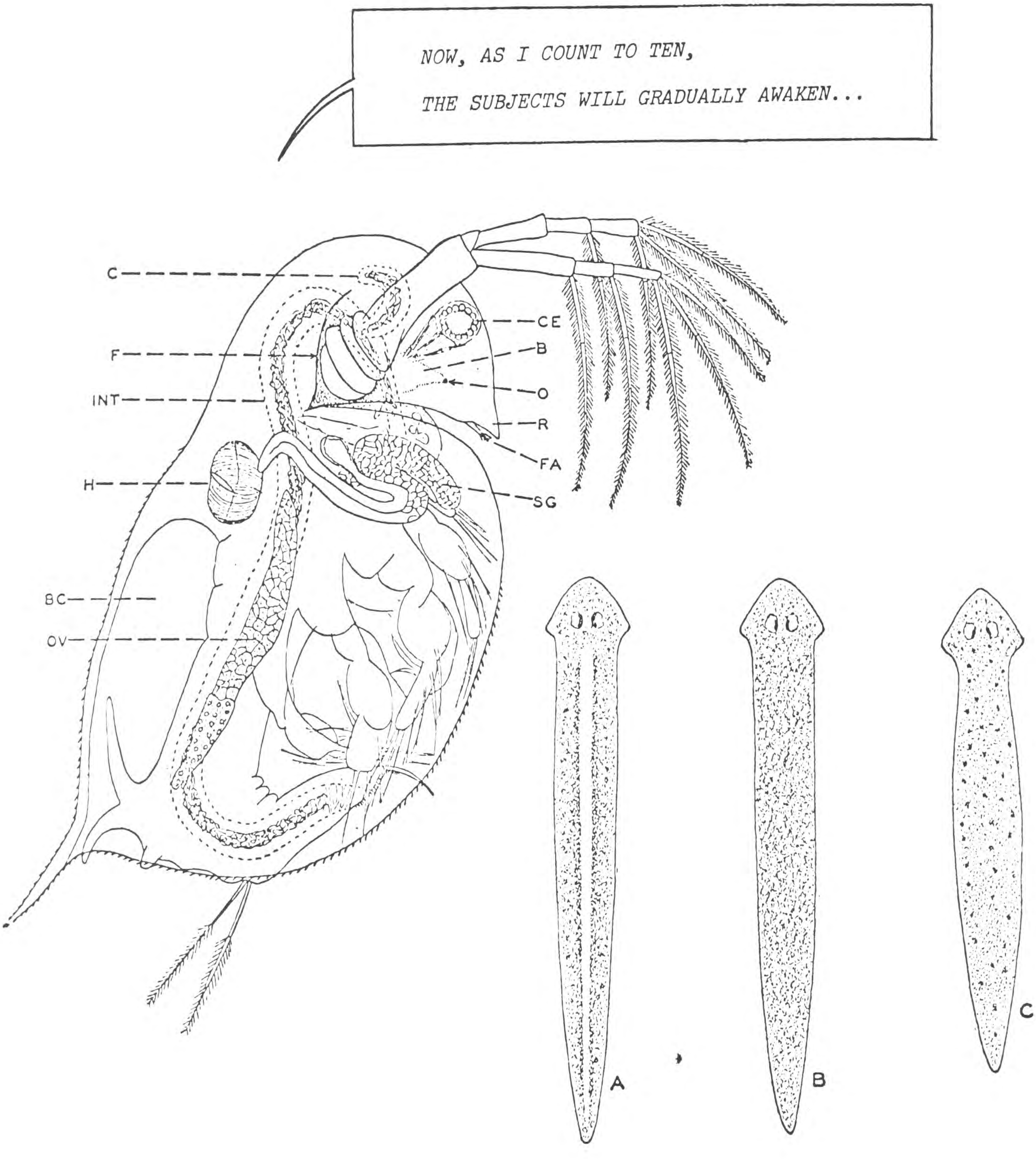


"LIMNO-
LOONIES"

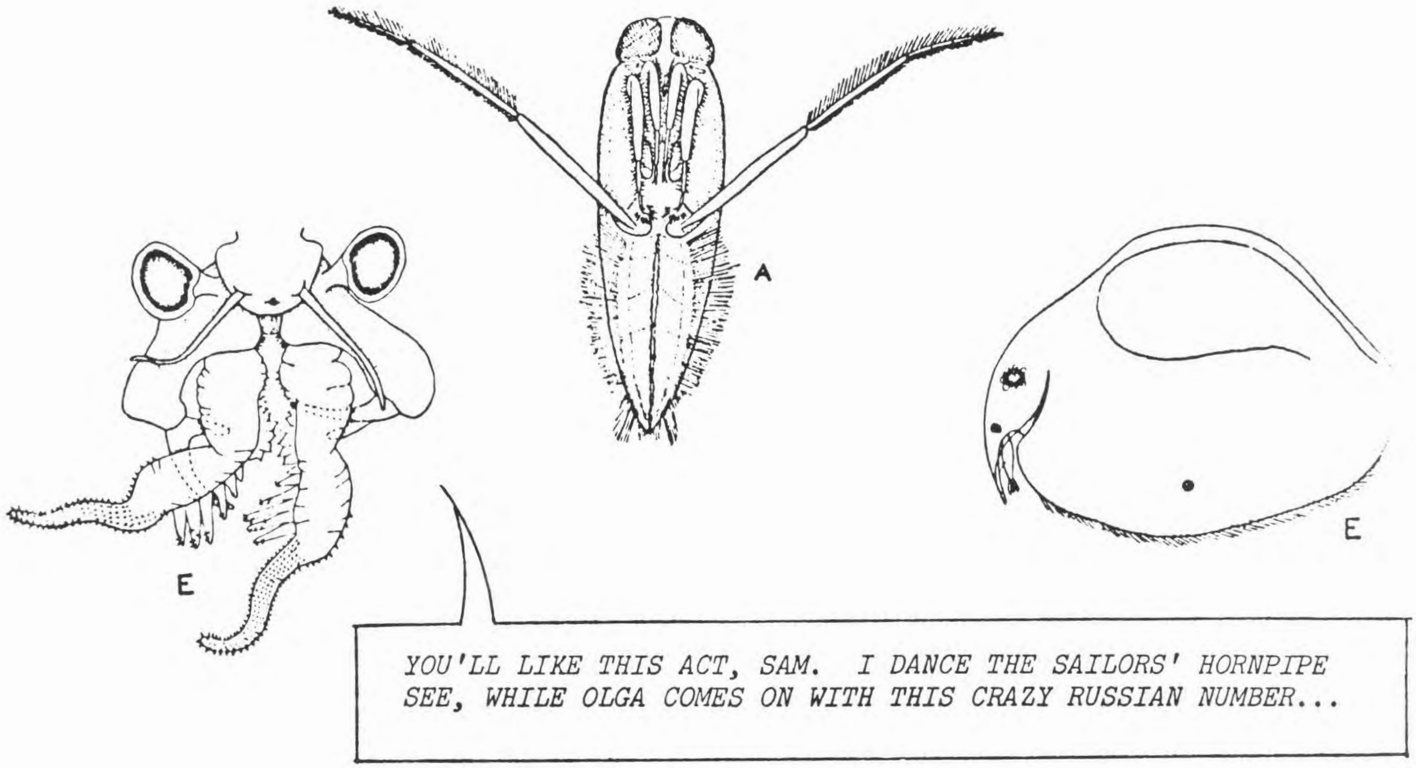
AN IRREVERANT LOOK
AT POND PLANKTON
WITH CAPTIONS BY
C. Phillips.

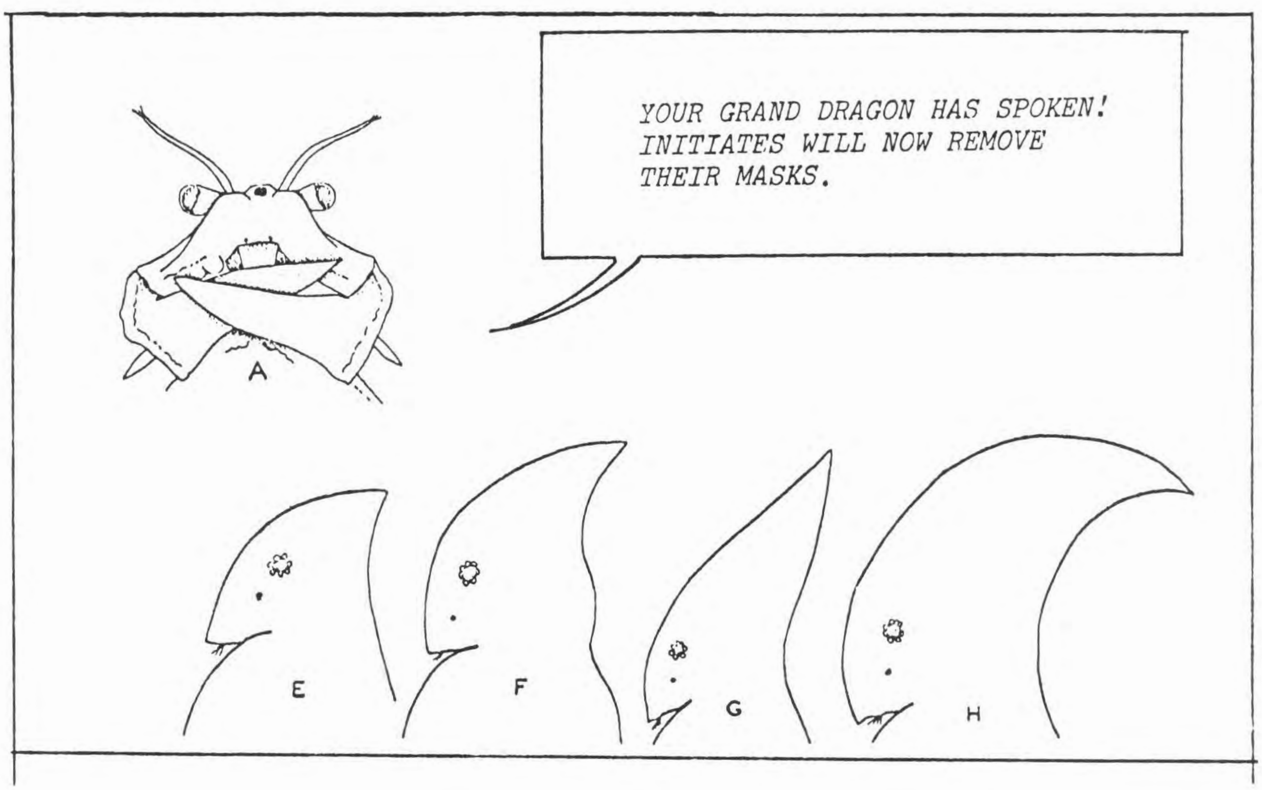


Upper: *Ergrasilus versicolor.*
Lower: G- *Latona parverenis;* E- *Sida crystallina.*

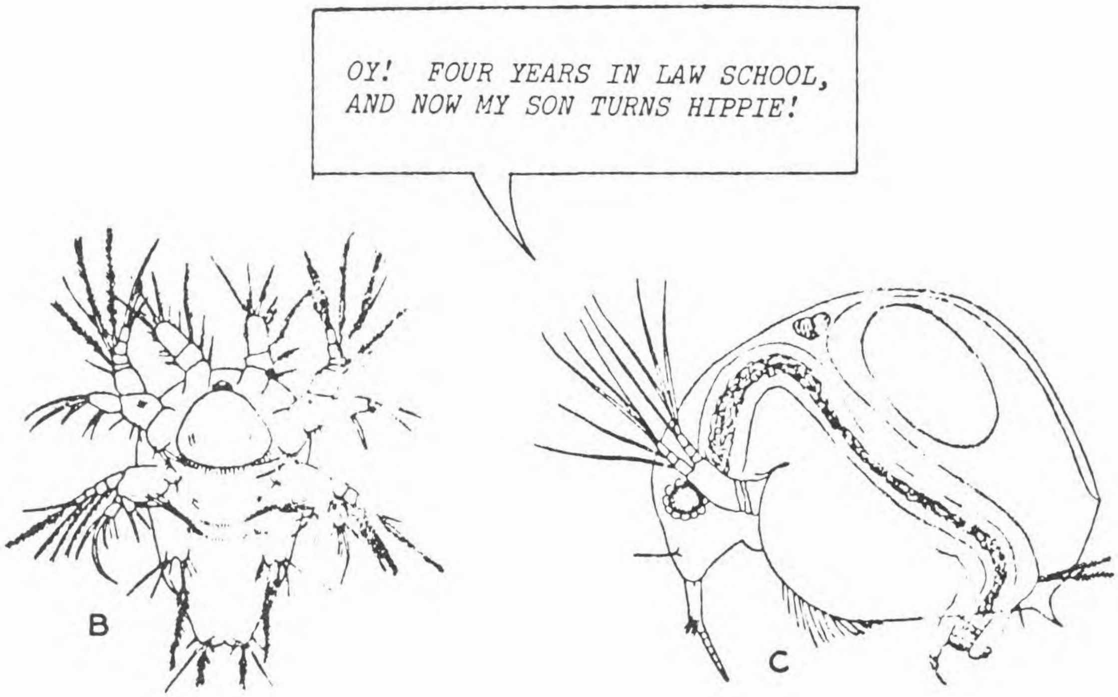


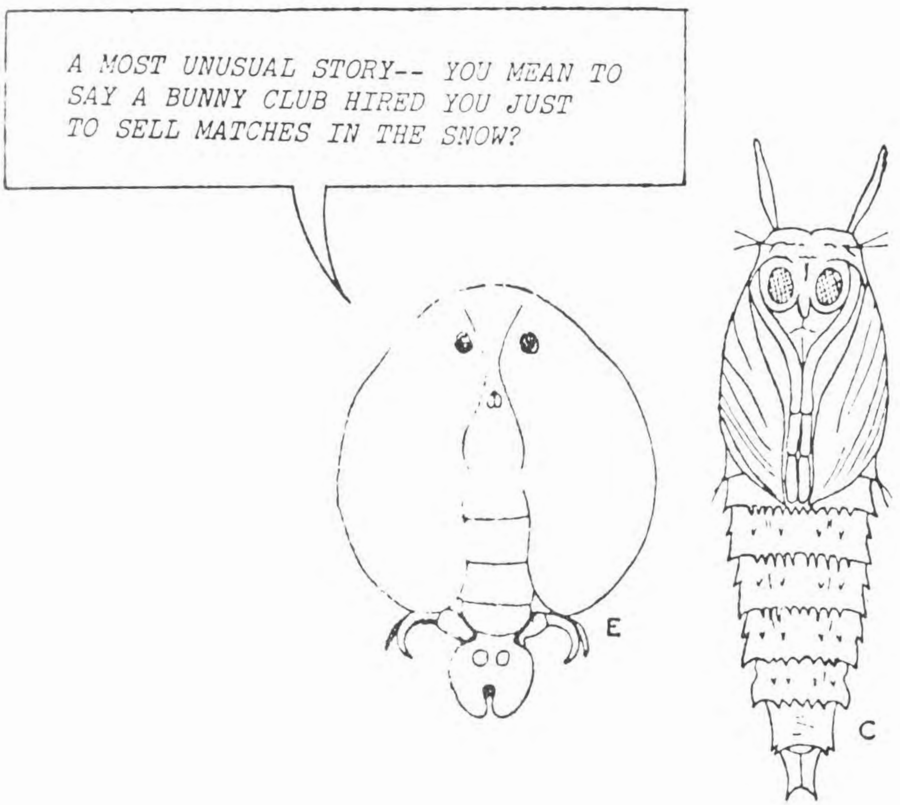
Left: *Daphnia pullex.*
Lower right: Variations in color pattern of *Dugesia tigrina.*





Upper (l. to r.): Eubranchipus holmani, Buenoa margaritacea, Chydorus gibbus.
Lower: A- Artemia salina; E-H, Variations in Daphnia longispina.





Upper: B- Nauplius of Cyclops; C- Bosmina longirostris.
Lower: E- Argulus flavescens; C- Pupa of Psychoda.

TOWARD UNITY IN CETACEAN MEASURING

Craig R. Mosier
The Aquatarium, St. Pete Beach, Florida

In the past, the measuring of captive cetaceans has been mostly overlooked, because most aquariums have had no real need to keep accurate records of their porpoises, and there has been no uniform agreement as to what measurements should, or should not, be taken.

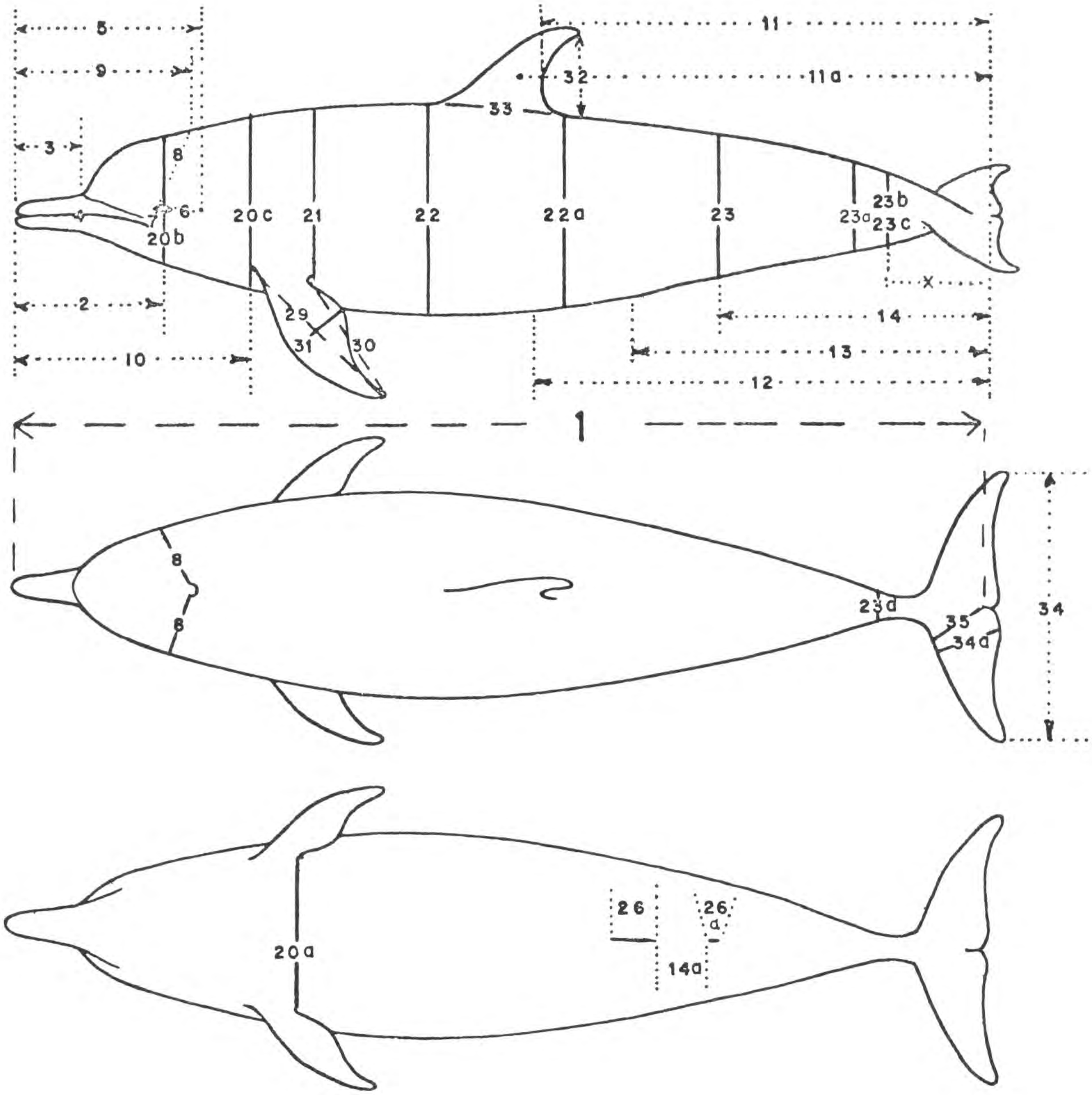
It is felt that the time will come when useful knowledge will be exchanged between interested parties, and a complete and uniform list of measurements will be needed for this.

In order to have unity in measuring the captive cetaceans at various aquariums, or in the event of measuring the often stranded animals, the following table is being submitted. The list of measurements was presented in the Journal of Mammalogy, 42, pp. 472-473, (1961), with slight modification in the order of measurements, by William E. Schevill of the Woods Hole Oceanographic Institution.

The order of measurements, as per this table, is to aid in making the task of measuring easier. When considering the bulk of these animals, and the conditions under which the measuring may sometimes be done (strandings), this is an important point to consider. The less moving around of the animal, especially on a beach, the better.

If this method of measuring is adopted by all aquariums, it will provide information that can be intelligently transferred, not only between aquariums, but to interested scientific parties as well. All measurements will be as uniform as is possible, varying only with individual interpretations of the actual measuring.

There are many new aquariums coming into existence every year, with more cetaceans being employed in them. Shouldn't there be a more uniform and accurate account of them in the future?


5
9
3
8
6
7
20b
20c
21
22
22a
23
23a
23b
23c
X
2
10
29
31
30
11
11a
32
33
14
13
12
1
8
8
23d
35
34a
34
26
26
a
20a
14a

Whale and Porpoise Data

Observer____________________

Date_______________ Serial No. (from whale log)________________

Position or locality____

Species____________________________________ Sex__________

Measurements (the most important are starred); indicate whether in centimeters, which are preferred, or in feet or inches.

*	1.	Tip of upper jaw to fluke notch____________
	15.	Lower jaw beyond upper____________
	15a.	Head beyond tip of jaw (sperm whales, blackfish, etc.)______
*	2.	Tip of upper jaw to eye (forward angle)____ left___ right____
*	3.	Snout length____________
*	4.	1/2 smile____________
	5.	Tip of upper jaw to ear______ left______ right______
	6.	Ear to eye (rear angle)______ left______ right______
	7.	After end of smile to eye______ left______ right______
	8.	Blowhole to center of eye______ left______ right______
	24.	Eye opening______ length______ height______
	27.	Blowhole(s)______ length(s)______ width(s)______
	28.	Ear opening, diameter______ left______ right______
*	9.	Tip of upper jaw to blowhole____________
*	10.	Tip of upper jaw to shoulder (fwd. base of flipper)______
	16.	Tip of upper jaw to rear end of throat creases (not all species)______
	20.	Throat creases: no.____ length____ max____ min.____
*	29.	Flipper length____________ external______
*	30.	Flipper length____________ axillary______
*	31.	Flipper width (maximum)____________
*	32.	Dorsal height____________
	33.	Dorsal basal length____________
*	34.	Fluke span____________
	34a.	Maximum fluke width perpendicular to leading edge______
	35.	Fluke notch to nearest point on leading edge______
	36.	Fluke notch depth (if no notch, say so)______
*	11.	Fluke notch to dorsal, deepest part of trailing edge______
*	11a.	" " " " , center of effort______
	12.	" " " center of navel______
	13.	" " " " " genital slit______
*	14.	" " " " " anus______
	14a.	Perineal length (males only)______
	25.	Length of mammary slits______ left____ right____
	26.	Length of genital slit____________
	26a.	Length of anal slit____________
	20a.	Axillary interval (over curve ventrally)______
	20b.	Girth at eye____________
	20c.	Girth at shoulder____________

21. Girth at armpit ______________________
22. " before dorsal ______________________
22a. " behind " ______________________
23. " at anus ______________________
23a. " at mid-tail (mid-point of No. 14) ____________
23b. " at ________ cm. before fluke notch ____________
23c. Small height at same place ______________________
23d. " thickness at same place ______________________
* 37. Length of palpable tooth row:

Upper left right ______
Lower left right

* 38. No. of palpable teeth:

Upper left right ______
Lower left right

* 39. Diameter of largest tooth ______________________
* 40. No. of baleen plates __________ left ________ right ______
40a. Color of baleen ______________________
17. Blubber thickness, mid-back ahead of fin ____________
18. Blubber thickness, mid-side amidships ____________
19. Blubber thickness, belly amidships ____________
41. Weight in water (lbs. or kg?) ____________
42. Weight in air (lbs. or kg?) ____________
44. Ectoparasites (note where found):

45. Endoparasites:
Nasal passages _____ Air sinuses ______ Stomach _______
Intestine _________ Blubber __________ Kidney ________
Other ______________________
46. Stomach contents (note from which stomach):

47. Foetus:

Material from items 44-47 may be frozen or pickled in 10% formalin.

Remarks (don't hesitate to use more paper):

The numbers of the items above correspond in general with those assigned in the Journal of Mammalogy, Vol. 42 (1961), pp. 472-473; their sequence is rearranged for the measurer's convenience, and for the same reason nos. 11-14 have been referred to the flukes.

MIAMI SEAQUARIUM COOPERATIVE PROJECT WITH DADE COUNTY PUBLIC SCHOOLS LABORATORY RESEARCH PROGRAM

Warren Zeiller
Curator of Fishes, Miami Seaquarium

The Laboratory Research Program was designed by the Special Science Department of the Dade County Public Schools for eleventh and twelfth grade students interested in pursuing scientific careers, and has been made possible through the cooperation of the Dade County Scientific community.

Carefully selected students arrange their school schedules so that they can report to research laboratories in the county for a minimum of six hours a week. They undertake research projects, write scientific reports and attend seminars. They are required to maintain high levels of academic achievement. Satisfactory work in the laboratory earns a student one unit of high school science credit. Special library cards are issued to the students allowing them the privilege of using all of the University of Miami libraries.

Each of the 17 Dade County Public Senior High Schools may recommend approximately one per cent of its anticipated graduating class for the program, plus alternates. For the 1969-70 school year, 115 students were selected. They worked on their projects in more than 85 participating laboratories -- commercial, private, institutional, governmental and university-affiliated.

It is of prime importance, of course, to select students who show a potential for benefiting from the program. Early in the second semester, each school is sent forms for recommending students. To be eligible, a student must have a minimum of a "B" average, and must complete two years of a laboratory science and two years of high school mathematics. An effort is also made to assess each individual's personality, motivation and aptitudes in making the selection. Personal qualities and character traits that are evaluated include the student's intensity of interest in science and mathematics, inquisitiveness, initiative, self-confidence, emotional stability, persistence, sense of responsibility, manipulative skills, ability to work independently and ability to work and communicate with other people.

In applying for the program, students are asked to write an autobiography in their own handwriting expressing their interests, accomplishments, and aims in the field of sciences. In addition, a parental consent form, high school transcript, standardized test record, recommendations from a science and a mathematics teacher are submitted to the teacher in charge of special assignment.

After a careful study of the comprehensive application, this teacher interviews the student. This is necessary to evaluate personality and temperament before recommending a student to a scientist. The final decision on placement is made after the scientist has interviewed the student.

The Miami Seaquarium has accepted three Laboratory Research Program students annually for the past three years. Four are entered in the 1970-71 program. Each student selects his or her subject with minimal guidance from the curator or staff veterinarian. For all of the students who have participated, the initial difficulty has been to define a research project that is realistic in its scope and within the range of the student's abilities. It has proved helpful to the student if the project is designed to produce end results that may be useful to the host organization. Though this is not a formal requirement of the program, it stimulates the interest of the student, encourages accuracy and affords pride in successful accomplishment of the project's goals.

Past titles of research projects have included:

"Pompano Mariculture"

"Responses of Enpomacentrus Leucostictus, Lagodon rhomboides and Haemulon sciurus to the toxin of Stoichactis helianthis."

"Correlation of Plant-Animal Plankton in the Natural Habitat and Artificial Environment."

"The Frequency Differentiation of the Tursiops truncatus."

"The Effect of Stress As Created by Captivity on the Behavioral Patterns of Bottlenosed Dolphins."

"An Analysis of the Parental Care of Eggs and Adult Cichlid Fishes."

"A Study of Biochemical Factors Pertaining to Water Pollution."

The titles for the 1970-71 projects are:

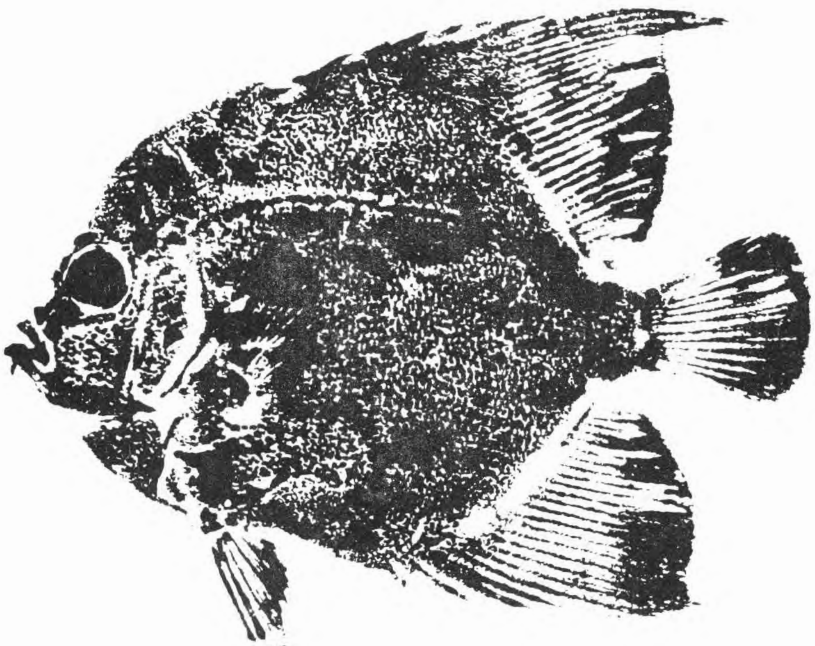
"Studies into the Behavior of the Killer Whale (Orcinus Orca)."

"The Effects of High Concentrations of Waste on the Growth of Catfish Fingerlings."

"The Effects of Various Pollutants on a Given Species of Salt Water Fish."

"The Effects of Various Pollutants on the Growth Rate of a Given Species of Plankton."

The final papers completed by all the students who have participated in the program at the Seaquarium have been rewarding evidence that their work has been of value. The return of former students now in college is also gratifying. The Laboratory Research Program has aided some students in obtaining scholarships, they have reported, and has also given them the advantage of having completed a technical project on a near-collegiate level in other than a scholastic environment.



FISH DISEASE AT THE
JOHN G. SHEDD AQUARIUM *

Donald Zumwalt
Curator of Fishes, Shedd Aquarium

Disease at the Shedd Aquarium and many other aquariums differs from that in nature and in the fish culture field in several ways as far as its occurrence and treatment are concerned. We hold thousands of fishes of hundreds of species from areas all over the world. They carry their own endemic parasites and disease which are passed to each other in our water systems which have common circulation.

The eradication of a particular parasite or disease, in these water systems, is not an easy task as the concentration of the control agent used must be directed to the weakest or smallest fish. Often this low concentration will not control the organism to be eradicated.

The parasite and disease organisms found in our marine and freshwater systems are:

MARINE

ORGANISM	TREATMENT
Monogenetic fluke	Freshwater dip (same temp.) 3 to 5 minutes
Benedenia melleni	CU S04 dip and/or continuous .25 ppm level
Protozoan (dinoflagellate) Oodinium ocellatum	CU S04 .1 to .25 ppm continuous level depending on size of fish
Protozoan (ciliate) Cryptocaryon irritans	.4 ML (37% formalin) /gal/ 30 Min. dip and .2 ppm CU S04 Continuous level
Bacterial infections fin, tail rot, etc.	Maracyn as directed
Virus Lymphocystis	Surgically removed proliferated cells and treat wound with antiseptic

* Presented at the American Association of Zoological Parks and Aquariums Conference, September 1971.

FRESHWATER

ORGANISM	TREATMENT
Protozoan Ichthyophthirius multifiliis	Malachite green, continuous Level CU S04 continuous level
Protozoan (velvet) Oodinium limneticum	CU S04 continuous level (remove Plants) .1 to .25 ppm
Fungus	Malachite green and salt
Copepod (anchor worm) Lernaea Sp.	Dylox .25 ppm
Copepod (fish louse) Argulus Sp.	Dylox .25 ppm

The occurrance of Lernaea in our freshwater circulation systems (500,000 gal.) has caused infestations of these parasites on certain fishes for several decades. In the past this problem was sometimes controlled by manually picking the parasite from a fish or treating these fish with benzine hexachloride (BHC), Parathion, Lindane, and potassium permanganate. These are all chemicals that have to be used at near toxic levels, which often results in mortalities of valuable exhibit specimens.

Four or five generations of the anchor worm parasites can occur between the months of May and September. Complete destruction of the adult is necessary for control.

Extensive testing (Meyer, 1966) has shown Dylox to be most effective in the control of the anchor worm on many warm water fishes without any toxic effects.

An application of Dylox, 80% soluble powder at a level of .177 ppm is now applied to all parasitized aquarium fishes in their respective 800 to 1200 gallon exhibit or reserve tanks with the water circulation stopped for the period of treatment, but with constant aeration. Water temperatures range from 76 to 78 degrees Fahrenheit. The length of treatment is four weeks. To prevent a build up of excretory wastes over the extended treatment interval, each tank is drained, refilled, and the new water retreated at the .177 ppm level of Dylox. No mortalities occurred during the period of treatment and all fish continued to eat, but at reduced rates.

The following fishes have been treated with Dylox:

Acipenseridae - sturgeon
    Scaphirhynchus platorynchus - Shovelnose sturgeon
Lepisosteidae - Gar
    Lepisosteus platostomus - shortnose gar
Anguillidae - freshwater eels
    Anguilla rostrata - American eels
Percichthyidae - temperate basses
    Morone chrysops - white bass
Centrarchidae - sunfishes
    Lepomis macrochirus - blue gill
    Lepomis gibbosus - pumpkinseed
    Micropterus salmoides - largemouth bass
    Ambloplites rupestris - rock bass
Anabantidae - anabantids
    Osphronemus goramy - giant gourami
Characidae - characins
    Chalceus macrolepidotus - candlefish

All fishes except the shovelnose sturgeon and the American eel were parasitized. These fishes happened to be in the tank with the other parasitized fishes so were treated along with them.

Only the shortnose gar was parasitized with the fish louse, Argulus. All other fishes were infested with anchor worm. The shortnose gar had received a treatment of potassium permanganate and copper sulfate (.25 ppm) ten days prior to the Dylox treatment, with no observable effect on the parasite Argulus. This prior treatment may have weakened this parasite as it was eradicated during the first week of dylox treatment.

All other fishes were parasitized with anchor worms and all appeared to be free of them at the end of two weeks except the bluegill which appeared to be free of them by the third and fourth weeks.

The candlefish and rock bass were treated at the rate of 1.36 ppm. The candlefish exhibited elevated scales and hemorrhaging of the body surface soon after treatment. These fish were then taken off Dylox and placed in a treatment of Maracyn where they soon recovered.

Treatment of fishes for disease and parasites during collecting trips is always necessary. The monogenetic fluke, Benedenia, is always a problem to us in Florida collecting, especially when fish have been held in canals for periods of time.

The incidence of Oodinium and Cryptocaryon in Hawaii makes it a must for continual treatment of all fish being held and transported from there.

Optimal conditions of low stress, good water quality, proper diet, compatability and a prophylactic treatment of all new fish on their arrival are general measures we use to prevent disease at the aquarium.

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