# DRUM AND CROAKER

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ATTEND THE 8TH PUBLIC AQUARIUM SYMPOSIUM at the Hotel Willard, Washington, D.C. on June 14, 1962. Send your titles to Craig Phillips, 2816 N. St., N.W. Washington 7, D.C.

On June 15, 1962, we will have a DRUM AND CROAKER SMOKER AND GENERAL BULL SESSION starting at 8:00 p.m. at the Hotel Willard. Our conversations, battles and machinations should revolve around animal management and presentation. The important suppliers and supporting fields will have representatives and displays adjacent to the Drum and Croaker Courtesy Room. Come to Washington and get in the swim. This year will make our biggest splash.*

*mw take note!

DRUM AND CROAKER
April 23, 1962

CONTENTS

# FIRST IS A FASHION

Were you the first to do something this year? You've got to be first to be in fashion. It's always been that every zoo and aquarium must be first in something.

This urge to be first in showing and doing has an historical basis. At sometime or other it was an important thing to have the first whale, gorilla or barless exhibit. The problems of capture, transportation and tradition made for some revolutionary firsts.

There are damn few firsts that are worth the mentioning these days. In fact the mentioning and the conflicting attempts to establish senior rights are commencing to interfere with the orderly evolution and perfecting of exhibitions and displays. The Museum Mad. Ave. people are years ahead of us.

While we're puffing and crowing about the first three-toed legless lung fish to be exhibited in this country and the brilliant new "animals asleep" display that we have cleverly put together with paperclips, rheostats and boudoir-pink paint, others are honestly appraising what their exhibitions mean. Were they planned with a purpose? Do they stimulate? Do they create a favorable reception?

# A GENERAL DESCRIPTION OF THE SEVEN SEAS PANORAMA PORPOISE AND SEAL SHOW AT BROOKFIELD ZOO - BROOKFIELD, ILLINOIS

BY
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An unusual exhibit has been installed at the Brookfield Zoo near Chicago. Unusual for a zoo since most zoos cannot venture out into exhibits of this magnitude and complexity. Mr. Robert Bean, Director of the Brookfield Zoo, had envisioned a Porpoise Exhibit for many years and in August of 1959 he started preliminary studies with our firm. At first the exhibit was to be a warm weather show with the mammals being displayed in an open air show. This would require that the mammals be kept at a southern climate during the cold weather months and then flown up to the show for the summer months.

When we began studying this project and began investigating the training and keeping of these animals, it became very evident that any interruptions of their training and living conditions seriously affected their performances, if not their health. Transportation of these mammals is not a simple operation as we found out later. Armed with these facts, we convinced Mr. Bean and the Society that a year 'round exhibit was necessary and practical.

The most important decision that has to be made was the use of brine solution for a salt water habitat for the animals. It was generally conceded by aquarists that porpoises could be kept healthy and happy in an artificial salt water pool, but there were a few experts who gave out statements that the animals would soon die from the lack of sea water salts and chemicals. Because there were no existing brine operations to check against, this question seemed to indicate our greatest risk. We, therefore, had to gamble on this point.

During the development of the preliminary studies, a comparative analysis was made between sand and gravel filters and diatomaceous earth filters. We finally decided on diatomaceous earth due to its finer filter medium, greater flexibility and less chance for disease retention in the filter bed.
The project is composed of four components. First, there is the large porpoise display tank, twenty five feet wide, one hundred and twenty five feet long and eighteen feet deep at the central section. It contains about 180,000 gallons of 4% salt water solution that is filtered at the rate of 120,000 gallons per hour.

There is an enclosed seating space around the upper level of the tank for 800 adults. In actual operation, we have been seating around 1,000 people. This seating is on raised tiers giving full view of the tank surface.

Around the lower area of the tank we have an underwater viewing gallery with sixteen 33" x 49" viewing windows at eight foot eight inches below water level. A hydraulic "Hi-Ranger" is used as a training and performance platform for the trainer.

The entire surface area of the pool is covered by a plastic skylight made up in sections that can be removed in the summer. The area over the spectators is covered by a thin shell concrete roof structure.

There are two open air pools and grottos for sea lions and elephant seals. These exhibits are designed for the greatest proximity to the animals by the public without the use of the usual barriers. Here, again, we used underwater viewing windows so that these animals can be appreciated in their more natural environment. This water is treated similarly to the porpoise tank but on an independent filtration system. These tanks each contain about 22,000 gallons of water and are of an irregular shape so that there is a large viewing area. There is no public area for the seal shows.

The fourth part of the project are the small fresh and sea water fish display tanks located in the underwater viewing galley of the porpoise tank. These are conventional aquarium tanks equipped with photographic lights and independent aquarium filter systems.

PORPOISE POOL - FILTRATION SYSTEM

The Seven Seas Panorama incorporates a vacuum-type, diatomaceous earth filter system. The pool empties into a long trench drain at the bottom and into a twelve inch return pipe line that runs to the connecting filter building where it ties into a header line and into three fiber glass box filters. These filters are located below the water level of the pool and on the return line to each filter. Each filter has twelve elements providing a rate of flow of 2 gallons per square foot of filter surface and providing a turnover rate of 1 ½ hours. The filtered water is drawn from the filters by the suction side of the pump and delivered by a series of jets into the tank. These jets are set at an angle of about $30^0$ to the long axis and provide a clockwise current of water in the pool.

Several cycles of circulation of water in the pool is provided by valving. The daytime cycle is obtained by introducing water in the side jets of the pool and returning water is removed at the bottom and at the two skimming gutters at the ends of the pool. The night operation (or when it is desired to have a quiet pool) is obtained by introducing water at the end gutters and taking off of the bottom only.

Rapid skimming of the pool is arrived at by closing the bottom drain and taking only from the end skimming gutters. Other variations are possible but are not usually necessary. It can be noted here that the jet flow operation is very desirable for the invigoration of the animals. They respond better to training when the jets are in operation.

All piping in the salt water systems is fabricated from poly-vinyl-chloride pipe ranging in size from three quarter inch to twelve inch diameters. All valves are either bronze, stainless steel, rubber, poly-vinyl-chloride or a combination of these.

The salt brine system is from an underground salt storage tank. The brine is collected from the tank and introduced into the system at the filters or the makeup water tank. The entire pool is filled and brine added to a 2% solution and the remaining 2% of salt is added during operation. The salt is Morton Purex Salt containing 99.6% Sodium Chloride, 0.31% Calcium Sulphate and 0.01% Calcium Chloride. No sea water salts or sea water chemicals are added.

The water source is a deep well pump supplying water at 45° F. and containing about 5 parts per million of iron. The filters reduce the iron content down to about 0.16 part per million.

After the pool was initially filled, the water was a murky, reddish brown from impurities in the well water. This water appears clear in drinking glasses and is potable, but in the depth of the pool it appeared murky. After the pool was filtered for about three hours, the water became quite clear and after six hours was considered "polished water."

When the animals were introduced, we began to have difficulties in water clarity. Within two weeks we could not see three feet into the pool. There were four porpoises in the pool, each contributing about 9 lbs. of waste per day. We tried many types of filter mediums and some chemical admixtures, but we never seemed to make much progress. We called in several water "specialists" and had many analyses made of the water, but still could not nail down the difficulty. After several months of frustrating investigations, Mr. Henry Armbrust of B.I.F. Industries, Inc., Providence, Rhode Island, suppliers of the filters, came up with a chemical flocking system that would not injure the animals. This is working well today and we believe Brookfield has the cleanest water of any porpoise tank in the country. Moreover, the system is perpetual in operation and it is possible to operate with only adding water for evaporation and spillage.

When analyzing the project after a year's operation, we have come up with certain conclusions. Many of us feel that the project should have been somewhat larger. It is extremely popular and more seating could be **(page 8 missing on this copy)**

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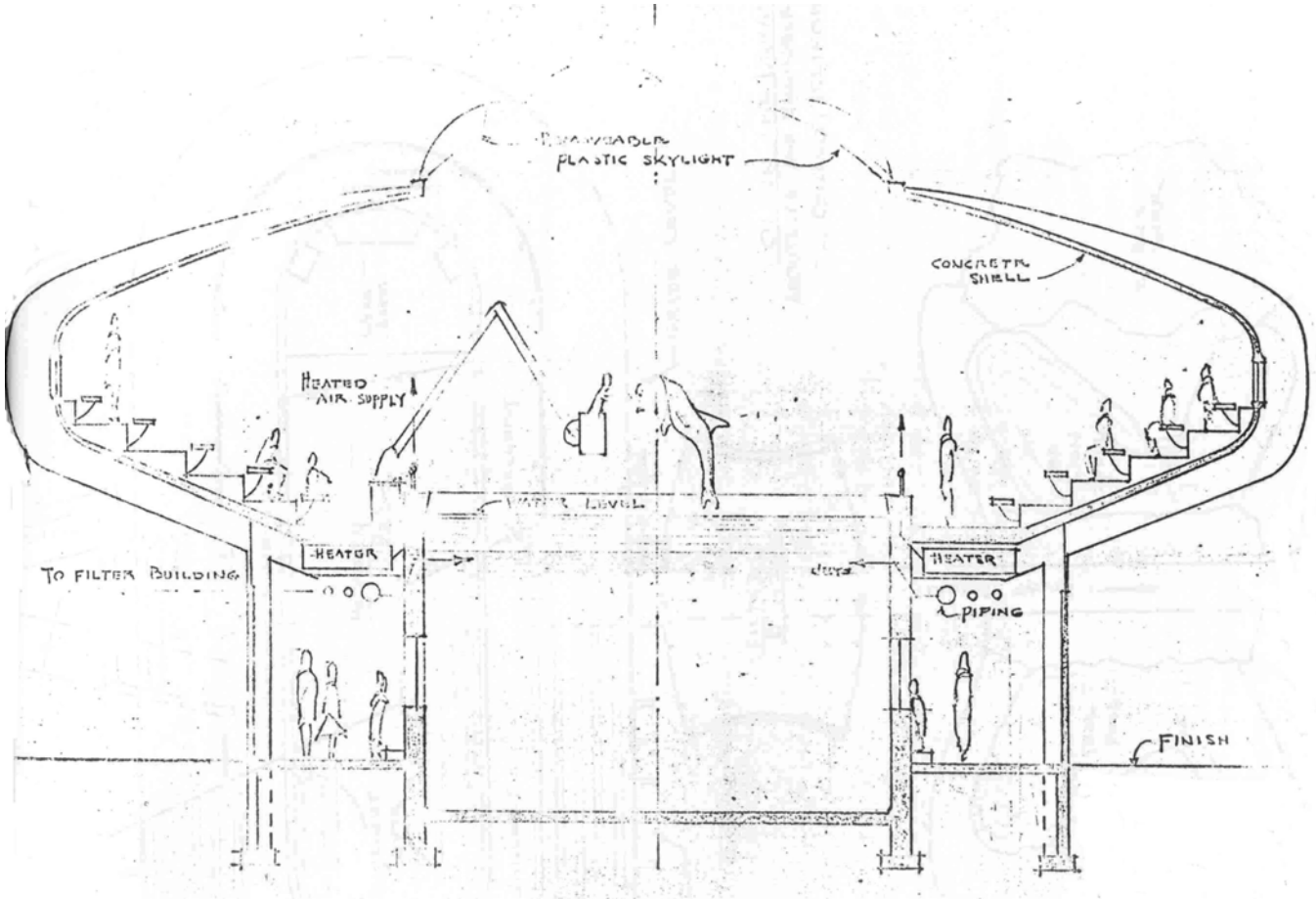
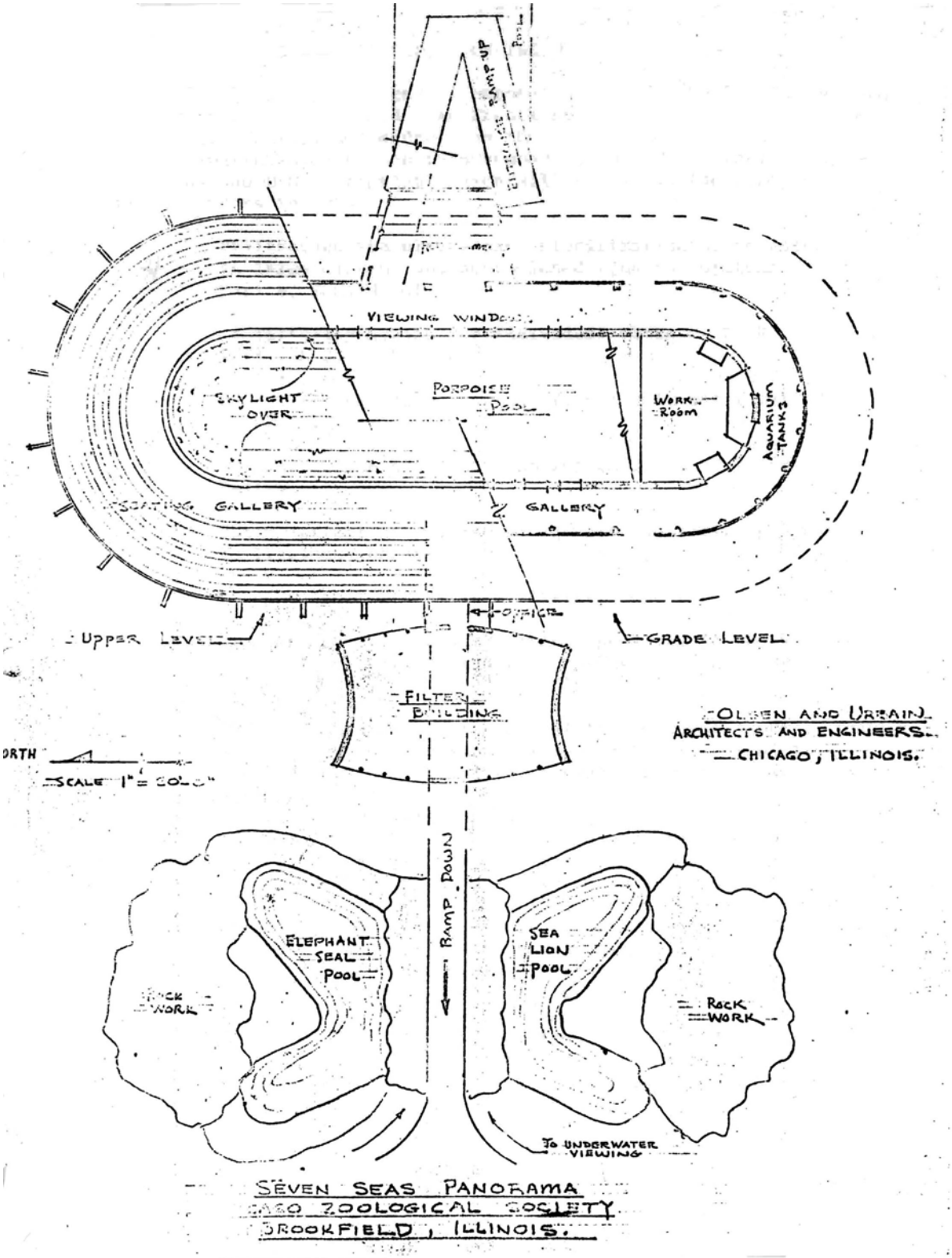



CROSS SECTION THRU POOL
SCALE 1/8" = 1'-0"

SEVEN SEAS PANORAMA
CHICAGO ZOOLOGICAL SOCIETY
BROOKFIELD, ILLINOIS.

OLSEN AND URBAIN
ARCHITECTS AND ENGINEERS
CHICAGO, ILLINOIS.




SEVEN SEAS PANORAMA
CHICAGO ZOOLOGICAL SOCIETY
BROOKFIELD, ILLINOIS.

## UNEXPURGATED REPORT ON THE MONACO MEETINGS

The American contingent, composed of Messrs. Kelley (Cleveland), Tinker (Honolulu), Herald (San Francisco), Newman (Vancouver), and Hinton (La Jolla), descended upon the International Meetings on Aquariology held in Monaco in November, 1960. The papers presented there by the U.S. delegates, which will appear in the Proceedings, are listed as follows:

"Filtration and ultraviolet sterilization of seawater in large closed and semi-closed aquarium systems," Earl S. Herald, et al.

"A filtering system for individual tanks," W.E. Kelley & D. H. Moreno.

"Water for aquarium purposes from a salt water well," Spencer Tinker.

"An aquarium exhibit with polarized light," W. E. Kelley.

"Some optical properties of aquaria and their application to lighting and design," W. E. Kelley.

"Longevity of fishes in captivity," Sam Hinton.

These papers are part of the 72 papers appearing in the four-volume report on the meetings and will be available shortly for a cost of 100 NF ($20.40).

It may be of interest to readers of the esteemed journal, DRUM & CROAKER, to cogitate over some of the observations made by this group. The first obvious item in comparing European and American aquaria is that there is an entirely different philosophy at work in the two places. Most American aquaria stress the importance of the fish and its activity, so that as a result, tanks in this country are usually jammed with all kinds of fishes. In Europe, great emphasis is placed on background and artistic tank design, with lesser emphasis on the fish so that it is not uncommon to see a 1,000-gallon tank which contains only one fish measuring 12-24 inches in length. Not all of the European aquaria subscribe to this philosophy, the most notable exceptions being at Frankfurt (It seems to us that Frankfurt had the most original ideas about background and went to a very great effort to carry them out viz, Polar Seas Case with penguins, South American Swamp, Trout stream over mountain, etc.-N) and Plymouth. The Trocadero (? - illegible on copy) Aquarium in Paris is perhaps the best example of the European philosophy with extremely big tanks, some of them in excess of 20,000 gallons, with very few fishes.

More than 300 aquarists assembled for the meeting and they came from all over the world with the exception of Japan, which was not represented. As might be expected, there were all ranges of competence to be found among the people at the meetings—from highly skilled aquarists to some who apparently had yet to see their first fish. The papers were presented in three languages – French, German, and English – with the help of UNESCO translators.

As is well known, Dr. Garnaud came up with his concept of the disappearing tank wall in 1950 and subsequently one-half of the Monaco Aquarium was rebuilt with angled tank walls. However, because of limitations of space, the idea was not really carried to its maximum result at Monaco, and it remained for the Plymouth Aquarium in its rehabilitation two years ago to apply the Garnaud concept of the disappearing tank wall to its fullest extent.

One other item is quite obvious when one visits various European aquaria, and that is there are few new ideas in the aquarium world; everybody copies everybody else. For example, at the now decrepit Brighton Aquarium (built around 1880) there was an oriental tropical fish display which is suspected of being the thought behind the design of the Chinese Room at Shedd Aquarium.

Many of the major European aquaria were built around 1880 following the lead of the first circulating aquarium setup, which was at the London Zoo about 1852. A number of these aquaria, such as London, Antwerp, Amsterdam, and others are set up with sand and gravel filters as well as large sedimentation tanks. In some cases, the sedimentation tanks are doing the most of the work of removing turbidity from the water; in other cases the filters are more efficient. Unfortunately no one in Europe at the present time is studying filter action. It may be noted that the redesigned large sedimentation tank—100,000 gallons—at Plymouth Aquarium results in crystal clear water in all of their display tanks which previously were noted for their murky appearance. They do not have filters.

Generally speaking, there is a resurgence of interest in aquarium work all over Europe, with many people clamoring to get into the porpoise field. For example, Monaco plans for a hanging oceanarium with large tank setup which will be cantilevered out over the ocean extending from the existing oceanographic building. Total cost is estimated at sic million dollars, of which three million will be for parking facilities. London Aquarium has plans for rebuilding; Amsterdam Aquarium at the present time is rebuilding a section of their warm fresh water system. During the war a bomb dropped in the center of the Frankfurt Aquarium and so it has been rebuilt, as has the Berlin Aquarium. This latter installation is really a sight for sore eyes, and it must be acknowledged that Berlin (Berlin is a better example of an exception to the European emphasis on background. Werner Schroeder is particularly proud of the completeness of his collections and probably has more species of crocodilians and loaches than anybody else. On the hand, his ability to decorate tanks is as poor as ours.-N) has the largest collection of living fishes of any aquarium in the world. They also have reptiles and amphibians as well as an insectory – all housed in a building which is four stories high.

The best mechanical equipment is at Frankfurt. They have a very complex installation which operates without a single engineer on the staff. Emergency systems take over automatically if the main system does not operate properly. If something really serious comes up at night, a red light goes on and the night watchman then calls one of the aquarists, who lives nearby.

The newest aquarium in Europe is at Bergen, Norway. Much care has gone into the setup of the displays so that an appearance of naturalness is achieved, and everything is done to divorce the visitor from the outside world and make him feel a part of the world of fishes. Built on two levels, the main floor features nine large tanks with disappearing walls and displays of a general nature grouped by families and species; downstairs are smaller tanks with specialized displays such as symbiosis, regeneration, camouflage, evolution, and so forth. The Bergen Aquarium is located next to the Institute of Marine Research and although separate from it, they work in close co-operation. A large toroidal tank for fish studies is expected to produce much information on the swimming habits of various species in simulated ocean currents, salinity, etc.

The Copenhagen Aquarium at Charlottenlund is the cleanest aquarium that one can imagine. They use vitreous glass in some of their tanks as background and as sides. The internal designs of the individual tanks are extremely well done. However they also subscribe to the philosophy of large volume of water and small body volume of fishes.

London, Amsterdam and Frankfurt have been working in the field of nitrogen balance of their seawater, using algal cultures in the tops of the filters in special containers. In this regard, it should be called to the attention of all aquarists that one of the most fundamental papers published for closed seawater circulation systems is that of Dr. J. H. Oliver, called, “The Chemical Composition of the Sea Water in the Aquarium” (Proc. Zool. Soc. Lond. Vol 129, Part 1, pp. 137-145, Sept., 1957). If you have need of this paper, it is possible that Dr. Gwynne Vevers, Curator of the London Aquarium, may be able to send you a copy.

Munich has a small fresh water aquarium located in the zoo. One keeper-aquarist operates the entire installation, which is rather phenomenal since many of the displays were in excellent condition and the workload was obviously considerable.

As may be suspected, each European aquarium has certain items that are exceptional; for example,

1. Plymouth has in its largest tank what D. P. Wilson calls a depressed area – it is a lowered section in the floor of the tank which gives the tank a very realistic ocean floor appearance. Plymouth also has the only arrangement whereby an aquarist can stand directly over the front glass in order to wash down algae.

2. London Zoo’s Aquarium has the only European manatee display; the visitor is slightly above the water surface of the tank and looks down on the manatee who always circles in the same direction.

3. Frankfurt Exotarium has several very startling tanks. Not only do they synthesize their salt water following their own formula, but the also have a stream tank in which one looks into a normal size 3 x 4 ft. display window but the water is at half level. In the water are trout and above the water extending upward for some twenty feet on an incline is a trout stream with many plants and birds. Their tropical rain forest display which extends for about 30 feet is equally striking – large freshwater fishes below the water surface and tropical jungle and birds above. In the reptile area they have a thunder and rainstorm machine which produces a cloudburst with the push of a button.

4. Antwerp has some of the most beautiful rockwork in their tanks to be found in any aquarium.

5. Amsterdam, currently rebuilding, has had considerable success and favorable comment on their mudskippers and Cerianthus anemonies.

6. Charlottenlund, Copenhagen, certainly excels in the use of tree trunks and other artifacts in creating natural underwater scenes.

7. Monaco's outstanding display was in the tube anemone department (Cerianthus) and in turkey or lion fishes (Pterois), the latter being the best assemblage that aquarists could imagine.

8. Bergen has a series of tanks showing symbiosis and general living arrangements which is outstanding. They also have the only aquarium where the visitor can be treated to the luxury of thick carpets and upholstered benches. It takes a lot of thinking to design a good aquarium, and Bergen has been richly endowed in this regard.

Hamburg - (MAN) - Carl Hagenbeck's Zoological Garden has added a new building called the "Troparium" where various kinds of tropical animals are exhibited. I can remember seeing chimpanzees, monitor lizards, tropical marine fish and alligators. The latter are displayed in a pool with rockwork and terrestrial plants at the back. A nice feature is that the alligators can be seen through a glass front in the water.

Munich - (M.A.N.) - An interesting feature of the Munich display was the geographic organization of the fish. South American, Asian, African and European species were separated into geographic units. This was done on the lower floor for large tanks and again upstairs for their small tropical aquaria.

# INSTANT OCEAN

R. M. Segedi
W. E. Kelley

1. Table 1 represents a copy of a sea watere formula received from Dr. Dieter Backhaus of the Exotarium in Frankfurt, Germany. Dr. Backhaus says (personal communication) that they miz each of the listed components in aerated and charcoal filtered water as stock solutions. They then combine the solutions in proper proportions to produce the synthetic seawater in use at the Exotarium. He further says that they consider C. P. grades of purity in these chemicals to be important.

My visit (Kelley) to the Exotarium in December, 1960 convinced me of the excellence of their preparation. Much of Dr. Backhaus' display was devoted to ocean fishes and invertebrates of many species (including Cephalopods) and I could see no evidence of trouble.

Richard Segedi of our Cleveland Aquarium Staff has produced an adaptation of the Frankfurt formula which we call "Instant Ocean". (TABLE II) In this form the seawater may be assembled in four steps using tap water from most sources. (1)

2. Part 1 consists of the gross dry components of the formula and these may be weighed and placed in a mixing tank. A hard stream of water directed into them will dissolve these chemicals. The container may then be filled almost to the level of the desired specific gravity.

Part II ($CaCl_2$) is dissolved in a small amount of hot water and added to the mix. Additional water may then be added to bring the mix to the correct specific gravity. $CaCl_2$ is mixed separately because at high concentrations of the gross components it will react with the $MgSO_4$ froming $MgCl_2$ and $CaSO_4$, the later of which will precipitate.

NOTE – If chlorinated tap water has been used, aerate the solution for a day or two before adding parts III and IV. If added sooner the residual chlorine will displace the ionic bromine and iodine since they occupy an lower position in the electromotive series.

Parts III and IV may now be added to the mix. These are stock solutions of trace elements. Liquid stock solutions of these are desirable because:

1. Convenient assembly of mixes.

2. Some of the compounds providing these trace elements must be dissolved by heat. i.e. (Calcium gluconate, cobalt sulfate, aluminum sulfate.)

3. Better quantitative accuracy may be achieved by weighing out large amounts for stock solutions.

There are many discrepancies between Table I and Table II:

1. CaCl in Table I should be $CaCl_2$ as in Table II.

2. Backhaus states (2) that SiCl should have been $SiO_2$. Silica ($SiO_2$) as the end member of Bowens Reaction Series is very poorly soluble, but is slightly soluble in alkaline solutions. We are currently investigating the release of silica filtrant in sea water.

3. Fe is abundantly present in our tap water (Great Lakes).

4. $ZuSO_4$ should have been $ZnSO_4$ according to Dr. Backhaus (2). The amount of zinc in Table I is greatly more than the amount in natural sea water. Fearing synergistic toxicity with copper, we havereduced the amount in Table II to correspond with natural sea water.

5. $MnSO_4$ should be $Mn(SO_4)_2$.

6. $Na_2MoC_4$ should be $Na_2MoO_4$ according to Dr. Backhaus (2).

7. $CuSO_4$ has been reduced to correspond with natural sea water.

8. KJ should be KI according to Dr. Backhaus (2).

Some comparison experiments have shown "Instant Ocean" to be similar to filtered sea water as supplied to us from Marine Studios (by F. G. Wood) in plastic lined 55 gallon steel drums. The following account of work with Octopus briarium is typical.

One 60 gallon closed-circulating aquarium with natural sea water, silica sand filtration corresponding to Saeki's formula (3) and a calcium carbonate (coral gravel) bed to maintain pH was set up on 11/21/61 with a female Octopus briarium weighing approximately 8 oz. A

similar aquarium system of 40 gallons was set up with a 6 oz female in "Instant Ocean" on the same date. 30% changes of new water were provided approximately each 10 days. By 1/9/62 our supply of natural sea water was exhausted. Both animals were very active and eating heavily. It was not considered important that further comparisons between octopuses in natural sea water and synthetic were necessary. Partial changes after the 9th of January were made in both tanks by "Instant Ocean".

On 1/18/62 the larger octopus laid eggs and continued eating heavily while guarding them. On 1/20/62 the smaller octopus laid eggs, continued to eat, but ate her eggs a week later. At this writing both animals are doing well (3/6/62) and embryos are showing in the eggs that the larger mother is still guarding.

It should be noted that we have used most American commercial makes of synthetic sea water in the past. All seemed to perform well with any fish species that we attempted. Very few invertebrates would live in them. Small octopuses attempted died in less than 1/2 hour.

REFERENCES:


1. Note that Table II is computed in American gallons, the gross components in avoirdupois weight, the trace element stock solutions in metric volume, and the compounds supplying the trace elements in metric weight. This sort of confusion seemed desirable because American aquariums compute their tank sizes in American gallons, often own avoirdupois scales for heavy weighing, and at the same time have metric laboratory balances and graduates.

2. Letter from Dr. Dieter Backhaus dated November 13, 1961, in response to our inquiries.

3. SAEKI, ARITSUNE – Studies on fish culture in the aquarium of closed circulating system. IN: Fundamental Theory and Standard Plan. Bulletin of the Japanese Society of Scientific Fisheries Vol. 23, No. 11, 1958 Pp. 684-695.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PUBLIC AQUARIUM SYMPOSIUM – Much of the worthwhile contributions to public aquarium knowledge have been made known and circulated through the Annual Public Aquarium Symposium started in 1954 by Earl Herald and continued by the faithful. The public aquarists always meet with the American Society of Ichthyologists and Herpetologists. This year we'll be in Washington, D. C. on June 14-18 – ATTEND THIS YEARS MEETING.

TABLE I.

Meerwasserrezept Frankfurt am Main 1960 fur 1,600 liter

| | |
|---|---|
| NaCl | 41.85 kg |
| MgCl2 | 8.165 ” |
| KCl | 1.120 ” |
| NaHCO3 | 0.35 “ |
| CaCl | 2.100 “ |
| MgSO4 | 10.380 “ |
| KBr | 0.045 “ |
| | |
| Al2(SO4)3 | 0.75 g |
| SiCl | 0.15 g |
| RbCl | 0.25 g |
| Fe | 0.07 g |
| ZuSO4 | 15.0 g |
| MnSO4 | 6.0 g |
| Na2MoC4 | 1.5 g |
| CoSO4 | 0.09 g |
| CuSO4 | 1.0 g |
| LiCl | 1.5 g |
| KJ | 0.15 g |
| SrCl2*6H2O | 30.0 g |

Additonal information given personally by Dr. Backhaus:

1. Add up to 40 grams boric acid (plant inhibitor)

2. Add 10 ccm of 10% calcium gluconate

3. NaHPO4*12H2O extra for plants (add 5 grams for fishes and up to 40 grams for plants)

TABLE II. INSTANT OCEAN

Formula for mixing 100 gallons with Specific Gravity of 1.025

PART I

| Compound | Amount | | Purity |
|---|---|---|---|
| NaCl | 23.0 | lb | Technical grade |
| MgCl2 | 4.5 | lb | " |
| MgSO4 | 5.75 | lb | " |
| KCl | 9.8 | oz | " |
| NaHCO3 | 2.8 | oz | " |
| SrCl2*6H2O | 7.5 | g | Analytical Reagent |
| MnSO4 | 1.5 | g | " |
| Na2HPO4*7H2O | 1.25 | g | " |
| LiCl | 0.375 | g | " |
| Na2MoO4*2H2O | 0.375 | g | " |

PART II

| | | | |
|---|---|---|---|
| CaCl2 | 1.15 | lb | Technical grade |

TRACE ELEMENT STOCK SOLUTIONS – Add 80 cc of each solution to above mix.

PART III

Dissolve in two liters of distilled water:

| | | | |
|---|---|---|---|
| Calcium Gluconate | 6.25 | g | U.S.P. |
| KI | 0.9 | g | Analytical Reagent |
| KBr | 270. | g | " |

PART IV

Dissolve in two liters of distilled water:

| | | | |
|---|---|---|---|
| Al2(SO4)3 | 4.5 | g | Analytical Reagent |
| CoSO4 | 0.5 | g | Food Grade |
| RbCl | 1.5 | g | Analytical Reagent |
| CuSO4*5H2O | 4.3 | g | " |
| ZnSO4*7H2O | 0.96 | g | " |

Isaac Walton's German Dictionary - Craig Phillips

Common eel - Der schlippenschleider.

Roe Shad - Der oppenmigraten spawnanschpiller.

Goldenshiner - Der smallenschooliteche glintengleamer.

Longnose Gar - Der needlenoggen rausenschnapper.

Smallmouth bass - Der linegeschnarlen fippenflapper.

Brook stickleback - Der unterwasser nestenhausenwever.

Sucker - Der muddenrooter.

Hog sucker - Der porkensnauten muddenrooter.

German brown trout - Der measelgespotten Krautentrouter.

Lamprey - Der klampentighten raspengulper.

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Have you heard about the traffic jam along the Atlantic Seaboard? It seems a whole school of jacks were lined up bumper to bumper.

And of course, you know the old story about the fur bearing trout. Supposedly, they live so far north in Canada, in water so cold, that they have developed a heavy growth of fur to keep warm. Of course, this is ridiculous. The truth of the matter is the trout line up at the nearest Hudson Bay Company trading post and draw out mink muffs.

And, from some questionable source, comes the story of two nimrods, out with their poles and dough balls fishing for carp. When approached by a warden and asked for their licenses, one of the pair accidentally dropped his billfold in the drink. Immediately it was seized by a colossal carp, which, in turn, lost it to one even larger, and then still another grabbed it. Soon it was being passed back and forth as a basketball by a whole school of these fish. The three men watched in amazement. It was the first time any of them had seen carp to carp walleting.

# USE OF LINDANE AGAINST ARGULUS, THE FISH LOUSE

The following is extracted from an article "On the use of Lindane in fresh and sea water" by Frank de Graff, Curator of the Amsterdam Aquarium which was published in June 1959 as No. 6 of Vol. 1 of the Bulletin of Aquatic Biology. At the time of writing, the Aquarium of the Royal Zoological Society "Natura Artia Magistra" has used Lindane successfully against the freshwater copepod ectoparasite, Argulus, for two years.

"The first time Lindane was used against Argulus, the stuff was administered in a single big tank, shut off from the circulation system in a dose of 1:10,000,000. As it appeared that the Lindane was insoluble in water, it was distributed over the surface of the tank in the form of powder. After 2 x 24 hours all Argulus were killed and no ill effects on the fishes were observed. The tank was brought into the circulation system again without changing the water, presuming that such a small dose of Lindane of the total capacity of 200 tons of fresh water could have no effect whatsoever. However, after two more days all Argulus parasites in some other tanks of the same circulation system died one after the other. With a dose of 0.3 grams of Lindane in 200,000 liters of water the infection was effectively stopped. The one possible conclusion out of this experiment that Lindane does dissolve in water after some time in such an amount that Argulus is killed. The lethal concentration for Argulus appeared after this first experiment to lie far beneath the dose administered. When, for the second time, an infection occurred in several tanks at the same time (one year after the first experiment), Lindane was introduced into the circulation system by way of the pressure tank. The dose used was half that of the first experiment. Once again the chemical was administered in the form of powder. The treatment was a complete success, all Argulus being killed in the course of one day. In both cases, no ill effects on the fish were observed, during and after the treatment. According to this experience, Lindane is effective against Argulus in doses of

at least 1: 20,000,000. The real concentration is unknown, because the percentage of the Lindane that did actually go into solution remains a question. As no more Argulus infections occurred, planned dosages of Lindane dissolved in absolute alcohol could not be carried out."

Treatment for Caligus infestation of marine fishes was not so successful, the Lindane being toxic to some fishes at the dose of one to ten million, which, incidentally, did not seem to discommode the marine copepod ectoparasite. Lindane, it should be remembered is a deadly poison for man and other mammals as well as fish and invertebrates.

J.W.A.

Drum and Croaker has had articles in #1 (6/15/58) p. 7 and #2 (1/15/59) p. 13 on this subject. The staff at Belle Isle Aquarium (Detroit), has very successfully used lindane in treating Argulus on recommendation of a paper in the Proc. London Zool. Soc., May, 1949, p.81.

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San Francisco – March 19, 1962 Steinhart Aquarium closed its doors for the first time in 39 years. The reason was a good one since this was the beginning of the second phase of the $1,575,000 rehabilitation of the building. Expected reopening date is in January, 1963. All of the pipe in the Aquarium is PVC and the valves are Saunders rubber-lined Chemtrol, and some are Ace hard rubber. All of the eight water systems are equipped for ultraviolet sterilization of the water; recording turbidimeters have been scheduled for installation, and it is hoped that recording pH, oxygen, and carbon dioxide equipment can also be included. Johnson control systems have been used throughout the installation.

HAWAII – The oceanarium is still proceeding more or less on schedule. A great deal of the preliminary groundwork has been completed, and the planning is now into preliminary stages prior to the final completion of the final plans. The layout has been made on the beautiful site at Kaupo Park on the Island of Oahu and will include as a unique feature a very large research center which will actually be of approximately equal size to the commercial display. The research center will include research tanks for commercial fishery studies on fish such as the skipjack and hopefully on the bill fishes, large tanks for work with marine mammals and biochemical studies of the sea, and other such enterprises which require the facilities of a large salt water availability.

PHILADELPHIA – Plans for the new commercial aquarium, Aquarama, now under construction, call for the place to be finished by November of this year. The steel framework has been put together now. This will consist of a glass porpoise theater all enclosed and a dish tank which will be the large fresh water community tank and include many of the unique fresh water animals living together in a community situation. There will be small tank displays and an outdoor display area for animals such as penguins and seals. This is expected to be completed some time next fall. Progress is at present being made on the development of the shows and the decoration of the various tanks and things of this sort.

SAN DIEGO – The oceanarium is proceeding on schedule and is in the final plan stage, the final plans being drafted for the facility on the Bay. It will be a facility featuring enclosed exhibits primarily with the exception of one large outdoor lagoon in which animals will be allowed to perform. Adjacent to it will be a research facility for work primarily on marine mammals. This facility is to be located in Mission Bay just north of San Diego as part of a 7,000 acre marine playground area which will include a number of other recreational facilities such as camping grounds, water skiing areas, boat racing courses, sailboat areas, motels, etc. It is expected that the construction on this oceanarium may begin in June of this year. At the present moment there are some difficulties concerning the stability of some of the land which may be used, and so this is the major uncertainty at the moment, although there are alternative sites available in which the land is stable.

TACOMA – The new Tacoma Aquarium which is now under construction and is expected to be completed by January 1963, is a $250,000 building some 1300 feet from the sea and at an elevation of 135 feet. A six-inch transite line will bring water to the aquarium. The new building will have 60 tanks ranging from 50 to 2,000 gallons, and will also have a large center tank of 135,000 gallons (12 feet deep). Additional tanks include a seal pool (30 ft x 25 ft x 6 ft deep), a porpoise pool (30 ft in diameter and 9 ft deep), and a penguin tank (15 ft x 10 ft x 3 ft). $169,000 has been allocated for equipment and other essentials necessary to open the new building. Cecil Brosseau, the long-time aquarist of the old Tacoma Aquarium, will also be in charge of the new installation.

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SUPPORT THE NATIONAL AQUARIUM

Considering the strong desire of American taxpayers to see and study exhibits of various forms of fish life - not readily visible to most citizens, otherwise - there is widespread interest in establishing a National Aquarium in the Nation's Capital. A woefully inadequate exhibit exists obscurely in the basement of the Commerce Building at present.

To provide a new facility adequate to meet the needs of more than six million school children and adults who visit Washington, D.C., annually, Congressman Michael Kirwan of Ohio introduced a bill last year to establish such an aquarium. He has reintroduced the measure into the House of Representatives this year as H. R. 8181. Senator Clair Engle of California has introduced a similar bill in the Senate, designated as S. 2296.

SFI Bulletin

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Copies of Drum and Croaker can be made available at Twenty-five dollars each.

# SOME PUBLICATIONS USEFUL FOR WATER MANAGEMENT IN PUBLIC AQUARIUMS


Breder, Charles M., Jr. and Thomas II. Hawley.
1931. The chemical control of closed circulatory systems of sea water in aquaria for tropical marine fishes. Zoologica, Vol. 9, No. 11, pp. 403-442. (Still a classic, but unfortunately out-of-print at present.)

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1948. Determination of water quality. Research Report No. 9, U.S. Fish and Wildlife Service, 122 pp. (Still a "bible" for fresh water handling. At one time sold for thirty cents by the Superintendent of Documents, U.S. Government Printing Office, Washington, 25, D.C.)

Goetz, Charles A. and Robert C. Smith.
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1954. Theoretical principles of aeration. Journal American Water Works Association, Vol. 46, No. 4, pp. 353-376.

MacGinitie, G. E.
1947. Sea water systems at marine laboratories. Science, Vol. 106, No. 2747, pp. 171-173. (One of the most informative of all discussions of the behavior of sea water in closed systems.)

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1960. Removal of free chlorine from running water by sodium thiosulphate. Journal Fisheries Research Board of Canada, Vol. 17, No. 4, p. 601.

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Strickland, J.D.H. and T.R. Parsons.

1960. A manual of sea water analysis. Bulletin Fisheries Research Board of Canada, No. 125, 185 pp. (A "must" if you have sea water or intend to set up any sea water systems. Order from Queen's Printer and Controller of Stationery Ottawa, Price $2.00.)

James W. Atz

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Curator, a publication of the American Museum of Natural History, has such stimulating articles as:

I. #1 (1958)
- p. 7 - On Being a Curator
- p. 29 - Design Standards in Museum Exhibits
- p. 42 - The Challenge of Change
- p. 74 - Teaching Functions of Exhibits
- p. 91 - Toward Well-Being For Museum Visitors

I. #2 (1958)
- p. 25 - Exhibits and Ideas

I. #4 (1958)
- p. 76 - Exhibits - Firing Platforms for the Imagination

II. #3 (1959)
- p. 233 - Science, A Public Heritage

III. #1 (1960)
- p. 26 - Labels: Writing, Design, and Preparation - Luther A. Williams

#4 (1960)
- p. 361 - Seven Lighting Problems: Seven Solutions - Robert T. Hatt

# Arapaima at the Memphis Aquarium

by
Bonnie Graves, Curator
Memphis Zoological Garden & Aquarium

On May 3, 1961, we received a call from a local Aquarium supply dealer, offering a "Pache" for sale. Not knowing what a "Pache" was, we investigated hoping to find a fish that the Aquarium could use.

At the dealer's shop, we found a six inch arapaima residing in an eight gallon tank. The fish was priced at $15.00, so we purchased it immediately.

The arapaima was put in a two hundred and fifty gallon reserve tank which was heavily planted. This tank also housed a large number of guppies and mollies which served as excellent first food for the acclimation of the arapaima. He grew rapidly under these conditions.

July 3, two months later, he was moved to a five-hundred gallon exhibit tank, along with two shovel-nose catfish and two tiger catfish. He continued to grow here until he was moved to a 1700 gallon tank on January 23, 1962. At this time, the arapaima was 22 inches long. On March 6, 1962 he had grown to 25 inches.

He now takes a wide range of food, including green sunfish, shiners, smelt, beef heart, shrimp and a prepared dry food. We feel that he will continue to grow at this rapid rate if he continues getting adequate tank space.

We would also like to report an albino bullfrog, captured May 21, 1959, near Clarkdale, Arkansas. He was found in an old river bed and was 5 ½ inches long at that time. He has grown to a length of 6 ½ inches, March 11, 1962.

## STOP CHASING THAT FISH!

Studies made by Canadian and Alaskan scientists for the past eight or more years show that some fishes can be killed by over-exertion. Moreover, as these investigators point out, this phenomenon has been known since 1938. Severe muscular activity was followed by the death of some individuals, but usually not all, belonging to the following species: Chinook, Coho and Sockeye Salmon, Cutthroat Trout, American Shad, Tench, Atlantic Cod, Striped Bass, and one of the European flatfishes, the Dab. Not all species are susceptible, but the application to conservative aquarium management is nevertheless obvious. Key reference: "Comparative Physiology of Carbohydrate Metabolism in Heterothermic Animals," edited by Arthur W. Martin and published in 1961 by the University of Washington Press, Seattle.

James W. Atz

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AT DALLAS, plans are being completed now for a marine addition to the building, with the north end of the Aquarium to be deleted, and a new 68 foot extension added. This will supply it with one 10,000 gallon tank plus two 2,000 gallon tanks, some 1,000 gallon tanks, plus numerous tanks ranging from 10 to 180 gallons in size. All in all, there will be approximately 30 tanks of salt water to be installed.

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AT BOSTON, plans are being completed for an aquatic exhibit with a forty-foot waterfall and a giant ocean tank. There are indications that it will open in latter half of 1964.

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Position Available

AQUATIC EXHIBITS CURATOR - $5200-$6000 to start. Male or female with ability to plan and develop aquatic world exhibitions for two million dollar public aquarium to be located in metropolitan Boston, Mass. Contact: L. C. Finneran, Director, New England Aquarium 10 Post Office Square, Boston 9, Massachusetts.

# TOWARD A UNIFORM SYSTEM OF POPULAR FISH NAMES

The American Fisheries Society published the second edition of "A list of Common and Scientific Names of Fishes from the United States and Canada" almost two years ago. This listing of practically all of the species of fishes from the fresh waters of the U.S.A. and Canada and from their coastal salt waters contains nearly 1900 items. A committee of seven prominent ichthyologists, headed by Dr. Reeve M. Bailey, worked on this project intensively for four years. They were faced with the impossible task of trying to please all of the people all of the time, and we believe that their list comes as near doing this as is humanly possible.

Label-writing and letter-answering public aquarists should rejoice loud and long now that they have a respectable and more or less complete authority to which to refer. A uniform system of popular and scientific names for our exhibits ought to be our goal; now we can achieve this for all U.S. fishes with practically no effort on our part. The names we use on our labels ought to conform to the list of the American Fisheries Society in every possible way. When we have to bow to local pressures or are convinced that the "official" name will not be locally recognized, we ought to use double popular names with the "official" name in first position, for example: MUMMICHOG or KILLIE.

In a country as big as ours, eventual uniformity in fish names can only be attained by "sinking" some perfectly good names. This is part of the price of uniformity. Moreover, there are always strong-minded souls who object to all authority and like to make their own rules as they go along. Their approach in this case, however, leads eventually to a Tower of Babel. On the other hand, submitting to a central authority smacks of the monolithic state. Of all the various pros and cons, the most is, to us, the confusion that a laiesez-faire attitude breeds in the usage of popular names of fishes, and this is the principal reason why we are convinced that the advantages of uniformity and a generally recognized authority greatly outweigh the disadvantages. At the New York Aquarium, we are trying to follow the List of the American Fisheries Society in every way.

Copies of the List can be obtained from E. A. Seaman, Secretary-Treasurer of the American Fisheries Society, Box 483, McLean, Virginia. Cost: $1.00 paperbound, $2.00 clothbound.

James W. Atz

Curator, New York Aquarium

Drum and Croaker first recommended this in the July, 1959 number. How many have looked into the situation?

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The first sharks to travel from the Pacific American coast to Europe since the Pleistocene recently made that flight by polar route, courtesy of Steinhart Aquarium and Marineland of the Pacific. Small leopards and hornsharks were sent to three aquaria – London, Amsterdam, and Antwerp. All arrived in good condition.

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Mill Valley:

Recent events of interest in northern California include the announcement of plans for a four-million dollar, three-tank oceanarium in Richardson Bay, which is best described as a very muddy slough directly north of the Golden Gate Bridge. At the present time the group, Marine World, Incorporated, is in the process of negotiating a long term contract with the city of Mill Valley, on whose recreation land the project would be constructed. The group seems to have the necessary money, and has made all of their preliminary designs without the benefit of an aquatic biologist to assist them. One rather serious problem they will face is to obtain good quality water for their installation.

**Missing Page!**

# ON HARBORING SEALS

W. E. Kelley

Who doesn't yet have these crazy kids (Phoca vitulina concolor) on display?

The New England Aquarium sent us our two, young female harbor seals last August (1961) and the Cleveland Aquarium hasn't been the same since. The Cleveland Press carried the story on the front page with photos and continued to ride it for nearly two weeks. More than seven thousand visitors tried to jam into our small building on August 13th to see them; and since then, they have continued to eclipse any of our other exhibits in visitor interest.

We are showing them in an 8' x 8' aquarium (the largest we could provide) with about 500 gallons per hour of fresh tap water being discharged through their "half-level" tank. Residual chlorination in the fresh tap water seems to irritate their eyes, so we keep it neutralized by dripping in a stock solution of "hypo." Air temperature over their tank is kept below 65 degrees F. by air conditioning. Water temperature fluctuates approximately from 40 degrees F. (winter) to 75 degrees F. (summer) as the supply water temperature changes. Their combined body weight is fast approaching 150 lbs. They are fed to repletion three times daily on freshly thawed frozen smelt and are consuming 15 to 20 lbs. per day. (total both) Once a week a few drops of a liquid multiple vitamin ("ABDEC") are inserted by hypodermic into the coelemic cavity of several smelt just before their use as food.

Much of their time is spent swimming rapidly about the tank while rolling on the long axes of their bodies. Leaps from the water into the air, or onto a platform over the water, punctuate their normal swimming behavior. Sometimes a furious game develops around possession of a rubber stick-like toy, with the toy being thrown and pursued. Often they pose at the tank glass for a moment to return the stares of our visitors, and not one can resist the enormous eyes of the harbor seal.

# POSSIBLE USE OF LIVING PARASITE PICKERS IN AQUARIA

James W. Atz
New York Aquarium, New York Zoological Society

Skin and scuba diving makes practical the close observation of aquatic animals in their native habitat. The many hours spent underwater by biologists since the widespread adoption of the techniques of free diving have resulted in some surprising observations, none more astonishing than those made on the cleaning symbiosis. For twenty years or more, small fish had occasionally been seen picking at larger ones with the apparent co-operation of their temporary associates, but the significance of the unusual relationship could only be guessed at and its prevalence not even imagined. Now we know that 26 species of fishes and 6 species of shrimp, and undoubtedly several more as yet unknown, act as parasite pickers on larger fishes which not only tolerate their attentions but seek them out by regularly visiting the locations where the cleaning fish or shrimp often set up shop. And do a thriving business, it might be added, with customers actually lined up waiting their turn. The parasite pickers are permitted to roam at will all over the host's body, the mouth and gill-covers being opened so that these activities may also be examined.

Ichthyologist, Jack Randall, has recently suggested that "Aquarium owners might consider the use of parasite pickers to combat parasitic infestations or secondary bacterial or fungus infections that may arise from them." Indeed, Dr. Rene Catala, director of the Aquarium de Noumea, reported he had been doing just that at an informal discussion on the construction and operation of oceanariums, held during the course of the Tenth Pacific Science Congress last September.

Of the fishes so far reported as cleaners, the following are available for purchase, at least occasionally: Fairy Bass (Gramma hemichrysos), young Butterfly Fishes (Chaetodon spp.), young gray Angel Fish (Pomacanthus aureus), Bluehead (Thalassoma bifasciatum), young Spanish Hogfish (Bodianus rufus), Senorita (Oxyjulia californica), Neon Wrasse (Labroides dimidiatus)

and Neon Goby (Elasatinus oceanops). We have exhibited all of these from time to time at the New York Aquarium, but have seldom witnessed any cleaning activity, and none that could have been recognized as such by the visiting public. So seldom does it occur that we have hesitated to call attention to the relationship by means of a label, since nothing the visitor would see could be interpreted in the light of this knowledge. Perhaps we do not provide enough space or a great enough number of potential customers for a cleaning station to be established, or perhaps our regular feeding schedule discourages the picking behavior. As far as I know, regular parasite picking has not been observed in the large oceanariums, where there would presumably be at least some spots suitable for a station.

The observation of aquarist Douglas Faulkner, who has kept the gorgeously colored Hawaiian cleaner wrasse, Labroides phtbirophagus, in small aquaria are of considerable interest. His fish practiced picking regularly. All foods not provided by a host fish were refused, and Faulkner believes that starvation was the cause of the wrasse's death.

On the other hand, the picking habits of these fishes sometimes may make them undesirable aquarium inmates. Butterfly fishes and angel fishes are notorious for picking on their tankmates, both literally and figuratively, and blueheads get out of hand in the same way. It should be noted that in nature, fish being treated by a parasite picker sometimes give evidence of having received too sharp a nip or too many of them. In the wild, the fish can simply move away, but in the confines of a tank, the fine line separating mutual benefit from one-sided advantage may be overstepped. It may well be lack of Lebensraum that makes murderers out of angel fish! Dr. Catala indicated that he found it necessary to move his parasite pickers from tank to tank in order to avoid this kind of trouble.

As far as cleaning shrimp are concerned, the red-and-white banded Coral Shrimp (Stenopus hispidus) is fairly often available from dealers. At the New York Aquarium, we have

never given it a really good opportunity to work on larger fishes. Limbaugh recorded an instance where a cleaner shrimp (presumably Hippolysmata californica) went to work at once on a number of fishes that showed lesions from bacterial infections when it was placed in their aquarium. He also noted, however, in another article, that a number of shrimp of this species will clean a fish to the bone, if kept with it long enough in an aquarium.

Parasite pickers would certainly be most helpful to any aquarium that has trouble with such scourges as Benedenia melleni, providing they eat this mono-genetic trematode and would do so under captive conditions. Parasite picking would also make a wonderful exhibit. I must confess, however, that I am not very hopeful of ever seeing the activity established as a regular thing in the vast majority of public aquariums, because of the difficulty in setting up all the environmental factors that are presumably essential to it. Perhaps our best opportunity would be with a form like Pederson's Shrimp (Periclimenes pedersoni) which seems to exhibit behavior that is relatively stereotyped, compared with the behavior of the cleaner fishes.

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# THE HIGHER SENSITIVITY OF ALICE MAE

Alice May was very troubled turtle. She was a very troubled loggerhead turtle who weighed four hundred and nineteen pounds to the nearest pound.

Born of a phlegmatic tribe, Alice Mae was a turtle set apart. A prey to her own keener awareness and higher sensitivity, she was incapable of phlegmatic acceptance. She was a turtle with a capacity for deep suffering, and she suffered deeply.

Alice Mae had had a lover. A vague sense of familiarity accompanying this experience had set her to pondering the mysteries of deja vu, but only fleetingly.

Theirs had been an innocence unblemished by adequate memory. They had known each other under moist tropical breezes and brilliant tropical skies. This meeting, this discovering of each other, this sharing of themselves had been for them a happy idyll. Then they had met the scientific expedition.

The scientific expedition had been composed of ichthyologists. They had had with them gear, and preservatives, and field references. They had also had with them a Kodak Zoom 8 Reflex Camera.

The ichthyologists had taken much footage of Alice Mae and her lover.

The scientific expedition had disbanded. The ichthyologists had traveled several hundred miles to attend the meetings of the American Society of Ichthyologists and Herpetologists. They had taken the several thousand feet of exposed film with them.

They had not shown the film as an accompaniment to a joint scientific paper. They had said:

> "Why should we stick our neck out with a herpetological paper."

They had also said:

> "What the hell: anything important about the mating behavior of loggerhead turtles is probably already known anyway."

They had shown the film, (which they had now reassembled and edited), after hours in

private rooms amidst flowing spirits and coarse hilarity.

With these traumas a schism had occurred within Alice Mae. A part of her that was unaveragely high-minded and tremulously sensitive had become partially disassociated from that part of her that necessarily had to preoccupy itself with the problems and needs of daily living. That part of Alice Mae that was all woman had split off from that part of Alice Mae that was all turtle.

Great with impending motherhood, it had been with a heavy heart that she had made her way to the higher fringes of the beach. Did she really wish to bring children into a world of scientific expeditions, and ichthyologists and gear and preservatives, and field references, and Kodak Zoom 8 Reflex Cameras, and A.S.I.H. members?

It had been with a feeling of nameless sadness that she had dug a deep and sloppy hole into the sand and deposited her first twenty-one children.

Then the men in the jeep had come and turned her over. Alice Mae had sighed. But then the conservationists had come and made the men in the jeep turn her back over just in time to deposit her twenty-second child, and she had deposited her next fourteen children while the conservationists had gotten the names of the men in the jeep.

After the conservationists had left she had deposited forty-one more of her children before the man had come from behind the dunes and turned her over. Alice Mae had sighed deeply. Then the conservationists had come back and made the man from the dunes turn her back over just in time to deposit her seventy-eighth child. Then the conservationists had stayed with her, but they had stood around criticizing the hole she had dug.

Upon observing her tears they had only said:

"Notice how their eyes always get gooey out in the wind like this."

With this last unkindness the split within Alice Mae had become complete and irreversible. Only through instinct had she somehow managed to cover her children. Afterwards the part of her that was all woman threw herself into the sea, but that part of her was all turtle just swam away.