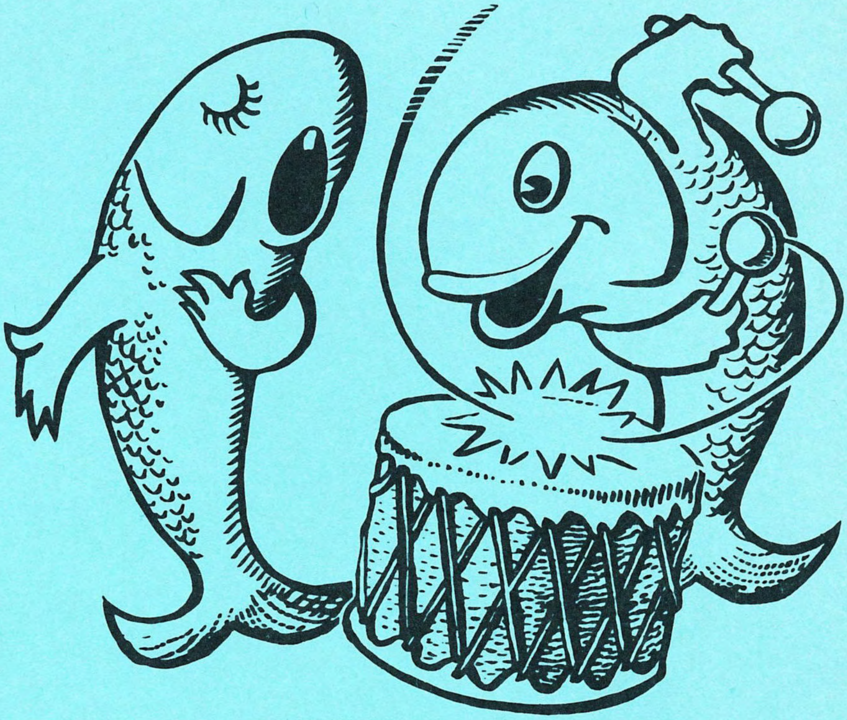

The DRUM and CROAKER

A Highly Irregular Journal for the Public Aquarist

October 1977
Volume 17(77), Number 2

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DRUM AND CROAKER

The Informal Organ
for Aquarists

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John H. Prescott
Executive Director
New England Aquarium

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ILLUSTRATIONS

ANOTHER MONSTER TURNS OUT TO BE A MYTH

James W. Atz
American Museum of Natural History
New York, New York

The Coffs Harbour Oceanarium has a leopard seal, a 6.5-foot male that strayed from its Antarctic home and was rescued on a New South Wales beach not very far from the oceanarium itself. Few leopard seals have ever been kept in captivity, but the most noteworthy item about Leopold, as he has been named, is his disposition. According to Hec Goodall, the institution's managing director, this seal has shown "a high intelligence and a friendly nature in training procedures."

And so another monster myth is about to be destroyed. Like the killer whale before it, the leopard seal has had a fearsome reputation as a savage destroyer of penguins and other seals and as a threat to man. Several well-documented instances of what appeared to be inquisitiveness that bordered on aggression are on record, including a couple of cases in which individuals repeatedly approached SCUBA divers and then struck at iron rods that the men pointed in their direction. On land, leopard seals rarely take the offensive, but there are two reports of seals chasing men over the ice. Despite this fearless attitude, however, there is no record of anyone being bitten by a leopard seal.

Such a bite could be disabling or even fatal, for the animal reaches a length of more than eleven feet and has an unusually large gape with a formidable set of canine-like teeth. Its menacing appearance certainly has contributed to its evil reputation. Lee S. Crandall, one of the world's great zoomen, described his one and only encounter with a leopard seal (at Hagenbeck's Tierpart in 1912) as follows: "As the leopard seal floated quietly in the water, it looked directly at me, giving a definite impression of sinister invitation, enhanced by the immense extent of its jaws. It was a chilling, unforgettable experience..." Mr. Crandall personally described this event to me in similar lurid terms more than once when we had gotten on the topic (as zoo and aquarium people often do) of what animal rarity we'd like to exhibit, for whatever particular reason. Let me assure you that Mr. Crandall was a steady gentleman of the old school and not in the least given to any kind of uncontrolled emotionalism.

An almost exactly parallel situation once existed with regard to the killer whale. So terrible was this creature reputed to be that aquarists hardly dared speculate on how it might behave in captivity. Early in the 1960's, when the first killer was captured and deposited alive in one of the huge tanks at Marineland of the Pacific, David H. Brown, who was then in charge of all the cetaceans there, vividly described the forbidding, almost diabolical look the whale gave him as it swam about the tank. I remember that a few years later, I cheerfully predicted that it would only be a matter of time before some captive killer would munch on one of its trainers right in front of the horrified audience.

So much for the impressions, preconceptions, and predictions of professional animal men. Perhaps we ought not look too far down our noses at the romantic notions of the public that help fill the movie houses where "Jaws" and "Orca" are playing.

But now, about those ferocious giant squid in the eastern Pacific . . . !

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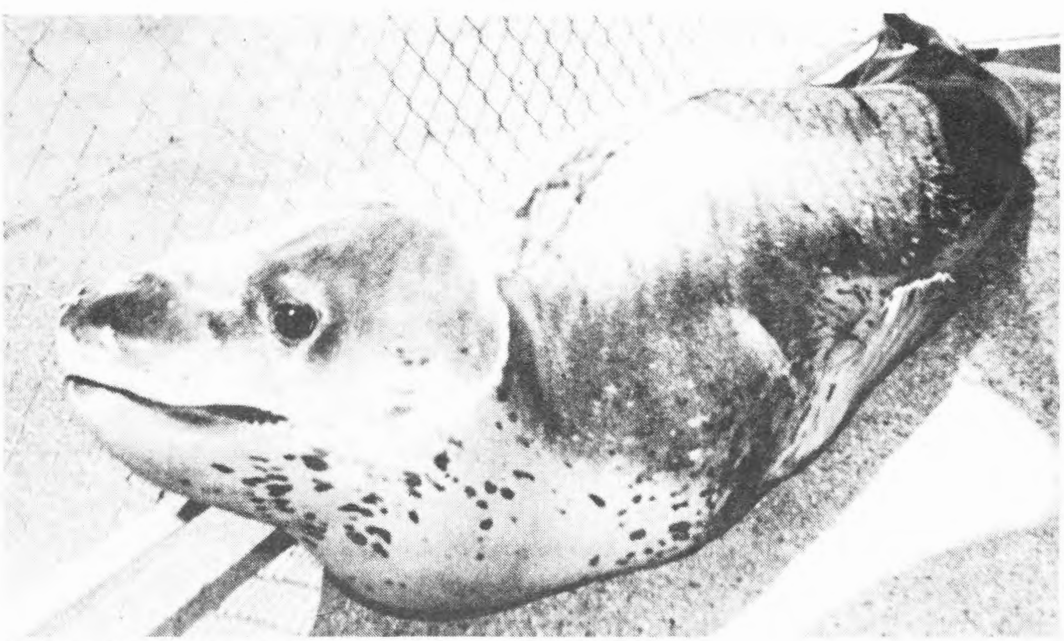

Leopold, the leopard seal
(Photo from Australian Fisheries)

STOLEN AND LIBERATED

Spencer Tinker
Honolulu, Hawaii

Two dolphins (*Tursiops truncatus* Montagu, 1821) of the temperate and tropical Atlantic have been liberated in Hawaii and are now at large somewhere in the Hawaiian area.

These two dolphins were stolen at night late in May, 1977, from their experimental tanks at the University of Hawaii facility at Kewalo Basin in Honolulu, transported about 40 miles, and released into the ocean near Makua on the Waianae coast of Oahu.

Two employees of the facility, Mr. Steve Sipman and Mr. Ken Lavasseur, subsequently indicted for theft, felt that these two animals were being denied their "animal rights," were being kept in "slavery," and were too intelligent to be subjected to the mental labors involved in their former situation. So, why not liberate them?

For a few days the dolphins were observed along the shoreline of Oahu. When first sighted and while they could still be located, all available aquatic facilities were called upon to assist in the recapture of the dolphins. These included trainers, swimmers, audio equipment, food, nets, small boats, helicopters, the Coast Guard, etc., but the dolphins could not be recaptured.

Within a few days the dolphins were lost and with them went a financial investment in six figures. These dolphins were part of an "intelligence study" being conducted by Dr. Louis M. Herman, Professor of Psychology at the University of Hawaii and supported by federal grants.

The future of the dolphins is uncertain. They may survive, although the people who have worked with them doubt that they will live for long "in the wild."

BREEDING OF THE GREEN SEA TURTLE (*Chelonia mydas*) AT SEA LIFE PARK, HAWAII

R. E. Bourke, Sea Life Park, Hawaii
G. Balazs, Hawaii Institution of Marine Biology, Coconut Island, Hawaii
E. W. Shallenberger, Sea Life Park, Hawaii

Introduction

During the period from 1964 to 1973 Sea Life Park acquired 29 adult green sea turtles from various sources around the Hawaiian Islands. These turtles were kept on display in a large artificial pool along with four harbor seals and briefly, four sea lions. Eggs were deposited in the water on four occasions and unsuccessful attempts were made to incubate these eggs. In July 1974, a separate turtle pond with an adjacent artificial beach was built in hopes of initiating a successful breeding program, and eventually restocking natural populations (Ehrenfeld '74).

Facilities

The pond presently housing the adult turtles (5 male, 7 female) is a free-formed oval shape approximately 15 x 8m with a maximum depth of 1.5m. The surface is painted with a hard surface copper-based antifouling paint. Water flow is variable but averages several hundred gallons per minute. There is a bottom drain and a large scum drain. A 2m-wide ramp (3:1 slope) creates an access to the sand beach from the pond. The beach holds twenty cubic meters of crushed coral sand at an average depth of 65cm. This sand contains much more dust than normal beach sand and was very compact before the advent of nesting activities.

The adult turtle diet has consisted of 8kg. of fresh frozen smelt, herring and squid (4:4:1) daily with added multiple vitamins.

Nesting Activities

No nesting or laying activities were noted for the first twenty-three months from the date the turtles were introduced into the new pond. Attempted copulations, however, were occasionally observed.

Beginning 18 June 1976 one or more of the three female turtles presumably involved in the breeding began almost nightly excursions on the sand beach and often escaped into the park grounds. The first clutch of the 1976 season was laid in the water on 6 July. On 12 July a clutch of eggs was deposited in a nest on the beach and subsequently removed to an incubation chest.

Artificial Incubation

Eggs were obtained for artificial incubation by digging and removing them from the nest after the female had completed the nest and returned to the pond. In one instance, an unsuccessful attempt was made to incubate eggs laid in the water.

Incubation methods were modified from those given by Simon (1975). Eggs were placed in a styrofoam chest. The chests had a 5cm layer of damp washed silicone sand and holes in the bottom to drain any excess water. Up to 64 eggs were stacked in each container and covered with a layer of damp paper towels. The chests were stored at ambient room temperature (25-29°C). One clutch was kept on top of a warm incubator. This clutch, although fertile, did not survive, possibly due to overheating. Eggs were checked every 2-4 days and moisture added to prevent desication. Eggs were soft and usually dimpled on one side when laid. Fertile eggs became firm and turgid within 2 days. Care was taken not to move or rotate turgid eggs. Hatchlings were removed to a clean incubation chest for 3-5 days until their yolk was completely absorbed.

Natural Incubation

On four occasions "escape" adult turtles were led to a sand pile 50m away and behind a building in hopes that they would find this sand suitable for nesting, but on none of these occasions did the turtles lay eggs. However, an unchaperoned escape turtle evidently found this sand pile and laid a nest. This sand pile was in direct sunlight most of the day and was kept moist by a slight leak in an adjacent salt water holding tank. Only one hatchling was obtained from this clutch. The remaining hatchlings were destroyed by mongooses. This unexpected hatchling was the first indication of what was to come.

The majority of turtles hatched from 8 previously undetected nests in the artificial beach between 9 p.m. and midnight. All of these nests were in a $10m^2$ section of the artificial beach farthest from the pond. Hatchlings appeared to crawl towards the brightest light source and were often discovered scrambling clustered around a footpath light.

Fertility of any unhatched eggs was determined by the presence of a blood spot or dead embryo.

Release of Hatchlings

After the first several successful clutches from the artificial beach, hatchlings were released, usually the same night as their emergence, on one of the two nearby isolated sandy beaches. Turtles were placed on the beach at the high-wave mark.

On all occasions they oriented immediately toward the brightest area in the sky, away from the dark cliffs, and scrambled toward the water. They were also attracted by the beam of a flashlight. Most of the hatchlings reached water in less than a minute (est.). Hatchlings kept for a greater length of time (up to 7 days) before their release were much slower entering the water. Being larger and more robust, they also had difficulties righting themselves when overturned by a wave.

Raising Hatchlings in Captivity

Forty-six hatchlings were kept in captivity. They were noted to accept food within 24 hours but did not actively feed until they were 2-4 days old. They were fed a diet of chopped smelt, squid, fresh frozen euphausids, spinach, and trout chow four times daily. They were also noted to graze on the filamentous green algae growing on the sides and bottom of their tank. Weight gain is plotted in Figure 1. Length increased from 6cm at hatching to an average of 15cm at the date of their release. Twenty-four of these turtles were released on 29 April 1977 from a slowly moving boat (courtesy of SeaFlite, Hawaii) 200m offshore the island of Lanai near Kaumalapau Harbor. The turtles were given a metal fore-flipper tag. Each was also injected with an antigen tag developed by Dr. Al Benedict, a research microbiologist with the University of Hawaii. Ten turtles from clutch #5 remain in captivity, four of them at Sea Life Park.

Rearing hatchlings in captivity brought problems of overcrowding and identification. As the hatchlings grew larger they required greater holding tank area. If overcrowded they would nip at one another causing wounds. This obviously could lead to a reduction of the victim's swimming ability. At least one hatchling died from the effects of severe bites, and several were noted to have lost weight during recovery. Of the twelve turtles that died in captivity, most were smaller than their tank mates and died during the first 2½ months. Identification of hatchlings by marking their shells with "indelible" ink was unsuccessful. The fading of the ink and the dark coloration of the turtles' shells necessitated remarking every three days, which became unfeasible. Four turtles of known parentage (clutch #5) were given small flipper tags when they were about 8cm shell length. These tags have worked quite well.

Discussion

Several problems have been encountered during this breeding season. Not the least of these was the awkward time (night) of both nesting and hatching. Female turtles were often not detected until they had wandered over a considerable territory after escaping the artificial beach. On at least eight occasions turtles nested on the beach without being observed. Hatchling turtles emerging from the beach often spread out rapidly, necessitating flashlight search parties. On each of these occasions at least one hatchling was not found until the following morning, often up to 50m away from the nest.

A number of false nestings occurred, usually when the female dug through the sand to the hard substrate below. The females tended to dig their nests at the far end of the sand patch away from the pool. On one occasion a previously unknown clutch was dug up by a nesting turtle. Considering the number of unknown nests in the small beach, it is curious that this did not occur more than once.

Before the next breeding season the artificial beach will be reconstructed to eliminate some of the above problems. By lengthening the beach it will be possible to erect successive barriers as each clutch is laid. The depth of the sand is being increased to at least one meter. The rock border around the artificial beach will be fortified to prevent adult turtles from escaping. A baby turtle trap is being designed that will attract hatchlings to a lighted box into which they will hopefully crawl and be protected from predators. Other light sources are being eliminated from the view of the emerging hatchlings.

Survival of fertile eggs from the artificial incubators was low primarily due to predation by insects and mongoose. Temperature and humidity in the ambient temperature room could not be controlled to optimize hatching time. These problems should be eliminated with the construction of an approriated chamber to control these variables.

SUMMARY

Seventeen clutches by no more than three female turtles produced 1,163 eggs, 455 of which were definitely fertile, to produce 398 hatchlings, 343 of which survived at least one day. Of these surviving turtles, 295 were released immediately into the ocean and 46 were kept. After six months, 12 turtles had died, 24 were tagged and released and 10 remain in captivity, four of these at Sea Life Park.

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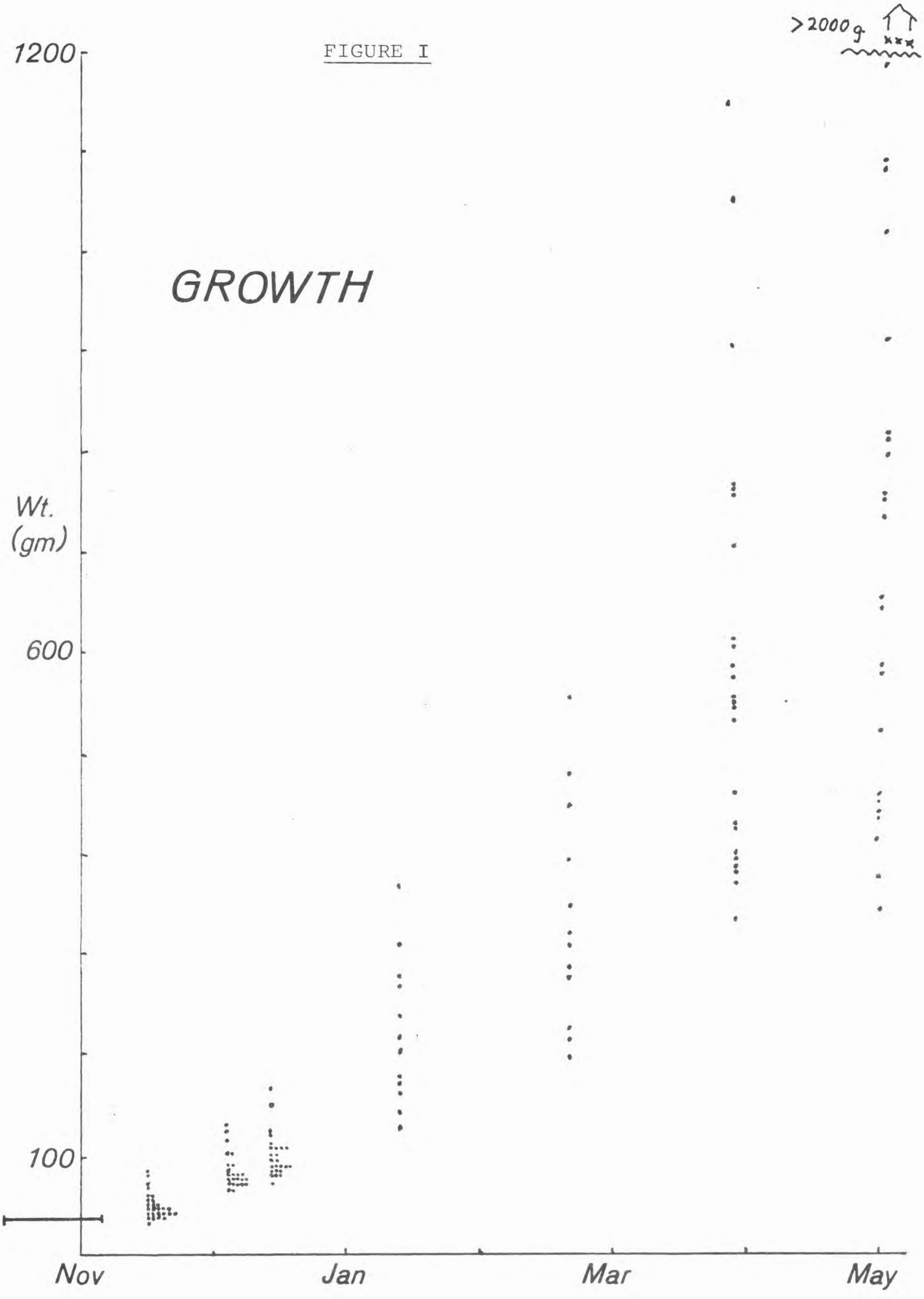
FIGURE I



1976 TURTLE HATCHINGS

Clutch #	Date Laid	Date Hatched	Total Eggs	Nonfertile	Fertile	Hatchings produced	Hatchlings Obtained	Artificial Incubation	Nest in Beach	Eggs in Pond	% Prod.
1	6 July		35	35	0	0	0	X		X	0
2	12 July		64	44	20	0	0	X			0
3	26 July		17	?	?	0	0			X	0
4	28 July		107	107	0	0	0	X			0
5	10 Aug.	3 Nov.	67	≥ 5	≥ 20	20	20	X			$33<P<80$
6		20 Sept	45	9	36	36	1		X		80
7	20 Sept		80	80	0	0	0			X	0
8	30 Sept		114	114	0	0	0	X			0
9		25 Oct	41	24	12	9	0	X			22
10		15 Oct	79	29	50	43	43		X		54
11		30 Oct	73	45	28	25	14		X		34
12		2 Nov	78	14	54	49	49		X		72
13		5 Nov	89	30	59	47	47		X		53
14		24 Nov	81	21	60	57	57		X		70
15		30 Nov	77	4	73	72	72		X		94
16		19 Dec	60	17	43	40	40		X		67
17		21 Dec	85	85	0	0	0		X		0
	TOTALS		1163	653	455	398	343				29.3

(2) Incubated on top of heat source.

(4) Clutch divided in two. One incubator in a constant T^{o} room.

(5) Unknown number of eggs destroyed by mongoose.
Eggs laid by female #2009
Four hatchlings sent to Vancouver, four to Waikiki, four kept at SLP.

(6) Hatched from sand pile behind Reef Tank building.

(9) Excavated during nesting of clutch #
Destroyed by mongoose.

(10) Insect destruction in nest.

(13) Three hatchlings found still in nest.

(17) Found when beach excavated.

A SAGA OF BATFISH AND SEA ROBIN
or
YOU'VE GOT TO BE KIDDING!

Nelson Herwig
San Antonio Zoo Aquarium

It was one of those dull, humdrum days in the aquarium when you just don't expect anything at all to happen. The pH stood at about 8.1, and the salinity was around 30 o/oo, a little low for some aquarists perhaps, but certainly nothing to add salt over. The latest pollution report from Aquarium Society Central reported all clear, Ammonia = 0, Nitrites = 0.1, and the Nitrates were holding steady at 5 ppm -- and a water change was due next week.

Batfish drifted leisurely and aimlessly in the water high over head, while Sea Robin sat in the shade of his favorite sea-weed and gave a fishy stare at the hermit crab sifting sand over by the seashore.

"Holy tomcod, that crab needs watching. He's always sneaking up behind the gals and giving them a hard pinch in the anal fin. Definitely delinquent," mused Sea Robin.

Sea Robin was an orphan from another ocean. He had been found one day drifting by in a bucket, the only clue to his origin was an inscription on the bucket that said "Made in Hong Kong." But no one really believed that, he was just too different. Rumor had it that he came from a muddy little back bay up in Connecticut, but you know how rumors are. The truth was, he could have come from anywhere on the Atlantic coast, even the Gulf of Mexico.

"Don't let that little scavenger in this tank. Why, he's nothing but a little sculp. I'll bet he wouldn't even bring a buck fifty at the pet shop," sneered his expensive neighbors. But Batfish, who was really wealthy, expensive, socially desirable, *Platax teira*, in disguise, who as a mild-mannered reporter for the *Daily Sea Planet* -- uh, no, that's another story. Anyway, getting back -- Batfish wouldn't listen to any of that dehydrated filter floss. After all, wasn't it his lofty aim in life to make life a better place for all small fry, regardless of what or whom they ate when they grew up? How much more unsel-fish towards your fel-low fish can you be than that?

Now it was going to pay off as Batfish and Sea Robin were about to face the toughest challenge of their careers. It came in the form of a note attached to a fishhook on a line, weighted down with a two-ounce sinker, splashing into the tank from above.

"Holy Eheim, Batfish," shouted Sea Robin, "What's that?"

"It's a note attached to a fishhook on a line, weighted down with a two-ounce sinker," replied Batfish, remaining stately and calm.

"Holy anchor worms, Batfish, what's it say?"

"It's a ransom note, Sea Robin. It says attach 20 million dollars to this fishhook in small unmarked denominations immediately, or you will never see the coelacanth you don't have on display ever again."

"Holy unholy Department of Interior Regulations, Batfish, what are we going to do?"

"I don't know, Sea Robin, let's just remain calm and see if we can figure out who or what is scoundrelous enough to perpetrate such an unholy scheme as this. Off to the batfish cave in our batfishmobile."

Later, in the batfish cave, Sea Robin scanned the Ichthyologists Review of Zoological Nomenclature and Taxonomy of Fishes for suspects, while Batfish talked on the batfish phone to Commissioner E. L. Garden (listed as Garden, E. L. in the phone book) of Sea Patrol Headquarters for Gotham Fish Tank.

"Holy Basket Star, Batfish, what a tangled mat the tentacles of evil weave. It's got to be the work of that master fiend, Penguinfish," decided Sea Robin.

"Not a chance, Sea Robin, he's strictly a freshwater fiend, you'll never see him set fin in salt water," corrected Batfish.

"Holy toadfish, Batfish, that's right! Then it must be the work of the Joker, that clown-fish is always trying to lure somebody into his lair."

"I don't think so, Sea Robin, the last I heard of him he was still all tangled up in the false cleaner anemone we gave him during his last caper."

"Holy spitlure, Batfish, then that leaves only that master of oriental deceit, our arch enemy, Won Ton Tuna, alias 'Charley.' Somebody should tell him we don't want tunas with good taste, we want tunas that taste good."

"That could be it, Sea Robin, but we've got to work fast, immediately is almost up."

"Holy Fire Eel, Batfish, then let's get the blazes out of here."

Soon it became apparent that knowing who the culprit was, was the easy part, tracking him to his old fishing hole was not. "We've got to have help in following that line back to it's source, Sea Robin, and I have asked Officer Mack A. Rel of the Deep Sea Patrol to go up on an aerial reconnaissance for us," stated Batfish.

Officer Mack A. Rel swam forward a little ways, flicked his caudal once, twice, and then launched himself into the atmosphere with a mighty lunge.

"Holy Stargazer, Batfish, what a leap!" said Sea Robin.

"I hope it tells us what we need to know, little buddy," said Batfish as they watched him arc through the air.

"It's no use. He's two tanks down in a display all to himself. There's no way to reach him," reported Officer Mack A. Rel upon his return.

"Holy Kingfish dare, Mack A. Rel, what we gon' do now?" wailed Sea Robin. (You old-time radio buffs should have seen that one coming.)

"In a tank all by himself ... hmmm!" thought Batfish. "I think we had better give in and pay the ransom," he said.

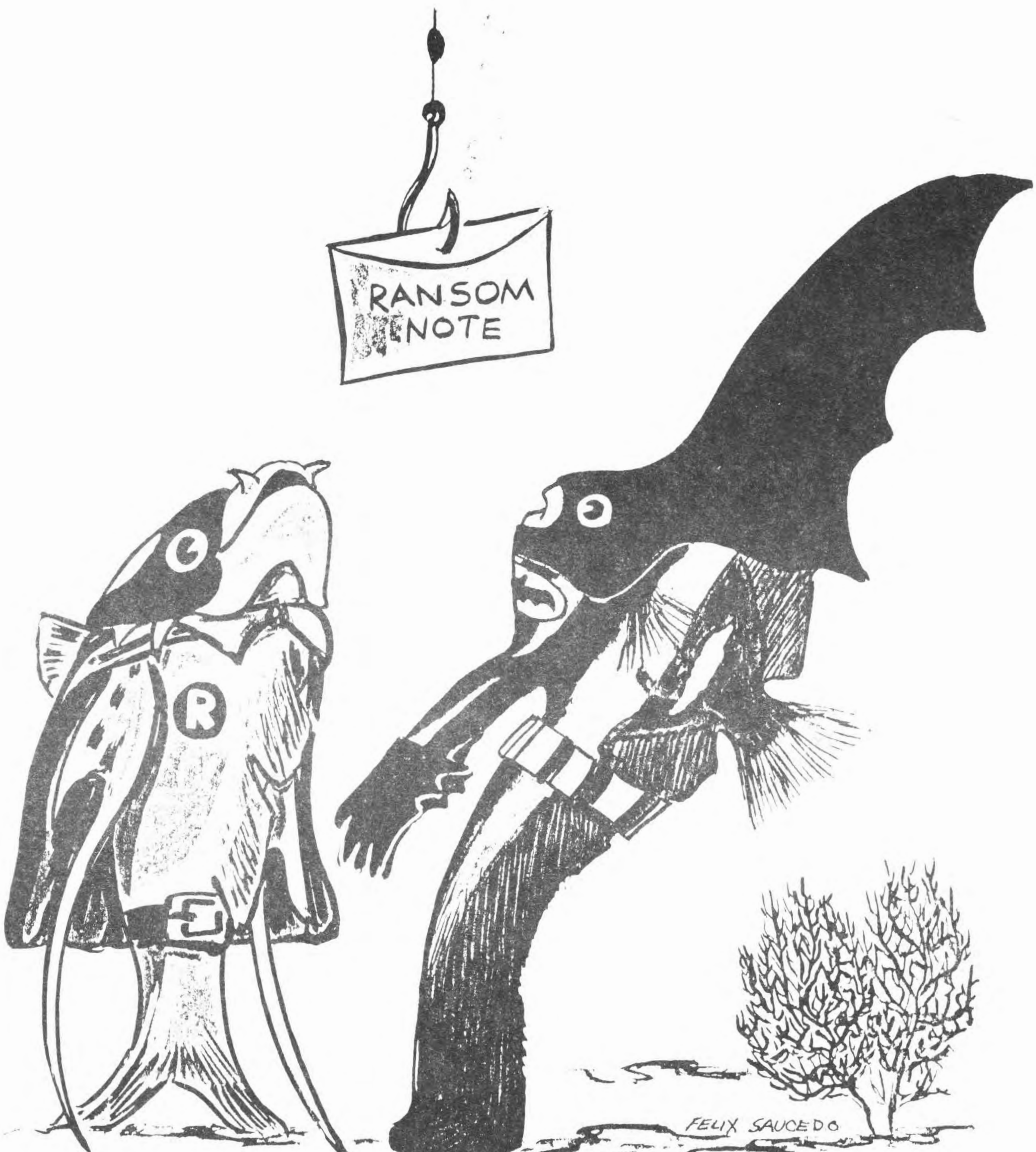
Sea Robin was astounded. His ol' pal, his ol' buddy, his hero giving up -- without a single fin being shredded. He couldn't believe it. Let that old hermit crab pinch the caviar out of the girls, what did he care. He was that crushed. It was all he could do to look at Batfish when he swam in a little later.

"Holy Chimera, Batfish, you Ratfish fink. Did you really pay that ransom?"

"That's right, Sea Robin, he wanted the money in small denominations, and we gave him the smallest, every cent of it, right down to the very last penny."

"Holy Copper Cure, Batfish, you mean ... " Sea Robin's gills paled at the thought.

"That's right, Sea Robin, by now the copper level in his tank must be up to 50 ppm at least, and Won Ton is well on his way to that great fish pond in the sky. Well, I've had a busy day, Sea Robin, outsmarting evil. I think I'll go to bed now. Put the catfish out before you turn in, will you?"



A PHOTOGRAPHIC TANK FOR AQUATIC ORGANISMS

Robert Parker Hodge
Formerly Curator of Exhibits,
University of Alaska Museum;
and
Point Defiance Public Aquarium
Tacoma, Washington

Close-up aquarium photography of living aquatic animals, such as insects, crustaceans, fish, amphibians and reptiles is difficult, with the results more often than not unsatisfactory. The sides of the aquarium tank, dime store gravel, and gaudy backgrounds all contribute to an artificial "indoor feeling." A confining system whereby the living animal can be restricted to a small area, eliminating the artificial bottom, and allowing for various unobtrusive backgrounds is desirable. The photographic tank developed by the author is extremely simple in design and can be fabricated in a few hours.

Needed are four pieces of single strength glass, a tube of Silastic aquarium cement, and masking tape. Plexiglass can be substituted for glass on the sides of the viewing tank for safety. The size of the tank will, of course, depend on the size of the animals you wish to photograph, a convenient size for small fish and amphibians is illustrated. The two viewing panes are 11" by 14", and the two sides are 8" by 18".

Begin construction by taping the two viewing panes together at the bottom as shown. Run a bead of Silastic down the INSIDE of the joint, and allow to set up for one half hour. Place the resulting V on one of the side panes with the open end of the "V" adjacent to the top of the side panel and now run a bead of Silastic on the OUTSIDE edge of the joint. Use ample amounts of cement. Allow this to set overnight, then attach the other side in the same manner. It is imperative that the bottom of the "V" be several inches above the surface used to support the tank to eliminate reflections. With the addition of water to the desired level, the tank is ready for photography.

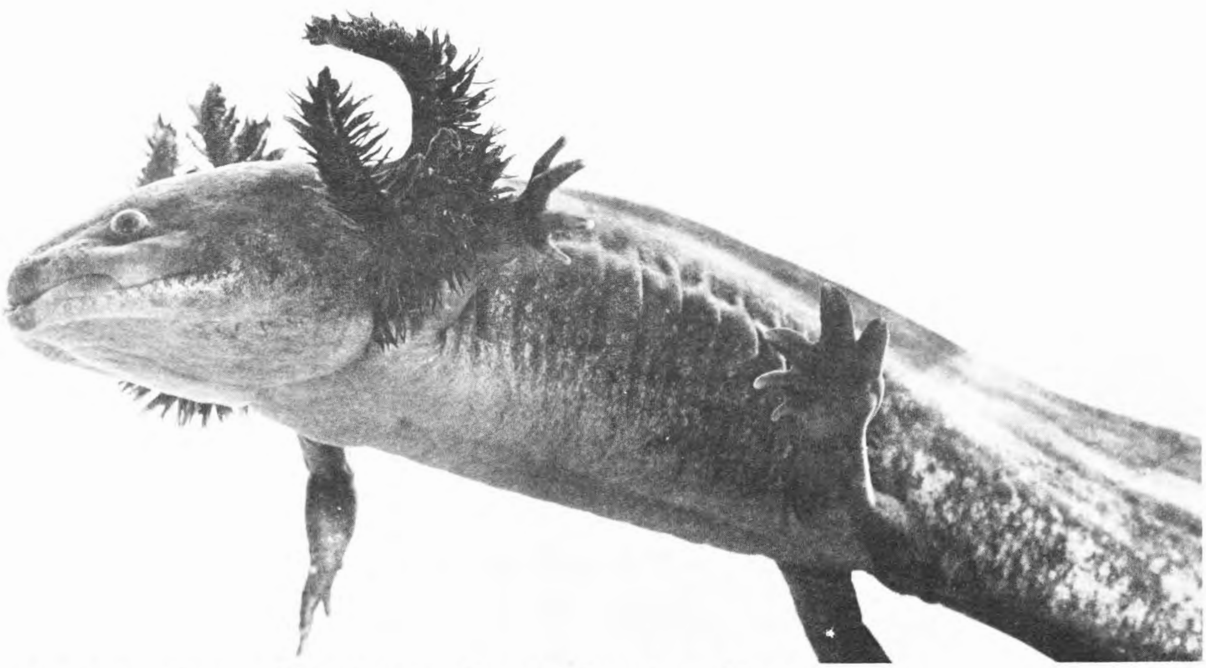
Railroad board or poster board, readily available at an artist's supply house, makes a suitable and unobtrusive background; a neutral gray is recommended. Slightly score the colored surface with a knife or razor blade to allow the board to be folded so it will stand independently.

A single-lens camera is desirable. With the addition of extension tubes or bellows and a reflecting shield made from a piece of stiff black paper, you are ready for work. The shield, cut to fit around the camera lens, eliminates the reflections of the camera and photographer in the tank. The shield must be larger than the aquarium tank.

Best results are obtained with natural light, electronic flash causing reflections on the aquarium glass. Using high-speed films (High Speed Ektachrome) and boosting the ASA to 400 (special processing by Kodak) makes it possible to use high F stops for depth of field combined with fast shutter speeds such as 60, 125, and 250 and eliminates the need for a tripod. This is extremely important when working with active animals.

An artist's paint brush works admirably for coaxing the subject away from the sides of the tank and removing bubbles from the viewing pane.

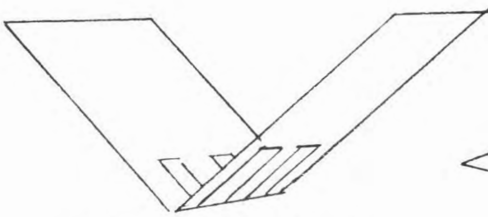
After one or two experimental rolls, satisfactory results are almost automatic. Bracketing, i.e. exposing one F stop above and one F stop below, in addition to the meter reading itself, insures the best results. The resulting photograph, while taken under controlled conditions, avoids the artificiality commonly associated with aquarium photography.

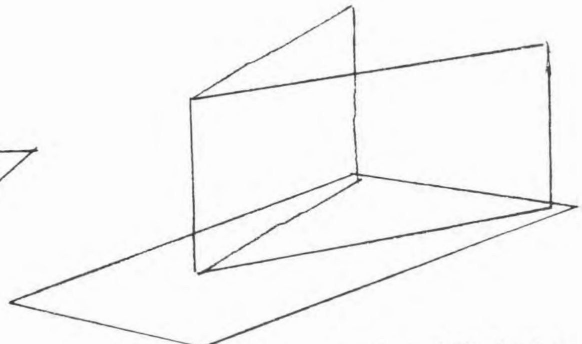


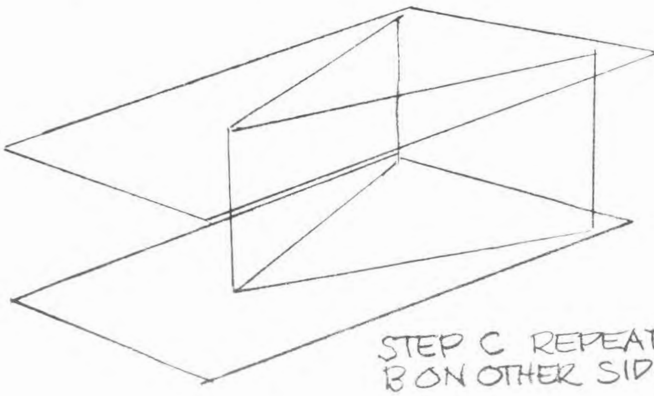
Mature waterdog. 9¼" long. Grant County, Washington
(Tiger salamander (Axolotl), Ambystoma tigrinum)

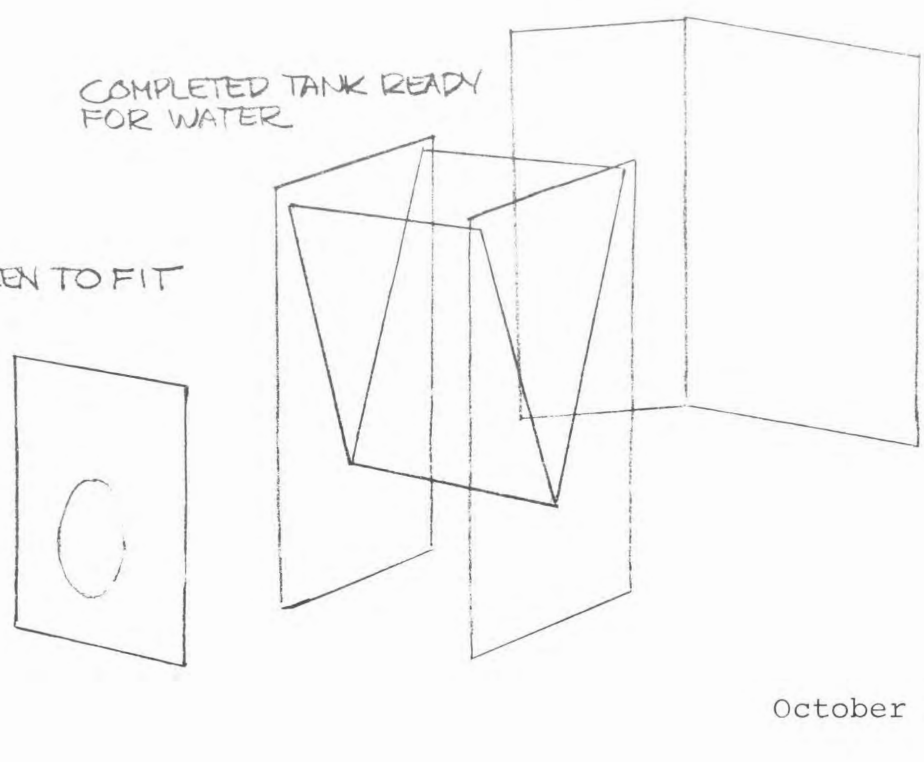
A Photographic Tank for Aquatic Organisms

by R. Hodge









THE PARASITIC DINOFLAGELLATE *AMYLOODINIUM OCELLATUM* IN MARINE AQUARIA

Adrian R. Lawler
Gulf Coast Research Laboratory
Ocean Springs, Mississippi

We have been studying various species of parasitic dinoflagellates of fishes since 1962. Studies were started in 1971 on *Amyloodinium ocellatum* (Brown, 1931), a cosmopolitan parasite of marine fish and the most destructive dinoflagellate of fishes in marine aquaria.

The parasitic stage, or trophont, is attached to the gills, skin, fins, buccal cavity, etc. (any surface exposed to tank water) and measures up to 150 microns in diameter. Upon reaching maturity, or upon death of the host, the trophont detaches from the host and forms a cyst. Divisions take place in the cyst, giving rise to 256 flagellated swarmers, or dinospores, which are free-swimming and infect susceptible fish. The unpigmented trophont may be identified by its possession of an elongate red stigma, single nucleus, starch granules, digestive vacuoles, stomopode tube ("flagellum" or "root-like process" of previous workers), and attachment rhizoids (See Nigrelli, 1936; Brown and Hovasse, 1946).

Skin scrapings or excised gill filaments can be examined for the presence of the trophonts. If one is trying to save the fish, examination for parasitic dinoflagellates can be done in one of the following ways:

... Brush live fish held in a dish of water, examine bottom of dish with dissecting microscope for trophonts that were dislodged.

... Examine restrained live fish with dissecting microscope in dish of water for trophonts attached to fins and surface of eye.

The above two methods are easiest in cases of heavy infections; for light infections, examine the gills.

... Examine restrained live fish with dissecting microscope in dish of water by lifting operculum and observing whitish trophonts on gills under reflected light.

In confined areas, as aquaria and large re-circulating tanks, the dinoflagellates can reproduce and infect fish so heavily that they kill the fish. In tanks it is not uncommon for fish near death to have over 200 trophonts per gill filament and all skin surfaces covered. Death can occur in as little as 12 hours in tanks with heavy dinospore concentrations. General signs of the disease are as follows: rapid gasping for air, irregular opercular beat, mouth not closed; little or no interest in food; loss of weight; change in color of fish; congregation near surface of water; scratching against objects in tank; sluggish or spastic movements; squirting water (or coughing) in order to back-flush gills; trying to jump out of tank; upside down on bottom of tank and gasping; rapid swimming to surface, then sinking to bottom; etc. The symptoms vary per species; however, ANY abnormal behavior may indicate an infection by A. ocellatum.

Thus far the dinoflagellate is known to infect 107 species of bony fishes of 44 families and 1 species of sting ray in tanks in North America (Lawler, unpublished; list sent upon request). Another parasitic dinoflagellate of marine fish, Oodinium cyprinodontum Lawler, 1967, has a much narrower range of hosts, infecting only members of the family Cyprinodontidae. Thirteen species of fishes from Mississippi Sound have been found to carry natural infections of A. ocellatum, but never enough to cause undue stress to the host (Lawler, 1972).

Some fishes appear to have partial or complete immunity to the parasite. Repeated exposures of Cyprinodon variegatus, Fundulus grandis, Anguilla rostrata, Opsanus beta, Poecilia latipinna, and Dormitator maculatus in tanks with heavy concentrations of dinospores produced inconsistent results -- a few members of some of these species died from infections, but most did not. The reason for their apparent immunity is unknown; however, all of these species either tolerate low oxygen levels or produce large amounts of mucus. It could be that a continual production of mucus prevents the attachment of the parasite, or there is a substance in the mucus that repels the parasite.

The disease is almost invariably fatal if infections are permitted to build up in closed systems, especially if the fish are crowded. Crowding enables the dinoflagellate to parasitize more hosts and thus build up in numbers faster. When the signs of the disease are recognized, the fish are often so weakened they do not survive the treatments employed. In addition to the mechanical blockage of gill function by their sheer numbers, the parasites destroy gill epithelium by their rhizoids pulling out surface regions into villi-like projections that can be severed from the cells plus feeding on lumps of host cell cytoplasm (Lom and Lawler, 1973).

The dinoflagellates are difficult to control. Those found in Mississippi Sound can live and reproduce in salinities from 2.8 to 45.0 ppt. Højgaard (1962) said the disease could be cured by keeping the fish in water of 10 ppt; however, dinoflagellates from the Gulf of Mexico do well in even 2.8 ppt. It is possible that there is more than one strain of A. ocellatum, or we are dealing with more than one species.

I have found that fresh water baths of 2 to 5 minutes will dislodge most of the trophonts; however, some may be retained in the gill mucus -- and they will divide and infect the fish again. Thus, several baths over a period of days may be necessary. Also, acclimating the fish to fresh water and holding them there will prevent their dying due to A. ocellatum; no dinospores are produced in fresh water (Nigrelli, 1936; Lawler, 1972).

Citrated copper sulfate (Dempster, 1972) will also dislodge the parasites, but some may be retained in the gill mucus. Thus, more than one treatment may be necessary. Dempster (1972) recommended treatment with 0.15 ppm Cu for up to 10 days. Kingsford (1975) used 0.15 ppm Cu on the first day, added more Cu the second day to make 0.3 ppm Cu, and held fish up to 6 days. Copper is toxic to fish and invertebrates and should be used with care.

We have tried several other types of treatments in an effort to control the parasites in aquaria. Some of the treatments that have proved unsuccessful in controlling A. ocellatum (all permanent baths) are as follows:

Aureomycin	13 mg/l
Chlorox (5.25% sodium hypochlorite	1:4082 - 1:7113
Chlortetracycline	13.98 mg/l
Formalin (100%)	1:4000 - 1:5314
Glacial acetic acid	1:7154
Malachite green (1 g/100 ml)	1:10,526
Malachite green (1 g/100 ml) + Formalin (100%)	2-4 ppm + 24-48 ppm
Microcide	1:2125 - 1:4250
Potassium permanganate (10 mg/ml)	1:2353
Tetracycline	13.83 mg/l
Wardley's Aqua Tonic	1:623

Live oysters placed in the tanks and commercial filters did not filter out the dinospores. Variable results were obtained using Maracide, Organi-Cure, and Tetra-Care Fungi Stop. None of these controlled the dinoflagellates; however, some treatments dislodged some of the trophonts. The preparations did, in some cases, extend the lives of the treated fish beyond that of the control fish, due to the parasite burden being lessened.

New fish should be isolated and treated with fresh water or citrated copper sulfate prior to introducing them to established tanks. One should avoid over-crowding in the tanks, and should remove all sick fish in order to prevent trophonts of the parasite from falling off and dividing to produce dinospores, thereby releasing many more infective stages into the tank.

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FIRST CROCODILE NURSERY
PLANNED IN THE PHILLIPINES

Reprinted from
"Pacific Business News of Honolulu, Hawaii"
July 11, 1977

If Ahmed Musur has his way, the Philippines soon will have its first crocodile nursery right in the heart of the creature's natural habitat -- a marsh at Prosperidad, Agusan del Sol, 400 miles south of Manila.

Musur, a member of the Philippines Fisheries Research Society, hopes the 1,800 head nursery he's proposing will serve the dual purpose of lessening the danger posed to the local population by the reptiles, while creating revenues for an area which -- despite its name -- could use the income.

According to Musur, just about every part of the crocodile is worth something.

The meat is a delicacy.

The bones can be used in animal feed and the teeth in handicrafts and jewelry.

Even the internal organs are in demand by pharmaceutical houses for laboratory experiments, he says.

The hides are prized all over the world for their beauty when fashioned into belts, shoes, and handbags.

But if Musur is hoping to attract American buyers, as the Philippines News Agency reports, he's stocking his ponds with the wrong animal.

The Mindanao crocodile appears on a list of imports prohibited by the 1973 Endangered Species Act.

So while Musur, who's known as the "father of crocodiles" in the Philippines, may be cleaning up a pesky local situation at home, to U.S. customs officials he'd be just another pelt peddler whose goods would be stopped dead in their tracks at the port of entry.

(Submitted by Spencer Tinker,
Honolulu, Hawaii)

EDUCATIONAL PROGRAMME AT DANMARKS AKVARIUM

Steen Lomholt
Leader of the Educational Programme
Danmarks Akvarium, Charlottenlund, Denmark

The educational programme at Danmarks Akvarium is now firmly established and we send to you some material, namely a teacher's guide and a collection of work-sheets for the pupils. Everything is unfortunately written in Danish, but nevertheless it may give you an impression of the work.

Organization

The educational programme in Danmarks Akvarium is working close together with similar programmes in the Zoological Garden, the Zoological Museum, the Ethnographical Museum at Brede, the Viking Ships' Museum at Roskilde and the Iron Age Museum at Lejre. They are all organized in an institution called "Skoletjenesten" (The School Service) which is run and paid by the school-systems in Greater Copenhagen and the adjoining counties. Skoletjenesten has placed a teacher at each institution and pays certain parts of the running expenses, while the institutions pay the majority of the daily running expenses and the salary for additional staff if necessary. In Danmarks Akvarium this is a conscientious objector, so that the staff here consists of two persons.

This institution is now firmly established with its own stable budget and with a high degree of cooperation between the institutions so that institutions with object in common e.g. the Aquarium, the Zoo and the Zoological Museum reach a certain extent of work together.

Such a cooperation is rather remarkable in view of the quite different nature of the involved institutions from government museums, university institutions (Zoological Museum), private institutions with government and municipality support (The Zoo) and a private institution with no support at all (The Aquarium).

Aim

The purpose of the educational programme is to train the many school children who visit The Aquarium to observe and think but not necessarily to learn more. Therefore, the work-sheets are constructed so that normally they do not require any basic knowledge. The object is not to test a knowledge but to force the pupils to watch the animals, their behaviour, shape, colour pattern, etc. These observations add first hand information to the second hand knowledge, which the pupils usually are dependent on at school. The issue of the programme fits the contents of the curriculum of the official school system in Denmark.

Practical Use

A teacher who wants to use the school system can make the booking either at the central "Skoletjeneste" or at Danmarks Akvarium. The teacher will then receive the whole collection of materials and when he arrives with the class he will ask for one or two of the work-sheets. The work-sheets are classified into four groups, referring to the pupils' ability at reading and theoretical thinking. The pupils will scatter in the aquarium building with their work-sheets and will soon return to one of the two teachers who work for The Aquarium, if there are points they want to have clarified, animals which don't behave as they ought to etc. Then the teacher will discuss with the children and perhaps accompany them to the aquarium.

Teachers who have not booked a time can get the work-sheets for their pupils but can't be certain of the attendance of the teacher from the "Skoletjeneste." Work-sheets can be obtained on holidays, vacations, etc., although the school system is not working.

No charge is taken for any of the materials.

Students make observations according to questions and suggestions on work sheet. They then discuss their answers with "Skoletjeneste" teacher.

Students at Danmarks Akvarium

Photos courtesy Steen Lomholt

NEW DIRECTOR FOR FAMOUS AQUARIUM

Reprinted from
"Pacific Islands Monthly"
May, 1977

Noumea's famous aquarium, operated for the past 20 years by Dr. and Mrs. R. Catala-Stucki, has been transferred to the Noumea City Council and will be operated by the French research institute ORSTOM.

The Catalas founded the aquarium in 1956, and maintained a wondrous collection of marine life, including 10 special tanks of fluorescent corals. These are in a darkroom periodically illuminated by ultra-violet rays to reveal their extraordinary array of colours.

From July 1, the new director of the aquarium will be 39-year-old New Caledonian Yves Magnier, who graduated in science in France before serving in Madagascar and with ORSTOM in Noumea.

Added to the lifetime efforts of the Catalas, the Noumea aquarium will now benefit from ORSTOM aid, which will include the construction of a new annexe for scientific porposes. Yves Magnier has indicated this could be used for research into pollution and organisms of medicinal use.

(Submitted by Spencer Tinker,
Honolulu, Hawaii)

WHAT MAKES FISH POISONOUS?
SCIENTISTS EXPOSE A VILLAIN

Reprinted from
"Pacific Islands Monthly"
May, 1977

Dr. Yasumoto is a Japanese chemist who, in 1975, was assigned by the World Health Organisation as consultant on the phenomenon of fish-poisoning which, according to the South Pacific Commission, claims about 1,500 victims a year around the Pacific. The WHO assignment was made at the request of the Government of French Polynesia.

On two visits to the South Pacific to study ciguatera -- a Caribbean word used for the illness due to fish poisoning -- Dr. Yasumoto worked with Dr. J. Laigret of the South Pacific Commission, Drs. R. Bagnis and H. Kaeuffer of the Institut de Recherches Medicales of French Polynesia, and Dr. Y. Hokoma of the University of Hawaii.

Their labours have paid off with the first positive identification of the primary source of poison found in edible fish caught in coral reefs around islands in the south and west Pacific region.

The scientists' accusing finger is pointed at a microscopic plant organism known as a dinoflagellate. The dinoflagellates, which attach to algae, are round, flat like a plate, forming two hemispheres with slender, whiplike appendages (the flagellae).

Small fish feed on the algae which carry the dinoflagellates. These small fish are in turn eaten by bigger ones. Thus the toxin is transferred and concentrated as it moves further along the fish-food chain. The bigger the fish, the more potentially toxic it is. The poison penetrates the flesh of the fish and cannot be removed by washing or cooking.

Humans are extremely vulnerable to the poison. Dr. Tasumoto estimates that as little as .75 of a milligramme of it would be sufficient to cause death of a person weighing 100 kilogrammes.

Dr. Yasumoto's concern with the preservation of coral reefs in their natural state arises from his research finding that: "The dinoflagellates are present in coral reefs, but they seem to be provoked to multiply when their environment is disturbed.

"The precise cause of this multiplication is not certain, but man himself may be causing it, as when reefs are blasted off or cut to pieces in building runways, wharves, or piers.

"There are several known examples where human aggression against coral reefs seems to have triggered explosive outbreaks of ciguatera."

He adds that natural causes, such as exceptionally heavy rain, may also cause a heavy growth of the dinoflagellates.

The surgeon fish is known to accumulate the toxin more than any other species. Known as Ctenochaetus striatus in scientific cirlces, it goes by the following local names: maito (Tahiti); te ribabui (Gilbert Islands); sazanami-hagi (Japan); labahita, indangan, mangadlit, yaput (Philippines); vanaki, pidja, abila (Indonesia);imim, ael, bir, diepro, tiebro (Marshall Islands); pone, palagi, nanife, ili ilia (Samoa); balagi (Fiji).

It is found throughout the Indo-Pacific area, excluding Hawaii and the Red Sea.

Nearly 60% of reported poisonings in Tahiti and other South Pacific islands have been attributed to consumption of maito, or surgeon fish.

Moray eel (Gymnothorax buroensis, Gymnothorax flavimarginatus), known as utsubo in Japan and called reef eel in Australia, feeds on the surgeon fish and can become very poisonous to man. It grows to about 1.5 metres in length and goes by the name puhi in Hawaii, dabea in Fiji, to'e in Samoa and hagman in the Marianas. Moray eel has 10 names in the Philippines, eight in Sri Lanka and four in the Gilbert Islands.

In coral reefs with abundant algae and dinoflagellates, the grouper, sea bass, red snapper, jack and pompano would be highly suspect. Outside these coral reefs the barracuda and amber jack could be toxin carriers too.

The South Pacific Commission reported in 1974-75 nearly 2,000 known cases of fish poisoning throughout the South Pacific area, from Papua New Guinea in the west, Guam in the north to French Polynesia in the east.

A technical paper on fish poisoning published by the Commission says: "The first symptoms are usually experienced within about three hours after ingestion and consists of nausea and vomiting followed by tingling and numbness about the lips, tongue, and throat."

To the victim, cold objects give a sensation of burning, and hot objects feel cold. An attack of the toxin does not impart future immunity.

The clinical picture is rather bizarre, the SPC paper notes, "Not all patients display the same syndrome, even among a group who have all eaten the same fish."

Following the breakthrough by Dr. Yasumoto and his colleagues, what of the future?

"At present we do not know how to control the dinoflagellates," Dr. Yamusoto says. "However, having isolated the organism, the search is now on for the substance that would inhibit or reduce the growth of these highly poisonous micro-organisms in coral reefs."

If Dr. Takeshi Yasumoto had his way, he would post "Do not disturb" signs on coral reefs all over the Pacific, Australia, the Caribbean and even the Indian Ocean around Sri Lanka.

(Submitted by Spencer Tinker,
Honolulu, Hawaii)

DAVID BROWN OF TAHITI DIES

Spencer Tinker
Honolulu, Hawaii

David Brown, director of the slowly-emerging marine exhibit in Papeete, died Tuesday, May 23, 1977, apparently of a heart attack.

David Brown had an interesting career. He was born in England and, after service in World War II, worked for a time in the London Zoo. Next, he came to the Aquarium at Hermosa Beach in California, which was owned and operated by the McBride family and which, incidentally, was the first institution on the Pacific coast to maintain an exhibit of dolphins.

The opening of Marineland of the Pacific at Palos Verdes in 1954 forced the closing of the Hermosa Beach Aquarium and Brown moved up the sea coast to Palos Verdes. Here he managed a large and varied exhibit of marine mammals.

In 1966, Mr. Brown was appointed the Director/Curator of the Marineland of Australia at Surfers' Paradise in Queensland.

David Brown loved Tahiti and eventually was able to organize a company to build a marine exhibit in Tahiti. He resigned from Marineland of Australia in 1976 and moved to Tahiti. He was engaged in the construction and organization of this project at the time of his death.

His wife, Mrs. Valerie Brown, his daughter Alison, and his son David, Jr., have returned to Australia.

David Brown produced a few small publications on marine mammals. He was a very good speaker, an able mammalogist, a gentleman, and a credit to the aquarium profession. We will miss him.

CORRECTIONS

In the April 1977 issue of DRUM AND CROAKER, the following corrections should be made:

1. "Some Notes on the Husbandry and Maintenance of the Dolphin *Coryphaena hippurus Linnaeus* by John C. Hewitt, page 10, second paragraph should read:

   After placing them in the larger display, the entire system was treated with sodium chlorite (at a concentration of 30 ppm) in order to prevent the occurrence of topical bacterial infection incidental to handling. Ultraviolet sterilizers were turned off while using sodium chlorite to prevent the release of free chlorine into the system. No ill effects were observed while using this chemical. Copper sulfate (at a concentration of 0.20 ppm) was also routinely used in this system with no ill effects. The growth rate observed in *C. hippurus* was extremely rapid, with body weight doubling in approximately 3 months. During this period their total length increased to approximately 36" for the female and 45" for the males.

2. "Playing and Learning With the Bottlenosed Dolphin, (A Personal View)" by Hermon Buttron, page 23, fourth paragraph should read:

   But captive dolphins in cement tanks are of course deprived of their natural habitat which provides exposure to elements, hunting for food, learning natural behavior from adults, proper selection of mates and proper incorporation into groups.

3. The cover information about the issue should read: April 1977, Volume 17(77), Number 1.

THIS SPACE WAS RESERVED FOR YOUR ARTICLE. DRUM AND CROAKER NEEDS YOU. DEADLINE FOR WINTER 1977 ISSUE IS DECEMBER 15, 1977.

New England Aquarium

Central Wharf, Boston, Massachusetts 02110

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