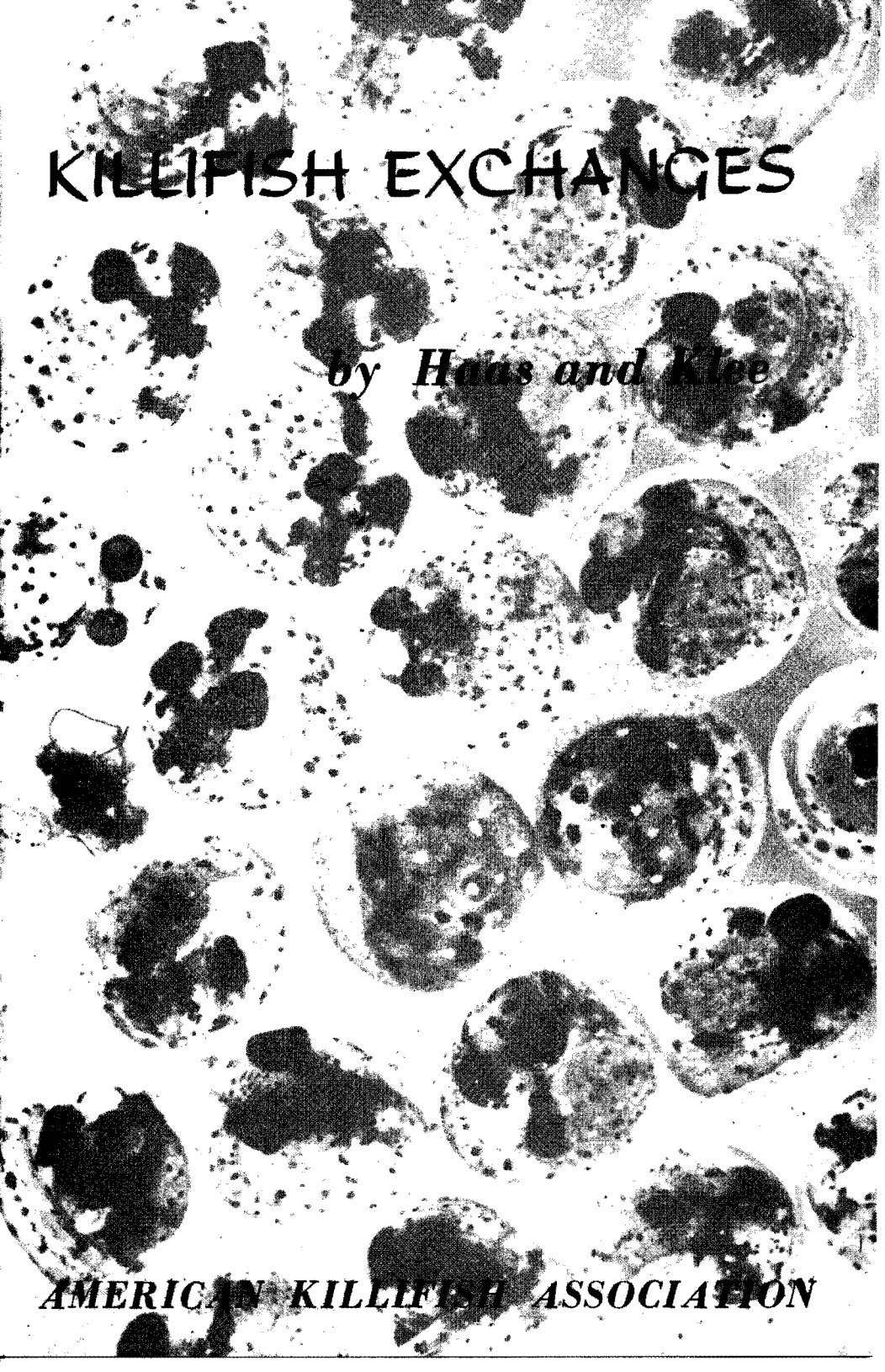

KILLIFISH EXCHANGES
by Haas and Klee
AMERICAN KILLIFISH ASSOCIATION

KILLIFISH EXCHANGES

A Manual of Techniques for the Shipment of Eggs and Fishes Through the Mails

by
RICHARD HAAS
and
ALBERT J. KLEE

Second Edition 1965

Cover photograph of ready-to hatch **Epiplatys** eggs by J. J. Scheel

Published by the American Killifish Association under the direction of its Technical Publications Committee, Albert J. Klee, Chairman.

I. INTRODUCTION

The shipment of the eggs of aquarium fishes over long distances is not a particularly new technique for hobbyists nor is the hobbyist-to-hobbyist shipment of live fishes themselves new either. Before the second World War, a few aquarists in Europe and the United States exchanged eggs and fishes via mail, achieving some success even with the use of regular, ocean liner carried postal service. The beginnings of killifish egg and fish exchanges by this means thus go back at least 30 years and most likely even before that. A prominent aquarium fish hatchery offered eggs of sundry species during the World War II years and after. These were shipped via Railway Express in containers of water, usually 1 gallon metal cans, packed in cardboard boxes. The species involved generally were those which laid adhesive eggs and they were sent along with a few sprigs of anacharis on which the eggs were laid. After the War, accounts appeared in various aquarium magazines describing successes with airmail shipments of **Fundulus** eggs from the United States to South Africa, Europe and Australia (this work being largely to the credit of Gene Wolfsheimer, of Los Angeles, California). Within the past 10 years or so, the technique of shipping eggs through the mails has gained widespread popularity, particularly among killifish fanciers. Even more recently, the same may be said for shipping live fishes through the techniques pioneered and publicized by Albert J. Klee, of West Chester, Ohio.

A large portion of the killifishes found in any U.S. city arrived in the tanks of local fanciers from some relatively far-off point. Not always did they become residents in their fish rooms by being purchased as wild-caught and imported fish. The chief reason for this involves the common attitudes of foreign collectors and the retail dealers in this and other countries. The general feeling amongst those in the business end of the hobby usually is that killies just don't pay. Justification for this point of view comes from the fact that frequently, killifishes aren't found in nature in quantity and that many times, they are found within heavy overgrowths of vegetation on the edges of small, inaccessible streams or in remote areas not easily reached. These factors combine to make their collection time-consuming and expensive.

Yet another reason for the relative scarcity of these fishes in ready commercial supply is that they have undeservedly attained a reputation for pugnaciousness and/or short lifespans. Far too many dealers display lethargy in the never unending battle not only to keep up with, but to add to the store of knowledge expected of a professional.

As a consequence of these factors, those hobbyists for whom the fish hobby represents a challenge and for whom a large part of their time is occupied with fishkeeping, form bonds with others of similar tastes. Thus are born organizations such as the American Killifish Association. In the case of killifish fanciers, this inevitably lead to attempts to exchange species by the only means available, i.e., postal or express carriers. Since eggs generally are more readily available than fishes as far as aquarists are concerned, exchanges frequently involve the shipment of eggs.

However, the shipment of live fishes from hobbyist to hobbyist is becoming more popular day by day. As for eggs, many techniques have been developed for shipping them. They all share three attributes consistent with reasonable success: the eggs must be viable; they must

be protected from the vagaries of the weather likely to be encountered along the way; and they should be shipped with minimum weight to reduce costs.

Our first look into shipping procedures and techniques then, is concerned with eggs.

II. EGG EXCHANGES

A. Collecting Eggs

The cardinal rule is that eggs that are to be shipped must be fertile eggs. In order to insure this, the aquarist should examine each and every egg individually or else send a large enough quantity so that infertile eggs are offset in numbers by fertile ones. If eggs are not examined prior to shipment, there is the danger of infertile eggs becoming fungused, the fungus spores then getting onto fertile eggs where they grow and destroy the incipient embryos. It is preferable that eggs to be shipped be all approximately of the same age, also.

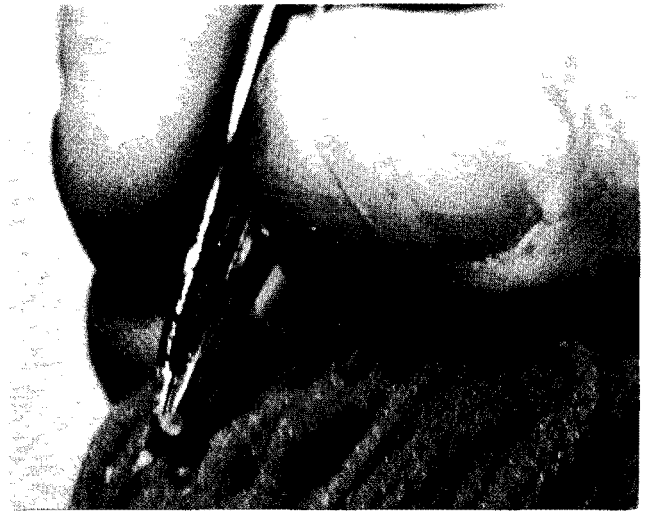
In the case of plant breeders such as **Aphyosemion australe, A. bivittatum, Epiplatys chaperi, Rivulus cylindraceous,** etc., mops in which the fish have spawned should be removed from the water, gently squeezed to remove excess moisture and gone over strand by strand to remove the eggs. A flat container, such as a photographic tray (which has never been used for photographic purposes) in which there is about one inch of clean water of the same pH and DH as the tank in which the breeders are, is used to receive the eggs. Eggs are picked off the mop either with the fingers or with clean tweezers. If the fingers are used, the eggs may, with care, be lifted off the mop without damage but in general, the tweezer method is preferable. Eggs which are so soft that they immediately burst open even with the gentlest of pressures, are either infertile or else they have been laid less than 24 hours prior to collection. With tweezers, it is difficult to grasp the egg directly without dropping it onto the floor or else crushing it.

Thus with tweezers, it is generally best to apply them to the nylon strands above the egg, perhaps removing a few of these strands along with the egg. Eggs are then either dropped or flicked into the pan of water. A small amount of acriflavine solution in the water safeguards against epidemic fungus attack. Only clear eggs, or eggs with visible embryonic development should be collected. Any eggs which are cloudy or white are infertile and should be discarded.

The tray should be covered with glass, its own cover, Saran Wrap or aluminum foil, and placed aside at about 68-75° F. for a few days before eggs are selected for shipment. At daily intervals the contents of the tray should be examined and any fungused eggs promptly removed with the aid of a clean pipette (or eye dropper). With most species, the embryo may be seen after about a week. These appear to the naked eye as a dark streak in the egg, most likely with two prominent black circles on either side . . . these are the eyes. If one has a pocket magnifier or a reading glass of about 10X magnification, an egg or two may be picked up with the glass pipette and viewed through the magnifying glass. The primitive nerve cord (the dark streak) and eyes can very easily be seen as can frequently the beating heart. Aquarists having access to a dissecting microscope can utilize it to ex-

Examining peat for eggs using a photographic tray.

Hand-picking eggs from a spawning mop. Use care so as not to break the egg!



Using tweezers to remove an egg from a spawning mop. The egg is not grasped by the tweezers but is lifted instead.

All photos this page by Richard Haas

amine the eggs also. Care must be exercised not to allow the light source used in conjunction with a microscope to overheat and kill the embryo.

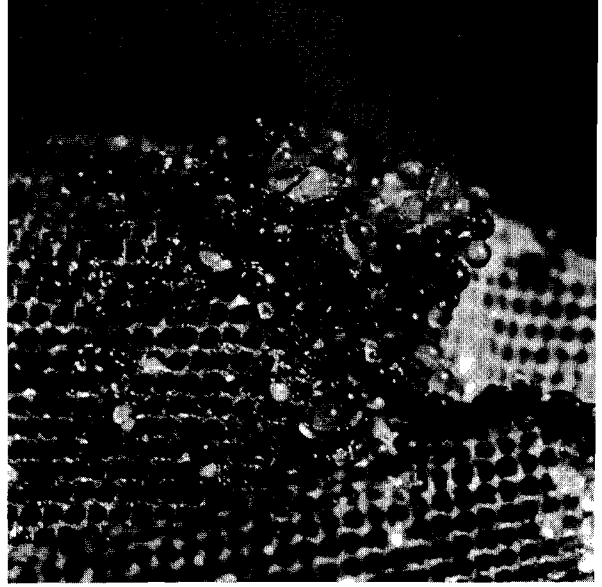
Some mop-spawning species lay very small eggs (e.g., **Epiplatys macrostigma**) or very soft, fragile eggs (e.g., **Aphyosemion christyi**). With such fishes, it is best to provide them with a small mop in a clean spawning tank and to remove this mop after a day to two. Examine for the presence of eggs, but do not handle them.

Place the mop containing the eggs into a suitable container and proceed as if you were going to hatch the eggs yourself. Examine them periodically and when the embryonic development is visible, they may be shipped. These eggs and those of others as well, may be shipped if they are perfectly clear with no embryo visible, but better results are usually achieved by the recipient if some development has already taken place before the eggs are sent out.

Bottom-spawning killifish eggs may be collected in a variety of ways, largely dependent on the medium utilized for spawning. Some, such as **Aphyosemion coeruleum** (the blue gularis), and **Aphyosemion nigerianum,** will spawn on or in mops which are on the bottom. These eggs may be handled like those of any mop spawner. **Nothobranchius, Pterolebias** and **Cynolebias** species generally appear to prefer to spawn in some substitute soil such as boiled peat moss or fine sand. If you use sand as a spawning medium, this should be clean and fine enough to pass through a net with a mesh smaller than the eggs. In the case of **Nothobranchius** species (and the eggs of other non-diver soilbreeders) which generally lay small eggs, the sand method is preferable if one wishes to see, examine and count individual, eggs.

If sand is used, the eggs may be separated from the sand after the fish are known to have spawned in one or two ways. One method is to syphon the sand through a net. The eggs are retained in the net, the sand passing through to be reused at some later date. The second method calls for stirring the sand in the breeding tank with a plastic rod or net handle, after having first removed the breeders. The heavier sand will settle to the bottom before the more buoyant eggs. The latter can then be syphoned off or netted out. Eggs collected in this manner are placed into a tray and examined frequently as outlined for mop spawners. Within two to three weeks, most of the eggs can be expected to show embryos (some resting eggs will not) and can be removed for shipment or storage in peat.

If peat is used as a spawning medium, it should be syphoned out into a net after the fish have spawned. The contents of the net are then **gently** squeezed to remove excessive moisture and then one of the two following procedures can be followed. Either allow the peat to partially dry, storing it for some weeks before searching for eggs (after first giving it a cursory examination to determine that it does indeed contain eggs), or eggs may be picked out by hand immediately and placed in a tray of water as with other methods. In either case, separating eggs from peat is a tedious job which may be eased by the use of a dissecting microscope or a large magnifying glass. If the ball of peat containing the eggs is placed at one end of a white enamel tray or glass tray placed over white paper, it may be dissected bit by bit and the eggs removed. The peat which has been searched through may be shoved to the other end.



Killifish eggs retained on a net.

Photo by Haas

If the peat is to be partially dried before the eggs are picked out (it is generally easier to collect eggs from dried peat than from wet peat), this may be accomplished by a number of methods also. About the fastest and most reliable is to spread the peat onto newspaper, four to five sheets thick, cover with additional newspaper, pat lightly and allow to air dry for a few days. Or, one may spread the peat in a pan and allow it to air-dry. Dried peat should be placed in a covered plastic container or a plastic bag, marked and stored when it has become as dry as fresh pipe tobacco.

For the purpose of collecting eggs to ship, the essential feature of any method utilized is that the eggs be determined to be viable, i.e., clean and unfungused, preferably with some embryonic development. A word of caution, however, especially when dealing with the eggs of **Aphyosemion** or **Aplocheilus** species. Do not allow development to proceed so far that there is danger that the eggs may hatch enroute. Newly-hatched fry rarely arrive alive. If eggs generally take 2 weeks to hatch, send them about a week after spawning. Time of hatching is not so crucial with annual species such as **Cynolebias, Nothobranchius,** etc.

B. Packing Eggs

Killifish eggs may be packed for shipment either dry, in peat or wet. Shipping eggs wet, in a water-filled vial (to the top) containing some fungicidal agent such as acriflavine, has been the least satisfactory method within our experience. The other two methods are no more difficult and provide more satisfaction. Consequently, these will be described in detail.

To ship dry, the previously selected viable eggs are either picked out of the peat, or lifted out with an eye dropper from the pan in which they are developing. If picked from the peat, they can be placed immediately into a small plastic or glass vial, one which can be capped

tightly. If lifted with a dropper, the eggs and water are expelled onto a paper towel or a few sheets of cleansing tissue. The water will be absorbed and the dry eggs can then be transferred to the waiting vials. Forceps, the fingers, or the broad end of a toothpick accomplish this task. The vial, which should be as small as possible, should be capped quickly to prevent excessive drying. Packing of vials should not be done under bright lights or during a very hot or dry day. These precautions are to prevent excessive dryness.

If shipping in peat is preferred, peat which has been thoroughly boiled and run through 2 to 3 changes of water is squeezed by hand as hard as is necessary to make it just **barely** damp. About a teaspoon of the peat is placed in a small cup and the eggs to be shipped are added. The peat method has the advantage of allowing the eggs to be so positioned that one does not touch its neighbor. This prevents contamination of all of the eggs as a consequence of one which may become damaged and then fungus. Boiling the peat further reduces the possibility of fungus. Some aquarists add a few drops of acriflavine to the last rinse water before excess water is squeezed out. This may serve to reduce damage by fungi. The peat containing the eggs is then placed into a vial or small plastic bag, and securely stoppered or tied.

The peat moss packing works well with all species, dry shipment works best with bottom spawners.

If the eggs to be shipped are still in the mop because they are excessively fragile or small, the mop is removed from the water, placed between newspaper sheets and dried somewhat to remove excess water. Then it is placed into a plastic bag and the bag tied securely.

If eggs are to be shipped overseas to a country having rigorous requirements for shipments of living materials, the problem may be overcome by placing eggs into lengths of rigid plastic tubing, such as that used for air stones, by means of a pipette. The ends may be sealed with aquarium cement, plastic tape or with a hot pair of pliers clamped tightly over the end momentarily.

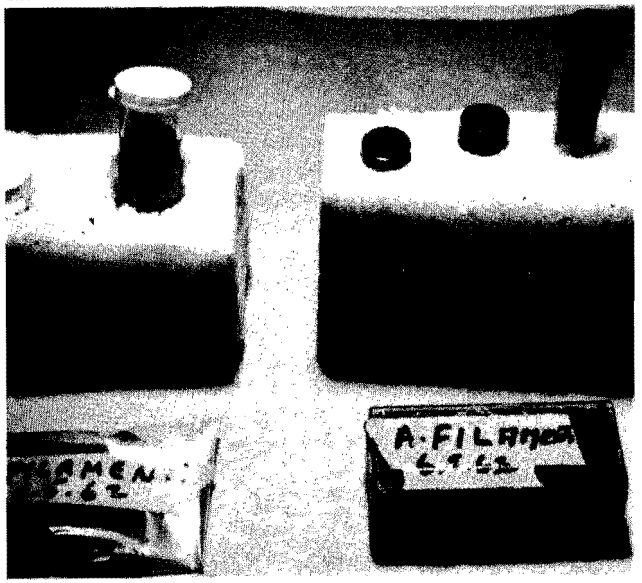
Flexible airline tubing may also be used in much the same manner. A short length may be packed with eggs, curved to form a circle which is then closed off by a ½ inch length of rigid airline tubing inserted into both ends. Either of these tubing shipments may be protected by sandwiching between two thin sheets of foam plastic or corrugated cardboard. They can then be slipped into envelopes and mailed. Other methods are preferred, however, and this method should only be used if all else fails to clear customs.

C. Outer Shipping Containers

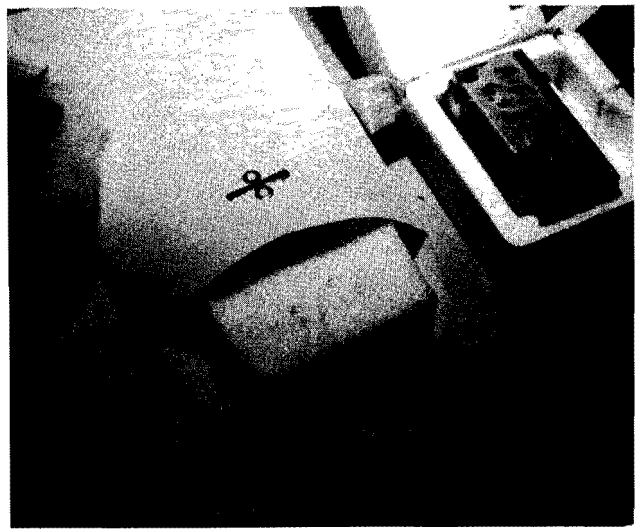
In the selection of shipping containers, preference should be given to those sturdy enough to withstand the damage unavoidably inflicted by the Post Office, yet providing at least partial insulation. This is important during **all** seasons of the year.

Vials or plastic bags containing eggs may be placed in small metal candy boxes, 35mm film cans, metal fishfood cans, etc. These in turn are either wrapped in or packed inside with glass wool, crumpled paper, or cotton or dacron batting available in some general hardware, houseware or upholstery shops. Dacron batting is a very good, lightweight insulator, and has the additional advantage of being a good

Some typical sources of egg containers.



Vials containing eggs set into styrofoam plastic; below, small plastic boxes containing peat and eggs.



Two methods of protecting eggs from extremes of temperature, and their containers from breakage.

All photos this page by Haas

spawning medium. Vials or plastic bags may be nestled in dacron or any other lightweight insulator in a small box, covered with more of the same insulation material, wrapped and shipped.

An excellent lightweight method of shipping eggs utilizes blocks or sheets of styrofoam plastic (polyurethane foam is also very good and has the advantage of being cut easily with large scissors). These "polyfoams" are available in sheets or blocks in many hardware, 5 & 10¢ stores, department stores and hobby shops. Beaded foam plastics, of which many kinds of picnic boxes and insulated jugs are now made, are quite available. If small vials are used for shipping eggs, a sheet or small block of foam about 3 inches thick can be cut in half, and a hole drilled with bit and brace in the center of each half so that the vial of eggs may be inserted. (The beaded plastics are easily cut with an old kitchen knife or hacksaw blade previously heated over the kitchen range and used while hot. Holes may be punched in this material with a hot drill bit or lit cigarette). The vial should fit ½ of its length in one end of the block, the other ½ into the other half. The block is then taped with masking tape, either wrapped in wrapping paper or placed into a manila envelope, and sent off.

If plastic bags or boxes are used to ship eggs, a larger block is cut in half and the center routed out or cut out with a paring knife to accommodate the box or bag. This method, although requiring some additional time in the preparation of the styrofoam container, is probably the best yet devised for it offers rigidity, lightweight and superb insulating qualities (see the sections on shipping live fishes).

After wrapping and addressing according to postal regulations, the container is sent airmail if to a major city, airmail special delivery if to some smaller community. If the season is cold, special delivery assures speedy handling and no layover in a cold storeroom in the post office. A customs declaration will have to be made out for foreign shipments (form 2976 can be made out and pasted on the outside of the package . . . it is very compact and easy to use). This should bear the legend, "Live fish eggs for scientific purposes . . . no commercial value."

Marking the Package with legends such as, "FRAGILE—LIVE FISH EGGS," and in the winter, "DO NOT FREEZE," or "PLEASE KEEP FROM FREEZING," also helps.

Shipments within the country are most safely made on Monday or Tuesday, to avoid the Saturday and Sunday holdovers in the Post Office (unless Special Delivery is used). To foreign countries, Saturday morning or early Monday is the best time. Mail enroute on Sunday continues on its way, but if it arrives Saturday or Sunday, it usually is held until Monday. A letter giving all details about when the eggs will be sent, under what conditions the adult fish are kept, expected hatching time and any other pertinent data and suggestions, should precede the mailing of the package by enough time to insure that the recipient is adequately prepared for their arrival. This is a most important consideration, and one very often overlooked by aquarists. In some instances, the recipient may wish to have the eggs sent to an address other than his home address. This might be especially true during the winter when eggs sent to a home address might sit in a freezing mail box for many hours. Let the receiver know how many eggs were to be sent (15 is a good number) so that he may subsequently inform you of the effectiveness of the technique used. And finally, be prepared for an occasional failure and repeated attempts. We are still dealing with Mother Nature and this is one subject for which all the answers are still to be found!

III. FISH EXCHANGES

A. Introduction

Although frequently killifish exchanges consist of egg shipments from one hobbyist to another, the fascinating techniques involving the shipment of the live fishes themselves appeal to the imagination of hobbyists all over the country. The reason for this stems from two basic problems encountered in shipping fish eggs. The first is that eggs frequently just do not hatch out properly after being shipped. There are many reasons for this, but aside from improper preparation and packaging (and we have tried to minimize this in Part II of this booklet), eggs are somewhat sensitive to the changes in environment which automatically occur as a consequence of such shipments. This is not merely a matter of proper insulation enroute since the techniques already discussed adequately take care of this requirement, but more important are the changes that inevitably occur when a living organism trades positions from A to B. In this, eggs are particularly sensitive to change where the adults are more resistant.

The second problem is that for many aquarists, the waiting period between receipt of eggs and growth to maturity of the fishes hatched out, is much too long. When one considers that many breeders have on hand stocks of young fishes that they would be perfectly willing to part with, it is ironic indeed. Formerly, shipments of live fishes were prescribed because of the expense and the uncertainties connected with shipping live fishes via air express or air freight.

Such risks and efforts may be justified by the commercial dealer whose livelihood depends upon such techniques, but this is not the case for the individual hobbyist, trying to make contact with a kindred soul many miles away. Fortunately for the hobbyist, developments in shipping techniques make the sending of live fishes through the ordinary mails an easy, inexpensive and successful operation.

B. The Outer Shipping Container

As we have already noted, expanded synthetics known as "polyfoams" are widely used and easily available. These plastics are made in both rigid and resilient forms. All forms are easily cut, shaped and managed by sawing, drilling or by just plain cutting with a knife. The purpose of the polyfoam is primarily for insulation although the foam adds structural stability to the type of containers used. Don't be misled into thinking that insulation is not needed merely because the weather is warm outside. Besides protection from the hot sun, polyfoam insulation protects when the airplane carrying the shipment of live fishes reaches heights where the outside temperature may be below zero! Some baggage compartments are heated but they are not all heated, and those that are may be heated inefficiently. Therefore, don't take chances either during winter or summer!

A typical structure is constructed as follows (and from this, other structures may be designed similarly). Procure a sheet of polyfoam, 12″ x 12″ x 1″ and cut it into four equal portions, each 6″ x 6″ x 1″. When stacked on top of one another, a sort of rectangular solid is formed. Now cut a square, 4″ x 4″, from each of the two pieces in the middle. The block now contains a hollow space which we will utilize later for the placement of the bag containing the fishes.

To protect the relatively soft polyfoam from damage enroute, a box is built around it. This is constructed of ordinary cardboard held together at the edges by 2″ wide masking tape. The completed container is rigid, light and strong, quite belying its rather fragile beginnings. Since it is difficult to find a ready-made box to fit, and since most boxes are too heavy anayway, the reason for building a new box around the polyfoam becomes apparent.

Such minimum size boxes weigh in the vicinity of 4 to 5 ounces without fish bag, larger boxes, of course, weighing proportionately more. Notice that the top layer of foam serves as a sort of cover to the foam container. The final cover to the shipping box is, however, the cardboard top which is fastened with masking tape after the fish bag has been loaded. The loading procedure then, goes as follows:

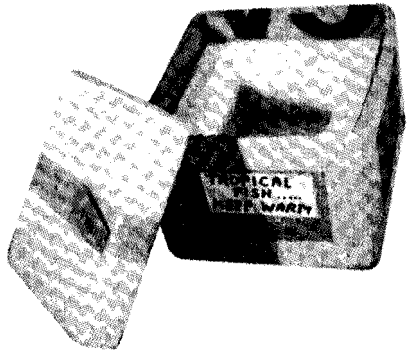
a. Place the bag containing the fishes in the hollow.
b. Slip in the top polyfoam layer.
c. Tape the cardboard cover to the box.

One can, if desired, place a letter on the foam just before the cardboard is taped on. Although the box can be addressed and mailed as is, is may also be wrapped in brown paper first before addressing. This latter additional step, however, is not necessary.

Although the foam may be expected to last almost indefinitely, the outer cardboard container will not. If a shipment should leak, the cardboard becomes soaked and useless. After a time (a dozen shipments or more) the corners of the cardboard will suffer considerable punishment, and the cardboard will become decorated with innumerable markings such as "airmail," "special delivery," etc. The top cardboard panel of the box may be reversed to provide a clean surface for addressing, and the whole box may be renewed as far as a fresh mailing surface goes by wrapping in brown paper, but ultimately, new cardboard will have to be supplied. This is a quick and easy matter and the old panels may be used as a guide for the new ones. For containers not intended for repeated use, a shipping container may be nothing more than a cardboard box filled with a glass wool or paper insulation. The principle behind the outer shipping container is merely to provide protection for its contents against either mechanical damage or extremes of temperature, and to achieve this with a minimum of bulk and weight.

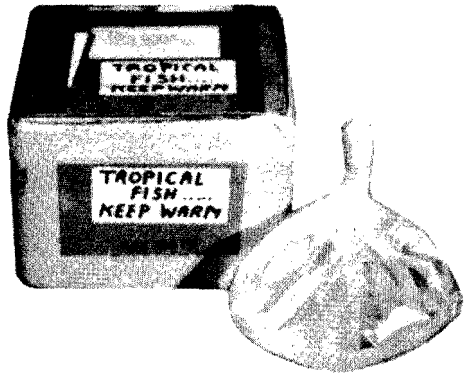
C. The Fish Bag

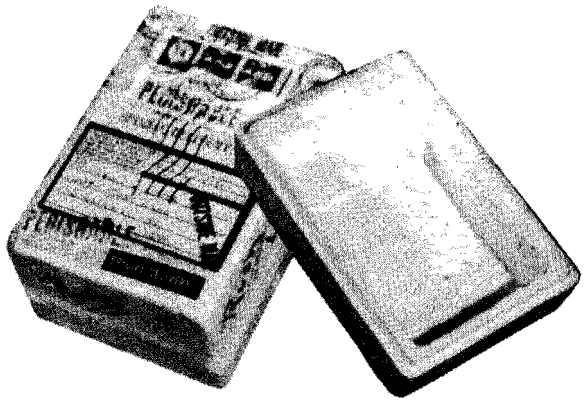
The fish to be shipped should be placed in a small plastic bag (double, one inside the other), obtainable from your local fish dealer. A convenient size 6″ x 10″ and may be purchased for about $1.50-$2.00 per hundred. Two ounces of water is sufficient! The bag should contain ⅓ water, the rest air and **not** the other way around. After the bag is tied, it should be laid on a flat surface and checked to see that



A completed box showing the outer cardboard container and the inner layer of polyfoam. The polyfoam cover rests against the box.

A bag all tied off and ready to be placed into the shipping container. Note the absence of corners on the bag.





A beaded-foam plastic box originally used to ship machine parts. The bag may be placed into it directly and the container mailed off.

All photos this page by Albert J. Klee

the fish are comfortable and completely submerged (no dorsal fins sticking out!)

The most important item that needs to be watched, is the sealing of the bag. Should water leak out, the fish may be in danger, the cardboard will be destroyed, and the insulating properties of the polyfoam reduced. In addition, leaking containers are not relished by the Post Office, either!

Twist the ends of the double bag and then bend the twisted end back on itself, fastening with two rubber bands. Then wind a piece of adhesive or plastic tape around the rubber bands. The complete package is then placed into a third package consisting of a single plastic bag, fastened with a single rubber band and a piece of tape. This may sound like a lot of extra trouble but bags are cheap (so are rubber bands and tape) and the technique removes the major cause of failure in such shipments.

In transit, fish frequently become terrified and make panic dashes. If they dash into the corner of the bag, there is a chance of the fish becoming trapped and dying. This can be avoided if the bags obtained are of the "cornerless" type (this is the type most fish stores use) or if the corners of the bag are tied off with rubber bands.

D. Tranquilizers and Oxygen

Fish need oxygen to breathe and the small amount of water used during shipments is felt by some aquarists to be inadequate to supply the needs of respiration. Whether this is true or not is a moot question, however. There is no doubt that fish can be overcrowded during shipping but using the methods outlined in this booklet, there is little such danger. The authors have made dozens of shipments as described with no failures whatsover. Nevertheless, we outline two approaches that may be taken should doubts persist.

The first involves slowing down the metabolic rate of the fishes so that they require less oxygen than when in the normal aquarium environment. This is accomplished by the use of a tranquilizer of some sort (e.g., Sandoz MS-222). The use of tranquilizers, however, is a tricky business at best. In many instances their dosage has to be measured extremely carefully and consequently, we do not recommend their usage by amateurs under any circumstances.

An entirely different approach and one that we can recommend without reservation, however, uses pure oxygen bubbled through the water in the bag containing the fish so that it displaces the air above the surface of the water. The bag in this case now contains ⅓ oxygenated water, and ⅔ pure oxygen, the bag being tied and sealed as before.

Commercial tanks or cylinders of oxygen are much too heavy and/or expensive for the average hobbyist to rent or buy. Fortunately, however, the problem has been solved with the advent upon the market of lightweight aluminum cylinders of oxygen, available at your local drugstore. These are normally used for home or beach emergency purposes as an oxygen inhalant. One popular brand is LIF-O-GEN, available in a lightweight aluminum cylinder (about 12 ounces) for about $7 or thereabouts. This cylinder comes with a plastic tube (and a plastic mask which may be discarded if not desired) that can be

inserted directly into the plastic bag containing the fishes. A button is pushed on top of the cylinder and oxygen bubbles through the water. This is a most convenient procedure and since the cylinder contains 7 gallons of oxygen (normal pressure and temperature), it should last for a number of years. The cost, therefore, is very low per shipment and the cylinder is easily stored when not in use.

E. Addressing and Shipping

On the top of the box, place your return address and, of course, the recipient's address. On the four sides of the container, paste tags or markers containing the legend, "LIVE FISH", or, "LIVE FISH—RUSH TO DESTINATION". These legends do not usually result in better physical handling of the shipment but they do help to insure that the postman who delivers such a package won't be inclined to leave it on a cold doorstep should the recipient not be home at the delivery time. The legends can be written on white, gummed labels and inscribed with India ink letters.

Take the box down to the nearest branch post office (some aquarists make up the shipment before they go to work and then have their wives do the actual mailing!) and have it mailed airmail first class, special delivery. A typical shipment would be a trio of **Aphyosemion bivittatum,** for example, costing roughly about $1.35.

The cost is all a matter of weight and the authors have been able to ship a trio of reasonably sized killies anywhere in the country for no more than this amount. A shipment of blue gularis obviously, will cost more since their container will have to be somewhat larger.

Be sure to ship first class as the special delivery charges are more for parcel post. In this, it is almost always more expensive to ship parcel post than first class! Check with your local post office on this when you mail the package.

F. Miscellany

It helps to forewarn the recipient of a shipment via postal card sent a week before shipment. Delivery takes anywhere from 10 hours to two days, depending upon connections between the cities or towns concerned. Work out with the recipient, the best shipping time for all concerned. When you are on the receiving end as a recipient and a permanent-type shipping container is involved, mail the container back as soon as possible, via airmail (but not special delivery). This will not cost very much since the empty container is extremely light. If the box is returned via ordinary parcel post, it will take some considerable time to arrive at its destination and along the way, it will be in serious danger of becoming crushed. Airmail alleviates this difficulty.

Some aquarists manufacture perfect containers, pack according to the correct procedures, yet still suffer leaky shipments. One major reason for this is as follows. After the bag containing the fishes is sealed and tied, the next step is to place it in the hollow of the polyfoam and cover it with the top slab of foam. If the bag is filled with too much air, it may still be possible to press the cover down and seal the box. What occurs is that the plastic bag containing the fishes

distorts to fill the rectangular space of the hollow. The finished container then looks normal, but the bag is under pressure. Often, aquarists do not realize just how great this pressure is. When the box undergoes some external force (like being pressed upon all sides by other boxes in transit), the pressure is transmitted through the foam to the plastic bag which is already under pressure. Under these conditions, it is not surprising that the bag sometimes bursts. Make sure that the bag is fully distended in the box without being under external pressure.

Any organic matter in the shipping bag robs the water of some of its oxygen, sometimes to the point of placing the fishes in jeopardy. To minimize this possibility, make sure the water is free of debris, and appears clear and clean. Do not feed the fish the day before or the day of shipping. This insures that all food is digested and droppings passed before they are placed into the bag. Fish fed just before a journey often regurgitate their meal and such an occurrence may easily foul the water.

Some fishes, as a consequence of being enclosed in a small bag and plunged into darkness, panic and attack their companions during shipment. In most cases, it is the female fish that suffers. Male **Pachypanchax palyfairii,** for example, often chew up females and occasionally, even kill them enroute. To prevent this, bag males separately from the females in species where this danger exists. The two bags can still travel in the same shipping container, however.

Finally, it should go without saying that only healthy fish should be shipped, and the usual quarantine precautions that receivers of fishes take, should not be ignored either.

G. Alternate Containers

Nowadays, it is the custom with some shippers of delicate machine parts, medicines or scientific apparatus, to ship their products in containers made of pressed polyfoam beads.

Similar containers are sold inexpensively in hardware and department stores as picnic ice buckets. This type generally needs to be reinforced with a cardboard box as previously described.

Another approach to the shipping problem is to place a polyethylene plastic bottle into a mailing tube. The bottle is filled ⅓ with water, the remainder with either air or oxygen. The bottle should have as wide a mouth as possible to facilitate the entry of the fish. Plastic baby nursing bottles are perfect for this use, provided the fish shipped are small. A young pair of **Aphyosemion australe,** for example, can easily be shipped in such a container. The mailing tube containing the bottle may be wrapped in insulation and packed in a cardboard box, to protect against the vagaries of the weather.

The shipping of live fishes through the mails is convenient and economical. It ties killifish fanciers together with a bond never before thought possible even though they be separated by many miles of country between them. Since young breeders may be had immediately, aquarists gain experience with new fishes immediately also . . . there is no waiting time between receipt of eggs and growth of fish to adulthood. If the principles discussed in this booklet are followed closely, there is no reason to expect failures.