

# Aquarium Careers

Third Revised Edition

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## Preface

As with all of my writing efforts, I've endeavored here to include only my own work and original ideas in this book. This means that I don't have to worry about compounding the mistakes made by others by repeating them on to you. On the other hand, I have to be especially careful that the information I present is as accurate as possible as I have no one to blame but myself for any errors or omissions. This is even more important in my eyes if the reader is using this book as a primary tool in determining their direction for a career. Few life choices have more of a wide-ranging effect on a person's happiness than does the career path a person decides to follow. If I paint too rosy a picture for this profession, I might entice some people who are better suited working at other jobs. Conversely, if I dwell too much on the negative aspects, some potentially excellent aquarists might be discouraged and end up in other fields. I think the reader can probably guess my own feelings in advance: If I didn't know that this was the only obvious career choice for me, I'd be doing something else with my life and would not have taken the time to write this book!

**December 22, 2015:** As I worked on creating the third revised edition of this manuscript I noticed that some sections of the material may seem dogmatic and overtly based on my personal history. Because of that, the text may seem biased in some ways. Rather than changing this, I just want to clarify that your career choice is a very personal topic, this material is based in part on MY career, and you are reading this to further YOUR career. Therefore, use this information as just one part of the comprehensive arsenal of information that you will need to employ in attaining your own career goals.

## Acknowledgements

First, I'd like to thank all my teachers, co-workers and bosses over the past 40 years – good, bad, or indifferent, you all had an impact on my development. Not all my best teachers were found in a formal school setting; my father patiently explained to me analytical methodology, my mother taught me the joy of reading, and my wife showed me tolerance and I try to follow her fine example. I never even met some of my best teachers; the enthusiastic writings of the late Robert P.L. Straughan had a great impact on me as a young home aquarist; I read all of his books until I had them memorized, and some of his passion hopefully rubbed off on me. Books by Raymond Ditmars, although

dealing with reptiles, also influenced my own career decision to work with “cold-blooded creatures”. Jack Rudloe’s natural history books were also very influential to me, as were the works of Stephen Spotte.

My employers in the pet trade prior to my career in public aquariums sometimes had less than positive impacts on my development; some were rather coarse characters; others were more or less blinded by potential profits – but a few exemplary ones gave me an excellent grounding in basic business practices. Larry McKenna, in particular showed me a good example of what it takes to succeed in business; he and his wife worked for many years building their first pet store without ever taking a vacation, or even a day off. They couldn’t afford a car at first, so they walked to work each morning from their small apartment about a mile away. Eventually, their business became one of the most successful non-chain pet stores in the country. For a time, I worked for Pablo Tepoot’s “Omega Exotic Fish” – a national fish wholesale firm in the early 1970’s. I actually only met my boss a couple of times, (I worked the late-night fish packing shift – (6 pm until we finished - usually around 2 am) but daily exposure to a constantly changing, huge assortment of tropical fish species taught me a lot simply through osmosis (pardon the pun). I met up again with Pablo over 30 years later when he surprisingly recognized me at a trade show and we had a lot of fun catching up on our respective aquarium career experiences.

My first position at a public aquarium was with the John G. Shedd Aquarium in Chicago, Illinois. I was hired as their reef tank diver in 1985. The curator then was Roger Klocek, and it was he and his staff that taught me the basics of public aquarium husbandry. When I left there in 1989 to become curator of fishes and invertebrates at the Toledo Zoo, I was given the opportunity to branch out more on my own and develop new skills. After over thirty years there as curator, we recently finished our six-year project to renovate the historic aquarium – the epitome of my career as a public aquarist. I now find myself satisfied with all things; family, career, and leisure time – and I’d like to continue to try to help others launch their own careers in this exciting field.



**The author's first real job – at a local pet store.**

## **Introduction**

What is a “Job”, what is an “Occupation”, and how might they differ from a “Career”? To me, a job is something distasteful that you must do in order to pay the bills, gain work experience or to otherwise engage your time. An occupation is a job that you spent some time learning, and is a bit less unpleasant of a task to perform than a “job” is – which is a good thing as this is what most working people spend a third of their adult life doing. A career is a step up from this, it is your life's work; something you have a strong passion for, truly enjoy doing, and more importantly, have an aptitude for. Many people have a strong passion for sports, but few can make that their career because they simply lack the necessary skills. There is probably a level even above “career”; Jacques-Yves Cousteau, Michael Jordan and Albert Einstein are just three examples of people whose aptitude for their chosen careers were so great that this level seems vastly transcended.

It's common for people to raise their job "up a notch" in their own estimation. A custodian might justify his or her effort by some monetary measure, "Sure I clean toilets for a living, but they pay me \$18 an hour to do it!" In college, I worked as a stock boy for a large department store. The whole time I was unloading trucks and pricing merchandise I kept telling myself; "this job is keeping me physically fit and is teaching me valuable inventory control methods". I hear similar stories all the time; "I work as a salesperson for company X – and I truly love the challenge of my work!" (Meaning; "I've had so many doors slammed in my face that my nose is indented"). Or; "My job allows me to travel the world!" (Meaning; "The overseas factory equipment broke down again, so I'm being sent to a third world country for the fourth month in a row"). I'm probably guilty of this as well; perhaps working with aquariums is really nothing more than "custodial work" for living creatures? Additionally, am I ranking my own skills as an aquarist too high? Is it presumptuous of me to write about careers in this field having never held a position above aquarium curator myself? I don't think so; I've seen enough of my staff aquarists and others in this field move on to new and better positions as they fulfill their career goals to gain some understanding of what it takes to succeed in this field.

What is it that public aquarists do? How do they differ from private aquarists? What defines an aquarium hobbyist? Although there may be differences of opinion, the following attempts to clarify these terms. It is always nice to know exactly in which "pigeon hole" you belong!

**An Aquarium Hobbyist** is traditionally the "home aquarist." Anyone who maintains aquariums for the simple pleasure of working with them can be considered a hobbyist. In some cases, these people have a very narrow focus. This focal point may change over time, expand or contract in scope depending on individual circumstances. An example might be a home aquarist who is very involved with breeding rare killifish. Upon the arrival of his or her first child, the aquariums may go into storage, only to be brought out a few years later and filled with goldfish to entertain the youngster. Upon retirement, the tanks might then be converted to working with discus or some other labor-intensive species. Generally, the expenses (in time and money) incurred by the hobbyist are solely justified by the personal satisfaction gained while engaging in aquarium-related activities. Business income generated from raising fish for sale, authoring articles, or other sources of compensation would not normally cover all of these expenses. If a point is reached where the satisfaction gained does not offset the expenses, the individual may simply choose another hobby. A wide variation is seen in the relative experience levels of aquarium hobbyists. The length of time spent in the hobby often (but not always) increases the hobbyist's knowledge. A person who has bred clownfish for only two years may be a wealth of information. Another could have stubbornly continued to make the same basic mistakes for forty years, and not be any more knowledgeable than when they

started. There are also some for which this hobby is primarily a means of relaxation. They only seek experience sufficient to keep their animals healthy, and then sit back and enjoy the results.

**A Professional Aquarist** is somebody who earns a living through captive aquatic animal and plant husbandry. Their salary can come from either the private or the public sector. A Private Professional aquarist would include: commercial fish breeders, pet store employees, authors and lecturers, or manufacturers. They may have a specific area of focus, such as a fancy discus breeder. Expenses must be less than the revenue received from the sale of produced goods, royalty payments, etc. Should expenses not be met for an extended period, the private professional aquarist is forced to discontinue their activities.

**A Public Aquarist** is a person who works in the animal husbandry department of an aquarium that is open for visitation by the public. Some confusion may be seen with those aquarists who work for private, for-profit corporations such as the Sea World parks or Sea Life Aquariums. Rather than categorizing these people as private aquarists, they are better grouped with the public aquarists. The work they do is virtually identical, and in this discussion, the term "public" does not refer to the not-for-profit status of the organization. Rather, it refers to the attendance of these facilities by the public.

It is entirely possible for an aquarist to belong to more than one of these groups over time. One example is the home aquarist who later acquires a position as a public aquarist. A person can even belong to more than one group at the same time. This is seen in the public aquarist who is also a hobbyist by virtue of having an aquarium at home as a leisure activity.

One unifying theme for all these groups is an interest in, and a respect for, aquatic creatures. This is most evident in the aquarium hobbyist whose pastime is chosen solely due these factors. This point is still very important to professional and public aquarists. There are many better ways to earn a living than being paid to work with captive aquatic organisms. Obviously, these people have allowed factors other than money to influence their career choices.

This book isn't about "jobs" or "occupations" – these are easy enough to find on your own. Rather, the focus here is to help you to develop a plan for those readers who have the interest and aptitude to make working with aquariums their career, their life's work and their passion.

## **Chapter 1 - Education**

Your teachers and family will always tell you that a good education is very important in order to have a successful career in any field. For the most part this is true; for every career path, there is often a minimum educational level that you need to reach in order to even be considered for a job. There are exceptions, you may hear stories of people who were “self made”, and attained excellent careers despite not having been well educated in a formal manner. In many of these cases, the people began their careers many years ago, before prospective employers put many more “minimum qualifications” in place for every job. In other cases, such as in the business side of working with aquariums, perceptive entrepreneurs may build lucrative businesses without a formal education.

The converse may also be true: it is entirely possible to obtain too much formal education for a given career. You would think that a public aquarium would be more than happy to hire a person with a PhD as an entry level aquarist when all they were asking for is a minimum of a high school diploma. In reality, cases like this make employers nervous. They worry that the “over educated” person may soon become bored, or have unrealistic expectations as to their ability to be promoted at that job, or that the individual is just “settling” for the entry level position because they couldn’t land a better job. While there may be some basis for these concerns, much of this is just a stereotypical reaction of the prospective employer.

While the ultimate level you reach in your education will have a bearing on meeting minimum requirements for different jobs, how well you do in school grade-wise is a little less important. Parents and educators don’t want to hear this, but most prospective employers do not use grade point averages in the hiring process unless two applicants are very close in all other respects. As long as the coursework is suitable (e.g. taking college prep courses in high school instead of P.E. classes) and your grades are a “C” level or better, you would be better off developing extracurricular skills than by pursuing that “straight A average” at the expense of everything else. The one exception to this is while you are still in school; the awarding of internships, monetary scholarships and student loans are often based solely on your grade point average.

### **Elementary school:**

With today’s cliché of the over-achieving parents who push their children too hard, some might think that my giving advice regarding directions for an elementary school curriculum would only serve to feed that unfavorable activity. While that might be true, remember that those parents who push their kids only “raise the bar” for all the others, and ignoring elementary education in order to “just let my kids be kids”, only puts your children at a disadvantage later on. As a youngster growing up in the 1960’s, in my family, homework was something only the high school kids had to do. Nowadays,

simple homework assignments are common for even kindergarten students, and it gets rather intense for second grade students and beyond. Families with multiple children in school often find the parents in a homework “crunch”; extensive assignments by teachers for their kids which take up more and more of their evening “quality time” together.

Most parents probably concentrate on their child’s extra-curricular activities, and let the teachers handle the classroom portion of their education. You should be involved in your child’s formal education to the point of remaining well informed; attend parent-teacher conferences and volunteer your time in the classroom if you are able. You should not “second guess” your child’s teacher on every point, make the teachers handle routine discipline problems, or expect them to be the sole resource for enriching your child’s educational experience. Some surprising activities may prove helpful for your child; the craze in Pokémon characters has helped many children to learn to read, plus the naming of these weird life forms have sets of rules which parallel that used by taxonomists in the biological sciences. Video games played on game consoles are probably detrimental to a child’s development in the long term, but computer games played on a real Windows or Macintosh computer system require the child to learn keyboard and mouse controls, as well as basic program installation and operation methods – and most likely are beneficial in the long run, if not taken to the extreme.

Students, even during elementary school, you can begin getting ready for junior and senior high school – and beyond! Visit your school library and read all you can about biology, fish and aquariums. Learn to swim. Regular lessons are fine, but competitive swimming is the best way to get you well accustomed to the water, a skill you must have in order to become a good SCUBA diver later on. Obviously, having a home aquarium (or two!) will help give you hands-on experience you will need for a career working with fish.

### **Middle school:**

Students in these grades (which vary by school district, but usually are 6<sup>th</sup> through 9<sup>th</sup> grades) are given a bit more choice in their own curriculum – mostly by being able to choose elective classes. Swimming lessons (or competitive swimming) are still important, as are shop classes (to teach basic skills for handling tools). Mathematics are important at this age, students who fail to progress past algebra at this point often have a difficult time catching up at a later date. Computer skills are generally best if self-taught; kids seem to pick up this skill just fine if left to their own devices (but again, not too many computer games!).

At this age, children are able to operate their own aquariums without adult supervision and some even begin SCUBA lessons. At the same time, extra homework, increased interest in sports and recognition of the opposite sex may come into play, all leaving less time for aquarium studies. At this age, students should focus on doing well at school and reading all that they can about aquariums and the aquatic environment. Less obvious, but

still very important would be a part time job, perhaps a paper route. This teaches a person responsibility at the same time producing a ready source of cash to use to buy more aquarium related material. If you've learned enough about your home aquariums and have a friendly, out-going attitude, it shouldn't be too difficult to get a part time job at your local pet store. Try applying for jobs at the smaller "mom and pop" stores first, some of the big chain "mega-stores" may have higher minimum age requirements for employees. Initially you will probably just sweep floors, run errands and take out the garbage. As time goes on, the storeowner may allow you to feed the fish, perform water changes and similar tasks. Don't be upset if you are not allowed to help customers at first. Customers need to know that they are getting good advice when they make a fish purchase, and even if you know a lot about fish, the storeowner also knows that the customers would rather have an older, and presumably more experienced person wait on them. One benefit of working at a pet store is that you almost always get a pretty decent employee discount – so work for a store that you buy a lot of your fish from anyway!

### **High School:**

At this age, students are given correspondingly more freedom in their lives, both in school and at home. With this however, comes an increase in responsibility. Individuals who fail to recognize this fact sometimes falter; failing grades, substance abuse and a general "slacker attitude" may prevail. Those who avoid these pitfalls will be keeping very busy preparing for college. Coursework in high school should focus on college preparatory classes. Take for example two science courses that might be selected by a high school junior:

Physical science 101. Explore the everyday world around you. Using hands-on laboratory work, you will examine all facets of applied physics: magnets, pulleys, and levers, as well as light, heat, electricity and other forms of energy.

Physics 101. Explore the everyday world around you. Using mathematical equations, you will be introduced to the basics of physics. Calculus 101 is a prerequisite.

While the course titles are similar, the courses themselves are very different. The former class is designed for non-college bound students, while the latter is a much more difficult course designed as college prep material. Don't load up your curriculum with "filler" courses; focus instead on advanced English, Math, Chemistry, Physics and Biology. The Humanities, (History, Art and Music) are important for developing into a well-rounded human being, but not at the expense of the hard sciences, at least not for this field. Introduction to Psychology, Anthropology and Sociology courses are even less important at this level of education. Some specialty courses may be appropriate; for example, I still rely quite a bit on what I learned in my high school photography classes.



High school students often unduly worry about their grades and entrance exam scores in terms of “being accepted to a good college”. Don’t put so much emphasis on getting in to a “quality” school; but rather, can you get into a school that offers you a major in a field that you are interested in? There is a small state college that has a much better applied marine biology program than just about any of the huge “first class” universities and a degree from that school might serve you better in the long run. One caveat to this: sometimes college students decide to change their majors “mid-stream” – and for them being a student at a major university has a distinct and very important advantage; **prestige**, as this is more important in many other fields.

Extra-curricular activities for high school students must surely include SCUBA diving, perhaps even advanced open water certifications such as rescue diver. Build your diving experience by getting as much bottom time as you can afford...too many people get their basic certifications, and then don’t take it any further. Joining a local aquarium club and working at local pet stores will be advantageous for most students.

### **College:**

Selecting a college is a traumatic process for many high school students. On the one hand you want to do well enough on your entrance exams to be accepted to a decent school, while on the other, there may be some trepidation that if you try too hard, and succeed too well in getting into a “tough” school, that you’ll soon find yourself in “over your head” and doing poorly in class. Perhaps for the first time, somebody you don’t know is going to evaluate your knowledge and personal experience and tell you if you can or cannot do something (e.g. attend their school). In some cases, this process seems very arbitrary and unfair – but in reality, it is not unlike the job interview process, so perhaps students should look at it as a learning experience.

It is relatively difficult to assess the prospects of a given school based on their course offerings. Larger universities show in their catalogs that they offer ichthyology and many related courses, yet don’t really focus on these topics. Some smaller schools, ones that have a professor very interested in this field, may have a better overall program. Look for a school that offers a Bachelor of Science degree in marine or aquatic biology, as well as a suitable minor in a related field; oceanography, chemistry, or botany. For those individuals interested in careers in the private sector, business courses may play an important role. A person with a major in aquatic biology and a minor in business management (a rather unusual pairing!) might be uniquely qualified for positions in many aquariums, both public and private.

Most college applications are now submitted online. This allows for students to potentially submit dozens of applications, where in the past, two or three paper applications was the norm. The converse of this is that some universities now have a much higher rejection rate. In 2013, the University of Michigan processed over seven applications for each student they admitted that year. Other state schools in Michigan

typically saw a 4:1 ratio the same year. Students do not need to submit blanket applications to schools like this; first determine what you want in a college, then do your research to determine those that are a good fit. You should be able to narrow your submissions down to six or so that are a good fit for you.

Entire books have been written about how to succeed at higher education levels – and you should refer to them for general questions regarding University study. The whole life experience of getting away from home for the first time and taking classes where the teachers don't really care if you pass or fail is really an eye-opener for some people. For the traditional college student living in the dorms, their freshman and sophomore years will be a lot like high school, but more intense. Their required classes or "core studies" will be Math, Science, English and History – with little in the way of electives in their chosen field of study. This drudgery causes more than a few students to drop out, with the honest intent of "starting back up later on" – don't you succumb to this! Many people who delay entering college, or decide to "take a break" never end up getting their degrees. The best way to approach University, (if you can afford it) is as a traditional student starting the fall after you graduate from High School. Plan to obtain your degree in four years or less as a full-time student. You can enhance this process by either taking summer courses, or locating summer internship programs.

Only a few schools offer comprehensive curricula for training in captive aquatic animal husbandry. In most cases, you will need to select a school based on some other factor, and then teach yourself the necessary husbandry topics. For example, in my own case, the only live fish we ever saw in my ichthyology classes were ones we collected and which were quickly dropped into preservative. My professor, a well-known ichthyologist, decided to set up a small aquarium for his class. I knew right away that I was going to have to rely on other resources for animal husbandry information when I saw him crumbling up white bread to feed his tank of minnows and darters! All was not lost however; I spent my junior and senior years soaking up knowledge of taxonomy, physiology and limnology. Outside my major I focused on coastal biogeography and other earth sciences – all the while working at a major local pet store and gaining a lot of direct husbandry experience in that way.

Internships, under a variety of names, have become a vital way for undergraduate college students to begin building experience in their chosen field. As mentioned, beware of over-stating any internship you have had; some are merely "job shadows" and do not count much towards your professional experience. Track all internships by the number of hours worked, as well as the time span. Prospective employers are wary of internships that are listed on a resume with just a date span – they want to know the actual hours spent at this activity. I've seen "six month internships", that when I examined further, amounted to only 20 or 30 hours of actual contact time.

An internship is "on-the-job experience" for a professional career. Internships are perhaps most similar old-fashioned "apprenticeships" for trade and vocational jobs, but

they often lack standardization and oversight, leaving the term “internship” open to rather broad interpretation. Interns may be high school students, undergraduate college students or even post-graduate adults. These positions may be paid or unpaid and are always of a fixed time span (but which may be renewed in certain instances). Generally, an internship consists of the intern giving a service in exchange for career experience from the organization. Students can use an internship to determine if they have further interest in a particular career, to create a network of business contacts, to gain school credit or any combination of these. Some interns find permanent, paid employment with the organization at which they held an internship. This can be of significant benefit to the employer as experienced interns often need little training when they begin regular employment, the employer already knows much about their work ethic and how well they fit into the culture of the facility. However, unlike a trainee program or an apprenticeship, employment after the completion of an internship is not guaranteed, and is usually not even implied.

There are three basic types of internships; those that pay you a stipend, those that are neutral cost for both you and the employer (most typical) and those in which you pay to participate. The latter can best be described as “experiential learning”. These “experiential learning” opportunities will likely increase in the future; where the students “learn by doing” for a specific project, such as a collecting trip. It has long been understood that these methods of active learning are far better for most people than is learning by rote or typical “instruction by demonstration”. Most public aquariums have long had internship programs which are perhaps the classic example of experiential learning. However, the number of students able to participate in this sort of activity is resource-limited. Additionally, internships are often not very structured, and some students do not excel without some structure. A new model has arisen; structured practicums of a finite time frame where the students underwrite the costs associated with the activity. Often, the students can receive college credit at the same time (usually as independent study or an elective field course).



**College students participating in an experiential learning trip to collect fish**

Typical unpaid internships have come under fire in recent years because some companies (usually not public aquariums) have seemingly taken advantage of the “free labor” afforded them by the interns. This has resulted in some lawsuits against the companies, often with verdicts made for plaintiffs. The result is fewer internships being available, and many of the remaining ones are offered “for pay”, which means there are fewer opportunities available for students overall. This leaves the student in a quandary; they need to develop experiences that will make them more marketable, but there are fewer chances for them to be accepted into a program. One possible solution is to volunteer for a public aquarium, and call it just that, and not have it considered an internship. The trouble with that tactic is that most employers consider internships to have more structure, with more actual learning involved, while volunteer hours accrued may be considered at a “discount rate” because the perception is that in that role, the student isn’t learning as much.

In evaluating which internships you may wish to apply for, consider the costs (if the internship requires you to relocate to a different location) as well as the prestige of the facility offering the internship. Keep scrupulous records of your internship, including

hours spent, people you worked with and tasks learned. Always send thank-you letter or email to the manager you worked under. If you later need a letter of recommendation from the facility, be sure to ask for this well in advance, and offer collaborating information including details of the internship so that the person writing the letter does not need to research your experience for you.

### **Graduate programs:**

Since I personally never attended graduate school, this is one facet where I've had to rely on the experience of others in order to try to offer some advice. In regards to careers in aquariums and advanced degrees, there seems to be a schism among employers. In some cases, applicants for entry-level aquarist positions who come to the table with a master's degree may actually be at a disadvantage (the previously discussed "overly qualified" conundrum). On the other hand, aquarists with only a bachelor's degree, who have "advanced in the ranks" to the point of curator, may find themselves facing a "glass ceiling" if they don't have a master's degree. It seems that some employers, looking to fill middle management aquarium positions, tend to throw in the qualification of "master's degree" just to limit the applicant pool, and perhaps to lend more validity to the position they are offering.

Doctorates seem to only be mandatory in three cases; for directors of aquariums affiliated with a university, research biologist positions with an aquarium, or as a curator of entomology (I'm not sure why the latter is so often the case, but it is). Some argument can be made for rather than pursuing a PhD; a person interested in additional education for positions within this field would be better served by acquiring a secondary bachelor or master's degree in business administration or similar program. Table 1 lists some universities that have graduate programs in aquatic and marine biology suitable for use in aquarium careers.

Bowling Green State University  
California State University  
Cornell University  
University of Central Florida  
Florida Atlantic University  
Florida State University  
University of Hawaii  
Harvard University  
Scripps Institution of Oceanography  
University of Puerto Rico  
University of Washington  
Virginia Institute of Marine Science

Table 1: Some Universities offering graduate degrees in aquatic sciences

**Trades:**

This is a difficult group of educational approaches to assess in terms of applicability to various aquarium-related careers. These positions would consist of skilled trades' people: plumbers, electricians, skilled woodworkers, mechanics, etc. Obviously these people would still need to have an underlying interest in aquariums, as well as a good amount of self-taught knowledge of the aquatics field.

How then, do they fit into the scheme of things? For private sector jobs, it is fairly obvious; an employer building or expanding a pet business is going to find a person who is skilled at one or more trades much more hireable than an unskilled, but educated marine biologist. It is less clear how useful a skilled trade might be for a prospective public aquarium employee. While some forward-thinking husbandry managers know that much of an aquarist's work entails hands-on working with tools and equipment, and that a skilled tradesperson might be best suited for that type of job, it is difficult for most of them to eliminate the common job requirement of a bachelor's degree in biology. Imagine this scenario; at a busy public aquarium, non-emergency work orders are averaging three months for the maintenance department to complete. A 3" true union ball valve begins to leak at the handle in an aquarist's work area. As a husbandry manager, who would you rather have working that area – an aquarist who graduated from college last month with a degree in ecology or an aquarist who was recently hired after spending a year working at a pet store, and before that was a plumber for 5 years? It's sometimes nice not to have aquarists running for outside help every time a small pump fails or a wire breaks! Taken a step further, a husbandry department might hire one mechanical "jack of all trades" to handle special construction projects as well as routine equipment repair. In reality, people in these sorts of positions often become burned out, they have to handle all sorts of emergency problems, but get very little in the way of hands-on work with the animals themselves – and that is what keeps most of us in this business going to work every day.

One technical trade is a bit different from the others, that of the professional diver. Schools around the country provide rigorous training for commercial divers, most of who find positions with oil companies, marinas or salvage operations. Larger public aquariums and perhaps some of the more progressive marine fish collecting companies have use for a well-trained staff diver to lead their diving safety program. This person would need to develop a diver safety manual, oversee all dive operations (both in-house as well as in the field) and see that all the dive equipment is kept in working order. Typically, these Dive Safety Officers need a SCUBA instructor rating (or higher) as well as advanced lifesaving, first aid, AED and emergency oxygen skills. Diving in aquariums must be done safely, under all applicable laws. Commercial divers typically must follow stringent OSHA standards. These regulations allow for some exemptions for "scientific divers". Public aquariums often determine that their divers fall under this exemption, and

modify their dive programs to allow for that. However, recent legal proceedings may eventually invalidate those exemptions – so aquarium divers may need to meet or exceed OSHA standards in the future.

My first job at a public aquarium was as chief diver for feeding demonstrations in a large tropical reef exhibit. A cadre of volunteers did most of the actual diving, so my work was relegated to scheduling their dives, tending the diver in the water, recording the dives logged, adjusting food amounts and repairing the equipment. This particular job had seen a high turnover rate for aquarists – I spent less than a year at it before transferring to another area, people before me had spent even less time in that position. After I left, the aquarium found the right person for that job – a professional diver who has been there now for over 25 years.

### **Extra-curricular activities:**

These groups of minor or “hobby” skills are those that a person learns “on the side” – either after school, on their own, or perhaps in school, but not as part of their major course of study. These activities serve two purposes; to keep a person’s personal interest at a level high while they are pursuing their formal studies as well as to provide that person with a saleable skill that may be unique, or at least will stand them a little ahead of others competing for the same position. Some are rather esoteric, and may only increase a person’s marketability in special instances, while others will serve a person well in almost every job interview situation.

#### **Art / graphic arts:**

Appreciation for, and a skill at producing artistic material may not present itself well on a resume for a person interested in a career in aquariums, but this is just one of many “hidden talents” that may help an individual in the long run. I doubt that a hiring manager would read, “Able to work in clay and other media to produce artistic products” on a resume and think that this would be an important aquarist’s skill. Actually, in some cases it might well be; just think how a skilled potter would be working with dyed mortar on the background of an exhibit, or how well a watercolor artist would do given the task of painting a diorama for the back of another exhibit. A well-trained artistic eye is very important in many aspects of aquarium work – but it’s doubtful that it would be a major selling point for any interview – perhaps this is just a nice “ace in the hole” – “Why yes, I do have experience developing commercial graphics!”

#### **Boating:**

At many larger public aquariums, as well as with marine fish collecting firms, there is a need for aquarists who can handle boats of various sizes, serve as crew on larger boats, or at least are familiar enough with boating to know when to keep out of the way! A commercial Captain’s license is probably more than one needs, but being able to

demonstrate an ability to handle boats up to about 25 feet in length is a good skill to have – and fun to acquire as well!

As an aquarist at an inland public aquarium, you might only have an opportunity to get out on a boat every few years or so – but when that occasion does arise, it's nice to know you won't then get seasick, mistake a halyard for a sheet, or run a dinghy up on a reef at full throttle.

#### Computers:

Beginning around 1984, personal computers began to gain importance to public aquariums, as well as many advanced pet stores and related operations. Informational services such as CompuServe, Prodigy and the fledgling AOL, gained attention from aquarists in the late 1980's and early 1990's. This was soon followed by the explosive growth of the Internet. As we forge ahead into the second decade of the next millennium, knowledge of computers and the Internet have become virtually mandatory for use in both public aquariums and business operations.

Having been involved with online computers since 1986 (first on CompuServe's FISHNET, then AOL and later the Internet itself) plus writing the successful Aquapro series of aquarium computer programs, I have had a lot of exposure to computers as they relate to aquariums. Many people blindly embrace the Internet, thinking it will answer all their questions or solve all of their marketing problems. They hear about Dot Com stocks going through the roof; producing overnight millionaires and they want to get involved. What you don't hear about as often are scams at aquarium auction sites, search engines that direct you to companies who paid them to send you there, bad information being spread through newsgroups and "informational" sites that are really just fronts for very aggressive businesses. The Internet should be looked at just as one of many important computer tools; it is virtually mandatory that you have an email address (preferably one that you can keep consistent and that won't change every time you change jobs) the World Wide Web is ready source for quick facts (but always confirm information you get from multiple sources!) and the newsgroups are great places to write to other aquarists (some of who may even dispense accurate information!).

Most business owners need to maintain a web site, but they need to avoid the common practice of setting up a home page that says "under construction", and then never filling it out with solid, pertinent information. Personal web sites a dime a dozen; I've seen home pages that have been set up for years and still have only 20 or so page hits, even some business pages do not get the marketing attention they require, and languish with virtually no visitors – there are simply too many other, high content pages for people to visit!

I'm not totally against online resources; I just feel that people need to temper their enthusiasm about the Internet with a dose of reality. Use it as a tool to get a job done, don't waste time aimlessly "surfing" (unless that's what you do for entertainment), and



always be aware of the myriad ways that people use the Internet to separate you from your money!

Social media is a new force to be reckoned with. Your online presence is going to be observed and evaluated by prospective employers. Simply put; never post anything online that you do not want a prospective employer to see. Monitor your own online presence by running searches for your name, and ensure that nothing untoward shows up. Taking this a step further; consider “spiking” your online presence with selective posts that enhance your search “hits”. Creating a blog that demonstrates your aquarium skills is one method, as is posting images of aquarium animals that you have taken. Removing a negative Internet presence is difficult, so avoid all controversial postings.

The person who can truly use computers to help them get ahead in the aquatics field is not the one who can navigate the Internet “like a dream”, beat every action game every written, or who is the “fish info honcho” for a major aquarium web site. The truly productive aquarist is one who knows the fundamentals of the Windows operating system, its related productivity software products, is well versed in computer hardware knowledge, and has a smattering of self-taught programming skills...being able to make it through all levels of “Call of Duty” without getting fried is only icing on the cake.

#### First Aid / CPR:

While nobody would mistake learning these skills as a hobby or a recreational activity, they nonetheless are important skills for any aquarist, if not for any person in general. In some cases, an up-to-date certification in CPR/First Aid is a requisite for an aquarist’s job. In other instances, it’s just a good thing to know, and shows prospective employers that you are serious about learning important skills. Remember that the key phrase here is “**current** CPR / First aid certification”. Most agencies require re-certification every 12 to 24 months, and a non-current certification is useless, so do not put this on your resume unless your certification is up to date.

#### Horticulture:

The vast majority of successful freshwater naturalistic aquarium exhibits have either submerged or emergent aquatic plants as some component of their design. An aquarist who has the knowledge to select appropriate plants and keep them healthy is one step ahead of those who only have experience with fish. Horticulture is a complex topic – comprising virtually as many categories as does aquatic science. There are three primary areas of plant culture as they relate to aquariums; submerged plants, emergent plants and terrestrial plants. Submerged plants include many thallose algae as well as vascular plants that spend most of their life completely submerged (*Caulerpa*, *Elodea*, eelgrass, etc.) Emergent plants as those that typically have their roots and lower stems submerged, but whose upper leaves are exposed to the air (water lilies, cattails, mangroves and rushes). Terrestrial plants might include *Ficus* trees, ferns, and mosses. The aquarist

who has experience propagating all three groups will be one step ahead of the typical applicant for an aquarium-related position.

As a side note; Bonsai (dwarf tree) culture combines cultural artistic aesthetics with horticultural pragmatism; Not only do you need to meet the stringent biological requirements of trees living in a small pot, but you need to be able to see the inner structure of the plant and attempt to enhance its beauty by selectively removing some branches and changing the growth patterns of others. The Chinese, Taiwanese and Japanese cultural mystiques surrounding this vocation add to its attractiveness for some people. Like many hobbies, this is one that is easy to perform in a crude manner, but is difficult to learn to do well, and is virtually impossible to ever completely master.

#### Photography:

While not too important for the private sector aquarist, many public aquarists are called upon one time or another to test their photography skills. In some cases, it will be to illustrate a magazine article, in other instances the photographs will be needed for specimen identification labels. In any event, photography (both on land and underwater) is a fun pastime that gives the aquarist one more skill to add to their repertoire. Owning your own equipment insures that you'll protect your investment by treating it properly and learning how to use it well.

Public aquarists often have difficulty photographing their exhibits. Not only do they have the same problems as home aquarists (flash reflection off the glass, issues with white balance, fast moving fish, etc.) they have the added distortion caused by thicker viewing panels (often with fingerprints or scratches on the surface of the viewing windows). In some cases, the answer is to photograph the subject in a special photo tank. In other instances, this simply is not practical. Since many public aquarium displays are large to dive in, underwater photography becomes practical for solution for many aquarists.

In the 15 years since the first edition of this manuscript was first published, camera equipment has completely changed its format from film to digital imaging. I originally said that film cameras were required for serious work, and that digital cameras were only useful for quick "snapshots". Today, there is virtually no use for film cameras (although some purist "die-hards" still maintain that film is somehow "better"). A high quality dSLR is a vital piece of equipment, and choosing which imaging system to adopt is very important. Unlike film camera bodies that could be used for twenty years or more, the lifespan of a dSLR may be less than five years (because newer models are released so frequently). The lenses are now the key to what camera system you choose – as these are generally adaptable from one body to a newer one.

#### SCUBA Diving:

Obviously, virtually every public aquarist can benefit from becoming a certified SCUBA diver; in most cases it is a mandatory job requirement. You should learn to dive as soon as you are able, and depending on the certifying agency's terminology, you should take advanced diving courses at least through "advanced open water diving" and possibly to the level just above that (rescue diver or other specialized certification).

Divemaster and other advanced certifications are primarily for those aquarists intent on gaining a position as an aquarium's dive safety officer. Perhaps more important than a person's formal training level is dive experience or "bottom time". I've met basic open water divers who have hundreds of hours of commercial diving experience and I've met a few master divers that although had done all the coursework and were duly certified, could barely swim a stroke. Which would you prefer as a dive partner? With this in mind, remember that actual diving experience, (assuming that it is performed safely) is much more important than the certification level obtained.

Not only should you endeavor to amass a proper amount of dive time, you should also try to remain an active diver, and not rely on past experience. As a Divemaster with well over 300 hours logged since 1974, I hadn't dived for 8 years prior to being invited to participate on a two-week scientific survey of the patch reefs of Belize. I assumed it would be just like riding a bicycle, once you learn, you never forget. I should have gotten some idea how wrong I was when I went in to a dive store to replace some of my old equipment prior to the trip; not only were the prices about double from what I remembered, there were all sorts of new "dive computers" and other unfamiliar equipment. Faking my way through all that, I got what I needed and made it down to the research site. The first dive went perfectly, as if I had been diving just the day before! The second dive was a real eye-opener; first I dropped off the side of the boat without my weight belt and bobbed around at the surface while I sheepishly asked the surface tender to hand it down to me. Once underwater, my air consumption just wasn't what it used to be. The close approach of a Caribbean reef shark didn't help much either. Here I was acting like a complete "newbie" despite my previous experience. I settled down on my third dive, but I learned a very important lesson; divers need to remain up to date regarding their equipment, and need to dive at least a few times a year in order to maintain their level of expertise.

## **Chapter 2 - Private sector jobs**

For use in this book, "private sector jobs" refers to non-public aquarium work involving the pet fish trade. There are for-profit, private sector companies that operate aquariums, such as the Sea World parks and the Ripley's aquariums. However, their operations are virtually indistinguishable from that of not-for-profit public aquariums, so they are covered along with the non-profits in chapter 3. There are some other aquariums that are

harder to classify: aquariums in restaurants, hotels, casinos and outdoor supply stores that tend to blend the line between “public aquariums” and “private sector aquariums”. All of these facilities may be defined by one factor: are the fish sold to the public on a routine basis? If the answer is yes, the job would be classified in this chapter. Careers in this field are different from those in public aquariums mainly by virtue of their being completely controlled by the ups and downs of the business climate. It's one thing to lose your job because you were lazy or inept, it is another matter entirely to lose it due to downward market fluctuations. Table 2 lists a variety of aquarist jobs and their estimated salaries.

### **Jobs in retail pet stores:**

Obviously one of the easiest to acquire jobs working with fish is that of a pet store employee. The requirements are minimal and there are many jobs in that particular market. On the other hand, the pay for entry-level positions is very low, and unless you become a stakeholder, there is little opportunity for advancement. Still, these jobs may offer some people a means to acquire enough work experience to eventually move on into public aquariums, or some other field that may offer better chance for advancement.

#### **Gofer:**

My first job was as a gofer at a pet store in 1970. I fetched the owner's lunch, swept the floor and took out the trash. I was paid \$1.00 an hour or \$1.20 an hour if I took my pay in trade (which I almost always did!). There were four of us in this position, all vying to become “real” employees by showing the boss how hard we could work. As I recall, I was the third of the four gofers to eventually be promoted to cleaning tanks and catching fish for customers. All of this was of course contrary to child labor laws; we were ten and eleven years old and couldn't have gotten work permits until we were 14. Still, we learned a lot about aquariums just by being around fish so much of the time.

#### **Clerk:**

An aquarium store clerk has to be a “jack of all trades”; primarily, they need to be able to answer customer's questions, either over the phone or in person. Secondly, they need to be able to maintain numerous aquariums in the store, including fish species that change virtually every week. Finally, they need to be able to perform many other smaller tasks: repairing broken equipment, cleaning out puppy cages, and general shop keeping duties. From the storeowner or manager's point of view, the clerk must be hardworking, knowledgeable, and above all, honest. Pay for clerks' ranges from below minimum wage (under-the table!) to perhaps \$12 per hour. Benefits and paid vacations are the exception rather than the rule. Some indirect benefits include being able to borrow new books from the shelves and employee discounts on fish and equipment.

Some pet store clerks, perhaps due to their young age, tend to become “know-it-alls” despite not really having a clue as to the proper operation of their customer’s aquariums. This can really turn off adult customers. New pet store clerks should always remember, “The customer is always right – even when they are wrong”.

#### Manager:

When a clerk in a larger pet store proves they are good at their job, they’re often rewarded with a pay raise and a job title change to “manager”. A pet store “manager” may just be a hollow title, simply used to impress the customers when they see that label on your name badge, or it may be a real working manager who is more involved in the business aspect of the store than is a clerk. The latter type of manager is generally charged with controlling the cash register or “till”. They will probably also be called upon to make the bank deposits, make routine orders for dry goods and fish shipments, as well as making assignments for the daily work schedule. Most managers still spend the majority of their time assisting customers, although some may be allowed to work for a commission based on their sales results. Salaries for store managers can vary widely, but few probably earn more than \$30,000 per year. More progressive pet stores will offer their managers at least a minimal benefit package and perhaps stock options.

#### Owner:

The pinnacle career for many pet store employees is that of owner. There are more than a few cases in the past where a person worked their way up from clerk to manager and then was able to buy the store and become the sole proprietor. However, things have changed dramatically in the pet store business with the advent of pet “superstores” in the late 1980’s. As these mega-stores move into a market area, the sole-proprietor pet stores are often squeezed out of the market. At first, this only happened in major markets – so if you owned a successful pet store in a small market area, (population less than 50,000) you were relatively safe from encroachment from this type of overwhelming competition. Lately, these super-stores have begun to saturate their primary markets, and have spawned off what can only be described as “mini-superstores”; these are springing up in virtually any market, even the smallest ones, and probably ring the death knell for the sole proprietor pet store. Combine this with ecommerce aquarium stores that sell equipment and even fish for much less and there is not much room for the “mom and pop” pet store. Now days, I cannot recommend that anyone contemplate opening a new pet store in any market unless they are very well capitalized and have a strong background in business administration. The day of the pet storeowner who succeeds just because he/she is highly knowledgeable about aquariums is gone, at least for now.

Some pundits argue that since these “superstores” and ecommerce sites actually seem to feed off of established pet stores (since they don’t sell too many pets themselves, mainly supplies) that there will soon be a backlash where these stores will begin to falter as the

pets previously supplied by sole-proprietorship stores eventually die off, and their owners no longer need to buy supplies for their pets. At the same time, it is argued; new specialty pet stores will spring up – offering customers’ quality livestock (including aquatic species) as well as unique supplies, combined with ample knowledge. Older aquarists may well draw some similarities here to the demise of the five and dime pet departments and the increase in specialty pet stores seen during the mid-1960’s through the mid-1970’s. Perhaps this is just another cyclic trend?

### **Aquarium maintenance services:**

Probably the most common “first business” for the undercapitalized young aquarist wanting to start a business is that of an aquarium maintenance service. I operated one myself for 3 years while working full-time at a local pet store after going to college. These businesses are easy to get started, carrying little financial risk, but are difficult to build into a profitable, fulltime venture.

This type of enterprise services established aquariums on a periodic basis for a fee. There are many levels of service, and those can vary between maintenance companies or even between clients of the same firm. For example, one customer might schedule for a 30-gallon freshwater aquarium in a dentist’s waiting room be cleaned every month. The service company would come in, check the fish, scrape algae, perform a partial water change, siphon clean the gravel and change the filter media. The fee charged might be on the order of \$2 per gallon of tank capacity plus supplies and mileage. At the other extreme is the office building that contracts with a maintenance firm to construct, install, stock and maintain a 1000-gallon cylindrical marine aquarium in their lobby. In this instance, initial consulting fees might approach \$2000 with a construction budget of \$75,000 and a \$1000 per month service fee for daily weekday service calls.

The reality of this business is a bit of a let down for anyone venturing to try their hand at it: virtually all of the most successful aquarium maintenance firms are located in large metropolitan areas, and are usually supported by one of the larger aquarium stores in the region – not really the market a young aquarist with a bucket, net, \$20 in their pocket and a 1974 Pinto should try to conquer head-on!

### **Inventor**

For some aquarium hobbyists and professionals, creating an aquarium-related invention is a natural combination of a life-long dream with their hobby or vocation. For all this interest, for most people it ends up being just a pipedream – acquiring the combination of a great idea, sufficient funding and proper marketing is just too difficult a task. Still, it’s always fun to dream, and who knows, if you’ve always had a “great aquarium idea”, this section may help you realize that dream.

An invention is typically a new composition, device, or a process. An invention can be developed based on a pre-existing device or idea, or it can be independently developed,

and considered to be a “breakthrough”. An aquarium invention that is novel enough and not obvious to others skilled in the field may be unique enough to obtain the legal protection of a patent.

The creative process is paramount. A good idea must be formulated, and then the process needs to be refined by trial and error, and modeling. Simply refining or changing the work done by others is usually not sufficiently unique to call the result an “invention”. Innovation is the process of applying new ideas, or old ideas in new ways. Using a Rubbermaid™ trash can as an external bio-filter, while cost-effective and very innovative, is not a new invention. The attribute of innovation has always been a core attribute to home aquarists; but by itself, is not always inventiveness.

There are obviously a wide variety of ideas for inventions that people come up with; some are more marketable than others. Unique products are what people usually think of when they think of an “invention”. These are products that fill a need, for which there is no existing product available. With so many inventive people out there thinking of new ideas, developing a truly unique product is actually a very rare occurrence. In some cases, the product may be unique, but there is no true need for it in the aquarium market. Knowing this, people may work at developing some sort of improvement on an existing product – if you build a better mousetrap, people will beat a path to your door. For aquarium inventors, extrapolating an idea from a related industry may prove to be very successful; various forms of “bio-media” for use in aquarium filtration all have their roots in the wastewater treatment industry. Beware of over-extrapolation, as not all ideas successfully make the transition into good aquarium ideas. People have also developed ideas for various fish disease treatments or chemical additives for aquarium water. Demonstrating actual effectiveness of some of these products is important; just like in the Wild West, there are snake oil salesman hawking their products to aquarists to this very day. Although not inventions in the strict sense of the term, there are also products that can be developed to help home aquarists such as computer software, problem solving keys and informational web sites.

“Inventing” a new living aquarium inhabitant is also a possibility. Color varieties of various fish have been developed through careful selective breeding. Although it is difficult to patent a hybrid or color variety, it is possible to trademark the name for one of these creatures. The current craze of giving fanciful names to color varieties of corals is just a fad; there is no direct development of a new strain, just marketing of corals that already have unique attributes when taken from the wild. In fact, it is doubtful that any genetic changes at all would be possible in an organism produced by direct fragments (cloning if you will) of the parent colony. Many corals are “phenotypically plastic” that is, they change the form they take, their size and their color all in response to being kept under different environmental conditions. Hobbyists taking advantage of this plasticity are not actually creating a new form, as the coral will change its morphology again when moved to an aquarium having different conditions.

In addition, it may be possible to patent the procedure used to produce a new type of animal, as in the case of the GloFish® that is a genetically modified (GM) zebra danio. There are also now some GM cichlids; angelfish and the like. Not all people see this as an improvement over the wild genotype, in fact, the sale of GM animals may be controlled by laws in some countries, including Great Britain (where their sale is apparently illegal). It apparently is not possible to patent animals derived from selective breeding, but it may be possible to trademark the names for such animals.

Looking back on previous aquarium inventions may be helpful, both in terms of what to and what not to do. The undergravel filter was a revolutionary device in the 1950's. The first one that I'm familiar with was a series of slotted green tubes placed under the gravel and operated by a simple airlift. These worked fine, but evidently, the manufacturer did not secure appropriate patents, as in 1960 Allan Willinger patented a plate filter referred to as the "Miracle Filter". A similar trend was seen with thermostatic heaters, diaphragm air pumps, all-glass aquariums and protein skimmers. None of the original manufacturers of those products were able to compete with similar products that were subsequently produced by other companies.

Although I've spent a fair amount of time dreaming up inventions of my own, I really don't have the time to focus on developing any of them myself. I prefer to write down my ideas as magazine articles and in books, and let others take it from there. In 1993, I described a method to control various pest anemones and algae in aquariums using slurry of calcium hydroxide. This idea was modified and has been marketed by at least one company. In my 2006 book, *Advanced Marine Aquarium Techniques*, I discuss two other potential ideas. One is a titanium contact switch connected to the pump running a protein skimmer to prevent accidental overflows. The other idea I describe in the book is a prototype for a pressure chamber used to resolve popeye (Exophthalmia) in fishes.

Currently, there is a flurry of activity looking at applying Light Emitting Diodes (LEDs) to aquariums, in particular as possible low energy reef aquarium lighting. I think there is also the possibility of developing mini-aquarium lighting fixtures using MR16 bi-pin 12-volt halogen bulbs such as the 5300k Ushio lamp.

For all inventions, securing a patent becomes a vital part of the process. A patent is a set of exclusive rights granted by a government to an inventor for a limited period of time. In order to ensure that the patent is unique, there must be a public disclosure of the details of the invention.

The patent procedure varies widely between countries, and due to the vast legal ramifications, it is always best to involve a patent attorney at some point in the process. A patent does not give the inventor the right to produce and market the invention, but rather, it protects the inventor from others who may try to develop and market the same product. Complicated devices or processes may be covered by multiple patents. Taking into consideration the cost of the patent application, maintenance fees and the potential



legal costs to defend a patent, the cost of this process can run in the tens of thousands of dollars.

Alternatives to patents include copyrighting an intellectual property, keeping the device or process protected as a “trade secret” or by producing a “defensive publication”. The latter is a published outline of the method used to create the invention. Then, at a later date, should you wish to pursue a patent the preexistence of your idea may help demonstrate that you indeed were the originator of the idea.

One very important aspect of the invention process is that of liability. With inventiveness comes the responsibility to develop products that can be safely used by consumers. A recent issue with a brand of aquarium heater comes to mind where the product failure initiated a voluntary recall by the manufacturer – but not until many consumers had problems with the defective product.

Various governmental agencies have become increasingly concerned about pet stores selling potentially dangerous chemicals to their customers, and the laws governing their manufacture and sale are likely to increase dramatically in the near future.

Even great inventions will languish if they are not marketed properly. Self-promotion is one course of action, but will certainly prove costly, and entails the greatest amount of risk for the inventor. You might be able to sell your invention to another company to develop and market, but there is always a risk of being “shut out” through legal wrangling, and even if the deal does go through, your financial gain will be correspondingly less, as the other company is assuming all of the risk. Special care must be taken if you develop a product while an employee of another company. A lawyer will be required to ensure that your invention is indeed your own, and not owned by the company you work for.

There are a variety of companies that offer to review your invention, and help you with patenting and marketing the product. Taking a lesson from “vanity book publishers” and “talent scouts”, if any of these firms ask for you to pay for their services up front, assume that this is the way they make their profit, and find another outlet for your invention.

In some cases, a blended marketing scheme may work; you develop your invention, market it on a small scale to “prove” its marketplace acceptance, and then take those results and develop a sales plan to sell the product rights to a larger company. I did this with some aquarium software I developed in the 1990’s – I could show the prospective buyer my past sales, and that made the product more desirable to them.

As with any novel venture, promoting an aquarium invention has a financial risk associated with it that is proportional to the amount of time and funds invested in the project. People have invested their life savings into developing a product that never pans out. If you are accepting the risk of such a venture by yourself, (and not as an employee of a company) try to mitigate that risk by starting to market your new invention slowly. Don’t invest more than you are willing to lose as you would through other similar risky ventures such as the stock market.

**Manufacturing, distributing, publishing and consulting:**

Successful companies involved with equipment manufacturing and distribution are usually good-sized concerns, with the smaller firms being “garage” or “spare room” based part time ventures. With the larger companies, the same career choices are available as with pet stores; you could work in sales, become a manager or even eventually become an owner of the company. With a few exceptions, these firms do not hire aquarist/researchers for product development – they do this work themselves, or more commonly, perform no real R&D at all. The most important position in this part of the aquarium field is that of salesperson. Some may find that career more or less distasteful, especially since there is little opportunity to work directly with very many animals. On the other hand, the pay is good if you work hard, you’ll get to travel and make many business contacts and the field really needs salespeople who understand fish and truly know the products they sell.

The publishing and consulting side of the aquarium business can support only a few full-time employees, so many of these people are involved only on a part-time basis and are covered later on in this book under that section. Unless you can “buy your own career” by starting up a magazine, or developing a well-capitalized consulting firm, it is probably best that you look elsewhere to begin an aquarium career.

**Importer/wholesaler, collector, breeder:**

For those interested in private sector work with aquariums, and really don’t want to work too much with customers, careers in this aspect of the field may offer them what they seek. Working for a large wholesale firm will entail some telephone sales, also packing and unpacking fish shipments, disease control, etc. Best of all; you get “first dibs” on the coolest fish, right when they arrive! The hours are sometimes strange; at one wholesale firm, I used to work from 6 pm until 2 am three nights a week packing orders to pet stores for ship-out the following morning.

Tropical fish collectors often have a difficult time making a go of it on a full-time basis. At first it would seem an easy way to make money, at least based on the price of some marine fish in pet stores today! In reality, the work is backbreaking, diving can only be done weather permitting, some fish are becoming scarce, and legislation regulating collecting is increasing all the time. That \$75 Queen angelfish in a pet store probably netted the collector (no pun intended) less than \$10.

Fish breeders/farms operate many successful companies, and employ many people in sales, fish husbandry and packing / shipping. Since it is generally too expensive to propagate tropical fish in northern climates once the heating costs are factored in, most of these firms are located in central and southern Florida. Some of these companies blur the line by rearing some fish and importing other fish to “grow out” for later sale. Since few

farms are large enough to supply more than a token number of species, many of these farms specialize in one group of fish and then sell to a Co-Op of one type or another.



**Toledo Zoo Aquarium in 2011 – prior to its renovation**

### **Chapter 3 - Public Aquarium jobs**

Working in a public aquarium is probably the career most people think of if they want to work with aquariums and fish. I recall visiting the Shedd Aquarium in Chicago when I was eight or nine and speaking with the curator (later director) William Braker about some problem I was having with my home aquarium fish. He took the time to answer my question, and really knew what he was talking about. I knew right then what career path I wanted to follow.

Public aquariums are springing up all over the world and there is at least a minor shortage of qualified applicants for many jobs in the field. Still, it isn't unheard of for an aquarium to receive 20 to 30 applications for every entry-level aquarist position they have, so it pays to build your qualifications so that you'll outshine all the other applicants. Public aquariums range from research-oriented facilities aligned with universities to huge theme parks that focus on family entertainment. Some aquariums are built as part of zoological parks while others are standalone facilities. Some aquariums are huge, housing over ten thousand animals, others are small, and may contain only a

few hundred fish. None of these formats is inherently better or worse, just different. They all need to supply their living aquatic collection with the best care possible, and in that respect, they are all very similar.

There are three main areas of public aquarium animal-related positions: husbandry, curatorial and executive staff. It is sometimes very difficult for an outsider at a facility to know exactly where a given position will fit into the greater scheme of things. The following is a generalized hierarchy for a typical moderately large public aquarium's animal care department:

#### Husbandry

- Assistant aquarist
- Aquarist / trainer / diver
- Senior aquarist
- Life support systems operator

#### Curatorial

- Assistant curator
- Curator
- Department manager

#### Executive staff

- Director of husbandry (sometimes curator)
- Director of operations
- Executive director

There are three "self-tests" people can use to see where their job lies if the titles don't match those in this model:

**Do you routinely feed the animals?** If yes, you are husbandry staff.

**Do you formulate the animal collection plan?** If yes, you are curatorial staff.

**Do you have direction over the master planning process?** If yes, you are executive staff.

What specific tasks are performed by public aquarists? The complete answer is as varied as there are different aquariums. However, most general duties are similar at all institutions. Curators, husbandry directors, and other managers tend to concentrate on tasks near the bottom of the following list, while entry-level public aquarists would spend the majority of their time working on tasks towards the top of the list:

Custodial work:

In most aquariums, some routine custodial work is expected of the aquarists. This often consists of wiping down the outside of the exhibit glass, emptying trash receptacles, and cleaning the public hallways. In most cases, this relatively unpleasant task is mitigated by at the same time, inspecting the health of the display animals.

#### Specimen feeding:

One of the more popular tasks is feeding the animals in the aquarium's collection. It is perhaps the single most important thing that an aquarist can do for their charges. Diet formulation and preparation followed by an appropriate feeding regimen is the cornerstone of maintaining a healthy animal population.



**Only public aquarists get to work with bizarre creatures such as this deep sea isopod**

#### Exhibit maintenance:

Much of the aquarist's effort is spent towards keeping the exhibits in a presentable condition. Routine work includes removing algae from the exhibit, water changes, redecorating exhibits and preventative maintenance of the life support equipment.

#### Disease identification and control:

The first step to controlling diseases and environmental problems is early detection. The aquarists soon learn the normal behaviors of the animals in the collection and are quick to identify any abnormal changes. Water quality analysis and veterinary care serve as a back up for this front line defense.



**The historic Belle Isle Aquarium prior to its closing in 2005**

#### Interactions with the public:

For the public, the most visible aspect of an aquarist's duties includes facility tours, feeding demonstrations, media event interviews, and responding to telephone calls and letters. This direct contact with the public is vitally important. A poorly handled response to a media question can result in a negative reaction from the public.

#### Clerical duties:

Every organization requires a certain amount of clerical and records keeping work. Ranging from daily reports to yearly specimen inventory data, paperwork is an everyday task for the public aquarist. The key to avoid being mired in a sea of paper is to know what data should be retained and for how long. In recent years, email contacts have taken precedence over written correspondence. A manager must work hard to limit their email to only important subjects; else they may find themselves spending many hours each day sifting through hundreds of worthless messages in order to read the few important ones.



#### Exhibit planning/construction:

All public aquarium staff constantly strives to improve their facility. The degree to which they succeed depends on the amount of available resources. Financial resources are of course helpful, but great strides can be made by a solidly motivated staff even in the absence of sufficient funding. All new exhibits must be designed with the interests of the visitors foremost in mind.

#### Education:

A cornerstone of every public aquarium's mission is education. Directly or indirectly, everything an aquarist does has the education of the public as part of the goal. "Sweeping the hallway promotes education?" A pleasant and clean facility enhances the public's visit resulting in a more receptive state of mind for any educational messages being presented. "The sale of rubber fish in the gift shop?" Profit from gift shop sales helps support the operation of the entire facility, including educational efforts.

#### Specialization:

Some aquarists, out of necessity or just personal preference, become specialized in one narrow aspect of aquarium husbandry. If done correctly, (such as a focus on seahorses or jellyfish) this can result in the potential for having a unique, very salable skill that will be much in demand by public aquariums. A poorly planned specialty focus (such as expertise in say, fancy goldfish) can result in an aquarist whose main job expertise is not in demand by very many aquariums. Recently, specialized aquarists have found success in the following areas; amphibians/reptiles, birds, coral culture, seahorses/seadragons, jellyfish, life support systems and larval fish propagation.

#### Research / conservation:

Research must be performed for any aquarium to forge ahead in the field of aquatic animal husbandry. Generally, this work is directly applicable to solving some current husbandry problem. In other cases, the effort is geared towards conserving some aspect of the aquatic environment. This is where a public aquarium can really shine. Few other organizations have the luxury of access to such a wide variety of captive aquatic organisms with which to work.

#### Specimen acquisition / de-acquisition:

Choosing which animals to exhibit in a public aquarium is not an easy task if it is to be done correctly. For each potential new addition, assessments must be made as to the relative value that the organism has for education, conservation and public appeal. The facility must have the resources to properly care for it. Should a time come when an animal is no longer needed for exhibition, its proper de-acquisition must be addressed. Some aquariums allow surplus animals to enter the pet trade. In other cases, extra

specimens may only be sent to another public aquarium. Without very careful planning, a surplus condition can result with there being no appropriate avenue of de-acquisition. While euthanasia might be a final solution in these cases, most aquariums elect to move these surplus animals to reserve aquariums.

#### Employee supervision:

In this work, the public aquarist's effort differs little from that of any other properly administered business. Not surprisingly, payroll is the largest single budgetary item for a public aquarium. In order to insure the best possible staff, it is important for management to train and evaluate employees properly.



**Interior of the Belle Isle Aquarium circa 2005.**

#### Budget development:

Every aquarium has a projected budget under which it must operate. Available funds must be directed in a manner that maximizes results. Treating any available money as one's own is good advice. Finding ways to cut costs without affecting the level of care given to the animals is a trait that all good aquarists soon learn.

#### Input into facility-wide operations:

The husbandry staff of an aquarium never operates in a vacuum. Additional support staff includes directors, marketing, maintenance, finance, veterinarians, and education. The aquarists need to support these other departments and they must all work together as a team to insure that the entire facility continues to operate at peak efficiency.



Facility master planning:

Beyond the continual development of new minor exhibits, each aquarium has a long-range master plan that is intended to guide the long-term development of the facility. The time span encompassed by a master plan is generally ten years. Aquarists can offer valuable input towards this plan, complementing that supplied by other departments. Developing a new master plan can be an exciting time. This is the occasion to use one's imagination to help guide the facility to new heights of excellence.

### **Compensation**

Despite what some naive people might believe, the primary driving force behind anyone's career is the salary they receive. No matter how much they love their work, unless a person has sufficient money from some other source, they need to earn a living from their chosen career. Aquarium work is no exception. Table 2 lists a variety of full time aquarist jobs and their relative salaries. This is an unscientific estimation based on recent classified advertisements seen for jobs in these fields. Remember that for each year after this book has been published, that these salaries need to be adjusted based on the history of the economy since the date of publication. One thing that is important to note is that in the 15 years since this book was first published, the low salaries for the listed jobs have not increased much, but the high range has (for limited positions). This has resulted in a much wider spread for each range. It is unknown exactly what may account for this trend, and it may simply be an artifact of how I collected the data.

<u>Job Title</u>	<u>Low</u>	<u>Average</u>	<u>High</u>
Pet store clerk	\$15,500	\$19,000	\$23,000
Pet store manager	\$16,000	\$19,000	\$29,000
Public aquarist	\$17,000	\$24,000	\$46,000
Senior public aq.	\$25,000	\$29,000	\$56,000
Mammal trainer	\$29,000	\$32,000	\$56,000
Assistant curator	\$30,000	\$40,000	\$75,000
Curator	\$33,000	\$48,000	\$90,000
Director of husbandry	\$46,000	\$68,000	\$100,000
Executive Director	\$60,000	\$90,000	\$175,000+

**Table 2: Relative Annual Salary Ranges for Various Aquarium Professions**

Other than a salary, the primary benefit of working for a public aquarium is the ability to work with living animals in captivity in a professional manner. Other less obvious benefits include being able to freely network with some of the finest aquarists in the

world, do husbandry related research, and become involved in significant animal conservation projects. Aquarium employees are also often able to travel as part of their job. In some cases, this may entail a short drive to a neighboring aquarium for a one-day meeting. In other instances, the travel might involve a specimen collecting trip, a research expedition to the tropics or a weeklong conference of zoo and aquarium professionals in a major metropolitan area. One recent development is that of “eco-tours” for the public led by an aquarium professional. For the participants, these trips are more than a vacation, but a bit less than a full-blown research expedition. Some lucky aquarists are given the task of leading such trips, with pay and without using their vacation time! I’ve led trips to Mexico, the Galapagos and the Bahamas – other aquarists I know have taken groups to Tasmania, Africa and the Amazon. I sometimes spend as much as one month a year away from the aquarium; traveling to meetings and working in the field.

### What is your current yearly salary? Asked of 380 public aquarist and curators



### Salary Survey of aquarists and curators taken in 2014

#### Aquarist:

An aquarist is the primary caretaker for a public aquarium’s collection of aquatic animals. Their chief duties are to inspect the animals for health problems; clean the exhibits, perform work area maintenance, and prepare and distribute diets. As they gain experience, additional tasks may be added including; exhibit construction, interaction

with the public, disease control and husbandry research. There are also “specialty” aquarists whose work might focus on dive shows, equipment repair, nighttime aquarium supervision, or animal quarantine.

Some institutions have an entry-level position that goes by various names including: “aquarist-trainee”, “assistant aquarist” or “aquarist II”. In these cases, the “full aquarist” position may have some longevity factor associated with it, for example; an assistant aquarist who has worked at a given job for two years then becomes a “full aquarist”. Some zoos with aquariums on their grounds may not differentiate between their zookeepers and aquarists, so their aquarium workers may be called “zookeeper-aquarium”.

The aquarist positions at a given facility may or may not be a union job, depending on the history of similar work at other companies in that particular area of the country. Pay may vary widely at different facilities, but this is mostly based on the geographical location of the aquarium. For the most part, aquariums in the South pay their aquarists a bit less than do similar facilities located in the Midwest and Northeast. Aquariums in Hawaii and California or in large metropolitan areas offer relatively good gross pay, but the higher cost of living in these areas may more than negate that factor. Private, for profit aquariums tend to pay more than government administered facilities, and private, not-for-profit aquariums lay somewhere in between. Health benefits for aquarists may range from none for some seasonal workers in the south to full medical, dental and vision for aquarists in major cities. Generally, however, these benefits have eroded over the past 15 years with a move toward HMOs, higher co-payments and employee contributions rising and coverage dropping (This is not unique to people in aquarist positions – it applies to virtually everyone in the work force today).

Aquarists in most instances are considered non-supervisory employees, and as such, must be paid overtime for hours worked in excess of 8 per day or 40 per week. At some aquariums, this can contribute 10% or more to an aquarist’s base pay in an average year. However, since aquariums are “24/7” operations, some aquarists, especially those with low seniority, should expect to work weekends or other odd shifts without receiving any premium pay. Table 3 lists a hypothetical “typical day” for an aquarist.

8:00-9:00: clock in, check email, clean lobby, inspect display aquariums  
9:00-9:30: Inspect reserve holding areas  
9:30-10:00: do specialty feeds; mysid shrimp, jellies, seadragons  
10:00-10:15: break  
10:15-11:00: prepare foods  
11:00-12:00: feed out foods to animals in building  
12:00-1:00: lunch  
1:00-2:00: clean various tanks and filters  
2:00-2:30: specialty feeds, baby fish, etc.  
2:30-2:45: break  
2:45-3:30: weekly aquarium department meeting  
3:30-4:45: work on new exhibit construction

4:45-5:00: write daily report, clock out

### **Table 3: A typical day in the life of an aquarist**

#### **Senior Aquarist:**

This position implies that the aquarist has had more experience at their work than has a regular aquarist, and thus is given more responsibility and higher compensation for their efforts. At some institutions one becomes a senior aquarist automatically after some amount of longevity has been shown (four years' prior experience as an aquarist is a common standard). At other aquariums, becoming a senior aquarist is wholly a function of promotion; uninspired workers may stay forever at the basic aquarist level, while hard workers may be rewarded with advancement to senior aquarist in a couple of years. Some aquariums have no limit on the number of senior aquarists on staff, while others may limit these promotions to one senior aquarist per work area.

The duties of a senior aquarist range from virtually the same as a basic aquarist to that of almost a curator, depending on the organization of a given facility. In general, senior aquarists are expected to set a good example for the basic aquarists, supervise and mentor them, and perhaps do a bit more in the way of exhibit planning and higher-level problem solving.

Pay for senior aquarists are generally on the order of 10 to 20% higher than for an aquarist position. Benefits are usually identical to that of the basic aquarist position with the exception of more vacation time due to longevity.

#### **Water quality / laboratory technician:**

Aquarists with strong chemistry or laboratory skills may find that they are qualified to work as a water quality or lab technician for a public aquarium. Because these positions require special skills, (not normally learned "on the job" as an aquarist) most aquarists who are promoted to this level find that it is a result of some prior experience, such as a strong background in chemistry, previous work in laboratory, etc.

Duties for these positions may include monitoring water quality for various aquarium systems, animal necropsies, research and computer records keeping. Generally, these technicians don't have any regular animal husbandry or custodial duties to perform, something that makes such jobs more attractive to some individuals. On the other hand, the routine water quality monitoring may prove too repetitive for the likes of certain people.

Pay and benefits are usually the same as that of senior aquarists, or in a few cases, just a bit better. Due to the minimal physical nature of this type of position, it is one of the few aquarist-related jobs that are more open to people with minor physical challenges.

#### **Animal trainer:**

A biologist who works with marine mammals needs a much different skill set than does an aquarist. These positions, usually termed “animal trainer” are involved with the husbandry of marine mammals, usually whales, dolphins and seals (but also including sea lions, sea otters and polar bears). Much of this person’s time is spent working one on one with animals for behavioral enrichment, training for animal demonstrations and accessibility for veterinary procedures. They must be meticulous in their record keeping, be able to perform well in front of the public, and be able to empathize with their animals without becoming too emotionally attached.

If you were to ask elementary students who say they are interested in becoming marine biologists, most would further define their future career wishes as “being able to work with dolphins”. Obviously, there is a great desire with many people to do this sort of work – far more than there ever are job openings. I often bluntly tell students that their chance of being able to work with dolphins in the United States is probably less than their chance of being elected as a U.S. Representative! By the numbers, there are more people in the U.S. House of Representatives than have jobs working with captive dolphins and whales in this country. I always try very hard to dissuade students who tell me they want to work with dolphins. My thinking is that the few truly dedicated students won’t listen to me anyway, but I may be able to talk the rest of them out of what will surely be a futile attempt at reaching their goal. It can be safely said that a career working with captive dolphins is one of the most sought after jobs in the world in terms of the number of people who try to attain that goal versus those that succeed!

#### **Assistant curator / manager:**

This position may not be present in all aquariums, especially newer facilities that utilize a non-standard employee organizational system. Applicants for these jobs are generally solicited from within, and may have previously been senior aquarists or laboratory technicians. In most cases, this position is that of a front-line, lower manager with the task of directly supervising the aquarist staff, ordering stock, having daily contact with visitors and generally performing other tasks as requested by the senior managers. They rarely have the opportunity to work at substantial research or collection planning (In a factory setting, this position would be called a foreman).

Benefits are generally a bit better than for senior aquarists, and the pay is usually about 25% higher. Because these managers are considered exempt supervisory employees, they are usually not paid for any overtime worked, and work weeks of 50 hours are not unusual. More than a few senior aquarists have discovered that when overtime is taken into account, they stand to earn less money as an assistant curator than they would as an aquarist.

Still, for most aquarists, this is their “big chance” – to make the move into a management position. Despite its drawbacks, (low pay, long hours and some boring tasks) many aquarists strive for such a position as this is perhaps the best way to advance

in aquariums to the level of curator and beyond. In some cases, your employer will urge you to apply for a position like this in the hopes to keep you available for other advanced positions in the future. This “grooming” generally works out for the benefit of the employee in every instance: you take the job as an assistant curator and do very well at it for a few years. Either a curatorial job eventually opens up at your present facility or you then have enough managerial experience to move on to a new facility – either way, you win!

Bear in mind however, that this may be a one-way street. Rarely if ever, can an aquarist make their move towards a management position, gain a toehold there, but then fail and expect to move back as a full aquarist. Employers may see this failed career move as a failure in all regards, and the employee generally ends up being forced to leave the field of public aquariums altogether.

### **Curator:**

In the broadest sense, an aquarium curator is a mid-level manager charged with overseeing all aspects of the animal collection: collection planning, husbandry, and aquarist supervision. At smaller facilities, additional duties may include public education, facility maintenance and in some cases, direct animal husbandry. Some larger facilities have “area curators” – these people supervise the husbandry of animals in only a specific area of the building, and work with other area curators under the direction of either a general curator or director of husbandry. To offer some more insight into the work that curators perform, table 4 lists the tasks I completed in a typical workday.

7:45-8:15: Read email and listen to telephone messages, delete unnecessary ones.  
8:15-8:45: Make rounds through building, meet with staff.  
8:45-9:30: Respond to emails; submit research paper to a journal.  
9:30-10:00: Call a fellow aquarium curator; seek advice on pending shark move.  
10:00-10:45: Make assorted phone calls to vendors, placing orders, etc.  
10:45-11:30: Treat new group of gizzard shad for protozoan disease.  
11:30-11:45: Euthanize two Lake Whitefish due to severe chronic health problems.  
11:45-12:00: Treat shark exhibit with iodine to combat goiter in one fish.  
12:00-12:45: Skip lunch, work on aquarium careers book.  
1:00-1:45: Move a small display aquarium to the zoo’s front office.  
1:45-2:00: Answer questions from curious employees about the animals in the new tank.  
2:00-2:30: Buy a soda, read email.  
2:30-3:00: Return various telephone calls from the public.  
3:00-3:30: Design filtration system for 900-gallon exhibit scheduled to be renovated.  
3:30-4:00: Prepare basement reserve tank to move a black tip shark upstairs to display.  
4:00-4:15: With aquarists, move black tip shark to main shark exhibit.  
4:15-4:45: Observe sharks for signs of aggression – intercede when it is seen.  
4:45-5:15: Close up office, file papers for the day.

Evening:

Two hours at home: writing, responding to home emails and researching a new temperate Atlantic exhibit idea.

**Table 4: A day in the life of one aquarium curator**

Perhaps the most important task of the curator is that of animal collection planning. Under the guidance of the facility director(s), the curator must formulate a comprehensive plan that is a careful balance between what is possible to accomplish with the resources at hand, and that which is as interesting and educational as possible for the visitors. “Curatorial discretion” can be used to acquire some animals that the curator is personally interested in, but if over-used, can result in an animal collection filled with tiny, dull obscure species panned by the visitors. A constantly updated collection plan avoids any confusion as to the direction the curator wishes to take the aquarium. One 14” juvenile giant grouper that I accepted as a donation when I first became a curator came back to haunt me 10 years later after it had outgrown the largest tank we had available, and I had to scramble to find another aquarium who would take it. Curators cannot just look at the “now” of their animal collections, but also the “future” - how it will change over time. At another aquarium, the curator was so busy with other duties that collection planning was relegated to lesser importance. At first there was little change at the facility, but as time went on, normal animal losses were not being offset by new acquisitions, and what acquisitions that were being made were uninspired “easy” ones. After a few years, the animal collection was primarily older, hardy species or those such as tanks full of cichlids that increased their own numbers by breeding unchecked, right on exhibit.

Second in importance is the curator’s daily direction of the husbandry staff. The aquarists need to be taught as much as the curator is able, using outside resources if necessary. The aquarists need to be inspired and motivated, so that they will be willing or even eager to take on new animal husbandry challenges.

Thirdly, curators usually are responsible for the health of the animal collection, especially with fish and invertebrates where the staff veterinarian is sometimes not able to help very much. Disease diagnosis and treatment, diet formulation and environmental parameters may all fall under the curator’s charge.

Fourth, curators are often the front line for direct contact with the public. This may take the form of “fish calls”, accepting or declining donations, interfacing with staff at other aquariums or being the media contact for news stories.

Finally, many curators find that they are responsible for much of the aquarium’s physical plant, including safety issues such as diving in exhibits.

**Upper management:**

Positions above the level of facility curator are considered here to be “upper management”. Job titles for these might include; director of husbandry, vice president, or assistant director. The curator generally reports to this person, who in turn reports to the executive director. There is much more overlap in this area than with other aquarium positions; there are curators who act autonomously to the point of serving as de-facto directors while on the other hand, there are directors of husbandry whose job function is indistinguishable from that of a curator.

People whose careers have reached the point where they are exploring the possibility of promotion to an upper management position should already be well acquainted with the duties of these sorts of positions, what the requirements are benefits and pay, etc. Besides, as mentioned before – since I’m just a curator myself, I can’t speak with any direct experience on this topic.

Finally, one must be aware that there is some “job title inflation” that has begun to be seen in public aquarium positions. Staff is hired as “curators” when the position (and pay) is really just that of an aquarist. A “vice-president of animal care” may perform identical work to that of a curator. I’m unsure as to what drives this phenomenon; it may be a way to make positions seem more attractive to applicants, or it might be a way for the facility itself to seem more professional based on the titles of their staff.

### **Other public aquarium jobs:**

There are a few other animal-related, specialty positions with public aquariums and zoos, including; veterinarian, conservation biologist, research director and exhibit/facility planner. For the most part, they require advanced degrees or specialized knowledge and are outside the scope of this book. These jobs are rare; most small to medium size aquariums do not even have any positions such as this on staff. Virtually none of these jobs are ever made available to people who do not already have ample prior experience working in zoos or aquariums.

Don’t forget that public aquariums are not just about the animals – public education and entertainment is vitally important. At most aquariums, fewer than 25% of the employees would actually be considered part of the animal husbandry department, the remainder are involved with supportive services such as education, development, human resources, visitor services, maintenance and society board members. It is not totally unheard of for an aquarist or other husbandry person to work in an aquarium for many years, and then discover that their true calling, while still involving aquatic life, may not be working with the actual animals themselves, but rather as a graphic artist, educator or development director.



## Chapter 4 – Other jobs for aquarists

There are other career choices available to aquarists, but are less commonly seen than are jobs in public aquariums or the pet industry. In some cases, the work is fairly close to what has already been described, just in a non-standard venue. In other cases, the work is a bit different from that of a standard aquarist. In most of these cases the potential employee either typically needs higher educational requirements (e.g. careers in the higher education sector) or being at the right place at the right time because jobs are so rare (e.g. entertainment sector).

### **Fish hatcheries:**

Working for a fish hatchery is similar to, but not identical to, working as an aquarist. Table 5 contrasts these two related careers. Most fish hatchery workers and managers have a background in fisheries science, not public aquariums or the pet industry. Work performed is similar, but the scale is often much larger; bigger tanks/ponds, more fish being cared for and more food being prepared. The emphasis is generally on enhancing fish growth and/or reproduction, with the resulting living product going to supply either the food fish industry or the sport fishing industry, or both. The following is a list of contrasts and similarities between fish hatchery work and work as a public aquarist:

<u>Task or job feature</u>	<u>Fish Hatchery</u>	<u>Public Aquarist</u>
Feeding fish	+	+
Bulk food preparation	+	0
Growing fish quickly	+	0
Educational component	-	+
Conservation component	0	+
Lateral viewing of fish	-	+
Disease control	+	+
High variety of species	-	+
High number of individual fish	+	0

+ = important feature of job, 0 = neutral feature, and - = not present

**Table 5. Contrasts between fish hatchery and aquarist careers.**

A few commercial fish hatcheries in both the United States and abroad blend aquaculture for food fishes with that of ornamental species. These facilities offer careers more closely aligned to that of typical aquarist work.

**University / field research:**

Few aquarists find careers in this area simply because those that gain the required advanced degrees (Master's or doctoral degrees) generally choose to work as pure scientists, and forgo the animal husbandry aspect of their career. The few exceptions include universities that have small on-campus aquariums and need staff to manage them, and universities closely allied with major public aquariums. Pure non-husbandry marine biologists, field researchers, oceanographers and the like are outside the scope of this book.

**Science museums:**

Varieties of "hands on" science museums have opened across the country in the past 20 years or so. Most deal primarily with the non-living, physical world, but a few incorporate living aquatic animals in some portion of their educational programming. Because the number of living creatures is generally small, they often cannot afford to hire dedicated aquarists to care for them, relying instead on any of their educators who may have (at least) an interest in aquatic animals. These people often must care for the animals in addition to their regular duties, generally have no aquarist training, (formal or informal) and are usually outside of any of the established informational networks that aquarists use to get information.

Still, working for a year or two caring for a few small aquariums at a science museum is certainly something that will build your resume enough to generally get you at least an interview for an aquarist job at a public aquarium (assuming you meet all the other job requirements).

**Entertainment / movies:**

We've all seen fish and aquariums used in movies, on television and in advertising. In addition, aquariums are often set up in non-typical venues such as restaurants, shopping centers, nightclubs and casinos (with the size of some aquariums at casinos surpassing that of many public aquariums!). Whenever there are living aquatic animals used in such a manner, there must be competent people to care for them. Many aquarists working at facilities such as this have a background working at typical public aquariums, and have made a switch to the entertainment sector for financial or job location reasons. This doesn't make them "second class" aquarists, the work they do is virtually the same as a public aquarist (although there may be a bit less emphasis on conservation and education). The argument can be made that zoos and public aquariums are entertainment facilities, and aside from their conservation and education messages, are no different from an aquarium in a nightclub. Countering that argument would go along the lines the main difference being the value of the conservation and educational components of the zoo or public aquarium. In my opinion, this does validate their existence to a much

higher degree – as long as the conservation and education aspects are not just “window dressing”.

A few aquarists have acquired jobs as “fish wranglers” for movies, television and advertising. At their best, using sophisticated filters, they can set up a gin-clear aquarium, aquascape it, fill it with previously quarantined fish, use it for a day or two’s filming, and then tear it down. At their worst, they set up a cloudy tank, with garish artificial corals and sunken bellied, incompatible fish.

## **Chapter 5 – Part time careers**

In some instances, a person simply isn’t able to make working with aquariums their fulltime career. It may be that they have already begun another, more lucrative career and cannot afford to change, or it may be they do not have the required education or experience for the job they really want. In either case, people that really want to work with aquariums above the level of a hobbyist may find that a part time career is exactly what they are looking for. You might think of it in this fashion – no career is 100% interesting and fun, every job has features about it that may be boring, repetitive etc. So you need to work in a factory in order to pay your bill, that doesn’t mean you can’t have a well-paying, part time career doing only what you choose to do.

In many of these cases, the career is a part time business done out of a person’s home. In these cases, there may be tax deductions for “home offices” and small business expenses. The Internal Revenue Service has very strict regulations regarding what is a legitimate home-based business expense and what are non-deductible expenses from a “hobby business”. You must consult a tax advisor before attempting to take any of these deductions, as the risk of an audit is reported to be higher for people filing returns with home business deductions. In the case of one home-based business that I operated (selling aquarium-related computer software) when my sales dropped below a certain threshold, I stopped declaring the “home office” deduction, and kept track of only direct office equipment and similar expenses against my sales.

### **Part time pet store work:**

For a person who wants to work with fish in a more intense way than the typical hobby aquarium can offer them, a part time job as a pet store clerk might be just the ticket. You’ll most likely get substantial discounts on fish and supplies, as well as getting “first dibs” on many new fish as they arrive to the store. In addition, since you may only be clerking for 8 to 12 hours a week, you are less likely to become burned out that hundredth time a person asks you how to set up an aquarium. Your employer will appreciate your fresh attitude, and if this is your second job, you’ll likely be a good bet in terms of punctuality, honesty, etc. The main drawback of course, would be the fact that part time pet store clerks often don’t earn much more than minimum wage. If you are already well

trained as a clerk, you might locate a job at a store that is both part time and temporary in nature. For example, business is very slow in pet stores during the summer, so it should be no problem at all if you chose to clerk at a store during the fall leading up to the holidays, and perhaps for a few months in the winter. Who knows, the storeowner might extend you an employee discount all year long if you become a regular, temporary employee!

Obviously, many (perhaps the majority) of aquarium maintenance services never progress past the point of being a part time venture. Knowing this, and being interested in such a part time effort, makes these services well suited to some people.

### **Home fish hatchery:**

Just about every hobbyist who actively breeds their fish thinks of ramping up their production to the point where it stops being a hobby and becomes a part time business. The reality of the fish trade does put strict limits on fish prices and species that stores might be interested in buying from you. If you insist on producing old world killifish to the exclusion of all other species, you'll soon find that you've saturated the market, and nobody will buy your fish. By the same token if you breed fancy livebearers, but do not grow them to a comparable size to what is available from commercial fish farms, don't be at all surprised if nobody will buy your fish. It is also difficult for some home breeders to come to terms with the fact that the group of silver angelfish that they fretted over, cared for and coddled for so long will only fetch fifty cents each at the store. The store may not want to buy your fish at all if they are not closely graded for size, or are not a desirable species. For example, few stores will pay anything at all for your clutch of 100 baby convict cichlids – probably the last ones they sold at their store was that pair they sold you the year before!

To make a home fish hatchery a self-funded venture you need to have a business plan: this should consist of a list of target species, their production rate, and their current wholesale value. You should also identify your market area, check with the stores (some chain stores will not buy fish from individuals) and only then, set up your breeding and grow out aquariums.

The more difficult the species is to breed, the more chance it will be something that pet stores will be in the market for. At least two basement fish hatchery businesses were active in the early 1990's selling tank raised marine clownfish and other difficult to rear species. Discus are another popular species to work with, but it is tough to compete in price with discus imported from Asia. I still feel that good sized, fancy angelfish are the best species to target. Every pet store sells a lot of them, they are not so easy to breed that everybody can do it, they don't take up too much space, yet they can bring a fair price if they are grown to a decent size.



**Clownfish can be raised in captivity, but selling at a profit is difficult**

#### **Small business:**

You might consider other small home businesses. As I mentioned, I operated a part time company selling aquarium related computer software I had written. I owned the company for six years, sold perhaps 3500 copies of the program and then sold the rights to the software to another company in 1996.

For a successful part time home business, you need to have a marketable product that can be produced using means at your disposal – which usually rules out injection molded plastic items and the like. Be extremely careful about marketing medications, tank additives and tonics. The U.S. government has been concerned about pet stores selling potentially dangerous chemicals to their customers, and the liability of their manufacture and sale is likely to increase dramatically in the near future.

Some ideas for small home-based businesses include authoring computer software, web page development, manufacturing specialty fish foods (both live and prepared) and constructing decorative aquarium elements such as driftwood attached to slate bases, etc.

#### **Writing:**

Obviously as you can see by reading this book, another part time venture I have been involved with is writing. I have always found writing to be an enjoyable, peaceful and rewarding pastime. Blog entries are perhaps the easiest material to produce, followed by monthly Internet magazine columns, articles for commercial aquarium magazines and then short books. More difficult to develop are popular press pieces, research papers and finally major books. I've written about 160 paid magazine articles since 1982. This equates to around \$50,000 in current dollars, or only around \$1500 per year. Typical payment for a 2500-word magazine article ranges from \$250 to \$600. If I factor in the time spent researching and writing a single article, I estimate that I earn less than \$15 per

hour writing at home in my spare time. I average only 3 to 5 articles per year, but there are more prolific part time writers in the field that produce upwards of 15 to 20 articles in a good year. Even still, few, if any aquarists can earn 100% of their living from freelance writing in this field – most of the best writers end up as the editors for hobbyist magazines or writers for popular press magazines.

There are some less tangible benefits to having your articles published – first is the real kick most people get when they first see their name printed as a byline for their article in a national aquarium magazine. While there are no real celebrities in this field, you may also find that after writing a few articles, when you attend aquarium conferences and the like, people may recognize your name. This may parlay itself into an invitation for a future speaking engagement (Yes, believe it or not, there is an “aquarium topic” speaker’s circuit!). If nothing else, this often serves as a way to open conversations with other aquarists at meetings like that. After that point, you may find that if your material is reasonably well written, and involves important topics, that it may enhance your resume – possibly to the point of being able to overcome some other shortcomings, such as a lack of a degree in the field of biology.

The first task that a prospective author needs to attend to is learning their market. I would caution people not to try writing a book as their first foray into technical writing – the time investment is too great and chance of acceptance is too small. Rather, subscribe to some hobbyist magazines you think you would like to write for, and go to the library and review past issues of those same magazines. Compare the topics of articles in their table of contents with ideas you think you might have enough experience to write about. You want to avoid writing material on a topic that was just covered by another author in the same magazine, just a few months ago. You also want to adapt your writing style to that which you see in the magazine – if you don’t, the editor will likely either reject the piece, or change it so that it does fit the magazine’s format. Your material does not have to be revolutionary, (although this does help) but must be well researched and presented in a fresh manner.

Two things seem consistent throughout the aquarium magazine publishing field; long delays in payment and low pay for any photographs and illustrations that accompany the article. Be aware of the contractual agreement you make when the magazine accepts your article, you want to retain the right to use the same idea in articles for other venues, and restrict their being able to use your illustrations for other uses without making additional payment to you.

Some aquarist/authors, who know their knowledge levels are not high enough to write technical pieces, write aquarium magazine articles on human-interest topics or humor pieces – many magazines will accept these as well, although the writer’s skill becomes much more important in these cases.

Just as the advent of digital photography has made everyone feel they are “professional photographers”, the Internet and computers has made everyone believe they are capable

of being “professional writers”. The market is becoming flooded with “E-books” on aquarium subjects written by people unknown in the field. Some publishers no longer need to pay for content, as there are so many aspiring “authors” and “photographers” willing to supply content for free. The aquarium print book market has almost gone away. Herbert Axelrod reportedly bought a house with the proceeds of his first aquarium book in the 1950’s. With the proceeds of my last book (a basic aquarium book, a bit longer than Dr. Axelrod’s) I was just barely able to buy a new digital camera.

### **Artwork/Photography:**

These part time ventures are related in that they both require technical skill as well as artistic talent. Even the best photographers and artists in the aquarium field do so only as part time work – the only fulltime people are likely to work for a large group such as the National Geographic Society, or are extremely talented, such as Joseph Tomelleri and his native fish artwork. My aunt has worked for many years as a wildlife artist, approaching fulltime status, but unless you are very good at what you do, the market usually isn’t there for that sort of success.

What would your markets likely be? Obviously aquarium publishers need good quality images for their magazine and books, but in many cases do not pay more than \$25 to \$50 per image, and at that they often request that they be allowed to use the image in any future work they choose. It is difficult to market photographs at such a rate, and virtually impossible to produce good artwork or scientific illustrations for that sort of payment. You might try self-marketing your artwork and photos, but this is very time consuming and expensive. Most aquarium photographers, artists and illustrators do this work as a hobby, or as a skill-building device for other careers in the field.

### **Volunteering:**

Most public aquariums have very active volunteer departments. These volunteers work in the aquarium’s education and husbandry departments, doing much the same work as would aquarists or staff educators. Some aquariums even utilize volunteer divers in their feeding demonstrations. What motivates people into making the sacrifice of volunteering their time for aquariums varies with the individual, but usually falls into three categories (in descending order of prevalence): Students looking to gain experience in the field, retirees and other people with sufficient spare time, and a few people volunteer at aquariums because they are interested in the animals, but have fulltime careers in other fields.

In most cases, volunteers work from between 2 and 8 hours per week under the direction of an aquarist or other staff member. Prospective volunteers should understand that many of the people they will be working with might not have much experience as a manager. Problems can and do result from this; an aquarist-supervisor may not train the volunteer effectively, might not motivate them properly or can become too emotionally involved

with the volunteer, to the point where productivity declines. Some aquarists simply choose not to work with volunteers, while others may develop whole crews of volunteers to help them in their areas. Generally, I find that the most effective level is to have a volunteer working alongside you about 20% of the time, taking care to schedule work that requires two pairs of hands for the time when the volunteer is available.

What do the volunteers gain from their experiences? Obviously, there is the satisfaction of helping a not-for-profit institution meet its goals and objectives. Other volunteers gain much satisfaction from working with animals; still others gain knowledge they can apply to their home aquariums. As mentioned, many volunteers are interested in gaining work experience for future jobs in the field. This is a very problematic issue. Some volunteers tend to develop an over-developed sense of self-worth from the experience they have gained. It isn't unusual to see people who have volunteered (often under the guise of "interning") at a facility for less than 50 hours who then highlight that experience on their resume. It may sound harsh, but when comparing volunteer time with time spent as a paid employee, I generally divide the number of volunteer hours by 5 to arrive at equivalent hours for paid service.

## **Chapter 6 – Job acquisition**

Now that you hopefully have some idea as to the various jobs available in this field, as well as the educational and experience requirements for them, you should be ready to go out and get that "dream job" – or at least a "stepping stone" job that will help you eventually obtain your career goals. Be aware that the job search process is fraught with negative experiences; employers are going to slam doors in your faces, seemingly less qualified applicants will be hired ahead of you, and your stress level will no doubt be very high for extended periods.

### **Defining your needs:**

In the most basic of requirements, you first need to know what level of work you are capable of performing, which employers might hire you, and know if the compensation will be sufficient to maintain the lifestyle you desire. There is no point in applying for jobs that you are not remotely qualified for, and conversely, do not sell yourself short by applying for jobs you can easily perform. If you want to work as an aquarist, but you will need a salary outside the range for an entry-level position, you may need to look elsewhere for work and fulfillment in your career. Be certain that your needs are within the scope of the position you are seeking.

There are less tangible career needs that you should consider; will the job require that you relocate to a new area? Most aquariums and larger pet stores are located in major metropolitan areas – yet many biologists loathe the big city life, and prefer to live in less urbanized areas. Does the employer offer benefits inherent with their operation such as access to a great research library, a unique location (like the Caribbean), free parking,



subsidized meals, or even just a great group of co-workers to hang out with after work hours?

### **Gaining experience:**

The old line, “Must have prior experience” still holds true, ironically even for entry-level positions. How can a person get that prior experience? It is a real “Catch-22” dilemma. As previously mentioned, experience at a lower job (such as pet store work prior to applying for a public aquarium job) is very helpful, as is volunteer efforts and time spent in intern positions. In some cases, you need to create your own experience by working with fish in your home and then documenting your knowledge by writing about it. One well-known public aquarist did just that; he parlayed his career as a schoolteacher into that of a respected aquarist by showing employers that he had taught himself enough about the field to more than handle the work requirements of an aquarist. It is doubtful that any other schoolteacher, lacking that experience, could have ever made the same transition to aquarist.

### **Locating job announcements:**

When I left college with my bachelor’s degree in biology firmly in hand back in 1981, I immediately began sending out resumes to every public aquarium that I could locate an address for. This was more than 15 years before the Internet became the job search tool of choice, I missed mailing resumes to most of the aquariums in the country, and the few resumes I did send out were “blind” in that they were not associated with any particular job announcement. I subscribed to the Miami Herald and the Key West Citizen Newspapers, vainly hoping to find a classified job ad in my field. I knew that “blind resumes” were only kept on file for 6 months at best, and I deplored the idea of sending out photocopies, so twice a year I would laboriously re-type my resume and send it out again to the top employers on my list. It took four years of working in pet stores and eating peanut butter sandwiches, but I eventually was offered two interviews simultaneously, and ended up accepting an offer from the John G. Shedd Aquarium in Chicago. Nowadays, the job applicant has the Internet as a primary resource – including the Association of Zoo and Aquarium’s web site at: [www.aza.org](http://www.aza.org) - the primary source for public aquarium jobs in the United States. For those interested in private aquarium and pet store jobs, consider looking in the classified advertising section of the various fish hobbyist magazines, or the pet industry trade magazine such as Pet Business.

### **Developing a Resume:**

Your resume and cover letter is usually the first “foot in the door” when looking for a job in any field. Because many aquarium-related jobs will be outside your local area, the resume may be your only means to sell an employer on your qualifications, at least to the point of being granted a personal interview. If you don’t have experience developing a

resume, you should at the very least read a current book on the subject. Some people find that hiring an assistant to help them write their resume is advantageous. I did this once, early on in my career, and have kept the same basic resume format since that time, just updating it to reflect additional experiences. Appendix 1 shows a generalized version of a professional aquarist's resume. It can be used as a template for a generic resume suitable for use in applying for positions at the level of assistant curator up to the level of director of husbandry.

Some people feel the need to make their resumes "stand out" visually – resist that urge! Your resume should "stand out" on the merit of your experience, not the font size or color of the paper used. One enterprising applicant for a preschool teacher position wrote their resume in red crayon. Their rejection letter was reportedly sent back to them written in blue crayon!

As you develop your resume, you will soon discover that there is a conflict between making your experiences seem vast, without resorting to falsehoods. My personal opinion is to not inflate your knowledge – if you do get an interview, the truth will eventually come out, and most human resource departments are adept at knowing when a person is exaggerating on their resume.

When submitting a resume, closely follow any guidelines the employer may give such as "no facsimiles", "plain paper only" and "must be accompanied by a standard application form".

In addition to your resume, any submission for a potential job must include a cover letter. In many cases, that letter will formalize a prospective employer's opinion about you as a viable applicant – even before they read your resume. You need to write a concise cover letter that will quickly set yourself apart from other candidates in a positive fashion – to gain their attention, and show that you are a viable job applicant. A good cover letter should emphasize your personality traits and job skills that show that you are the best-suited person for the job. Avoid reiterating too much information that is already contained in your resume. The cover letter should be customized explicitly for the job you are applying for. I once received a resume that had a cover letter which explained that the applicant was very interested in a position with a "laboratory involved in zebra fish research" – but this was submitted for a position as an aquarist! In today's computerized society, it is very easy for job applicants to send out dozens of resumes in a generic form. These are rather easy to identify, and hiring managers can definitely see that you are sending the very same resume/letter to many different, possibly unrelated firms. I would also suggest that you avoid saying things like, "I just love to work with animals" – while you may think that this sort of statement will show your fervent interest, it may instead label you as someone who is too emotionally attached to animals to be an effective employee. Avoid the temptation to over-customize your text. I once received a resume that stated as the person's goal, "To work with Jay Hemdal at the Toledo Zoo". I

knew that their next resume would list their goal as, “To work with John Smith at the XXX State Aquarium”!

Always have somebody else with good job-seeking skills review your cover letter and resume for accuracy – a single typo or poorly structured paragraph may well move your material to the bottom of the pile.

While working in the pet industry early on in my career, I sent out more than 30 resumes over five years before my efforts finally resulted in my first job interview. Since I was first hired as a public aquarist, I’ve applied for 10 public aquarium jobs and was asked in for interviews seven times. Of these interviews, five resulted in job offers, two of which I accepted (at different times of course!). The obvious point here is once you get your foot in the door, it is much easier to move ahead in this, or any other career.

### **Before the Interview:**

Generally, if you have sent out 5 to 10 resumes and have not yet been called in for an interview, you may be marketing your skills to the wrong people, or for the wrong jobs. If you are being called for interviews for every resume sent out, you may be applying for jobs that you are over-qualified for. Your first contact from the prospective employer will likely be someone in the human resources department asking if you would be interested in interviewing for a position. Usually, for positions below that of curator, applicants are expected to pay their own way to the interview, while for higher-level positions, above curator, these expenses are often paid for the applicant. For curatorial positions, it varies – in some cases part of the expenses will be covered, such as room and board, or just transportation. I have not heard of any instances where travel to an interview was paid for aquarist positions, although in rare instances, for special applicants, exceptions might be made.

Opinions vary on the idea of a telephone/Skype interview as a means to reduce costs for the interview process. Some employers may give you the option of paying your own way to the interview, or meeting for a conference or Skype call. It is often difficult to decide which to do; it depends on how badly you want the job, and how much money you have at the time. It probably will impress a prospective employer if you offer to travel for a personal interview rather than handling it over the phone. Remember, even if you do interview remotely, you will still be expected to meet with them in person at some point in the process anyway. By making the statement: “Thanks for the offer of a telephone interview, but I really want to work for you and will be glad to meet with you in person next week at my expense!” you are showing them you are truly interested in working for them, and it will impress them that you will pay your own way. Other applicants who opt for the less expensive “first telephone interview” will now be at a distinct disadvantage. Assuming you make a good impression, the other applicants will remain simply disembodied voices on the phone, and you will be a tangible person – who hopefully made a great impression!

Be aware that virtually all employers now carefully screen all applicants for pre-existing health problems, drug use and legal issues for prospective employees prior to hiring them. Be sure to comply fully with their testing requirements.

Social media is now a huge issue. Any prospective employer will type your name into various Internet search engines and learn more about you than perhaps you might like them to. Keep your Internet presence 'clean', and check it periodically by entering your name into various search web sites, including Facebook.

### **The interview:**

It shouldn't be necessary to mention this, but you must look presentable for your interview. This means suit and tie for men and a business suit or dress for women. Do not discount the importance of this factor. Removing your nose ring, getting a haircut and wearing a suit shows that you respect the interviewer, and that you really want the job. Although they are gradually gaining acceptance in the workplace, it is still best if you cover any visible tattoos.

I once interviewed three people who were working for me as temporary aquarists while I was looking to permanently fill two positions. One came to the interview wearing the same dirty work clothes they had on that morning, while two brought a change of clothes with them, and changed into business clothes right before the interview. All else being equal, can you guess which two were hired?

Another obvious, but sometimes ignored aspect of the interview is: never lie, never stretch the truth, and always reiterate exactly what is stated on your resume. Remember the employer will have your resume in front of them and they will be checking references, so it simply doesn't pay to misrepresent your skills during an interview. Don't try to turn a four hour "career shadowing" experience you had in high school into an "aquarium internship". Don't list impressive names as references if those people are not very familiar with you, and haven't been asked in advance to serve as your reference.

The interview consists of a process where both you and the employer learn about each other, while you endeavor to present yourself in the best possible manner. The strategies vary; some interviewees spend hours rehearsing potential interview questions with friends and family, while others may just "wing it". At the very least, tour the facility before the interview, visit its web site and read their guidebook before "the big day". Some interviewees approach the process with the attitude of "what can you do for me" while others are opposite, "here is what I can do for you". Interviewers vary as well; some are very laid back, "Hi, how are you, can I get you a soda? Mind if I ask a few questions?" Others use what is termed "the stress interview". Watch out for the latter, it can really trip you up. The stress interview might consist of a whirlwind of meetings with so many people you can't remember who you told what to. The people will vary – some will be very hospitable, others will be downright antagonistic. This is often

orchestrated in that fashion to keep you off balance and to observe how well you react under those conditions.

For aquarist interviews, I generally ask a series of basic husbandry questions, while our human resources director asks the more general questions. Table 6 lists some questions we have used in the past. One question I used to use, right in the middle of the interview was, “So, can you tell us why you think manhole covers are always round?” This throws many people off pace, as they were expecting another fish-related question. I’m not really so interested in hearing the correct answer, (round is the only shape, that no matter how the cover is angled or dropped, will not accidentally fall down into the sewer) but rather seeing how people react to it and use their problem-solving abilities. I also look favorably towards the applicant who is curious enough to ask me after the interview, why indeed are they round?

What is a refractometer and what is it used for?

What do you feel about euthanasia as a population management tool?

If you were given a task to perform, but disagreed about how it should be done, what would you do?

What do you know about ZIMS?

What is meant when a fish is termed a diurnal predator?

Tell us a little about yourself, your ambitions and goals in life?

Are you interested in furthering your education?

What are the top three goals of public aquariums?

What have other people considered your strong and weak points?

In aquariums, what is formalin used for and how?

What is your reason for wanting to leave your present job?

What can you tell us about the husbandry of a chambered nautilus?

#### **Table 6: Some potential interview questions aquarist applicants might expect**

#### **Job offer / negotiations:**

The culmination of this entire process for most people is the moment that the prospective employer makes them a job offer. In most cases, nothing more is required than to smile broadly, shake hands across the table and say, “Thanks, when do I start?” In other instances, the offer is ambiguous; it may not be clear that the job in question is even ready to be filled, what the job description actually is, or even what the salary will be. I had once had a job offer that was rescinded a week later because a new applicant had stepped forward. Luckily, in that case it was an internal promotion and I was able to argue that I had been made a legitimate job offer and should be allowed to receive the promotion. External candidates, if this sort of thing happens to them, may never know what went wrong – an offer was made, they accepted it, yet through some problem, they never ended up with the job.

I once interviewed a likely candidate for an aquarist position. The advertisement that he responded to had stipulated a salary range of \$19,000 to \$23,000 per year. His resume was excellent and he did very well during the interview. After conferring a bit with our human resources department, we offered him the job. At that time, he explained that he couldn't possibly accept the position for less than \$26,000. He may have thought he was negotiating with us, but in reality, the job had to conform to the salary range we had advertised, and there was absolutely no way we could hire him at that salary. Because he had been very dogmatic about not being able to accept less, there was no way to compromise, and we were forced to pass him by and hire another person.

### **The first day on the job – and beyond:**

Before a job offer is made, an employer will likely ask you when you can start work. Unless you are currently unemployed, avoid the temptation to say, "right away!" – While you might think this shows you are really interested in the job, it also shows them that you have no concern for leaving your present employer without proper notice.

Employers know that if you are willing to leave your present job with no notice, you will do the same to them when you leave their employ. It is usually safe for you to ask for at least two weeks, sometimes as much as a month's notice before being able to start your new job. In a few instances, the new employer will be so desperate to hire somebody that you may need to start right away, and they will come out and ask you to leave your present job with no notice. You'll have to weigh this situation very carefully. Why did the employer get into such desperate straights in filling the position that they cannot afford to wait two weeks? Will they perhaps exhibit other "hardcore" business behavior after you are hired, such as frequent layoffs or random firings of "at will" employees?

Most professional aquarium jobs will require you to relocate, often to another state or even a different country. Since people generally have lives outside of their careers, it pays to try to mesh a good job with a good location in which to live. Younger aquarists obviously have fewer family ties, and jobs in exotic locations such as Las Vegas, Hawaii and the Bahamas may be very attractive to them. For a few experienced aquarists without family ties, there are sometimes high paying jobs available in other countries. I recall hearing of aquarium job offers made to Americans in Bahrain, China, Indonesia, the Caribbean and Portugal. My impression has been that if you are contemplating taking a job in another country, be sure to sign a contract with the employer. Some of these jobs are for limited duration (just long enough to get the facility up and running and train the local employees who will take over for you) and in other cases there may be misunderstandings that could leave you stranded without a job, far from home. Aquarists with a family will usually prefer relocating to an area with suitable amenities such as good schools, shopping and entertainment nearby as well as low crime rates. In this case it is usually helpful to speak with current employees and estimate commuting times and relative level of amenities from the area where they have chosen to live. When I moved

from Ann Arbor, Michigan to go to work for the Shedd Aquarium in Chicago, I chose a community to move into without checking with any other employees. It turned out that although I had selected a decent (but expensive) part of the city, it was all the way across town from where all my other co-workers were living. I lost out on a lot of their after work parties, plus any chance to car pool in to work.

Before your first day of work, it is helpful to review the firm's employee manual, know the dress code, and perhaps meet some fellow employees. When you start your job, avoid having people confuse your enthusiasm with being a "know it all". Go slow, make careful observations as to the politics of the company, and above all, don't make any egregious errors in your first few days at work.

Most new employees will be under a probationary period for the first few months, and certain employers have been known to exercise their right to terminate any employee who they have misgivings about during that period. This is especially true of union positions; once these employees pass probation and join the union they are very difficult to remove from their jobs should their work prove to be unacceptable.

Now you are happily employed at your "dream job", is it time to take it easy? No, of course not – you should constantly update your resume; and continue to learn "on the job" as much as possible, network with other aquarists and watch for other job opportunities (if just to keep updated on current salaries, etc.). For those interested in furthering their careers, it is vitally important that they show a progressive, rapid rise in job experience. This means that being able to demonstrate a history of steady promotions with no "blips" that make employers nervous such as working at many previous jobs less than two years, being fired from a job, or accepting a job with less responsibility than a former one. Three to four years at a job, with demonstrated internal promotions is the best way to prepare you for advancement at another facility. Longer than ten years on the job and it begins to seem to prospective employers that you are a "lifer", and they become highly suspicious of your motives if you suddenly decide to leave a job you have worked at for that length of time. Being employed less than three years and subsequently looking for a new job may be commonplace in the technical computer field, or in businesses, but it makes aquarium supervisors and pet storeowners a bit nervous.

## **Chapter 7 - Related topics**

This chapter discusses a variety of topics that pertain to working as an aquarium professional primarily at public facilities, but much of this information applies to the pet industry as well. The inclusion of this information in this book may help familiarize some people with aspect of aquarium careers that they might not be able to learn from other sources. Obviously the soft science topics listed below such as philosophy, ethics and exhibit design are very subjective so are offered here only as thought provoking exercises. Following that are sections on specialized topics for professional aquarists,

ones that don't directly include animal husbandry, and as such, are unlikely to be found in any other aquarium-related books.

### **The “soft sciences”:**

There is an aspect of professional aquarium work that doesn't get much attention, the ethics and various philosophies related to aquarium keeping. Authors involved with basic aquarium issues generally don't delve deep enough into the topic to explore these issues, while people writing on advanced technical issues generally concentrate on the more tangible aspects, and usually only give these topics a brief nod if they mention them at all. Prospective professional aquarists need to at least be aware of these issues, so I decided to include them in this book. At first it may not seem that they have a direct bearing on the aquarium careers of the readers, but I assure you that they do.

### **Philosophy of public aquariums:**

Although there may be variations on this topic between facilities, the basic three tenets of public aquariums are: Education, Conservation and Entertainment. The relative importance of each of these issues may vary between facilities, but all aquariums must acknowledge these principles to one degree or another. Some people try to “hide” or downplay the entertainment issue, ranking it last or splitting conservation and education into smaller sub-sections, so that entertainment becomes only one of five or more basic driving factors for the aquarium. You might also hear aquarists who vehemently disagree with the thought that “entertainment” should even be listed as one of the basic goals for aquariums. You will never hear a chief executive officer say this isn't an important objective! There is absolutely nothing wrong with offering entertaining exhibits for the public, in fact some aquarists realize that this facet may rank at the top of the list of the “big three” – without visitors, there will be no funds to drive education and conservation, and entertainment is the most commonly cited reason why people visit aquariums. Most aquariums have a formal mission statement that outlines these three tenets while also listing others as minor points, such as “operating on a sound business basis”, “using exemplary animal management techniques”, “offering our employees a good working environment” etc.

### **Ethics, the Law and aquariums:**

There are ethical issues involved any time one moves an animal from the wild into captivity. There are some that feel this should never be done, that there is no justification for keeping wild animals in captivity. At the other extreme are those that feel that wildlife is simply a commodity, and if it is profitable to bring a creature into captivity, then they are justified in doing so. Obviously, the vast majority of individuals fall between these two extremes. No matter what your personal opinion is, people who work with aquariums will also face a ‘double standard’ with their animals. For example,



euthanizing a zoo gorilla for a health reason would most likely require an exhaustive review by an animal care committee, veterinary department, mammal department and chief executive officer - while euthanizing a sick starfish might only require that an aquarist take the initiative to do it. Obviously, they are both captive wild animals, yet society has clearly set different standards based on the taxonomical level of the creatures. The manner in which you acquire an animal also has a bearing on the ethics of doing so; some fish are illegally collected with the use of cyanide and other chemical agents. Is it ethical to buy these fish? I argue that it certainly isn't. In any event, the Lacey act makes it illegal to import any animal that was acquired or transferred illegally in the country of origin. Since it is illegal everywhere to collect fish with cyanide, it is therefore illegal to import such fish into the United States – and ethics become a moot point. Some live corals are collected and exported under false CITES permits. This gets them through United States Fish and Wildlife inspection, but is it ethical to buy corals knowing this?

Various laws have been written in attempts to regulate the wildlife trade, primarily to protect wild populations. Some public aquarists think that these laws only apply to commercial importers, this is not true. It can be very helpful to understand these statutes, both to avoid legal troubles yourself, as well as to support the ethical and legal wildlife trade by being better able to avoid specimens that may have been traded illegally prior to your acquiring them. Please understand that I'm writing this from the viewpoint of a professional aquarist, and I'm not a lawyer. Always confirm the legality of potential trade in wildlife with your local officials. The information in this book pertains mainly to Federal laws as they are applied in the United States, other countries will have different laws. Bear in mind as well that the application of some laws varies with the individual enforcing them. While this should not be the case – these things should be very consistent – you may come across in instance where a wildlife officer enforces a particular law in an unexpected way. Additionally, wildlife agencies are hard pressed to inspect every single transaction, so past success with a particular transaction does not necessarily mean that it was done legally.

### **Overview of laws affecting aquariums**

The **ESA** (Endangered Species Act) was passed in 1973, and is designed to protect critically endangered species from extinction. What makes it a strong law is that it also protects the ecosystems upon which the species depend. Individual states also maintain lists of animals and plants that are threatened or endangered within the boundaries of that state (while the same species may not be endangered in other states). As a general rule, private individuals in the United States cannot possess species listed as endangered under the ESA, of which the Asian Arowana (*Scleropages formosus*) is the primary aquarium-related species. Two corals, the Elkhorn coral, *Acropora palmata* and the Staghorn coral, *Acropora cervicornis* are listed as threatened under the ESA.

**CITES** stands for the “Convention on International Trade in Endangered Species of Wild Fauna and Flora”. The 175 member countries use these conventions to monitor and restrict trade in critical species, by listing endangered species into one of three appendices. Appendix I includes those species most endangered in the wild; Gorilla, giant panda and Asian arowana for example. Trade in these species is allowed only under exceptional circumstances. All stony corals, *Tridacna* clams, Napoleon wrasse and seahorses are listed in appendix II. This means that they cannot be imported into the United States without proper permits from the exporting country. Specimens traveling to and from Canada are also regulated in this manner. Appendix III includes species that a single member country wishes to monitor more closely, especially in light of that species possibly needing to be listed in appendix II in the future. Proposals to list, uplist or downlist a species (or population of a species) are made based on new population data and must be approved by a two thirds majority vote of the member countries. These votes take place at the Conference of Parties, or *COP* that are held about every three years. Currently, 86 species of fish and 2387 species of invertebrates are listed in one of the three CITES appendices. In the United States, the office governing application of CITES is the United States Fish and Wildlife Service (USFWS). In Canada, it is Environment Canada.

Most aquarists understand the international trade in all stony corals (Order Scleractinia and some Hydrozoans) is regulated by CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). Since soft corals are not regulated by CITES, how can they be illegal to import in some instances? Well, most soft corals arrive in the United States attached to pieces of coral rock. Since CITES regulates the trade in live or dead specimens (think live elephants as well as their ivory) the rock anchoring the soft coral is actually the material that requires the CITES export permit.



**Captive raised Asian arowana can be legally sold in Canada, but the US does not recognize their status, so they cannot be possessed in the United States.**

The **Lacey Act** was enacted over 100 years ago, making it the oldest wildlife law still in effect (although it was substantially changed in 1981). This Act makes it unlawful to import, export, buy or sell or transport any plant or animal in violation of any law of the United States, an individual state, an Indian tribe, or any foreign government. Technically, it is therefore illegal under the Lacey Act to buy fish that were collected using sodium cyanide (since the use of that compound is illegal in both the Philippines and Indonesia where it is still used to collect fish). Enforcement can be an issue of course, but aquarist still should avoid any transaction that would be a Lacey Act violation – for the sake of wild populations if nothing else. This act is most often applied to the original importer, but it can theoretically be applied to public aquariums who purchase from the importer.

Collecting laws vary greatly by region. In the United States, most of these regulations are determined by the state in which the activity takes place. In some cases, collection of aquarium animals is regulated under a sport fishing license, but in other states, a collecting permit is required. In most cases, commercial collection of wildlife is the most highly regulated. Collection quantities such as daily possession limits are one way this can be accomplished. In other cases, the species may have size limits imposed. “Slot limits” is one method of doing this; a regulation may state that only fish between two particular sizes may be collected (say between 2” and 5” in length). This ensures that the larger adult fish of that species are left in the wild to reproduce, and the smaller fish have a chance to grow up. Frequently, the methods used to make a collection are stipulated, for example allowing only hand nets, or slurp guns and restricting the use of drugs or fish traps.

### **Invasive Species**

Aquatic Invasive Species (AIS), more specifically, those that are Organisms In Trade (OIT) should be a concern of all aquarists. Most aquarists know that invasive species are causing major damage to many ecosystems around the world. Examples include the Eurasian round goby and zebra mussels in the Great Lakes and the Indo-Pacific lionfish now present in the tropical Western Atlantic. Anthropogenic (human-caused) transfers of organisms from one region to another are the biggest concern. Ballast water transfer and deliberate moving of species to new areas (such as the stocking the Nile perch in Lake Victoria) certainly have caused most of the problems, but animals being bought and sold as pets also frequently mean that species are being moved to new areas – and if released to the wild, can cause severe ecological disturbances. It is illegal in every state to release exotic species of plants or animals. Still, people with unwanted pets may feel sorry for them, and there is a strong tendency to “save” them by releasing them to the wild. Remember, the welfare of an ecosystem always takes precedence over that of an

individual animal. Unwanted aquarium pets must be euthanized if another captive home cannot be found for them.

Outdoor ornamental ponds are a special concern. Any organism an aquarist places in the pond, being outdoors, is already one step closer to being introduced to the ecosystem. A spring flood, or even a wading bird may transfer an organism out of the pond and into the surrounding area. Aquatic nuisance plants such as *Hydrilla* and “*Anacharis*” are of real concern in this regard.

Aquarists also need to understand that it is not always the primary organism that is of concern, but also that those primary organisms (say a fish) might be carrying a virus or parasite, that if released into a new region, could wreak havoc on organisms native to that area which might not have normal immune responses to the new disease.

### **Importation Process**

Importing aquarium animals into the United States can be a very confusing process for anyone except professional importers. First, you must have an import/export license (USFWS form 3-200-3). Second, unless you have a designated port exception permit (3-200-2) from the USFWS, any shipments you receive must be scheduled to arrive to one of eighteen designated ports of entry.

Anchorage, Alaska  
Atlanta, Georgia  
Baltimore, Maryland  
Boston, Massachusetts  
Chicago, Illinois  
Dallas/Fort Worth, Texas  
Honolulu, Hawaii  
Houston, Texas  
Los Angeles, California  
Louisville, Kentucky  
Memphis, Tennessee  
Miami, Florida  
Newark, New Jersey  
New Orleans, Louisiana  
New York, New York  
Portland, Oregon  
San Francisco, California  
Seattle, Washington

**USFWS designated ports of entry for**

**wildlife importations. New stations are added from time to time.**

The USFWS is gradually changing over to an electronic shipment declaration system called eDECS. The importer needs to complete declaration of import/export (form 3-177) and submit it electronically at least 72 hours prior to the shipment's arrival. The fees associated with this vary, depending on the port used, and if overtime is accrued during the inspection or not. Commercial shipments must also clear U.S. customs. Hiring a broker who is familiar with wildlife importations is the best course of action for all but professional importers. It is unclear if non-commercial shipments of live aquatic animals traveling with an individual as baggage require a form 3-177, but it is best to always declare anything you are bringing into the United States through customs.

### **Bill H.R. 669**

In the spring of 2009, a bill was introduced to the House that stated it would, *“prevent the introduction and establishment of nonnative wildlife species that negatively impact the economy, environment, or other animal species’ or human health, and for other purposes.”* While the goals of this bill are vitally important, its implementation was flawed. Basically, no exotic animals would be allowed entry into the United States until the importer had presented a case to the USFWS showing that the species would not be invasive in the United States. The “United States” covers a huge range of environments – Florida and Michigan have very different climates, yet would be covered the same under this process. Something that could survive in Hawaii may not survive in North Dakota, yet it would be denied importation if it could survive in Hawaii.

Congresswoman Madeleine Bordallo of Guam (author of the bill) said, *“We recognize the bill is by no means perfect and that changes will be needed to address various concerns before any legislation moves forward.”* This was probably the death knell for this bill; if the author herself says the bill “isn’t perfect”, why should anyone else support it? There is of course, the potential for some version of this bill to resurface in the future.

Aquarists need to be vigilant in watching for new proposals, and help support the formation of better legislation to control invasive species.

### **Possible “sting” cases**

In 1981, there was a case where federal fish and wildlife service agents set up a “pet shop” buying and selling illegal reptiles outside Atlanta. After they had built up a sufficient clientele, they arrested all of their past customers who had purchased illegal wildlife. While this has not yet happened with aquarium fishes, there is that possibility, should enough people continue flaunt the laws. More recently, one state has begun to develop a “WebCrawler” to search for Internet based sales of potentially injurious

wildlife. Their primary interest is in stemming the sale of potentially invasive aquatic plant species from one state to another. Remember that the Internet is a public, searchable resource. One person came to the attention of his local Department of Natural Resources when he joked about potentially circumventing his state's wildlife laws on an aquarium message board. The problem was that he held a scientific collecting permit for that state – and his lack of professionalism could have put his permit in jeopardy.

### **Cyanide issue**

Forty-five years ago, when I was in the fourth grade, our teacher had us all write a "book" which we printed out by hand and bound in cardboard covered in wallpaper. Needless to say, (given my life's interest) the topic of my book was marine fish! Included in this early "masterpiece" was the following sentence: "Anyone who uses drugs to catch fish is a dumb cluck!" Out of the mouth of babes as they say! I dare say my views on this subject haven't changed much in the ensuing 30 years, except that I might change that particular expletive!

The collection of marine aquarium fishes with Sodium cyanide has been well documented. Exporters handling these fish either categorically deny that this takes place, just side-step the issue, or quietly agree that while their fish are collected in this manner, maintain that no major harm is done to the captured fish or the reef structure itself during this process.

In during 4 months in 1985, while manager of a pet store; I tracked 448 directly imported reef fishes through the 30 days following their importation: of this sample, 28.7% of these fish died. All fish were housed in a central water system that also held 11 control fish (None of which died during the study). 31% of the Philippine fish in the sample died. 9.3% of the non-Philippine fish died. Many of the Philippine fish were hardy damselfish. When these were removed from the calculation, fully 61% of the non-damsel Philippine fish died. The non-Philippine fish (no hardy damsels in the samples) included those imported from Sri Lanka, Hawaii, and the Seychelles.

A similar test undertaken in 2006 showed that 55% of a group of Philippine and Indonesian fish died within 30 days of importation versus 3.1% of the control fish in the same systems. In a third study, which followed a group of marine fish for 40 days after their arrival, 55.9% of the fish from suspect areas died while only 6.2% of the fish acquired from more sustainable regions and quarantined in the same system (at the same time) died. Believing that this data IS accurate, throughout my ensuing career in public aquariums, I have strived to avoid acquiring ANY fish collected under suspect conditions. I have also written about, and lectured to others, concerning this problem.

After all this, I still feel that I'm running up against a brick wall. All a fish dealer has to do is to advertise their fish as "net caught", and many of their customers blindly accept this as fact, and the dealer can then continue selling the same cyanide collected fish! Some have argued that there are other, more detrimental impacts to coral reefs than the

use of cyanide. They cite pollution, siltation, dredging, and the harvest of coral as building material. I agree that these other impacts ARE major problems, but that does not allow anyone to condone this added insult to coral reefs! That is just like a person saying that it is ethical to make a copy of a friend's computer program for their own use, since this sort of thing happens on a much larger scale all the time in major corporations.

Over-collecting by ANY means is a problem: since comprehensive population studies on marine fish collection for the aquarium trade have not, to my knowledge, been performed, one must rely on anecdotal methods to determine if this is, indeed a problem. Thirty years ago, a purple color variety of a species of anemone known as the "colored carpet anemone" (*Stichodactyla gigantea*) was commonly seen offered for sale for around \$15 to \$20. About 25 years ago, the price rose to around \$40, and a brown variety of this species began to be seen more often, selling for a slightly lower price. This trend continued until the colored carpet anemone was priced out of the market at around \$60 - \$70. For a time, the brown carpet anemone remained available for around \$30, and then its price also started to edge up. Now, a related brown anemone, *S. haddoni* is being sold as a "carpet anemone" for around \$30, and the "true" brown carpet anemone is becoming scarce. I have not seen a large colored carpet anemone offered for sale from the Philippines for many years. In some cases, these anemones do become available again, but only because a new, as-yet unexploited collecting site has opened up. Some scientists believe that tropical anemones have life spans of well over 50 years, and are prime targets for over-collecting because juveniles take so long to grow to a marketable size. *Paracanthurus hepatus* tangs and *Amphiprion ocellaris* clownfish collected in the Philippines have also shown a similar trend.

Nowadays, many importers list the origin of their fish in that the same species may be available from two or three different countries. The implication is that this allows the customer to avoid the poorer quality Philippine fish, which are often offered at a lower cost (but with a higher mortality rate!).

Indonesian collectors also resort to cyanide, and exporters in other areas sometimes import fish from the Philippines and then export them from their own country as "net caught fish". It has been said that bleach is used in the Caribbean to drive cryptic fish out of their hiding places and into the waiting nets. No studies have been done to examine any harm this might cause the fish, but bleach IS known to harm the delicate living reef corals.

### **Holistic aquarium thought / problem solving**

This is simply being knowledgeable enough about aquariums to see "the big picture" and be able to solve aquarium problems as you encounter them. Think of the equivalent of a person having a gardener's "green thumb" – this is what you need when working with fish in captivity. Unfortunately, it isn't a skill that can be taught to another person, you just acquire it over time. For many years, while growing up, I killed off fish after

fish in my home marine aquariums – partly because I lacked the necessary “knowledge base” required to make informed decisions about the fish in my tanks, but also because it seemed I was just having “bad luck”. A friend of mine had the same lack of aquarium experience as I did, but he rarely lost any fish. It seemed that he just had “better luck” than I did. In retrospect, he simply had a knack for selecting good fish and he definitely showed more restraint in the number and types of fish he bought. Eventually, through trial and error, I developed a similar skill at selecting and maintaining marine fish, but it took some time, and many, many fish. I’d like to think that I’ve developed this skill to an even higher degree over the years, but it is certainly difficult to quantify this. The one bit of advice I wish I had learned earlier was to pay attention to anything about a fish that just “seems wrong”. The vast majority of unsolved aquarium problems began with a person “noticing something wrong or different” but then not carrying through and trying to identify what the problem is. An example of this almost happened to me last week: I was hurrying through the aquarium at the end of the day and glanced into a tank of cichlids as I walked by. I happened to notice that four of the fish were sitting on the bottom in a row, looking out of the tank. My first reaction was, “Hmm, that’s pretty comical looking – those four fish all lined up like that.” I almost kept walking out the door, but instead I turned back for a closer look. Upon close inspection I noticed on each fish, a few telltale white spots of *Ichthyophthirius* – a common protozoan disease. They were huddled on the bottom because they were developing a disease. If I had gone out the door without stopping, the disease would have gotten more advanced through the night. More importantly, this tank shared water with half the other freshwater tanks in the building – and the longer they were left without treatment; the more of a chance there would be of the disease spreading to other tanks. I isolated the tank, treated it, and solved the problem, thinking I was glad I took the time to stop for a closer look!

Making the rounds of the interwebs is a video from a Charlie Chaplin film from 1928 apparently showing an elderly woman walking along talking into a cell phone:

<http://www.youtube.com/watch?v=TiIrpEMbQ2M>

Dubbed the “time traveler cell phone”, people seriously feel that this clip shows something unusual. Why on earth do people think she has a cell phone? I heard NOBODY ask who in the world she might have been talking to (so there are at least two time travelers?) and then, more importantly, how was the cell phone working without cell towers? It would be more likely that this “time traveler” would be using a simple two-way radio. What makes this video so compelling for some people is that we are all so in tune with the body language of a person walking and talking on a cell phone, and that makes it difficult for us to see this video any differently. In my opinion, in this scene, she is holding a hearing aid to her ear and is talking to the elderly man in front of her.

So – what does this have to do with fish? In solving problems, applying Occam’s razor is usually the best course of action: basically, selecting which of the competing hypothesis that makes the fewest new assumptions. So; a new photograph of the Loch



Ness monster is likely to either be a hoax, or can be explained by some other known natural phenomena, as these have already been shown to have been the cause of previous Loch Ness monster sightings. It is much less likely that the photo is actually OF a monster, because that would require proof of a new hypothesis.

Things aren't always what they seem. Many years ago, a person called me and said they had found an unidentified eel while cleaning out a storm drain. After asking many questions, I finally admitted I was stumped and asked if they could bring it in for me to see. When they arrived, I examined what looked like a brown, eyeless lamprey eel. It had a 1" diameter opening at one end, and you could distinctly see myomeres (muscle banding) running around its body. At the distal end, the body tapered to a flat tail. It was about 18" long and 1.5" in diameter. A number of people observed and commented on it. Some felt it was indeed a lamprey, others thought it was some sort of giant segmented worm. I got a scalpel and cut the thick rubbery skin. Inside was a weird network of fibers, a bit lighter than the skin. I suddenly had an idea – I gave the creature a sniff and determined exactly what it was - What did I smell? A very strong odor of paint! This "eel" was a huge drip of oil-based paint that somebody had dumped down a storm drain. The glob of paint had adhered to a root (the reason they were cleaning the drain). Flowing water had stretched to glob of paint out until it dried. The smooth rubbery skin looked so real, everyone wanted to come up with a biological answer to what it was.

Then there was the case of a spinner shark caught in Lake Erie. Other aquarists struggled to determine just how this species of shark could have come to live in the Lake. They debated salinity tolerances of the species, could it have migrated through the Saint Lawrence Seaway, etc. I was more interested in the wrinkly skin of the shark seen in its photograph – obviously to me, someone had caught fish shark in Florida or the Carolinas, froze it, brought it back to Ohio, thawed it out and "caught" it in Lake Erie. Of course, to follow this line of questioning, one would have to call the person who caught it a liar.... but the same hoax had been perpetrated in Chicago years ago with a bull shark. The prankster had brought the shark back from Florida. Early one morning he went to a beach in Chicago, rammed a hook in the shark's mouth and swam it out into deeper water. He then sat there until enough bathers showed up later in the day. He then started jumping around and reeling in his catch. When he got it to shore, he beat it to "death" with a baseball bat. Of course, nobody questioned why he was fishing in Lake Michigan with a baseball bat by his side and a hook the size of his fist....

If you think about it, virtually every major challenge facing us as aquarists is a direct result from our needing to solve a particular unknown animal husbandry problem, (or series of problems) concerning our aquariums. Specimen loss is the penalty for failing to meet this challenge. The rewards are healthy, growing, or reproducing organisms. Use Occam's razor in your development of a solution – the weird new disease your fish have is more likely something commonly dealt with by others before, and is just new to you. High ammonia levels most likely are derived from your animals,

not the window cleaner somebody used in the next room, or as the result of some nefarious poisoning plot.

Aside from simply finding the time to work on the aquariums all aquarium-related challenges can be classified as trying to answer basic animal husbandry problems. Aquarists approach solving these sometimes formidable challenges in different ways; some rely almost entirely on external resources such as magazines, books, the Internet or other staff (e.g.: Please solve my problem for me!). Others strive to completely “fly solo”, forging ahead without really utilizing any external information sources at all (e.g.: I’ll work this problem out on my own!). The former path requires the least resource investment by the aquarist, but often results in being torn between conflicting opinions from the informational sources. On the other hand, the latter route, while perhaps the only real way to proceed when blazing a new trail, does not make sense when attempting to resolve more mundane problems which have already been worked out by other aquarists many years ago.

Obviously then, proficient aquarium problem solving incorporates a combination of these two extremes; search out all available resources, then synthesize that data as you merge it with your own reasoning ability to best solve your aquarium’s problems. Many people find that when faced with a difficult problem, it helps to work out a formal plan for attempting to resolve the issue. The steps in this plan include:

- 1) Recognize the problem as soon as possible: “If something looks just a little bit “off” with a fish, there is almost always a much more serious underlying problem!” In other words, as Mark Loyd, an exotic animal veterinarian: “Beware of any animal that suddenly presents itself as ADR”. That, he explained in a Southern drawl, simply stands for “Ain’t Do ‘in Right”. This phrase describes that unsettling feeling you get when you observe an animal and notice that something appears to be wrong, but you can’t identify exactly what the problem is. The main danger with an “ADR” case is in doing nothing because the problem seems to be insignificant. In reality, you may need to react very quickly; with aquatic animals sometimes the only timely clues you get are these very subtle changes in an animal’s behavior. Less than twenty-four hours from the start of symptoms, to an untreated animal’s death is not unheard of.
- 2) Identify the potential solutions: Once the problem is identified, research the various solutions. List all possibilities: Your fish have tail rot, O.K., so then cut their fins off? Your fish keep dying; so change your hobby to stamp collecting? These may not be your primary solutions, but list them anyway, along with hopefully, more suitable alternatives!
- 3) Select the solution(s): The simplest answer is often your best initial choice. Rank all of the potential solutions in descending order of practicality, risk to the animal and

potential for success - so that you'll have a secondary plan of action ready in the event that your first solution fails to solve the problem.

4) Implement the solution: Once you've done this, give it a fair chance to work. For example, many antibiotics don't show much effectiveness until they have been used for 4 to 7 days. Changing the type of antibiotic used prior to that time may mean that you've skipped over a potential cure for the problem.

5) Record the results: Whether just for your personal records or for passing the information onto other aquarists, it is vitally important to record the results of this process. Success or failure, if you don't record your results, the opportunity to share the information with others is lost. Long-term aquarists with bad memories (like me!) will find if they don't keep good records, they will inevitably waste time working out solutions for the problems they face today, but that they originally solved many years ago!

### **Exhibit design / construction:**

The design of public and private aquarium exhibits is a vitally important skill, but is difficult to teach to new aquarists. One idea is to offer a series of exhibit examples with the hope that in reading them, the new aquarist will formulate their own ideas. Most ideas come to a person while they are studying somebody else's designs. I once was struggling to come up with a name for our new insect exhibit. I couldn't think of a good name on my own, so I started to browse the Internet. Going through various insect sites, I ended up at a site devoted to pest control. I stopped at the sentence, "...and to positively identify these pests, you must first go into the crawlspace and look for them...." And I had the name for the new exhibit, "The Crawlspace"!

#### **Idea #1: Fatal Attraction**

Proposed temporary exhibit for an aquarium. Using graphics and live organisms, the theme of the sometimes juxtaposition of beauty/color and deadly nature would be described. "Fatal" would be defined as an organism possessing the capability (venomous or poisonous) of harming another— especially humans. "Attraction", like beauty is of course, "in the eye of the beholder" – but for species selection it would focus on bright colors, fantastic shapes (especially if they are aposematic). Graphic elements would both interpret the exhibit as well as illustrate certain species that are not appropriate for the living component of the exhibit (e.g. box jellyfish, etc.)

#### **Potential species list:**

Black widow spider  
Blue ring octopus  
Lion's mane jellyfish

Radiata lionfish  
Blue boxfish  
Freshwater stingray

Possibly obtainable species:

Leopold stingray (black with white spots)  
Mimic octopus (brown and white stripes)  
*Rhinopias* scorpion fish  
*Laticauda* sea snake

Security would obviously be an issue. Animals would need to be cared for before 10 am. The exhibits would need to be sturdy enough to protect the visitors from their contents and vice versa. A temporary full-time employee could be hired to serve in a supportive capacity for the aquarium department, freeing up the more experienced staff to handle the dangerous animals during the exhibit's tenure. Of the aquatic exhibits, only the Lion's mane jellyfish require extraordinary husbandry efforts – these would need a \$5000 exhibit tank. Other graphic ideas: a curtained area with a sign that says “the deadliest of all” – open it and have a mirror there. Large photo panels of various small species like the insects. Place a video monitor behind some tanks if the animal is prone to hiding (e.g. blue ring octopus). Then, run a video of that animal in action – through the back of the exhibit.

#### Idea #2: Lake Erie Forage Fish Exhibit

Most aquariums lack the facilities to properly exhibit smaller native fishes – most native freshwater fish displays house predatory animals of one type or another, precluding the display of forage fishes. This proposed exhibit would consist of a 320-gallon acrylic cylinder aquarium would house a large number of schooling forage fish such as gizzard shad or shiners. The primary educational message for the visitor would be the importance of a forage fish base as a link in the food chain that includes game fish and people. In addition, specific governmental initiatives for related non-game aquatic species could be described.

The resultant exhibit would also be physically attractive: Imagine a huge school of glittering silver fish swimming in unison, around and around against the circular flow of water. Similar cylindrical exhibits have proven popular at other public aquariums, especially with children. The inherent lack of obstacles or corners inside such an exhibit definitely enhances the ability to exhibit schooling fish that tend to be unable to form proper groups in the normal rectangular aquariums.

Construction considerations:

An acrylic tube aquarium, 48” tall by 44 1/5” in diameter would be installed on a base in the center of a public exhibit hallway. Filtration and cooling equipment would be housed in the tank’s base, while lighting and graphic panels would be installed in a hood. A nearby floor drain and hose bib would be used to drain and fill the exhibit when cleaning.

#### Budget:

An acrylic aquarium manufacture would be found to construct the cylinder tank, as well as fabricate the base and top. The aquarium department would design and install the life support equipment, develop the graphics, and acquire the fish.

320-gallon acrylic tube aquarium	\$7800
Base stand with access panel	1200
Hood with lights & access panel	1500
Shipping for above items	2000 (est.)
Water filtration system	1100
Chiller system	1250
Graphics panels	1000
	=====
	\$15,850

#### Idea #3: Living Coral Reef Exhibit

##### Outline:

A custom-made fiberglass aquarium with an acrylic viewing would be installed in the gallery of an aquarium (replacing smaller exhibits previously there). The resulting exhibit would have a single 10-foot viewing panel and would hold 1300 gallons of water. The focus of this exhibit would be living corals and small reef fishes. Flanking this exhibit to the left and right would be two smaller exhibits housing larger coral reef fishes, but with artificial corals, as these fish tend to feed on live corals. The life support system would be a generalized Berlin set up with a remote sump and metal halide lighting.

##### Exhibit Focus:

Aquariums have been working for many years to refine their live coral husbandry techniques. We now are able to grow and reproduce many corals at will. The proposed exhibit would focus on living Pacific corals, with an emphasis on captive raised colonies. It is feasible that every coral in the exhibit will be available as a captive raised colony. Many of the fish and some non-colonial invertebrates may also be available as captive raised specimens. The exhibit graphics should focus on the point for the visitors.

#### Idea #4: Pirate Perch Captive Breeding Project

#### Proposal:

The Pirate perch, (*Aphredoderus sayanus*) is listed in Ohio as an endangered species. Few people (mostly hobbyists working with freshly captured animals) have been able to reproduce this species in captivity. This proposal outlines a system that might work to propagate these fish in captivity. If approved by local regulatory agencies, captive raised fish could be repatriated to a watershed in Ohio where they had historically been found.

#### Project description:

This project has two main components: the captive breeding system and a small public exhibit. The breeding system would consist of an acrylic compartmentalized aquarium system similar to those used in retail pet stores. The system would have a refrigeration unit to control the water temperature, as well as an ultraviolet sterilizer to control diseases. Installed behind the scenes of an aquarium, this system could comfortably house up to 25 pirate perch. A public exhibit would consist of a 15-gallon display and associated graphics. Being small and secretive, pirate perch are best suited for small “jewel” exhibits such as this.

#### Idea #5: Pollution Exhibit

The “Pollution Exhibit” at the Toledo Zoo was constructed around 15 years ago. This 550-gallon exhibit originally had no fish in it, just various “artifacts”: cans, bottles, an old tire and the requisite boot. The backdrop is a brick wall with a simulated sewer outfall. Overhead backlit graphics discuss local water pollution issues. The whole exhibit is allowed to grow algae and the build up of detritus adds to the overall effect. With the introduction of zebra mussels and round gobies to local waters in the early 1990’s, these species were exhibited in this display as examples of exotic introductions or “living pollution”. The exhibit remained moderately popular with our visitors.

In order to “punch it up” a bit, we decided to add some fresh accoutrements to the exhibit; a lost tackle box, more bottles and fishing lures were all discussed. One of the aquarists mounted a pair of rubber boots to the top of the brick wall. The result looked like somebody was sitting on the wall, dangling their boots in the water. We immediately noticed an increased response from our visitors – pointing and laughing, but also stopping to read the important messages about pollution. Another aquarist dangled a fishing lure and bobber in the center of the tank in front of the boots. More laughter and finger pointing, “Hey somebody is fishing in that tank!” We had a stepped down motor gear assembly from a peristaltic pump (left over from a failed experiment). By attaching a cog to the motor and tying that to the fishing line above the exhibit, we were able to simulate the bobber being jigged up and down. The effect was now complete – and we had people crowding in front of the exhibit and trying to look up through the surface of the water to “see who was fishing”. Most adults understood it was just a gimmick, but children often

were heard to wonder what was going on. The adults would then explain it to them, often reading them the graphics at the same time.

### **Professional groups:**

Both public and private aquarists may find the many membership groups available to them quite helpful. In some instances, membership is a matter of prestige – and belonging to a particularly elite organization may help enhance your resume. In other cases, joining a group may give the member access to information that is simply not available to non-members. In other situations, membership in certain commercial organizations that simply require a fee to join, and offer little in the way of unique information may not be advantageous to an aquarist looking to advance their career. For example, one would not mention that they are a “member of the National Geographic Society” on their resume – while this member-supported organization does amazing work, belonging to the group simply means that you mailed them a check in order to join. In other cases, such as being a professional member of the Association of Zoos and Aquariums may prove to be a major factor in being offered a position over another person who is not a member.

#### **AAZK (American Association of Zookeepers):**

Primarily a professional association for zookeepers, there is sometimes a carryover of information for aquarists, such as in the development of the AAZK’s animal diet and behavior notebooks that encompasses fish and invertebrates as well as terrestrial animals. They have tried very hard for many years to incorporate aquarists into their group, but as of 2014, the AAZK remains a mostly an organization for zookeepers.

#### **AFS (American Fisheries Society):**

An organization for biologists involved in ichthyology, this group’s focus is on fisheries science; managing fish for food or sport fishing. Secondly, the organization produces substantial works in the realm of taxonomy and natural history of aquatic animals. This is the only truly professional group that an aquarist has available to join for information of this type, or to present or publish peer-reviewed scientific papers.

#### **AZA (Association of Zoos and Aquariums):**

This organization is most important to aquarists who work for, (or hope to work for) public facilities. Their web address is [www.aza.org](http://www.aza.org) and membership in this fine organization cannot be recommended highly enough. When I review job applicants, one of the first things I look for is if they are AZA members, and if they participate in any of the AZA’s conservation or education programs. One thing that may seem daunting to new aquarists is the AZA’s proclivity for using obscure acronyms and titles for their various programs. Statements such as, “The FFTAG’s educational liaison met with the

SSP co-chair to discuss the RCP and how it relates to the CAP,” are not unheard of. Appendix 3 lists some of these acronyms and what they mean.

EAZA (European Association of Zoos and Aquariums):

Virtually the equivalent of the AZA, but whose membership consists of European facilities.

PADI (Professional Association of Diving Instructors):

This is one example of an international certification organization for SCUBA divers. Other groups also offer certifications, and weighing their relative merits is beyond the scope of this book. Prospective employers will look at two criteria regarding SCUBA diving certification: level of instruction (basic, advanced, Divemaster, etc.) and hours of open water dive experience.

RAW (Regional Aquatics Workshop):

Originally begun in the late 1980’s when four aquarium curators in the Midwest United States got together for a day-long meeting at the Columbus Zoo, the first official RAW meeting was held at the Toledo Zoo and was attended by about 20 aquarists from nearby aquariums. Each subsequent year, these meetings were longer, were held at larger aquariums, and were better attended. The 2013 RAW meeting was a five-day affair. Hosted by the Georgia Aquarium, it was attended by over 340 professional aquarists from North America and Europe.

As the membership of this group is open, and there are no bylaws or rules of order, aquarists of any caliber are welcome to attend. There is usually only a token conference fee as well as the normal travel and room expenses. This might be a great opportunity for new people in the field to meet curators and others already working at public aquariums. The only limiting factor is that the venue of this meeting is not widely advertised outside the realm of public aquarists, so pre-entry level people may not have the means to determine where the next meeting will be held. The format of this meeting has been changing rapidly over the years, but usually consists of a series of “pre-meetings” for the working groups of the various aquatic conservation groups of the AZA; typically, there are meetings of the Freshwater and Marine Fishes Taxon Advisory Groups, the Aquatic Invertebrate Taxon Advisory Group and the Lake Victorian Cichlid Species Survival Plan.

EUAC (European Union of Aquarium Curators):

Very similar to RAW, but about 10 years older, and with a bit more formal of a structure.



## **Institutional Collection Planning**

An Institutional Collection Plan (ICP) is simply a list of species that are desired for inclusion into a collection of animals. However, developing such a list for aquariums has proven challenging; with over two million species of marine animals, (Mora, et al., 2011) how does one select one over another? The collection plan process becomes a tool to manage this immense task. The selection method is vital; it must be comprehensive, yet streamlined in application. It should be objective, without losing the ability to subjectively evaluate some species. The results must be technically accurate, but still useful when reviewed by non-technical persons.

Having a comprehensive, well-conceived collection plan aids public aquarium curators in maximizing the effect their animal collection has on inspiring their visitors, enhancing conservation efforts, and minimizing surplus animals. Resource allocation and communication are also improved when a high-quality collection plan is in place. The Association of Zoos and Aquariums requires that all accredited facilities have an approved institutional collection plan.

From the AZA web site: <http://www.aza.org/institutional-collection-plans/>

*“All institutions must have an Institutional Collection Plan (ICP) that is re-evaluated and updated at minimum of every five years. The ICP should include a statement of justification for all species and individuals in the institution’s planned collection.”*

Collection planning processes run the gamut from a curator simply typing out a list off the top of their head, to results from a committee using specialized keys that use weighted values to rank various criteria against one another. A simple list may be too subjective, while running thousands of potential species through a lengthy key can be too laborious. Weighted scoring systems are particularly difficult to implement. Take two common criteria used in collection planning; conservation need of the species and acquisition cost. Most aquarists would agree that conservation need trumps cost (within reason of course). In order to reflect this difference, they may assign weighted scores to each of the criteria, say a 3x multiplier for conservation and a 1x for cost. There is then a strong urge to add up the scores and make a blanket determination such as, “any fish rating higher than 5.6 will be included in the ICP”. Avoid this temptation! The curator must drive the process, and not be dictated to by the process itself. “The model made me do it” is not a valid response to problems with an ICP (Willis, 2000).

## **Simplified Collection Planning Process:**

The Toledo Zoo Aquarium has utilized different planning methods over the past twenty years, some were very complicated (Hemdal, 2013). A simplified process was

recently developed for use in the planning of a temporary exhibit, and it may have wider application to ICPs in general;

The process starts off simply enough; first, referring to the taxa's AZA Regional Collection Plan, a candidate species is selected. Each of the following four questions must then be answered with an unequivocal "Yes" in order for that species to be included in a collection plan. The curator would then need to subjectively weigh the strength of the affirmative answers in order to select one species above another.

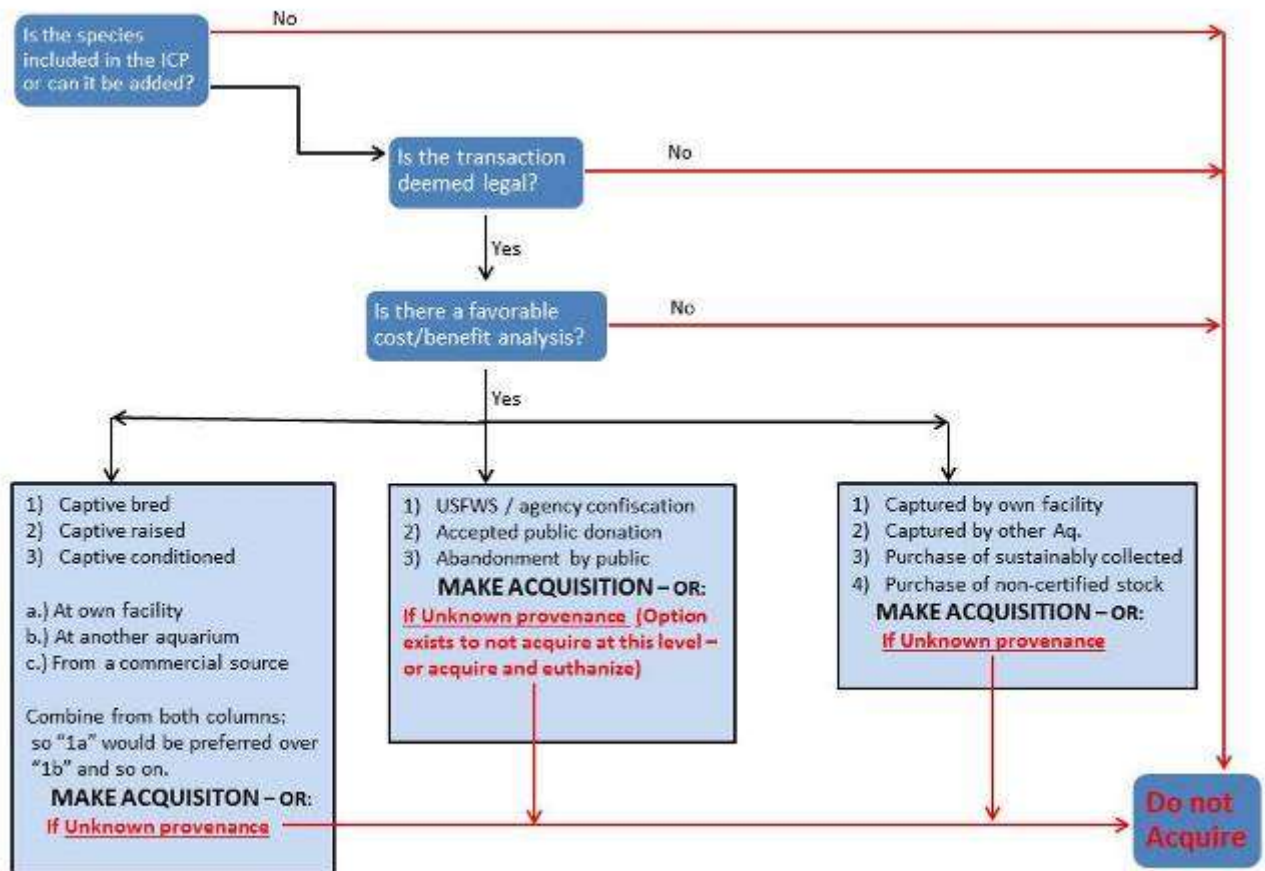
**1) Are they a notable species from the exhibit's region or do they support the theme well?**

**2) Will they inspire our visitors? Color, form, unusual habits all build interest OR Do they have an important educational/conservation message to convey?**

**3) Can their husbandry requirements be fully met (including compatibility & quarantine)?**

**4) Are they legally available at the right time and cost, from ethical vendors?**

Selecting a species for inclusion in an ICP is just the first step of the process. To be effective, the ICP must then be implemented. This of course means actually acquiring the animals. As a continuation of the ICP process, the following animal sourcing flow chart outlines various animal sources and compares their relative viability.



**Aquarium Animal Sourcing Flow Chart**

Once the potential animal sources have been identified, it is helpful to analyze the different sources to determine their relative costs versus benefits. The first step is to determine the true cost of the animal. This is the sum of the purchase price of the animal multiplied by the number of animals plus the transportation costs. This figure is then divided by the number of animals from the group still alive after quarantine. The true cost is only part of the equation. There are some intangible costs that need to be factored in. For example, staff time needed to manage the animal may vary from one source to another. There may be a negative public impression seen when acquiring animals from a particular source that is not seen if another source is used. There is also a negative environmental cost associated with unsustainable collections.

Once all of the associated acquisition costs have been tabulated, they are then compared to the benefits. These include; lower true cost, value of the specimen as a public exhibit, P.R. value of making sustainable acquisitions, as well as staff development from collecting trips, captive propagation, or learning new husbandry techniques.

Collection plans are vital for the proper operation of a modern aquarium. Curatorial staff should make this process a key component of their work flow. The plan must also be a living document, reviewed and updated as-needed. Remember:

*“Everybody has a plan until they get punched in the face.”*

— Mike Tyson

### **Fish and Invertebrate Data management:**

In addition to the problems and issues facing any other complex database system, the primary underlying difficulty in managing data for fish and invertebrate collections centers around our almost complete inability to track these animals as individuals. In some cases, such as with colonial invertebrates, there are problems in deriving even a simple census or group count.

#### Problems with Data Management at Aquariums:

- Difficulty in working with group counts:
  - What if a group is split between enclosures?
  - More than 4 to 6 fish of 1 species generally receive group counts
- Need to define “colony” and “colonial”
  - Colony of insects: breeding group that is T.N.C. – can be counted as “25”
  - Colonial: 1000 polyps on a rock = “1” animal
- Rapidly changing nomenclature – adequate taxonomic list management is almost impossible
- No way to track water quality, a basic “enclosure parameter” for aquatic animals
- Aquarists lag behind in terms of general computer experience, and based on past practices, the need for retrieval of any sort of extensive collection data is minimal
- No real pressure to change from current pen/paper census for those using that method
- Aquariums are loathe to give up their in-house data management systems
  - In some cases, development costs were very high and need to be justified
  - Can be more easily customized to meet changing needs (assuming they wrote it in-house)
  - Already in use, so why change? – Even at the cost of isolating their data

**Inv** \_ \_ X

## VSSP Inventory Record

---

Location:

Species:

Generation:

Sex:


Quantity:

Viable: ☒

Repro:

Memo: 

24 TO NYAQU 8/99  
17 BORN 11/99



**Reproductive codes:**  
 A=active G=geriatric J=juvenile  
 E=exhibit P=diseased or other problem  
 I = can be increased M=maintained D=no space

---

Lake Victorian Cichlid SSP flat field census database.

**Location** \_ \_ X

## VSSP Participant Location

---

Location:

Name:

Orgname:

Address:

City:

State:  Province:

Country:  Postalcode:

Workphone:

Fax:

Emailaddr:

**Notes:**

Rogan Wood is new  
contact, replacing Bill  
Huffman 1/99

---

Lake Victorian Cichlid SSP flat field participant database.

**Inv** \_ \_ X

**Specimen Inventory - Toledo Zoo Aquarium**

---

Order:  Family:  Animal type:   
 (A B F F I T I M S F R)

Name:  Sci name:  Record #: 592

---

Quantity:  Date acquired:  Value:  Total: \$50.00 Years here: 0.21

Vendor:  Location:   Sign?:   
 Safety warning:    Photo?:

---

Manage:  Treatments:

Diet:  Medical notes:

Notes:

ARKS #:

Memo:  + -

---

Aquarium Specimen census / husbandry database (Aquapro 4).

**Atc\_log** \_ \_ X

**Animal Transaction Log**

---

Acq./Deacq.?  Vendor:

Description:  Date started:

Date Signed:  Date done:

Completed?: ☒ Transaction #:

Euthanized?: ☒

# days to sign: 14

# days to complete: 0

Notes:  + -

---

Animal transaction log

## **Information Resources for Home Aquarists**

Every aquarium professional, no matter their experience level, will eventually have questions regarding some problem they are facing with their work. Getting an appropriate answer to these questions is vitally important; the lives of the animals in your care depend on it. Receiving incorrect information and then acting on it (as you may not know any different) can be more detrimental for your animals than taking no action at all. The following is an overview of the typical informational resources available to home aquarists, along with some benefits and potential drawbacks of each:

**Books** – Prior to the advent of the Internet, print books were one of the primary informational resources for home aquarists. Because of the competitive nature of getting a book published, combined with (usually) extensive editorial oversight, books generally contain accurate information. Of course, some are better than others, but because it is so costly to produce a print run of books, few publishers wish to risk being stuck with a “dog”, so they keep close reins on their authors. Most professional aquarists with information that they want to share with the greatest number of other people still choose books as their primary venue. There is something about the permanence of a book that holds great appeal for most authors.

**Electronic magazines** – Internet magazines have become a boon for aquarists. Usually having free access, the fast publication schedule of these “e-zines” means that aquarists can have access to the freshest information possible. Along with that rapid publication speed does come some increased potential for errors or omissions – but by virtue of the material being online; corrections take only seconds to perform.

**Fellow professional aquarists** – Networking with other aquarists is a great way to get information, provided that your sources are reliable, and more knowledgeable than you are. While this information resource is free, you should consider “payment” by assisting others in the network yourself.

**Internet forums** – This form of information exchange is by far the most commonly used at the present time. Since the member base of most of these groups is huge, there is a wealth of information to draw from. Many forums are very active, meaning that answers to questions may be posted within minutes or hours. However, aquarists need to plan their information requests somewhat; posting an emergency question at 2 a.m. on a Monday morning will probably not result in a proper response within a hoped-for 30-minute time frame. There has also been the creation of what is termed “Niche Experts” – people on a particular forum, (or section of a forum) that have become the local expert on certain topics. Utilizing them for information works well as long as these people

supplying the information are truly experts in their fields and not that they just know “just a bit more” than the people they are responding to. Another problem is when these niche experts then begin to expound on other topics that they are not quite as familiar with. Their status as an expert belies the fact that they do not have as strong of a knowledge base on other topics that they might branch out into.

**Manufacturers** – Manufacturers should be responsible for supplying technical information about the products they produce. Some forward-thinking manufacturers have produced their own newsletters or even short magazines that provide general information about the aquarium hobby. Of course, everyone understands that their primary business is to sell product, so it is expected that the information that they provide would support that goal in some way. There is not anything inherently wrong with this combination of business and information flow – as long as it is kept to reasonable levels.

**Print magazines** – Print magazines are positioned between books and Internet resources in terms of timeliness of their information. In regards to accuracy, most articles are reviewed by editors who are familiar with aquariums, so most errors are corrected before they reach print. It is suspected that some magazines must kowtow to manufacturers who advertise with them; to the degree that they do not allow certain topics to be covered that might negatively impact the sales for those manufacturers. The most common example of this is a distinct lack of comprehensive product reviews in most magazines. With the advent of the Internet, there seems to have been a corresponding general decline in print magazine sales. While most of these magazines have remained in operations for many years, overall subscription rates seem to be gradually declining. One magazine had seen monthly distribution of 50,000 copies 30 years ago, and this has decreased to around 20,000 copies a month today.

**Personal research** – Simply put, this information resource is when the aquarist cannot find an answer for a problem, and researches the issue for themselves. For example, I once needed to calculate a very critical dosage for a medication. I needed to know the exact volume of water contained in the aquarium, including the amount found in the interstices of the gravel – and add that into the calculation. During one lunch hour, I had run a series of tests using gravel and graduated cylinders, I soon discovered that about 30% of a layer of regular sized aquarium gravel is actually water, and was able to factor that in to my dosage calculation. Of course, this only works well for simple, narrowly focused questions such as this. Problems such as “all my fish just died, why?” do not lend themselves well to this particular technique.

**Web pages** – The Internet has substantially changed how home aquarists gather, process and implement information about their aquariums. “Googling” has become a verb. This



is the resource that I generally use myself. Web searches will result in a wide variety of information, from technical papers, to online aquarium magazines to threads on Internet forums. I feel that I have enough experience to separate the “chaff from the seed” and can quickly discount any erroneous information that may show up in the search engine results. Because the search engines work best when fed just a single word or a term, they are not well-suited for broad questions such as “how many fish can I safely add to my 20-gallon aquarium?”

### **Interactions with the Public**

All pet store employees and public aquarium staff are involved with visitor contact to one degree or another. For people in the pet industry, these contacts are typical retail, wholesale or manufacturing business contacts. For the aquarium husbandry staff, these interactions may include guided tours, job shadowing, internships, telephone inquiries and responding to emails. Topics of these contacts commonly consist of requests for career information, help with home aquarium problems, and offers to donate specimens and basic marine biology questions. Most aquarists would agree that assisting the public in these matters is an important (but not always the primary) function of their jobs. Many also worry that these inquiries take a substantial amount of time away from other husbandry and curatorial duties.

It is shortsighted for staff to neglect or delay answering public inquiries because they haven't the time. Aquarists would be better served to institute a more streamlined protocol for handling the questions so that the public promptly receives the information they need with the least amount of time invested by the aquarist. The people you help will become better educated, a primary goal of every public aquarium.

I tracked my own visitor contacts for 3 months, and determined that I spend an average of 6% of my workday interacting with the public through phone calls, tours and written inquiries. Add in contacts with other public aquarists and this percentage reaches 10%. Certainly, I carefully plan and implement other curatorial duties that take a similar amount of my time such as ordering stock, inspecting the collection and developing new exhibits. Why then, should I relegate this major task to the "I'll get to it if I can" category?

The following are some of the problems I've identified with public contacts and what I try to do to solve them:

**Problem:** Phone calls arrive at inopportune times.

**Solution:** Establish a set time each day when staff will be available to answer telephone calls from the public, or have a receptionist or voice mail system take messages which you can then return at your convenience (but still in a timely manner).

**Problem:** Inquiry is outside the facility's range of experience.

**Solution:** Avoid attempting to respond to subjects outside one's own field. Refer the contact to a more appropriate organization (keep a list of common referral numbers handy).

**Problem:** Multiple inquiries on the same topic.

**Solution:** Prepare a series of "fact sheets" on common topics such as career information, fish donations, shark biology, etc.

Offer to mail them this material as opposed to repeating the same information repeatedly.

**Problem:** Excessive amount of time required responding to a single inquiry. (More than perhaps 5 or 10 minutes)

**Solution:** Rather than attempting to offer a person an A to Z description of how to maintain a home aquarium over the phone, refer them to other informational sources (keep a bibliography handy). With telephone inquiries, it seems that some people simply do not realize that by talking with you for 30 or 40 minutes, they have disrupted your day's work schedule to a major degree. I've sometimes found that politely explaining this fact returns an apology and a quick end to an overly long call. If all else fails, have a co-worker trip the building's fire alarm!

**Problem:** Behind-the-scenes (BTS) tours are disruptive.

**Solution:** Develop a protocol for scheduling these tours including maximum number of visitors allowed, minimum age, and tour day/times. In many cases, a BTS tour might be better handled by touring the group through the public areas, with just a quick look at the work areas. Most people don't realize that work areas offer very poor viewing of the animals, and a quick look generally satisfies their curiosity.

**Problem:** Complaint from a visitor regarding a previous contact with staff such as not returning phone calls, fish care advice that failed, poorly given BTS tour, etc.

**Solution:** This is a very rare occurrence for those organizations that are truly dedicated to assisting the public. In recent years, I can recall only one such instance where a teacher complained that a BTS tour I gave to her pre-school class was "too dry".... Perhaps if I had dressed in a purple dinosaur suit?

**Problem:** Parent/secretary calls with questions from their child/boss.

**Solution:** This is a personal sore point with me. I generally politely ask that the person needing the information contact me directly. In the case of the children, this ultimately benefits the student in that they learn to do their own work. In the case of the employer who is "too busy" to call on his or her own, I explain that attempting to send the

information through an intermediary too often results in poor translation and I need to speak with the person directly.

**Problem:** Prompt, informative responses to inquiries, or a really well done BTS tour, in turn, produce additional contacts when the person you assisted tells other people how helpful you were. This can pyramid and create an out-of-control situation.

**Solution:** One major source of multiple contacts is pet stores who find it easier to refer their customer's questions to you rather than taking the time to solve the problem themselves. I always ask callers if a pet store had suggested the person contact me. In one month, I discovered that almost a third of the people calling for information had been told to do so by a single person at one pet store. I then called the pet store and asked that person to please restrict their future referrals to only the most difficult questions.

**Problem:** A specific contact is too demanding in terms of time versus benefit. For example, a student requests that he be allowed to "job shadow" an aquarist for 80 hours.

**Solution:** While an intense experience like this would be very beneficial for a young biology student, the effort required by the aquarium staff to satisfy this request would be too great. That same effort might be better directed towards a series of public programs reaching a larger number of individuals.

**Problem:** Simply not enough time available to assist the public.

**Solution:** Hey, that's what lunch hours and 60-hour workweeks are for! It may just be that you have not assigned a high enough priority to this particular task. Perhaps you can find a series of tasks you can perform during telephone inquiries, such as printing out reports, running an automated E-mail session, sorting your mail, scanning periodicals, etc.

Always handle visitor contacts in the fashion in which you would like to be treated yourself. This is basic advice, but it seems some aquarium staff loses sight of the tenet:

**"The customer (or visitor) is always right, even when they are wrong".**

## **Workplace safety**

Safety of people in the work place must be of utmost importance to all employers and employees. It is the only item that takes precedence over the safety of the animals, as well as other concerns which rank lower still, such as exhibit appearance and the like. This view of internal safety is not limited to employees. Visitor safety is also extremely vital, not just for large public facilities; even small businesses must keep their customers safe.

### **1) Electrical problems:**

Water and electricity are a deadly combination. People have been killed working on aquariums when an electrical problem was present.

Never work on an aquarium in bare feet, or wet shoes. If you spill water on your shoes, wear a pair of rubber boots until your shoes dry.

If you drop a pump, heater, or other electrical device into a tank, DO NOT REACH FOR IT, unplugs the item first.

If you find a heater that has leaked water into the tube, or otherwise seems to be malfunctioning, throw it away so that it is not inadvertently used by somebody else.

Never defeat the three pronged ground on any plug used around water. Use a ground fault interrupt (GFI) system if one is available.

Securely tie off any electrical device mounted over water. Using a short cord, which will unplug if the item should fall, is also a good idea.

Should you see another employee possibly having been electrocuted, do not approach him/her for assistance until power to the area has been shut off.

On humid days, dried salt on light fixtures, etc., can begin to conduct electricity. Prevention by not allowing salt spray to build up is the best way to avoid this.

Signs of live electricity in a tank include bubbles in the water, gray cloudy water, and sometimes a "burnt" odor. The fish will most likely appear fine. Turn off electricity to the area before servicing the tank.

If you should get a slight shock from a tank, stop work on the tank, and resolve the problem at once; it may become more serious later, and must not be "shrugged off".

## 2) Dangerous Aquatic Animals:

In addition to the commonly known "dangerous animals, many seemingly harmless animals can also cause injury to unwary employees. Visitor/customer safety in this regard has only one criterion; the visitors must be denied access to any animal. For employees who handle the animals on a daily basis, certain precautions need to be taken. Never start a siphon by mouth; there are a few diseases that can be transmitted to humans who ingest aquarium water. Preferred methods include filling the siphon hose with water first, priming the hose with a water pump, etc.

Always wear latex gloves or at least wash your hands before and after handling animals or food items.

Until otherwise informed, consider any new aquatic animal you are unfamiliar with as being potentially dangerous.

Some anemones and corals can sting humans. Except for fire anemones (*Actinodendron plumosum*), they rarely cause severe problems. In a few individuals, repeated contact with anemones results in a sensitivity reaction. To avoid developing this syndrome in yourself, you may wish to use rubber gloves when handling these animals.

The algae *Caulerpa* is reported to contain toxic compounds. The zooanthid *Palythoa*, the coral *Goniopora*, and possibly others in the group contain extremely virulent toxins; do not ingest any cnidarian (Anemone, coral, sea whip, etc.).

Some sponges can cause dermatitis in humans when touched. The Red beard sponge, (*Microciona*) and the fire sponge, (*Tedonia*) are the worst of those common to public aquariums. To be safe, treat any red or brown sponge with caution.

Fire worms are 1 to 2-inch-long annelid worms that commonly live in aquarium gravel. Contact with them results in a mild form of dermatitis. Prevention is the same as for anemones.

Cone shells have a long dart known as a radula, which they use to inject venom. These must only be handled with tongs.

A bite from a Blue ring octopus can be lethal. They make poor display animals, and there is no antivenin available. Avoid contact with this species, and keep the aquarium tightly covered. The toxin of this species has been identified as being identical to tetrodotoxin; the same as in the Fugu puffer, and as such, has no known antidote. There may be other species of octopus that also possess dangerous bites, so take care when handling any species.

A variety of fish such as groupers, triggers, pacu, arapaima, etc., can bite. This is usually a misdirected feeding response, easily avoided by watching your hands when they are in a tank. Moray eels, sharks, sea turtles, and some others will bite severely as a form of aggression.

Lionfish/Scorpionfish have venom in spines along their dorsal fins, pelvic fins, gill covers, and anal fins. The toxicity of the venom varies from species to species and person to person. First aid for these wounds is mainly submerging the injury in as hot of water as the person can stand, and get medical attention. Tanks containing these animals should be clearly marked as "dangerous". Antivenin is available in Australia for some species of stonefish.

Electricity producing fish would have many of the same warnings as shown in the section on electricity. If you must handle these fish, wear dry shoes on a dry floor, rubber gloves, (Two pair is best) and wooden or plastic handled tank tools. Tanks with these fish will also be marked with a warning label.

Stingrays and catfish can inject venom through sharp spines, (On the tail for the rays, and on the dorsal and pectoral fins for catfish). First aid is the same as for lionfish. Two species of catfish, the striped sea catfish (*Plotosus* sp.) and the sea catfish (*Arius* sp.) are both highly toxic. Most injuries from these fish occur when they are stuck in a net and the person is attempting to remove them. There is no antivenin for stings of either of these two types of fish.

### 3) Chemical Handling:

Many of the potentially dangerous chemicals are not unique to aquariums, and the proper handling of these is more fully discussed in other documents. Those which are used frequently in an aquarium are outlined below:

When using a pipette to measure small volumes of a medication, never use your mouth to suck the fluid into the tube.

Formalin is commonly used as a fish medication. It is extremely toxic to humans whether inhaled, ingested, or comes in contact with the skin. It is best, when working with formalin, to use the smallest volume possible. For example, rather than taking a gallon of formalin over to the tank to be treated, measure out the approximate amount required using a mask, gloves and eye protection at the sink area, and re-seal the gallon container and store it away. That way, if a spill occurs, the volume will be minimal.

Copper is less frequently used as a medication, but also very toxic if ingested. Gloves and eye protection should be used when handling this drug.

Test kit reagents are generally safe to use, wash hands after use.

Dylox - trichlorfon is a rarely used, but extremely toxic medication. Use gloves and a full-face mask when applying this medication. Avoid creating large amounts of dust when adding to an aquarium. Rinse any containers that have held the drug in the tank, which was treated, seal and label the container, and dispose of it properly.

With all medications, avoid contact with feeds or feed equipment. All chemicals must be properly labeled. Material Safety Data Sheets give specific safety information such as antidotal procedures must be on file in the workplace.

## Conclusion

I'd like to be able to say here, "if you try hard enough, you can succeed at anything in life" but this simply isn't true. I do hope that the information I've presented here will help some of you succeed. Remember that "working hard" is not the same as "working smart" – but striving for both at the same time will vastly increase your chance of landing a successful career in the aquarium field.

"The best career advice given to the young is: Find out what you like doing best and get someone to pay you for doing it." - Katherine Whitehorn

**Good luck with your careers, and most importantly – have some fun!**

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## Appendix 1. – Sample Generic Resume

**John Q. Aquarist**

**Your Home and Work Address's Go Here**

**Telephone numbers, Email, etc.**

### EXPERIENCE

#### **New State Aquarium, Big City California**

##### **Curator of Fishes**

Responsible for management of the aquarium building and ancillary terrestrial arthropod exhibits comprising 450 species and over 5000 specimens. Develop yearly departmental budget. Generate aquarium master plan and project proposals. Perform necropsies; devise fish treatments. Develop animal husbandry research projects. Supervise aquarium staff and volunteers. Supply input for zoo-wide operations. Facility diving safety officer. North American Studbook keeper for the endangered pupfish Species Survival Plan (SSP) since 1994. Awarded the AZA's Aquatic Conservation Exhibit award in 1999 for the Aquarium's Lake Trout Exhibit.

#### **Major Aquarium, New York City**

##### **Aquarium Department Manager** *March 1988 to June 1989*

Responsible for the daily operation of the fishes department: maintained stock levels, water analysis, disease control, organized collecting trips, special projects and performed necropsies. Direct supervision of all gallery aquarists. Daily interaction with the public; answering husbandry questions, giving tours and accepting donations.

##### **Marine Aquarist - Gallery Two** *Jan. 1987 to March 1988*

Responsible for daily husbandry requirements of all of the Aquarium's temperate and cold water marine exhibits.

##### **Freshwater Aquarist - Gallery Four** *Oct. 1986 to Jan. 1987*

In charge of the aquarium gallery which emphasized tropical freshwater fishes from Asia, South America, and Africa.

##### **Pacific Reef Exhibit Aquarist** *May 1985 to Oct. 1986*

Duties included performing feeding demonstrations for the public, supervising 35+ volunteer divers, and general husbandry of the tropical marine species in the 150,000 gallon Pacific Reef Exhibit.

Dec. 1980                      **"Fish are us"** Detroit, Michigan

##### **Assistant Manager**

Maintained the aquarium section, ordered stock, assisted customers.

1972 to                      Employed by various wholesale and retail tropical fish businesses in  
Dec. 1980                      Southeast Michigan (Concurrent with High School and College).

### EDUCATION

#### **Bachelors Degree** - Michigan University

Major: Aquatic Biology

Minor: Coastal Environments

Course work in major included ichthyology, and other taxonomic field studies. Emphasis of minor was coral reef biogeography.

Attended AZA zoo and aquarium management school 1991-1992.

### SKILLS

- Possess multiple SCUBA certifications through PADI Divemaster.
- Over 320 hours of open water dive time logged under a wide variety of conditions.
  - Proficient in aquatic specimen collection techniques.
- Current First Aid and CPR certifications.
- Able to operate boats up to 25 feet in length (power or sail), and can serve as crew on larger vessels.
- Capable of building or repairing many types of electrical and mechanical devices.
- Proficient with MS-DOS / Windows computer systems and software including; Microsoft Word 2000, Excel, and Power Point, as well as ARKS 3, Harvard Graphics, and FoxPro.
- AZA professional member, American Fisheries Society member.

## **COMMUNICATION EXPERIENCE**

- Have published over 80 articles and papers in the following magazines and journals:
  - Aquarium Fish Magazine
  - Freshwater and Marine Aquarium Magazine
  - Journal of Aquaculture and Aquatic Sciences
  - Progressive Fish-Culturist
  - Tropical Fish Hobbyist Magazine
  - Drum and Croaker
- Contributing editor for Freshwater and Marine Aquarium Magazine.
- Presented numerous adult education lectures on a wide variety of aquarium topics.

## **PERSONAL DATA**

- Born 1959 ... Married, one child ... Excellent health.
- Hobbies include; photography, archery, bonsai culture, antique collecting and sailing.

## **Appendix 2. - Acronyms:**

Newcomers to any technical field are likely to feel overwhelmed by the acronyms so frequently used by long time employees. Don't let the jargon scare you off – most of them have very simple explanations. The following descriptions will prepare you for the few interviewers who will pelt you with a variety of these terms just to try to trip you up. Once you have a basic understanding of these expressions, you will discover how simple they really are – and will be able to shoot back a reply just as full of aquarium acronyms as the interviewer's in the first place!

AAZK – American Association of Zookeepers. Mostly an organization for zookeepers, there is sometimes some “carryover” to aquarists, especially those aquarists employed by a zoo.

AAZV - American Association of Zoo Veterinarians. <http://www.aazv.org/>

AFS – American Fisheries Society. An important member society for fisheries scientists, and has some interest for aquarists as well.

ARKS - Animal Record Keeping System, see ZIMS (ISIS)

ASIH – American Society of Ichthyologists and Herpetologists. A scientific organization that some aquarists have found helpful. [www.utexas.edu/depts/asih](http://www.utexas.edu/depts/asih)

AZA – American Zoo and Aquarium Association. Once referred to as the AAZPA, this national organization has a number of membership categories such as: commercial, Institution, professional, affiliate, associate and retired. [www.aza.org](http://www.aza.org)

CAP – Conservation Action Plan. A specialty group of the AZA formed to direct conservation programs for various animals such as corals. Less specific than an SSP and more animal-oriented than a FIG.

CAUZ – Consortium of Aquariums, Universities and Zoos. A very ambitious project to maintain a massive database of people working in various fields at aquariums, zoos and universities. Appears to be defunct as of 2015.

D&C - Drum and Croaker. A venerable, but rather informal publication for public aquarists. Recently, has been published once yearly by Sea World Cleveland utilizing submissions from aquarists around the world. The material presented is not peer-

reviewed, but is often of very high quality, and usually demonstrates the cutting edge of public aquarium work. <http://drumandcroaker.org/>

EAZA – European Association of Zoos and Aquariums. The equivalent of our American Association of Zoos and Aquariums (AZA).

EUAC – European Union of Aquarium Curators. A group of European aquarists who began meeting more than 20 years ago. Very similar in scope to the RAW meetings held in the United States.

ICP – Institutional Collection Plan. A document that lists every species at a zoo or aquarium, why it is there and what the plans are for it.

IR – Institutional Representative. The person at a facility with the task of interacting with a given AZA group (TAG, CAP, etc.).

ISIS – International Species Information System. Located in Minnesota, this organization tracks the animal collections at most zoos in the United States, as well as many aquariums and zoos in other countries. [www.worldzoo.org](http://www.worldzoo.org)

IUCN - International Union for Conservation of Nature. [www.iucn.org](http://www.iucn.org)

IZY - International Zoo Yearbook. Annual publication for zoos and aquarium.

LSS – Life Support Systems modify environmental parameters to allow an animal to live in a location outside of the acceptable range for that species. A heater in a greenhouse would be an LSS, as would a filter on an aquarium.

MedARKS - Medical Animal Record Keeping System, see ZIMS (ISIS)

NGO - Non-Governmental Organization

RAW – Regional Aquatics Workshop. A yearly meeting held at different aquariums around North America. Usually attended by around 200 aquarists, this is one of the most important annual meetings for public aquarists. Because it is unstructured and there is no official contact person, it is difficult for new aquarists to attend because they won't know where the next meeting will be held. Appendix 3 gives the history of these meetings to date.

RCP – Regional Collection Plan. A document produced by a TAG. It lists all the species governed by the TAG and what the plans are for the conservation and/or display of that species.

SSP – Species Survival Plan (trademarked by the AZA). This is the name of a formal program for zoos and aquariums designed to assist with the conservation of a particular species – such as Lake Victorian Cichlids (the VSSP).

TAG – Taxon Advisory Group. A specialty group of the AZA that concentrates on the conservation and display aspects of a group of animals, such as the Marine Fishes (MFTAG), Freshwater Fishes (FFTAG) and Aquatic Invertebrates (AITAG).

TRAFFIC - Trade Records Analysis of Flora and Fauna in Commerce

WCMC – A special committee of the AZA, it stands for Wildlife Conservation Management Committee. This board oversees the actions of various TAG and SSP groups, and offers suggestions as to how they can more effectively operate.

ZIMS – Zoological Information Management System. Software designed by ISIS to assist with the management of animals at zoos and aquariums.

Z Tape: The printed record of the day's transactions from a retail store's cash register. If you are in charge of "Z-ing out the register" you have gained a substantial level of trust in the store's operation, and may soon be on your way to becoming a manager!

### **Appendix 3. – Regional Aquatics Workshops (RAW)**

The RAW workshops are the premier annual meeting event for all public aquarists in North America. Each year, usually in the early spring, a public aquarium in North America hosts a meeting of from 150 to 350 public aquarists and vendors for five to seven days of intense meetings.

History of RAW: (Written by Pete Mohan and amended by Jay Hemdal, two of the original founders)

The Regional Aquatics Workshop held its first official meeting in 1989 at the Toledo Zoo. The tongue-in-cheek name (Raw-Fish Meeting) was designed to provide lots of elbow room for future development. The meanings intended for each title word by the founding attendees evoke the sentiments that led to RAW and help us understand and preserve its unique character:

#### **“Regional”**

Intentionally vague enough to include a future region of any size. (Originally encompassing the Great Lakes/Midwest region, attendees now come from all over North America, Europe, etc.)

#### **“Aquatics”**

The group is not limited to those interested in fishes, or to those working at traditional public aquariums. Over the years “Aquatics” has been occasionally garbled to “Aquarium” or “Aquatic”.

#### **“Workshop”**

An intentional attempt to avoid the creation of (or reference to) a traditional governing body that would evolve unnecessary bureaucratic structure. Read “Workshop” as “public aquarium professionals of all levels learning from one another”.

From 1989 to 2000 RAW meetings were organized by the host institution with informal help from previous hosts and other interested RAW enthusiasts. Attendance has grown from 20 to over 300. The sheer size of the meetings, increasingly complicated logistics, and associated communication issues prompted the previous organizers to establish a RAW Advisory Committee in 2001.

## **Appendix 4 – Online resources**

The following links may provide additional sources of information for prospective aquarists. Please understand that these links may change over time, but were current at the time they were collected.

Aquarium of the Pacific job posting page

<http://www.aquariumofpacific.org/employment>

AZA jobs page:

<https://www.aza.org/joblistings/>

Drum & Croaker – Public aquarium journal

<http://drumandcroaker.org/>

Florida Aquarium job posting page:

<http://www.flaquarium.org/careers.aspx>

Georgia Aquarium jobs:

<http://partners.georgiaaquarium.org/all/Lists/Join%20Our%20Team/AllItems.aspx>

Information about SeaWorld careers

<http://seaworld.org/animal-info/animal-infobooks/zoo-careers/aquarium/>

Monterey Bay Aquarium job posting page:

<http://www.montereybayaquarium.org/about/job-opportunities>

Mystic Aquarium jobs:

<http://www.mysticaquarium.org/about/employment>

New England Aquarium job positing page:

[http://www.neaq.org/get\\_involved/jobs/](http://www.neaq.org/get_involved/jobs/)

Shedd Aquarium jobs:

<http://www.sheddaquarium.org/About-Us/Jobs-Internships-and-Volunteering/Jobs/>

Seattle Aquarium jobs:

<http://www.seattleaquarium.org/jobs>

## **Appendix 5 – Selected career advice from a survey of public aquarists**

**The following are the top 50 comments made by 350 public aquarists and curators, when asked to provide their best advice for aspiring aquarists. Most responses duplicated the same basic themes; work hard, volunteer/intern, don't expect to get rich and learn all you can.**

Love what you do

Get a lot of experience watching and caring for fishes by working in a pet shop when you are young.

Never stop learning and asking questions!

Gain experience and contacts via internship arrangements, volunteer programs and conservation programs with the facility, agency or organization that you aspire to work in.

Build a network.

Get some experience by volunteering, internship or part-time

Get your degree and start gaining experience as soon as you can whether it be volunteering for an aquarium facility.

Read, ask and read some more.

Make sure the field is your passion and look almost everywhere for opportunities.

Versatility as an employee is key. Know your fish but know other skills like plumbing, carpentry, electrical work, and computers. I'm valuable at my current job because I'm good at all these things. I am asked to utilize all of them frequently.

Be willing to work on any project that gives you the opportunity to expand your skill level.

Stabilize your finances to survive the low salary.

Show initiative and be very attentive to details.

Get a home aquarium.



Gain as much related animal experience as you can. It is also critically important to gain as much leadership, team building, critical thinking, and interpersonal communication experience as possible as well.

Never stop learning. I learn something new every day in this job and will continue to do so for the length of my career.

Two items: once you have a job keep it for a while until you find another, Managers like continuity, 2) It is a small field: stay professional and current along with good work ethics and it will pay off in the long run with a good reputation.

Never stop reading about aquariums.

Work hard, put in extra hours, try new ideas

I would recommend doing an internship in each field (aquarist, LSS, maintenance, dive operations, etc) to see what they exactly want to do. I thought I wanted to be an aquarist or coral guy for the longest time, but after a few years I got extremely bored with the job and went into LSS. I've worked at 5 zoos/aquariums and seen a lot of great people just get burned out in the field doing the same work every day. Giving the student a taste of all aspects in the field may give them a better idea on what they really want to do instead of what they thought they wanted to do.

Marry someone rich if you like fancy things like food and a house.

Be dedicated. Be patient- it may take some time to figure out what exactly what you want to do and it may take longer to actually get that job. Volunteer as much as financially possible while in school, and after graduation, until you are hired someplace you want to work. Take initiative. Work hard! Ask a lot of questions during volunteering/interning but realize that there are times and places to ask questions. Sometimes you need to file those questions away for a more appropriate time.

Study hard, graduate college and get as much varied practical experience as you can while you study. have a goal, but be flexible and open to advice and new ideas/opportunities.

Don't be afraid to take a job just because it isn't your dream job. The experience and your hard work will get you to your dream job.

Find a way to tie in research with aquarium work

Take advantage of the opportunities to intern at different facilities throughout the world. You will establish a network for contacts, gain experience, and interact with a variety of animal species.

Get as much experience in as many different areas of marine biology and aquarium biology as possible while you are young. Volunteer, intern, save up money for volunteer research abroad, etc. Do as much as you can while you have freedom and flexibility to determine what area you love the most. Finally, make sure you create and keep up with the network of people already in your field of interest.

"It's who you know, not what you know" is somewhat true, as the professional contacts you make in the industry are valuable."

Get hands-on experience. After hiring dozens of employees over the years and fielding requests from hundreds of local Marine Bio grads, the biggest factor is how dedicated are you to the field, demonstrated by how much effort have you put into learning our trade. We can teach knowledge once hired, we can't teach good work ethic and effort.

I find a job in this industry incredibly rewarding; but you need to love it, as those rewards are rarely financial and it often takes a physical toll on your body. Stay in shape, stretch and make peace with not owning luxury cars. Also, if you are trying to get a foot in the door, move to where the job is. I see many people try to get into the industry who are not willing to move and they struggle more than those willing to uproot.

Volunteer & intern work in aquariums and spend as much time as possible in the field to understand aquatic environments

You must ensure that you are truly passionate about your career path, this is not a career that is heavily rewarded monetarily. It's kind of like joining the clergy, you take a vow of poverty when you get you graduate with your degree. Also, while being book smart is nice, the hands-on experiences you can gain are what will propel you into a job.

"Never give up and don't let pay dissuade you from doing something that you love. And never leave a tank while its draining or filling."

Do not think that anyone owes you anything.

Don't set your sights too narrow...volunteer/intern/work with as many different organisms at as many different facilities as you can. Focus on making a difference (what can you do from the facility to enhance education, research, and conservation of the organisms in your care).

You must be passionate about your career choice.

Obtain a college degree in Biology or Life Sciences (minimum) and scuba certification. Gain as much experience in the field as possible; be it working at a fish store, home aquariums, volunteering at an aquarium, or working with local fisheries biologists. Experience counts!

Gain on-the-job experience in as many aspects of the field as possible, not only for practical experience, but to determine what you enjoy and what your strengths are. Practical experience also gives you first-hand knowledge of what the day-to-day job entails and what ultimately gets you up for work in the morning. The salary range and amount of responsibility makes enjoyment of the job more important than other fields so a realistic view of the job - whether you will actually enjoy it or not and whether it suits your skills (are you good at it?) - are necessary considerations for a long-term career.

Try to get as much work experience in while you are going to school. Grades are important, but if the only thing you have on your resume when you graduate is a 4.0 GPA you most likely won't get any interviews.

To never give up! It can be difficult to get the first job (foot in the door). If you don't get the job, try an internship, if no internship, then volunteer. To help show dedication and passion.

Use common sense, show initiative, be flexible, learn from your mistakes, and prioritize your work. These 5 points have allowed me to improve my skills, get promoted, and stay sane all at the same time.

Set your expectation early that the majority of your time will be spent cleaning dishes, cutting up food, scrubbing something, and getting dirty and sweaty.

Do it for the love of the animals. Nothing else matters.

Husbandry is 95% cleaning and 5% really awesome stuff. If you are cool with that, then this job is for you.

Don't specialize right away. Keep your options broad, just in case you change your mind.

Get really good at writing so you can effectively document your ideas, observations and achievements

Reinforce that this career is a lot of repetitive routines sprinkled with challenging projects and emergencies. It is not just about dealing with the animals.

Learn to keep aquariums hands-on BEFORE you try to get an aquarium job, and learn to do it well. The aquarium hobby is a probably the best way to learn aquarium care fundamentals, and many of the top aquarists and curators got their start in the hobbyist aquarium industry such as working in aquarium shops. Traditional marine biology programs don't generally teach those skills sufficiently, but you can still learn them before your first internship or entry level job.

If you want a career that you love and is rewarding and don't care about making a lot of money... then this is the field for you. Also, internships and volunteering while still in school help you gain experience that will make you competitive against others who just have a degree in the hiring process.

Work hard, have fun, enjoy life.

### **About the Author:**

Jay Hemdal –

Jay has been an avid aquarist for over 50 years. He was raised in Ann Arbor, Michigan and set up his first marine aquarium when he was 9 years old. He worked part time for over 10 years at various local retail pet stores and fish wholesale companies when he was living at home and later while at college. After graduating from college, he managed the aquarium department of a large retail pet store for four years until 1985 when he was hired as an aquarist (and later department manager) for the John G. Shedd Aquarium in Chicago Illinois. In 1989, he accepted the position of Curator of Fishes and Invertebrates for the Toledo Zoo, where he still works today as the Zoo's general curator. The Aquarium at the Toledo Zoo underwent a \$25.5 million renovation, and reopened in March, 2015 as a completely new facility. This new aquarium exhibits over 3000 animals comprising over 250 different species including; flashlight fish, deep sea crustaceans, giant spider crabs, giant Pacific octopus, sharks, a sea turtle, as well as many other, more commonly seen species.

He has been the AZA's (American Zoo and Aquarium Association's) studbook keeper for the highly endangered Lake Victorian Cichlids since 1993 and is a member of the

executive steering committees for the AZA's Aquatic invertebrates, Freshwater Fishes and Marine Fishes Taxon Advisory groups.

Jay has written seven books and over 200 articles for 15 different aquarium magazines and scientific publications since his first article about sharks was published in Freshwater and Marine Aquarium magazine back in 1981. In addition, he has presented numerous lectures on aquarium topics to various professional and hobbyist groups as well as given lectures to community college classes and has appeared on many episodes of the regional "Zoo Today" television show. He holds the PADI rating of Divemaster, and has logged over 350 hours of dive time under a wide variety of conditions. His current professional interests include; animal collection planning, aquarium careers, flashlight fish husbandry and public aquarium exhibit design.



**The author measuring water quality in a HLLE study system circa 2011**