Koi Ahoy

August 2012

PRESIDENT'S MESSAGE – *Jerry Kyle*

The room was overflowing. What a great turnout at Georgia's for our Annual Pot Luck. A note of thanks to Anthony Quintero for bringing Dr. Scott Webber, DVM, from the UC Davis Vet School to talk to us about KHV. No cure but, a vaccine available to be administered by a bath was good news. Better still was that a number of Koi can be vaccinated with the same bath at the same time for the one cost. And, the food just keeps getting better with this club. I tell people I joined for the Koi but stay for the people. Maybe I need to say I stay for the food too.

Inside this Issue

Have you seen the July/Aug KoiUSA Magazine? Our "Pond Tour/Progressive Dinner/Poker Run" was a five page spread feature article. The editors just loved what we did and our pictures. Now they want to see if other clubs will follow our lead and send them pictures of what they do. We started something. The picture of Melody smiling with Duane at their pond side was so wonderful they made it a half pager and our Koi Person of The Year Trophy is so special it was also a feature. More wonderful was the picture of members standing pond side at Gus's and Leslie's pond. The editors were so pleased with that picture they made it into a centerfold across two pages as the featured picture of "Who' Reading Koi USA?" That has never happened before. Everyone looked good. Even Garry Chinn and me in other articles looked good. Together we all make CKC look good. Thank you.

This month we go to smiling Duane and Melody's again for our Annual Koi Auction. There will be some nice Koi available. Show off by bringing a friend and bring a smile for the camera. The Carlson's will provide liquid refreshments. Some of us might bring a finger food. No sense to stop eating since we also do that so well.

Camellia Koi Club Report to AKCA, August 10 2012 by Jerold Kyle

July witnessed our Annual Pot Luck. Anthony Quintero of Koi Enterprise invited Dr. Scott Webber, DVM, from the University Of California to talk of news of KHV. His extremely interesting attention grabbing presentation showed there still is no cure for KHV but, there is now a vaccine administered in a bath so needles and injections are not needed. We feel fortunate and pleased to have Dr. Webber and the UC Davis Vet Program available to support us.

Plans for August are to have our Annual Club Auction where newer members along with the rest of us are able to get some very nice Koi at reasonable costs as other members reduce fish load in their pond to make way for the excitement of growing even better Koi. Camellia Koi Club makes an "Annual" affair out of those activities we love most like "Pot Luck" and "Koi Auction" as well as other things we join this club for.

Photos from July's meeting

Georgia's pond was a real delight.

AKCA Ko Person of the year was awarded to Gus by President Jerry.

Anthony from Koi Enterprises arranged for KHV presentation
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Dr Scott Weber brought by Anthony.

Dr. Scott gave us an update on the new KHV vaccination.

Slide projector set up by Cavoy represent-ative who manufact-ures the new vaccine..

The potluck set up was eagerly awaited.

Of course the eating and visiting was always welcome.

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More members and guests.

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Full bellies and we were ready to learn more about KHV.

Lots of questions from newer members and an update on the latest treatment for koi KHV.

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NEXT MEETING

Annual CKC Koi Auction

Bring your favorite snack to share and a chair.

12:00 noon Board of Director's Meeting
1:00 General Club Meeting
Note the good instructions from Jim Phillips on bringing your koi to the auction. If you need help bringing them call Duane or Jerry

Aug 26
at
Duane & Melody's home in Granite Bay
8725 Spooner Ct.

916/791-7607

Transport Bag Water Chemistry

By Jim Phillips

This is an abbreviated version of what I hope to finish and have vetted by more knowledgeable people shortly.

Occasionally I hear someone say, "When you get this fish to its new environment, put some of that new water in the bag to prevent pH shock." Do you think it's a good idea? Please read this and I'll ask this again at the end.

When fish are in the bag, it is a whole different environment than what we and the fish are used to. As it is in a bag that has had all the air expelled and then filled with pure oxygen, this is something we do not have in nature, a closed environment. As the fish consumes oxygen and expels carbon dioxide and ammonia, the closed environment causes different things to happen. The volume of water compared to volume of fish is much smaller, that is, there is no dilution factor. The carbon dioxide and ammonia produced by the fish are much more concentrated. So, what really happens in the bag?

First, we all know the fish requires oxygen, it is there in abundant supply in the portion of the bag not occupied by water. Oxygen is a water soluble gas, it dissolves into the water so we know the fish is not going to suffocate. Second, the fish produces carbon dioxide through respiration, just like we do. It also produces ammonia as a by-product of protein metabolism. So what happens to the carbon dioxide and ammonia? They are also water soluble gases. A quick refresher on pH is going to be helpful here. The pH scale goes from 0 to 14. 0 to 7 is considered acid meaning it has a lot of hydrogen ions. 7 is neutral, and 7 to 14 is considered alkaline, meaning it has a surplus of hydroxide ions (not to be confused with alkalinity, which we will not discuss here.)

The carbon dioxide dissolves in the water and forms carbonic acid. This acidifies or reduces the pH of the water. This means there is a surplus of hydrogen ions in the water. As the fish spends more and more time in the bag, the pH continues to go lower and lower (more and more hydrogen ions).

At the same time, the fish is producing ammonia. Remember there is no bio-converter to consume this ammonia. We all know that ammonia kills fish, right? So why can the fish survive in the bag for extended periods of time? As the ammonia dissolves in the water, it becomes one of two different forms or species of ammonia: ionized ammonia or ammonium which is a combination of ammonia and one of those hydrogen ions floating around; or regular ammonia. Ammonium, the ionized stuff, is relatively non-toxic. Ammonia on the other hand is very toxic.

How much ammonia can there be and the fish still survive? A lot, a whole lot if the pH is low enough. That is because the vast majority of it is locked up as ammonium. My mentor, Norm Meck has found examples of fish bagged for extended periods that had truly staggering amounts of ammonia where the fish survived. Why? The pH was incredibly low. The exact numbers were a pH of 4.5 and total ammonia of 30ppm.
You many have noticed I used the term total ammonia. When you use an ammonia test kit, it does not differentiate between ionized and unionized ammonia, it just tells you how much is there. There are tables that tell you based on temperature and pH, how much free ammonia you are dealing with and this is the important number. For example, that 30 ppm ammonia at a pH of 4.5 at 72 deg F is really less than .02ppm free ammonia. Now if that same amount of total ammonia was present in water with a pH of 7.6 at 72 deg F, the results would be much different, .547ppm. While this is a level that won't immediately kill your fish, it causes a great deal of damage to the gills and weakens the fish immensely.

Ok, so what does this mean? As long as the bag is closed, everything is fine. As soon as the bag is opened, the pent up carbon dioxide begins to gas off and all the chemistry that has gone on in the bag begins to reverse itself. The carbonic acid decreases, the pH starts to go up, the ammonium/ammonia ratio starts to reverse, just from opening the bag.
So what happens if you introduce some of this water from the new environment? Water with a much higher pH? Water that is most likely pH 7.6 or above? The pH of the water in the bag spikes upwards rapidly closely approximating the pH of the new water. This immediately reverses the ammonium/ammonia ratio and releases much more unionized ammonia to possibly critical levels based on how long the fish was in the bag.

So, I'll ask you again, still think it's a good thing to add new water to that bag?
The problem of pH shock is very real, just not what a lot of people have believed for a long time.

Last year for the auction, I recommended that fish brought that were not in a bag with pure oxygen, be re-bagged, with none of their original transport water, into a bag with fresh water treated with The Ultimate water conditioner and filled with oxygen.

CKC BOARD OF DIRECTORS MINUTES

July 24, 2012

Attending: Jerry, Georgia, Marilee, Gus, and Jim Phillips, Duane

Treasurer Report: As reported in Koi Ahoy this month

Old Business:

Calendar: We still need a November meeting location. Duane will pursue.

December party is going to be at last year's location. Duane will contact them for reservations.

Jerry updated Jim on the condition of the tanks that was returned by ZNA. The tanks were randomly unfolded by Jerry and found to be dry and carefully folded, returned in excellent condition. He also reported ZNA's intention to schedule their next year's show in the spring so as to not conflict with our traditional show dates. A copy of the contract we are using for renting out equipment to other organizations was given to Jim.

Financial Report August 2012

BeginningBalance	$8152.01
Expenses	89.71 Host fee ($40) Pot luck expenses (paper goods, etc) $10.86 & Check Image fee $3
Income	3.00 Refund Check Image fee
Ending Balance	$8065.30

New Business:

Jerry reports a splint off group of 14 Koi Show Judges (known as AKJA) has been organized away from AKCA. Details at the end of this report. Jerry also reports a change of editors at Koi USA. Larry Illes wants the magazine direction to refocus on backyard ponders, not just koi competition. Jerry will have more to report following next week national AKCA meeting

Discussed whether CKC should have a show in 2013 or 2014. It was decided that the decision should rest with next year's BoD and membership. AKCA is planning a possible seminar in 2014.

Discussion regarding August koi auction, and a protocol for tanks receiving incoming fish. When asked Jim said he would draft the necessary protocol.

Garry's Did You Know?

by Garry Chin

Interaction

Since the beginning of the year I have covered many topics related to water chemistry. This month the discussion will be about the interaction of these topics.

Water quality in Koi ponds is affected by the interactions of several chemical components. Carbon dioxide, pH, alkalinity and hardness are interrelated and can have profound effects on pond productivity, the level of stress and Koi health, oxygen availability and the toxicity of ammonia as well as that of certain metals. Most features of water quality are not constant. Carbon dioxide and pH concentrations fluctuate or cycle daily. Alkalinity and hardness are relatively stable but can change over time, usually weeks to months, depending on the pH or mineral content of watershed and bottom soils.

pH and carbon dioxide

The measure which indicates whether water is acidic or basic is known as pH. More precisely, pH indicates the hydrogen ion concentration in water and is defined as the negative logarithm of the molar hydrogen ion concentration
(-log [H+]). Water is considered acidic when pH is below 7 and basic when pH is above 7. Most pH values encountered fall between O and 14. The recommended pH range for aquaculture is 6.5 to 9.0. Fish have an average blood pH of 7.4. Fish blood comes into close contact with water (1- or 2-cell separation) as it passes through the blood vessels of the gills and skin. A desirable range for pond water pH would be close to that of Koi blood (i.e., 7.0 to 8.0). Fish may become stressed and die if the pH drops below 5 (e.g., acidic runoff) or rises above 10 (e.g., low alkalinity combined with intense photosynthesis by dense algal blooms phytoplankton or filamentous algae). Pond pH varies throughout the day due to respiration and photosynthesis. After sunset, dissolved oxygen (DO) concentrations decline as photosynthesis stops and all plants and animals in the pond consume oxygen (respiration). In heavily stocked Koi ponds, carbon dioxide (CO_2) concentrations can become high as a result of respiration. The free CO_2 released during respiration reacts with water, producing carbonic acid (H_2CO_3), and pH is lowered ($H_2O + CO_2 = H_2CO_3 = H^+ + HCO$).

Carbon dioxide rarely causes direct toxicity to Koi. However, high concentrations with lower pond pH will limit the capacity of Koi blood to carry oxygen by lowering blood pH at the gills. At a given dissolved oxygen concentration (e.g., 2 mg/L, milligrams per liter; same as parts per million, ppm), Koi may suffocate when CO_2 levels are high and appear unaffected when CO_2 is low. In a reservoir or natural pond, CO_2 rarely exceeds 5 to 10 mg/ L. High CO_2 concentrations are almost always accompanied by low dissolved oxygen concentrations (high respiration); the aeration used to increase low dissolved oxygen will, to some extent, help reduce excess CO_2 by improving its diffusion back into the atmosphere. Chronically high CO_2 levels can be treated chemically with hydrated lime, $Ca(OH)_2$. Approximately 1 mg/L of hydrated lime will remove 1 mg/L of CO_2. This treatment should not be used in ponds with poor buffering capacity (low alkalinity) because pH could rise to levels lethal to the Koi. Also, Koi could be endangered if hydrated lime is added to waters with high ammonia concentrations. High pH increases the toxicity of ammonia.

Alkalinity

The quantity of base present in water defines what is known as total alkalinity. common bases found in Koi ponds include carbonates, bicarbonates, hydroxides, phosphates and berates. Carbonates and bicarbonates are the most common and most important components of alkalinity. Alkalinity is measured by the amount of acid (hydrogen ion) water can absorb (buffer) before achieving a designated pH. Total alkalinity is expressed as milligrams per liter or parts per million calcium carbonate (mg/L or ppm $CaCO_3$). A total alkalinity of 20 mg/L or more is necessary for good pond productivity. A desirable range of total alkalinity for Koi is between 75 and 200 mg/L $CaCO_3$. Carbonate-bicarbonate alkalinity (and hardness) in surface and well waters is produced primarily through the interactions of CO_2, water and limestone. Rainwater is naturally acidic because of exposure to atmospheric Carbon Dioxide. As rain falls to the earth, each droplet becomes saturated with CO_2; and pH is lowered. Well water is pumped from large, natural underground reservoirs (aquifers) or small, localized pockets of underground water (groundwater), typically, underground water has high CO_2 concentrations, and low pH and oxygen concentrations. Carbon Dioxide is high in underground water because of bacterial processes in the soils and various underground particulate mineral formations through which water moves. As ground or rainwaters flow over and percolate through soil and underground rock formations containing calcite limestone ($CaCO_3$) or dolomitic limestone
[$CaMg(CO_3)_2$], the acidity produced by CO_2 will dissolve limestone and form calcium and magnesium bicarbonate salts. The resultant water has increased alkalinity, pH and hardness.

Alkalinity, pH and carbon dioxide concentrations

In water with moderate to high alkalinity (good buffering capacity) and similar hardness levels, pH is neutral or slightly basic (7.0 to 8.3) and does not fluctuate widely. Higher amounts of CO_2 (i.e., carbonic acid) or other acids are required to lower pH because there is more base available to neutralize or buffer the acid.

Alkalinity, pH and photosynthesis

The bases associated with alkalinity react with and neutralize acids. Carbonates and bicarbonates can react with both acids and bases and buffer (minimize) pH changes. The pH of well buffered water normally fluctuates between 6.5 and 9. In waters with low alkalinity, pH can reach dangerously low (CO_2 and carbonic acid from high respiration) or dangerously high (rapid photosynthesis) levels. Phytoplankton are microscopic or near microscopic, aquatic plants which are responsible for most of the oxygen (photosynthesis) and primary productivity in ponds. By stabilizing pH at or above 6.5, alkalinity improves phytoplankton productivity (pond fertility) by increasing nutrient availability (soluble phosphate concentrations). Alkalinities at or above 20 mg/L trap CO_2 and increase the concentrations available for photosynthesis. Because phytoplanktons use CO_2 in photosynthesis, the pH of pond water increases as carbonic acid (i.e., CO_2) is removed. Also, phytoplankton and other plants can combine bicarbonates (HCO_3^-) to form CO_2 for photosynthesis, and carbonate (CO_3^{-2}) is released: $2HCO_3^-$ + phytoplankton = CO_2 (photosynthesis) + $CO_3^{-2} + H_2O$) $CO_3^{-2} + H_2O = HCO_3^- + OH^-$ (strong base). High pH could also be viewed as a decrease in hydrogen ions (H^+):$CO_3^{-2} + H^+ = HCO_3^-$ or $HCO_3^- + H^+ = H_2O + CO_2$. The release of carbonate converted from bicarbonate by plant life can cause pH to climb dramatically (above 9) during periods of rapid photosynthesis by dense phytoplankton (algal) blooms. This rise in pH can occur in low alkalinity water (20 to 50 mg/L) or in water with moderate to high bicarbonate alkalinity (75 to 200 mg/L) that has less than 25 mg/L hardness. High bicarbonate alkalinity in soft water is produced by sodium and potassium carbonates which are more soluble than the calcium and magnesium carbonates that cause hardness. If calcium, magnesium and photo synthetically produced carbonate are present when pH is greater than 8.3, limestone is formed. Ponds with alkalinities below 20 mg/L do not usually support good phytoplankton blooms and do not commonly experience dramatic pH increases because of intense photosynthesis.

Hardness

Water hardness is important to Koi culture and is a commonly reported aspect of water quality. It is a measure of the quantity of divalent ions (for this discussion, salts with two positive charges) such as calcium, magnesium and/or iron in water. Hardness can be a mixture of divalent salts; however, calcium and magnesium are the most common sources of water hardness. Hardness is traditionally measured by chemical titration. The hardness of a water sample is reported in milligrams per liter as calcium carbonate (mg/L $CaCO_3$). Calcium carbonate hardness is a general term that indicates the total quantity of divalent salts present and does not specifically identify whether calcium, magnesium and/or some other divalent salt is causing water hardness. Hardness is commonly confused with alkalinity (the total concentration of base). The confusion relates to the term used to report both measures, mg/L $CaCO_3$. If limestone is responsible for both hardness and alkalinity, the concentrations will be similar if not identical. However, where sodium bicarbonate ($NaHCO_3$) is responsible for alkalinity it is possible to have low hardness and high alkalinity. Acidic, ground or well water can have low or high hardness and has little or no alkalinity. Calcium and magnesium are essential in the biological processes of Koi (bone and scale formation, blood clotting and other metabolic reactions). Koi can absorb calcium and magnesium directly from the water or from food. However, calcium is the most important environmental, divalent salt in Koi culture water. The presence of free (ionic), calcium in culture water helps reduce the loss of other salts (e.g., sodium and potassium) from Koi body fluids (i.e., blood). Sodium and potassium are the most important salts in Koi blood and are critical for normal heart, nerve and muscle function. Researchers have shown that environmental calcium is also required to re-absorb these lost salts. In low calcium water, Koi can lose (leak) substantial quantities of sodium and potassium into the water. Body energy is used to reabsorb the lost salts. A recommended range for free calcium in culture waters is 25 to 100 mg/L (63 to 250 mg/L $CaCO_3$ hardness). A low $CaCO_3$ hardness value is a reliable indication that the calcium concentration is low. However, high hardness does not necessarily reflect a high calcium concentration. But, since limestone is common in the soil and bedrock of the southern United States, it would be reasonably safe to assume that high hardness measurements reflect high calcium levels. A $CaCO_3$ hardness value of 100 mg/L represents a free calcium concentration of 40 mg/L (divide $CaCO_3$ value by 2.5) if hardness is caused by the presence of calcium only. Similarly, a $CaCO_3$ value of 100 mg/L represents a free magnesium value of 24 mg/L (divide $CaCO_3$ value by 4.12) if hardness is caused by magnesium only. These factors (2.5 and 4.12) are related to the molecular weight of $CaCO_3$ and the difference in weights between calcium and magnesium atoms. Where hardness is caused by limestone, the $CaCO_3$ value usually reflects a mixture of free calcium and magnesium with calcium being the predominant divalent salt. Limestone can be used to increase calcium concentrations (and carbonate-bicarbonate alkalinity) in areas with acid waters or soils. However, at a pH of 8.3 or greater, limestone will not dissolve. Food grade calcium chloride could be used to raise calcium levels in soft, alkaline waters. Expense might be prohibitive if large volumes of water need treatment. Identifying a suitable water source may be more practical.

Effects of pH, alkalinity and hardness on ammonia and metal toxicities

Ammonia becomes more toxic as pH increases. Higher concentrations of the toxic form of ammonia (NH_3) are formed in basic waters; while the less toxic form, ammonium (NH_4^+), is more prevalent in acidic waters. Since alkalinity increases pH, ammonia will be more toxic in waters with high total alkalinity. Hardness is not typically associated with ammonia toxicity. Metals such as copper and zinc are may be found around aquatic environments (tanks, plumbing and copper sulfate), then these metals become more soluble in acidic environments. The soluble or free ionic forms of these metals are toxic to Koi.

High total alkalinity increases pH and available bases which produce less toxic or insoluble forms of copper and zinc. High concentrations of calcium and magnesium (hardness) block the effects of copper and zinc at their sites of toxic action. Therefore, copper and zinc are more toxic to fish in soft, acidic waters with low total alkalinity. Ideally, a pond should have a pH between 6.5 and 9 as well as moderate to high total alkalinity (75 to 200, but not less than 20 mg/L) and a calcium hardness of 100 to 250 mg/L $CaCO_3$. Many of the principles of chemistry are abstract (e.g., carbonate-bicarbonate buffering) and difficult to grasp. However, a fundamental understanding of the concepts and chemistry underlying the interactions of pH, CO_2, alkalinity and hardness is necessary for effective pond management.

Finally, there is no way to avoid it; water quality is water chemistry.

34th ANNUAL CENTRAL CALIFORNIA KOI SOCIETY KOI SHOW

Our annual koi show will be held at Fig Garden Village, 5082 N. Palm Ave, Fresno, CA 93704, corner of Palm and Shaw, on Friday September 28th (set-up 7am and koi check in beginning at 3pm). Saturday September 29th koi judging begins at 9:00 am and our show ends on Sunday September 30th at 3pm.

This show is open to any koi hobbyist interested in showing at our event and is cordially invited. Space is limited so please register early as show tanks will be reserved on first come first serve basis. There will be koi and pond vendors available selling pond equipment, koi food, and koi. We have added a Long Fin competition to our show this year.

Our show is always expanding and improving for both the koi hobbyist and public who come to enjoy viewing the beauties that come out to compete from as far as San Diego to as far north as San Jose, California.

To reserve a show tank or for more information please call

Show Chairman Rosimeri Tran at 559-970-8508
or email cencalkoi@gmail.com

or

Show Vice Chair, Tony Palazzo 559-409-9024
or email tonypalazz12@comcast.net

Check us out on the web at cencalkoi.com

2012 Club Calendar (to date)

Date	Topic	Location
January 20	Winter update	Marilee & Jim's Auburn
February 26	Flora Tropicana	Elk Grove
March 25	High Hand Nursery	Rocklin
April 29	Bay Area Koi Vendor Tour	San Jose
May 20 (3rd Sunday)	Intraclub pond tour, progressive dinner, and poker run	Starts at Tran home
June 24	Golden Pond	Rocklin
July 29	Annual Potluck	Vonk Home
August 26	Annual Club Koi Auction	Carlson's home
September 30		Haugland home
October 28	Spaghetti cook-off Challenge	Kyle & Flockhart homes
November 18 (3rd Sunday)	TBD	Do home
December 9	Christmas Party 1:00 p.m.	Umeko Buffer 8353 Folsom Blvd. Sacramento

If you would like to host your pond and house next year, please let Duane Carlson know. We will be delighted to schedule your convenient month.

2011 Board of Directors

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