COLORADO AQUACULTURE ASSOCIATION

THE FISHLINE

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PANDEMIC-DRIVEN ANGLING BOOST PROPS UP HATCHERY OPERATIONS

by Liza Mayer

Fishing is a hobby for the patient – like watching paint dry. But to any avid angler, fishing is a respite from life's stresses. They'll talk about fishing as an escape from reality and a chance to be enveloped by the sound of calming water and breathe in fresh air. The catch, many will say, is just the icing on the cake.

This is most likely why fish farmers who cater to the recreational fishing market reported an increase in sales since the start of the COVID-19 pandemic, which is a stressful period for most. Sales of angling licences in the United States, Canada and the United Kingdom have increased.

"People who haven't fished in years are going out and catching fish," says Katie Mackey-Harris, a second-generation trout farmer in Paynes Creek, California. She says sales of trout to the recreational market are "as strong as it has ever been, if not more so, with this pandemic."

Recreational fishing licences went up by 30 per cent in Alberta and Manitoba; 20 per cent in Ontario, and 15 per cent in British Columbia and Saskatchewan, CBC News has reported.

Owen Schoenberger, hatchery manager at the Kootenay Trout Hatchery (KTH), located in the town of Bull River in British Columbia, says angling license sales at KTH reflect the provincial trend. While sales to non-residents went down significantly due to border closures, he notes the rise in license sales to B.C. residents somehow made up for the slack.

"The increase in resident angling licence sales provincially is one of the silver linings to the pandemic. Fishing is one of the many other outdoor activities that allowed for social distancing. Hopefully, the people that bought licences because they renewed their interest in fishing, and the ones that started fishing for the first time, will stay interested in the activity and keep buying licences in the future," he says.

The hatchery raises fish – primarily Rainbow trout, and some Cutthroat trout, Kokanee and Eastern Brook char – to stock local lakes. It is one of the six hatcheries owned and operated by the non-profit Freshwater Fisheries Society of BC (FFSBC). Every year, KTH and FFSBC's other hatcheries, located in Abbotsford, Duncan, Summerland and Clearwater, release a combined five million to six million fish into around 800 lakes throughout British Columbia to support the provincial recreational fishing program.

The COVID-19 pandemic has highlighted the role that hatcheries such as KTH play in the community. Schoenberger notes that close to 50 per cent of freshwater angling in B.C. occurs in lakes stocked by FFSBC. "There would be a significant reduction in angling opportunities in all regions without the provincial stocking program," he says.

Going green

The Kootenay Trout Hatchery has implemented major retrofits since it opened in 1966. In the early 80s, fish health concerns prompted a switch of the water source from surface water to groundwater.

Schoenberger recalls that the original water supply was surface water from the nearby Norbury Creek, which was diverted to the hatchery through a kilometer-long pipe. The switch in the mid-eighties meant a more consistent water supply. And because it was a groundwater source, fish were not exposed to disease or pathogens that could come with river water.

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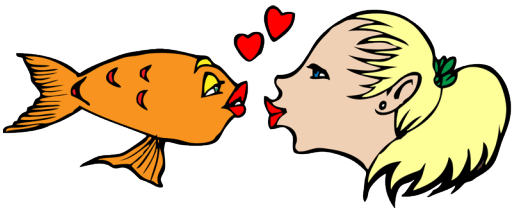

President's Corner

Hello Colorado Aquaculturists and Welcome Spring 2021,

It is with a heavy heart that I share with you that Joe Marrinan, a friend and colleague to the aquaculture community, was diagnosed with brain cancer earlier this year. Joe is a graduate of the TSJC Aquaculture Program, worked at the CPW Native Species and Aquatic Restoration Facility, and was most recently the manager at Las Animas Fish Hatchery. His family has a GoFundMe page (more info in Fishbits) if you would like to relieve some of the financial burden or even send a note of positive energy and prayer.

Please know that you have not missed the annual membership meeting! With COVID restrictions still in effect, the board decided to sadly forgo the annual education opportunity and focus on a business meeting only in 2021. Details on the annual business meeting will go out to the membership as soon as the date is finalized. However, it looks like vaccination rates are rising and restrictions are easing, so let's plan to meet in person at Mount Princeton in 2022!

But before this meeting, our community needs to take necessary action to support aquaculture in our state. The landscape of Colorado aquaculture will likely be changing, and we need to stand united so our voice is heard. A public enacted 2022 ballot initiative to Protect Animals from Unnecessary Suffering and Exploitation (PAUSE) was recently released. This initiative poses major impacts to both the food and recreational fish industry. Although I fully favor the protection of animals from unnecessary suffering and exploitation, this ballot creates a subsection to the accepted agricultural animal husbandry practices by adding that animals cannot be processed prior to living least one-quarter of their natural lifespan. Not only is this impractical but will further challenge the current generation and impede future interest and possibly collapsing the future of fish cultivation here in Colorado!

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In This Issue ...

THE FISHLINE is published by the CAA. Contact Cheyenne Carrell, with your submissions for the next issue of The Fishline at cheyenne.carrell@hotmail.com or (970) 819-1311

Web site: www.colaqua.org

Changes in information?
Contact the Colorado Aquaculture Association, colaquaassn@gmail.com

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Lastly, consider enrolling your farm in the ongoing eDNA gill lice research with CPW. Research staff continue to look for private farms interested in participating in the investigation of gill lice detection utilizing eDNA. This program is currently open to any fish farms in Colorado or transport fish into Colorado. All collected data is strictly confidential and will not affect your aquaculture permit status.

As we continue to navigate the obstacles presented over the last year, remember that times of uncertainty often brings necessary but difficult change. Together we will pave a path that supports this industry now while encouraging the next generation to get involved now.

Continue to stay healthy and sane!

With gratitude,

Kendra L. Holmes, CAA Board President

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In 1987, decision was made to put a cover over the raceways that housed the fish because the open raceways would often freeze over in the winter. This also provided protection from predators such as ducks, herons and king fishers. The enclosure also virtually eliminated the transmission of pathogens by these predators from the creek to the hatchery fish. Being now shielded from the sun, algae growth is also prevented.

"The hatchery has evolved over the years. We originally had 20 concrete raceways that contained the bulk of production rearing, and then in 2015, we had a major retrofit where 10 of those concrete raceways were demolished and the round tanks were installed," explains Schoenberger. Today, the hatchery has four 20 ft. round tanks and five 16 ft. round tanks for grow-out. Annual biomass is around 11,000 to 12,000 kilograms, but some of that come from other rearing containers.

That 2015 modernization effort, budgeted at roughly $900,000, was focused on reducing energy usage and enhancing operational efficiency. The installation of the circular tanks to replace the fish rearing raceways was projected to significantly reduce water consumption, and thereby reduce water pumping cost.

The aeroboost units installed inside those tanks were key to water-use reduction, says Schoenberger. "We pump atmospheric air into the water through these aeroboost units to supplement the oxygen, so we're able to reduce water use by between 50 and 60 per cent in each tank. That significantly reduces our water pumping cost, which is one of the major costs at our site here."

The groundwater water comes at an ideal temperature of 8.7 C in the winter, but this cools to less than 7 C, or closer to six degrees, by the time the fish are released in May.

"Our aquifers are on a six-month delay so we actually have our warmest water in December and January. This makes it difficult to finish off the last few grams of growth to reach target release sizes," explains Schoenberger. While the water used for incubation could be heated in order to push the fish to grow a bit further, this takes a lot of energy, so the hatchery eschews it.

"We try to get to our target release size using the best husbandry and fish culture practices we can," says Schoenberger, who joined KTH in 2004 as senior fish culturist.

Besides, "higher temperatures can also lead to higher risk of bacterial infection or other pathogens to establish," he says. "So the cold water is kind of a curse and a blessing for us. When we don't reach target size, it doesn't mean we have inferior fish; the fish are in excellent health, they're just not up to the size that we like them to be by the time they need to be released into the lake. And that's not all the time. But one of the challenges certainly is to try and meet those goals by the time for us to release the fish."

In terms of energy consumption, the retrofit was projected to reduce electricity use. In 2020, the hatchery used 876,000 Kwh, down from 1.18 million Kwh in 2015.

"The improved tank design constantly moves waste out of the system, reducing the time required to clean the tanks. With better access to feed throughout the tank, fish are better able to convert food to body mass, reducing variance in fish size. The result is more consistent, better-conditioned, healthier fish released into rivers and lakes throughout the region," the hatchery announced following the renovation.

In subsequent tweaks in the years that followed, the hatchery installed other technological innovations

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that have made processes less energy-intensive and more environmentally friendly.

About 75 per cent of the feeding system in the hatchery is now automated. "Our Arvotec feeders are computer-operated, which helps to reduce day-to-day manpower needs and also gives us a much better and consistent feed delivery to the tanks."

Temperature and dissolved oxygen are digitally monitored in these tanks as well and linked to the alarm system.

"Our water supply systems are controlled primarily by a digital control panel that enables us to turn our wells on and off. Also, in conjunction with that, we have a PLC (programmable logic control) program, which is a panel that will signal any alarms for our system.," Schoenberger says. "Almost all of our rearing or incubation areas tanks are alarmed in some way whether it's a low-level in aeration tower or low oxygen in some of the tanks or some kind of failure in the system. We're alerted through that computer program."

The alarm system is also linked through the local phone service provider to notify staff of alarms through their cell phones.

The system allows for remote access to the wells. "Most of our wells are several hundred meters from the actual hatchery site but we can actually turn them on off and on inside the building with a click of a mouse," Schoenberger says.

Variable frequency drives are installed in four of the five groundwater wells, allowing each to only pump the water according to what is needed at a time. "So if we're only demanding a little bit of water, one of our wells can now pump only as low as about 50 per cent capacity. Whereas in the past, it was either on or off, and it used the same amount of power regardless of how much water is actually needed. So that's been a huge cost savings."

The greening of Kootenay Trout Hatchery is an ongoing initiative. And while technology has allowed these innovations at the hatchery, Schoenberger knows they could only do so much without the skills and competences of his team of six full-time staff, a part-time office manager and two seasonal fish culturists.

"Our staff's ability to weather the storm and willingness to achieve results, regardless of what gets thrown at them whether it's a low fish run or a pandemic, and our flexibility and the disposition to do what needs to be done to accomplish our goals is fantastic," Schoenberger says.

"We have a very competent team; each of them has been here for quite a few years – even our seasonal staff. We've been hiring the same people these last four to five years. Everybody is well-versed in the systems and our operations from our egg collecting through incubation, early rearing and our releases," he says.

COLORADO STATE BALLOT INITIATIVE 2022 #16

Protect **A**nimals from **U**nnecessary **S**uffering and **E**xploitation

Be it enacted by the people of the state of Colorado:

Section 1. In Colorado Revised Statutes, 18-9-201, amend (2), (2.9), and (5); add (3.5) as follows:

18-9-201. Definitions

As used in this part 2, unless the context otherwise requires:

(2) "Animal" means any living dumb NON-HUMAN creature, including, BUT NOT LIMITED TO, A DOG, A CAT, A HORSE, LIVESTOCK, a certified police working dog, a police working horse, and a service animal as those terms are defined, respectively, in subsections (2.3), (2.9), (2.4), and (4.7) of this section.

(2.9) "Livestock" means bovine, camelids, caprine, equine, ovine, porcine, FISH and poultry.

(3.5) "NATURAL LIFESPAN" FOR THE FOLLOWING SPECIES SHALL BE EXPLICITLY DEFINED HERE BASED ON STATISTICAL ESTIMATES: A COW LIVES TO 20 YEARS, A CHICKEN LIVES TO 8 YEARS, A TURKEY LIVES TO 10 YEARS, A DUCK LIVES TO 6 YEARS, A PIG LIVES TO 15 YEARS, A SHEEP LIVES TO 15 YEARS, A RABBIT LIVES TO 6 YEARS.

(5) "Sexual act with an animal" means an act between a person and an animal involving either direct physical contact between the genitals of one and the mouth, anus, or genitals of the other. SEXUAL ACT WITH AN ANIMAL ALSO INCLUDES ANY INTRUSION OR PENETRATION, HOWEVER SLIGHT, WITH AN OBJECT OR PART OF A PERSON'S BODY INTO AN ANIMAL'S ANUS OR GENITALS . A sexual act with an animal may be proven without allegation or proof of penetration. Nothing in this subsection (5) shall be construed to prohibit ANY PERSON FROM

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PAUSE, continued from page 4

DISPENSING CARE TO AN ANIMAL IN THE INTEREST OF IMPROVING THAT ANIMAL'S HEALTH accepted animal husbandry practices.

Section 2. In Colorado Revised Statutes, 18-9-201.5, amend (1) and (3) as follows:

18-9-201.5. Scope of Part 2

(1) Nothing in this part 2 shall affect accepted animal husbandry practices utilized by any person in the care of companion or livestock animals or in the extermination of undesirable pests as defined in articles 7 AND 10 , and 43 of title 35, C.R.S.

(2) In case of any conflict between this part 2 or section 35-43-126, C.R.S., and the wildlife statutes of the state, said wildlife statutes shall control.

(3) IN CASE OF ANY CONFLICT BETWEEN ANIMAL CARE OTHERWISE AUTHORIZED BY LAW, THIS PART 2 SHALL CONTROL. Nothing in this part 2 shall affect animal care otherwise authorized by law.

Section 3. In Colorado Revised Statutes, 18-9-202, amend (1)(b), (2)(a.5)(VII), and (4); add (1.9) and (2)(a.5)(VIII) as follows:

18-9-202. Cruelty to animals - aggravated cruelty to animals

(1) (a) A person commits cruelty to animals if he or she knowingly, recklessly, or with criminal negligence overdrives, overloads, overworks, torments, deprives of necessary sustenance, unnecessarily or cruelly beats, allows to be housed in a manner that results in chronic or repeated serious physical harm, carries or confines in or upon any vehicles in a cruel or reckless manner, engages in a sexual act with an animal, or otherwise mistreats or neglects any animal, or causes or procures it to be done, or, having the charge or custody of any animal, fails to provide it with proper food, drink, or protection from the weather consistent with the species, breed, and type of animal involved, or abandons an animal.

(b) Any person who intentionally abandons AN ANIMAL a dog or cat commits the offense of cruelty to animals.

(1.9) ANY PERSON WHO SLAUGHTERS LIVESTOCK IN ACCORDANCE WITH ACCEPTED AGRICULTURAL ANIMAL HUSBANDRY PRACTICES DOES NOT VIOLATE THE PROVISIONS OF SUBSECTION (1) OF THIS SECTION SO LONG AS THE ANIMAL HAS LIVED ONE QUARTER OF THEIR NATURAL LIFESPAN BASED ON SPECIES, BREED, AND TYPE OF ANIMAL AND THE ANIMAL IS SLAUGHTERED IN SUCH A WAY THAT THE ANIMAL DOES NOT NEEDLESSLY SUFFER.

(2) (a) Except as otherwise provided in subsection (2)(b) of this section, cruelty to animals, or cruelty to a service animal or certified police working dog or police working horse pursuant to subsection (1.5)(c) of this section, is a class 1 misdemeanor.

(a.5)

(VII) This subsection (2)(a.5) does not apply to the treatment of pack or draft animals by negligently overdriving, overloading, or overworking them, or the treatment of livestock and other animals used in the farm or ranch production of food, fiber, or other agricultural products when REGARDLESS OF WHETHER the treatment is in accordance with accepted agricultural animal husbandry practices, the treatment of animals involved in activities regulated pursuant to article 32 of title 44, the treatment of animals involved in research if the research facility is operating under rules set forth by the state or federal government, the treatment of animals involved in rodeos, OR the treatment of dogs used for legal hunting activities. , wildlife nuisances, or to statutes regulating activities concerning wildlife and predator control in the state, including trapping.

(VIII) THIS SUBSECTION (2)(a.5) DOES NOT APPLY TO THE TREATMENT OF ANY ANIMAL INVOLVED IN RESEARCH IF THE RESEARCH FACILITY IS OPERATING UNDER RULES SET FORTH BY THE STATE OR FEDERAL GOVERNMENT, WILDLIFE NUISANCES, OR TO STATUTES REGULATING ACTIVITIES CONCERNING WILDLIFE AND PREDATOR CONTROL IN THE STATE, INCLUDING TRAPPING.

(4) The short title of this section is " Punky's WILBUR's Law".

Section 4. Effective Date:

This act takes effect April 1s t 2023, and applies to offenses committed on or after said date.

Section 5. Severability:

If any provision of this Act or its application to any person or circumstance is held invalid, the invalidity does not affect any other provision or application of this Act that can be given effect without the invalid provision or application, and to this end the provisions of this Act are severable.

*new text in capitalized letters and text that is being eliminated in strikeout type

IMPACTS OF COVID-19 ON U.S. AQUACULTURE, AQUAPONICS, AND ALLIED BUSINESSES

Virginia Tech Seafood AREC and The Ohio State University Extension

Quarter 3 Results

UNAVAILABLE

Quarter 4 Results

On March 23rd, 2020 Virginia Tech Seafood AREC and The Ohio State University Extension initiated an online survey of the U.S. aquaculture, aquaponics, and allied businesses. This survey was designed to capture and quantify the effects of the coronavirus disease (COVID-19) on the aquaculture, aquaponics, and allied industries. The survey was distributed at the conclusion of every quarter for 2020, to attempt to capture the evolving impacts of COVID-19 over time. The Quarter 4 survey was open to respondents from January 4th 2021 to January 22nd, 2021. A report and an accompanying appendix summarizing the Quarter 4 survey results has been developed.

Below follows a short summary of key project results based on the survey responses. The survey closed with a total of 211 responses, of which 119 were sufficiently complete to be usable. Based on the 2018 Census of Aquaculture, this represents approximately 4% of U.S. aquaculture operations.

83% of respondents indicate that their farm or business had been impacted by COVID-19 in Q4.

42% of respondents had private sales or contracts canceled in Q4 of 2020 because of COVID-19.

23% of respondents had terminated employees in Q4 of 2020.

7% of respondents had no cash on hand to cover operating expenses in Q4.

15% of respondents had less than 1 month of cash on hand to cover expenses in Q4.

47% of respondents would survive 3 months without external intervention or support.

51% of respondents applied for USDA CFAP support

37% of respondents applied for PPP support

13% of respondents applied for NOAA CARES support

61% of respondents indicated that Federal assistance would help their farm or business to survive.

If there are any questions about the research or results please reach out to Jonathan van Senten (jvansenten@vt.edu) or Matthew Smith (smith.11460@osu.edu).

Thank you to those farms and businesses that participated in the study and to all of those who helped distribute the survey link to industry and other stakeholders.

Additional reports are under development.

Access to the Overall Summary of Results, Quarter Results and Detailed Summaries for Species and Regional Results can be located at https://www.arec.vaes.vt.edu/arec/virginia-seafood/research/Impacts_of_COVID19.html

5 GLOBAL TRENDS INFLUENCING FUTURE OF AQUACULTURE

By Liza Mayer, RAS Tech Magazine

https://www.rastechmagazine.com/5-global-trends-influencing-future-of-aquaculture/

Having found that aquaculture's issues regarding sustainability come primarily from a lack of monitoring capabilities, Dalhousie University computer science grads Mathew Zimola (CEO) and Hossein Salimian (CTO) knew they could help the industry address this need.

In 2018, the Halifax, Nova Scotia natives founded ReelData AI with the goal of using artificial-intelligence-driven technology to help land-based farmers boost efficiency, profitability and environmental sustainability. The startup has attracted venture-capital investment, and includes industry disruptor Atlantic Sapphire among its clients. The adoption of AI solutions is one of the major trends ReelData AI is seeing. Here are the big shifts they're tracking that offer powerful signals of where the industry is and where it's heading, writes ReelData's Nick Punjabi.

1. Land-based aquaculture: RAS and flow-through

Many aquaculture visionaries claim that land-based farming is the future we need. This unique and cutting-edge approach to fish production was derived from environmental concerns surrounding ocean-based operations and the belief that there must be a better way. With Atlantic Sapphire successfully fulfilling their first commercial harvesting, the viability of the land-based route continues to grow, spurring an inflow of capital and specialists.

There are two leading approaches used today: recirculating aquaculture systems (RAS) and flow-through systems. Staunch proponents back and implement each method, with their decisions made based on the unique advantages and disadvantages of each.

RAS is a system where water is continually recirculated through a fish tank and designed to reduce resource requirements while artificially creating a healthy, natural environment for the fish. Critically, RAS uses extensive biofiltration to continuously and sustainably maintain water quality, monitoring and adjusting vital parameters such as oxygen and ammonia.

The technology has piqued the interest of entire nations. Case and point, Ireland is investigating if RAS technology can help reduce its dependence on freshwater sites for fish production. Through the SALMSON project, the country will implement a salmon-sector-friendly rollout, one that will provide a more productive smolt output through hatcheries. Ireland's Marine Institute's Newport Research Facility has even installed infrastructure that can support up to 44,000 liters and 12,000 Atlantic salmon pre-smolts.

The private sector is increasingly accepting RAS as a prudent business choice with production growth poised to skyrocket. Pure Salmon and Atlantic Sapphire are leading the way with planned Atlantic salmon production of 260,000 MT and 220,000 MT per annum, respectively.

Flow-through systems, also known as raceway systems, consist of a culturing method through which fish are raised in concrete-based basins powered by perpetual water flow that mitigates ammonia levels and metabolic waste.

A European company that will take advantage of flow-through technology at a considerable scale is Salmon Evolution, which is projected to build Norway's largest salmon farm with an initial capital expenditure of £19.6M ($26.3M). The facility will be built to produce up to 36,000 tonnes of salmon annually using coastal-dependent flow-through technology.

Additionally, Icelandic-based Matorka uses flow-through tanks to raise Arctic Char, a fish breed similar to Atlantic Salmon. The company capitalizes on the country's natural fresh water to power its farms, complemented by an automated oxygen system that adds oxygen to the water when necessary.

2. Adoption of advanced technology

Leading technology can drastically increase the profitability, humaneness, and sustainability of fish farms. This reality has been facilitating their widespread adoption within the industry.

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For instance, farms are increasingly using artificial intelligence applications to gain access to information previously unattainable. Biomass estimation through AI enables farms to better plan their sales, preventing overproduction or underproduction of fish to appropriately meet demand. Feed accounts for roughly 70 percent of a typical land-based farm's costs; thus, automation and optimization can drastically increase their margins and sustainability. Health analysis can be used to make sure fish are happy and healthy while also understanding/mitigating the company's risk.

Furthermore, advanced technologies are being deployed beyond monitoring fish farms themselves. Blockchain is playing a crucial role in supply chain management as traceability grows as a priority in ocean productions. For example, Bangladesh-based ByteAlly plans to launch a blockchain-backed system to trace carp from farms all the way to consumers' plates. This allows all checkpoints in the supply chain to know where the carp is coming from. Not only is this technology based on IBM's Food Trust blockchain, it will use a handful of other advanced technologies, such as a cloud-based ERP and IoT infrastructure.

3. Biosecurity & optimizing fish health

In 2019, Scotland reported over 25,000 tonnes of farmed fish deaths related to disease. This was a record-high and a whopping 13.5 percent of total harvest. This insecurity is ubiquitous across every fish farm and, accordingly, solving these issues are of paramount importance. Keeping salmon and other fish healthy is essential to sustainable fish farming procedures. Harmful algal blooms, disease, sea lice and hazardous pesticides all pose serious threats.

Algal blooms can secrete toxins and deplete oxygen levels for fish, while antibiotics that prevent infections encourage the growth of dangerous, contagious bacteria to outside of the farmed fish population.

Sea lice are a common problem in ocean-based farming and costs the industry roughly a dollar to treat, per kilogram of farmed salmon, according to some estimates.

But innovations develop to address overall fish health and longevity. Stress management procedures are improving to prevent fish disease. The level of biosecurity instilled in a fish farm is dependent on the level of present and potential disease contaminants from internal or external humans, animals and objects. Accessible documentation and signage, staff training and keeping animal-health authorities informed are all proactive and reactive measures fish farms employ to enhance biosecurity.

Besides health monitoring, disease control, and external threat mitigation, many are experimenting with new fish feed alternatives, as the now more traditional supply of fish oil and fishmeal may be eclipsed by the demand of fish itself. Plant-based alternatives, insect-based substitutes, algal food products and food waste itself are all emerging fish feed solutions. For example, Nova Scotia-based DeNova Inc is producing a microorganism-based protein.

4. Rising demand & economic impact

21st century aquaculture has experienced a dramatic economic surge, with many countries demanding and producing fish at an exponential rate. As a result, they enjoy the economic stimulus the industry provides.

The World Bank projects that by 2030, the total aquaculture-supplied fish will reach over 93.6 millions tonnes. In 2013, aquaculture-supplied fish (97.11 million tonnes) overtook wild catch fish supply (91.75 million tonnes) for the first time. This complements the fact that in over 50 years, the average person consumes almost twice as much seafood.

Many countries continue to contribute to this meteoric rise in aquaculture. Here is a list of a few countries that have experienced an exponential surge in aquaculture production (in metric tons) from 1990 to 2016 (Aquaculture production (metric tons), n.d.):

5. Rising government support and investment

In 2020, governments all over the world have shown substantial support to the aquaculture industry. Beyond economic growth, countries support the industry's environmental and financial sustainability.

In the United States, an aquaculture reform bill (AQUAA Act) is now in the Senate for consideration. If passed, it would enable the Department of Commerce to oversee new fish farm areas in US federal bodies of water.

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In September 2020, land-based farmer Kingfish Maine received a water intake and discharge permit in Maine that will help advance the company's plans in building a land-based facility. With the support of the Main Bureau of Parks and Lands clearing the lease application for the water pipes, the governmental support for land-based fish farming is evident in the United States.

Just like Andhra Pradesh, Lebanon intends to advance its aquaculture presence. As of September 2020, it was reported that the country is now quite involved with the UN's Food and Agriculture Organization and considers both land and water-based agriculture critical to its long-term sustainability goals.

Mature technology companies, start-ups, governments and the many players of fish aquaculture, especially fish farmers themselves, all play a vital role in shaping the future of the industry – and it's all happening now. We believe that RAS, flow-through systems and other advanced technology game changers all serve efficiencies and environmental sustainability. Fish farms and the entire value chain are better positioned to grow fish sustainably when empowered by the ever-growing industry boom, improved fish health care and global governmental support. We're pleased to be a piece of the puzzle.

UPDATED USDA GUIDE TO BUILDING SUSTAINABLE FARMS, RANCHES, AND COMMUNITIES

It can be difficult for farmers and ranchers to navigate the wide range of US Department of Agriculture (USDA) resources and stay up to date with program changes after each Farm Bill. Thanks to the newly updated Building Sustainable Farms, Ranches, and Communities, producers, researchers, nonprofits, and landowners can easily find USDA programs that can help them achieve their goals.

This guide is written for anyone seeking help from federal programs to foster sustainable and innovative initiatives associated with agriculture and forestry in this country and territories. Sustainability can be understood to embrace the triple concepts of economic, environmental and social viability.

A reader can find information about program resources pertaining to economic development; farm loans; insurance and risk management; local food systems, value added and marketing innovations; natural resources conservation and management; nutrition and consumer food access; renewable energy and energy conservation; and research and outreach.

The guide can help farmers, researchers, entrepreneurs, community developers, private landowners, conservationists, and other individuals, as well as private and public businesses and organizations. It describes program resources ranging from grants and loans to technical assistance and information resources.

KEYS TO SUCCESSFUL RECRUITMENT IN A COMPETITIVE HIRING MARKET

By Ron Hill, Hatchery International

https://www.hatcheryinternational.com/keys-to-successful-recruitment-in-a-competitive-hiring-market/

Successful companies understand they need to sell their company to prospective workers, particularly in a competitive market. The workforce and the minds of the people entering the aquaculture industry have changed drastically in the last 10 years. It is an insightful exercise to examine what these new breed of aquaculture workers are looking for and how they are weighing their life choices.

Compensation

Compensation is important to everyone but it is often only one priority for those entering the workforce. It's important to have a competitive package. Low salary rates are likely to push students away, but higher salaries don't necessarily attract them, either. Students may accept less money to work for a company that appeals to them, but only to a certain point. While employers may not be able to offer the highest salary in the industry, the whole employment offer package must be competitive.

Opportunity

Workers must be able to see progression and advancement in their career with the corresponding increases in compensation. Many of the larger companies have a structured "tech level" system

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of advancement to make sure that employees are compensated for advancing their role, responsibility and skills – even if they're not moving to a management or specialized role. Smaller operations, where there aren't many different roles and different pay rates, can have difficulty providing a path of advancement for their workers. While some students may not envision a role to grow into, others will see small operations as an opportunity to learn a larger skillset and gain experience on a wider range of jobs on the farm. Many students will consider entry level jobs at smaller operations because they feel they can learn a lot of transferable skills and make a big impact.

Impression

From when a company is first introduced to a student, the impression made on them can make or break the recruitment process. Perception is reality. Great presentations or site tours by knowledgeable and energetic individuals can entice students toward a company. To a student, how potential employees are treated during the recruitment process is a reflection of how they will be treated as an employee. Thus, if their emails and questions go unanswered or avoided, if they receive an offer verbally and receive a different offer in the written form, they will assume this is how the company operates and may cause them to take another offer.

People

The people who work for your company can be a huge draw for workers and are an often-overlooked resource for recruitment. Students want to talk with farmers. They want to see the quality of the people working with them and leading them. One of the reasons that Mitch Eisan (Manitoulin Trout Farms) chose his placement in 2020 was the quality of the people around him. "The Ontario industry is led by many astounding farmers which grow high-quality, local seafood. Being from Ontario, I saw it as a unique opportunity to begin contributing to the province's seafood sector. I chose to pursue a placement in Ontario [to put] myself in a position where I can learn and continuously advance my knowledge towards aquaculture." Highlighting former students and showing where they are now and how they have progressed are excellent recruitment strategies to help students envision a career path.

Environmental stewardship

Young people are extremely concerned by the state of the environment and will not tolerate a company that does not live up to their personal standard of responsibility. Students want to be part of the solution to the environment, food security and sustainability challenges. Third-party certifications like BAP or ASC are a good way to display corporate social responsibility, as are contributions/donations to local stewardship and restocking programs. Mayah Mahabeer chose her placement at Cermaq Canada because, "I loved the values of the company. They have such a close connection with indigenous people, they care so much about the environment and try their best to decrease their environmental footprint as much as possible. When I had my interview, I had the same vibe as my interviewers so I knew that I would work well with them."

Employment security

Many students will generally not apply for positions that are seasonal, term-based or not permanent, unless they have a specific interest in that position. Government and funding-based jobs are notorious for offering an uncertain future. These jobs are usually well paying and interesting but the uncertainty of continuing will turn away all but the most passionate or those willing to chase term contract positions over a period of years.

Reputation

Despite the rosy pink smoke that some interviewers may blow to sell their company, students would typically have some idea of the company's reputation before they sit down for the interview. Students may also reach out to former students to get an unofficial impression of a company from the inside.

Safety

Skills programs stress safety, protective equipment and making it home safe each day. Being able to make choices, students will avoid companies with low safety standards. In fact, many students will choose to have no job rather than work for a company with low safety standards.

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Adventure

Often overlooked is the adventure and non-work experience associated with many aquaculture facility locations. Most people who get into aquaculture love the outdoors, hiking, fishing and can be enticed into remote locations when there is a lot of outdoor fun to be had. Students from inland regions are often interested in the adventure of living and working on the coast. If a facility is in a remote location, sell the remote location's strengths and fabulous sights. Always mention fishing opportunities. Ryland Clarke, who took a co-op position at Icy Waters in the Yukon Territory, explains, "I chose this placement because it seemed like a great opportunity for me to grow in the aquaculture industry. I also liked the location. I love the outdoors and I had never been [to the Yukon] before, so I saw this as a good opportunity to experience the Yukon and all it has to offer. The fishing is also excellent."

Selling it

Whatever the situation, make sure to send the best people to sell your farm/facility on the recruitment mission. The effort a company puts into recruitment is directly proportional to the quality and number of students they can attract. The labor market is very competitive and new workers are in a position to make choices and they know it.

USDA FUNDS DEVELOPMENT OF FISH-FREE FEED FOR RAINBOW TROUT

By Liza Mayer

Professors Pallab Sarker and Anne Kapuscinski of the University of California-Santa Cruz received a $496,000-grant from the US Department of Agriculture (USDA) to support the development of a more sustainable feed for rainbow trout.

The scientists are looking at replicating the success they had with the fish-free tilapia feed.

They chose rainbow trout feed as their next subject because it is the most widely cultivated cold freshwater finfish in the world and also "an important model for all farmed salmonids, which dominate finfish aquaculture," said Sarker.

He acknowledged that several leading aquafeed and ingredients companies have recently started including DHA-rich oil from microalgae into salmon feeds. Among these are AlgaPrime DHA, an algae-based source of long-chain Omega-3s from Dutch biotech company Corbion, and Veramaris' algae-derived oil.

Sarker is looking at replacing traditional fishmeal or fish oil ingredients with several types of oil-rich and protein-rich marine microalgae. "One type would be microalgal co-product that is a waste product left over after Omega-3, called EPA, has been extracted for use in human nutritional supplements," he said.

Experiments are now underway, including testing various processing methods for manufacturing new microalgal co-product protein meal.

"The results will characterize nutrient and anti-nutrient levels in processed co-product protein meal. This will fill a knowledge gap important for encouraging the aquafeed industry to use this new protein ingredient," he said.

The rainbow trout were scheduled to be stocked into the tanks at UCSC's new recirculating aquaculture facility this past February, where digestibility experiments will be conducted.

HATCHERY HIRING PROSPECTS

By Liza Mayer, Hatchery International

Will technology and innovation be the key to attracting young people to work in aquaculture?

Controlled environment agriculture" sounds like a mouthful and perhaps an unfamiliar term to some, but on it could rest the future of aquaculture.

The phrase is an umbrella term under which technology-based approach in food production falls, for instance, recirculating aquaculture, aquaponics, hydroponics and aeroponics.

Academic and research institutions are leading cutting-edge research in these fields but they also play another crucial role: providing the industry with a qualified, adequately trained workforce.

Recent heightened interest and investment into technical food production systems have put the industry's manpower shortage under the microscope.

"I can think of two (investors) right off the bat that I've spoken with in the last three months and both

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need to hire, in a three-year horizon, between 80 and 120 people per location," says Dr. Michael Schwarz, director of the Virginia Seafood Agriculture Research and Extension Center.

He says the massive U.S. seafood deficit has attracted significant domestic as well as international capital over the past two years and this is powering the expansion of U.S. aquaculture. The Trump administration's executive order in May 2020 sought to promote the competitiveness of American seafood. It would remove barriers to aquaculture in order to help the industry expand.

"Investors see the benefits to taking their capital and their technology and engaging in the U.S. production sector to access the U.S. market. They see the potential in having production in the U.S. versus importing, and from their perspective exporting from Central America, South America, Europe or Southeast Asia. That's accelerating, and it is exacerbating the demand for workforce development, there's no question."

Founder and CEO of recruitment firm AquacultureTalent, Cristian L. Popa Aved, says the aquaculture industry has expanded "extremely aggressively" in the last five years but various academic institutions' capacity to churn out a trained workforce has lagged.

While official U.S. government data specific to aquaculture workforce is unavailable (federal agencies lump aquaculture under the category "other animal production"), anecdotal evidence suggests that the shortage of skilled manpower is a reality that companies are grappling with.

Seafood farmers in Canada face the same problem. According to the report, "Labor Market Forecast to 2029" released by the Canadian Agricultural Human Resource Council, there will be 600 fewer people in the aquaculture workforce over the next 10 years, as workers retire and the industry expands. Farm operators expect to grow over the next five years to meet the strong market demand for seafood. Labor shortages could prevent or delay those plans.

"Unfortunately, we're still not getting the next generation jumping into the industry," says Schwarz. "We've had 'agricultural flight,' as we've termed it, and this has been going on for a generation. Very little has changed in that aspect. The general trend continues. And it's not just aquaculture, but agriculture in general.

"If we look at agriculture statistics, there's a general reduction in agriculture farms in the U.S., there's fewer family farms," he continues. "The children that used to work on the farms are going into other sectors. I don't have to go any further than my children or my friends' children. They're going to college, they're going into engineering, computer engineering, software design."

Key challenge

The Canadian report highlighted the rural location of most aquaculture operations as a key challenge in recruiting and retaining workers.

"It's not for everybody," says Brenda Bailey, assistant freshwater production manager at Grieg's hatchery in Gold River, British Columbia, Canada. The small coastal town of roughly 1,200 doesn't even have a grocery store. Some newly arrived workers sometimes forget this, Bailey chuckles. "So they come here with nothing, not even groceries. I say: 'I told you there's no grocery store here.' There's a pub, but it's not for young kids, and there's a gas station where one can get milk and some dairy and vegetables, but the nearest grocery store is over one-hour drive, in Campbell River."

"In sea sites you're actually living together, you can't go anywhere," she adds. "At the hatchery it's a little bit different because you can get away from work. There's hiking, there's fishing, trail walks, caving, rock climbing. But yes, if you're a young kid that is used to city life, it's not the place for you."

Bailey's daughter Ashlee, who grew up in Gold River, is also assistant freshwater production manager at Grieg BC. The mother and daughter have been working together for a little over 10 years now, both starting out at the company as part-time hatchery technicians.

"I don't feel I'm missing out because I'm an outdoorsy person," says Ashlee Bailey, on the limited social and cultural opportunities in rural communities. "I think as long as you're an outdoorsy person, you're good. I know a lot of people that I work with on my shift who love the fact they could go for a hike after work."

The right fit

Mauricio Moreno, hatchery manager at The Kampachi Company, an offshore farm in La Paz, Baja California Sur, in Mexico, encounters challenges in recruiting young workers.

"Things have changed in the last 10 years," he says. "I remember when I was just out of college I started working in a shrimp farm located far away

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from everything and I was really happy to be working there. And I thought that was the mindset of everyone that just got out of college. But what I have been seeing now is that people want to live in the city where they have everything. The new generation coming out of university is not willing to sacrifice their comfort when starting their professional life."

Dr. John Supan, retired research professor at Louisiana State University (LSU) and retired director of LSU's Louisiana Sea Grant Oyster Hatchery in Grand Isle, adds: "There are life challenges that come with youthfulness but there's a lot of excitement in their minds and hearts because they're out of college, which in itself is an achievement. They've got their degree and they're glad to have a job in a field that they studied for. But over time there's life's other interests, whether it's relationships, family or wanting a more youthful life than living in this small little coastal town where there's nothing to do."

This is why it is crucial to find people with the passion, not only the skills, for fish farming. Moreno says: "I choose people that are willing to develop a career in this field and are not simply here to have a job. People who want 'just a job' won't want to sacrifice their comfort. Those who want to grow professionally in this field would be willing to make those sacrifices."

Aquaculture recruiter Popa Aved says being the "right fit" for a job isn't just about having the right qualifications and background, but also having the right personality traits. It is also critical, he says, that both employer and potential staff are clear about each other's expectations.

"Our main priority is to find the right candidate from a different perspective: that he or she is qualified and has the personality for the job and that he or she understands the company. Most important is to have the candidate stay in the position. We don't want to hear that six months later the candidate has left the job."

AquacultureTalent, launched in 2016, has so far had 100-percent retention rate for candidates – from technician to CEO positions – it has placed with employers, according to Popa Aved. Specific to hatchery work, the firm has hired about 90 technicians and assistants over the past two years on behalf of clients worldwide.

"We always tell our clients that we want to invest a little bit more time with each candidate to make sure he knows what to expect. We ask the company to have the candidate over to meet management, co-workers, see the facility and location, etc., for a couple of days to a week before making the offer so the candidate can determine if it's the right place for him and if he is the right candidate for them. About 80 percent of our clients are willing to do that. When it comes to senior positions, it's a must," he adds.

Misconceptions

The perception that work is financially unrewarding may be another reason why young people are not attracted to this industry. Popa Aved says there's limited information available regarding the economic potential of careers in aquaculture.

"On the other hand we do have candidates that realize that salaries and benefits are much higher than other industries and they jump in and are willing to learn," he says.

Dr. Louis R. D'Abramo, professor emeritus at the Department of Wildlife, Fisheries and Aquaculture at Mississippi State University, says that aquaculture is still a young and minor industry in the U.S. so "young individuals may not be fully aware of the critical importance of aquaculture and the opportunities it could present."

"They don't see it as a job that, in fact, will contribute to the food security of a growing world population. Also, there is a lot of disinformation and misinformation about the quality of farmed seafood and the detrimental effects of aquaculture on the environment. Aquaculture is not viewed as eco-friendly."

"I also believe that young people of this generation are not all interested in hard working and high-risk ventures. They are looking for instant gratification. When you have an infant industry, be prepared for setbacks and slow growth toward achieving progress and success. I think that the aquaculture industry is going to have to come up with some type of profit-sharing plans as incentive to get young people into the industry. Interest and devotion will ultimately come from being part of the company. There need to be avenues for promotion and, of course, good benefits."

Brenda Bailey of Grieg BC says the retirement package at the company is something she hasn't seen in any of her previous employment. "For every 1 percent we put in, Grieg matches it with 1.33 percent. The benefits are also good. And we're always looking at new ways to train people or making sure that they are trained. We're always trying to improve the

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health and safety of our employees. It's a wonderful company to work for, let alone the industry."

But the negative perception of aquaculture may also be a hindrance in attracting some youth. "When I tell people that I raise Atlantic salmon, the feedback is: Oh you're one of those people," says Bailey.

She believes the industry can capture the interest of the young people "if we just continue doing what we're doing – because I think there's such a bad name around farmed fish – being open and honest with the world and educating people, and by word of mouth."

Bridging the divide

As traditional fish farming becomes more high-tech and controlled environment agriculture expands, perhaps the industry will encourage more youth to engage in the sector?

"A good question and I would say, yes," says Schwarz. "If we look at Virginia Tech's new SmartFarm Innovation Network, which contains the Controlled Environmental Agriculture Innovation and Education Center, we can take any industrial or academic discipline and fit it inside that program.

"SmartFarming and precision aquaculture incorporate new technology. At Virginia Tech we're looking at SmartFeeds, SmartFarm, automation, robotics, blockchain traceability, big data management, and much more – these are large industry activities and requirements as we move into large-scale agriculture. These are all needs being expressed to us at summits with the industry, with the private sector."

D'Abramo says the industry will require more trained engineers as production becomes more technologically advanced throughout the life cycle stages as well as post-harvest processing.

"There will also be a need for individuals who have a business background, most probably individuals who have earned an MBA with an emphasis in aquaculture business management. In the education area, there will be a need for individuals who are specifically trained and graduate from a two-year college with an Associates degree. There will be a special need for these workers as the industry matures. Individuals in these programs need to be educated about the level of work and risks involved and be afforded opportunities to work as part of an internship program."

The story is changing

Schwarz says the issue of manpower supply has been a constant in discussions with the industry for the past several years, but over the past two years these conversations have become "more sincere and more substantive."

"Whereas before it was 'Yes, we're looking for capital. We're looking for a loan and if we get the loan and if we build it, it will create this many jobs…' you know, the typical economic development cycle. But now it's coming more to where the industry is starting to push, saying: 'We're going to need these people. Where are they coming from?'"

"So at Virginia Tech we're now working more closely with economic development, state agencies and academia in developing aggressively a workforce development program, not just in anticipation but as a result of industry request for assistance to develop the workforce."

"We're not seeing significant growth in what we call the 'homestead farms' or small-scale farms, but we're starting to see significant capital investment in recirculating aquaculture systems and aquaponics," he says. "Barriers are lifting and boundaries are spreading. I think there's more broad-based opportunities in aquaculture, in controlled environment agriculture."

Another sign that aquaculture's story is changing can be gleaned in display cases at big retail chains. While offerings include the usual favorites – shrimp, salmon, tilapia – the range is widening. "This shows aquaculture product is going into these main distribution channels, which signals the sector is maturing. This means these are large vendors because these large wholesalers cannot purchase products from very small farms," says Schwarz.

"I was just at Costco the other day and there was farmed barramundi, Coho salmon and rainbow trout cultured in the U.S., and farmed snapper from Central America. What normally would have been fisheries-caught are now farm-raised. More of the seafood that's there is farmed and it's more appreciated because it's no longer something novel. The industry is very proactive in doing many things right, we have quality, very safe seafood and it's entering the market by demand. And that's what drives industry," he adds.

USAS POSTS NEW WEBSITE

The US Aquaculture Society (USAS) has posted a new site, ***https://www.usaquaculture.org/***, that harnesses the latest tools to provide members and colleagues with up-to-date information on their events and aquaculture news, while expanding their resource library of videos, publications, and partner information. USAS hopes you will like the new, updated look and feel - take a look around, save them in your bookmarks, and come back often! Also, follow them on their social media pages for the latest information!

The United States Aquaculture Society is a chapter of the World Aquaculture Society (WAS). WAS is a worldwide professional organization dedicated to the exchange of information and networking among the diverse constituencies interested in advancing the aquaculture industry. As WAS becomes more globally involved in providing services and professional development opportunities, the role of USAS is increasingly important for the U.S. aquaculture community.

The USAS mission is to provide a national forum for the exchange of timely information among aquaculture researchers, students, and industry members in the United States. To accomplish this mission, the USAS will sponsor and convene workshops and meetings, foster educational opportunities and publish aquaculture-related materials important to U.S. aquaculture development.

Upcoming Events:

- GoFundMe page for Joe - https://www.gofundme.com/f/medical-and-travel-expenses-for-joe
- 2021 Forum on Colorado Agriculture was Canceled. The Colorado Agricultural Leadership Program (CALP) board has made the tough decision to cancel the 2021 Forum that was scheduled for Feb. 24, 2021.
- Aquaculture America 2021- 4 day event is August 11-14, 2021 at the San Antonio Marriott Rivercenter in San Antonio, Texas. Meeting details at www.was.org/meeting/code/AA2021.
- US Trout Farmers Association 2021 Fall Conference will be held in person September 8-10, 2021 at Radisson Hotel Branson in Branson, Missouri. Meeting details at https://ustfa.org/2021-fall-conference-confirmed/.

Sources of Aquaculture Industry News:

- Elizabeth Brown, Invasive Species Program Manager has left CPW. Her last day was June 30th. To reach the CPW Invasive Species Program after July 1st, Please email Invasive.Species@state.co.us or call (303) 291-7295.
- April Kraft, CPW Project Leader and Aquatic Animal Health Lab Pathologist has replaced Vicki Milano. She can be contacted via phone: (970) 842-6304, cell: (970) 441-1264, email: april.kraft@state.co.us, or mail: 122 E. Edison St, Brush, CO 80723-2518

Board Position Changes:

- The CAA Board currently has two vacant positions. The support and participation of our members is crucial to this organization's future.

Help support the printing of this newsletter with your advertising! Rates are for two issues per year.

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1/2 page	$100.00	$160.00	Full page = 7.5"W x 10"H
Full page	$150.00	$210.00	

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