Capturing and Valorizing Research Information and Knowledge in Aquaculture Nutrition

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When I am asked what I do for a living and answer "research in fish nutrition and aquaculture", my interlocutors often get a puzzled look on their face. Most people, even those working in animal production, don't know how vibrant our field truly is.

A Vibrant Field

When you have thousands of scientists and industry stakeholders attending congresses, symposia and workshops on aquaculture nutrition each year, one can only conclude that our field is very dynamic and draws of lot interest. Each year, thousands of research trials are carried by academic, governmental or industrial research groups. These research activities are supported through generous funding from numerous governmental granting agencies and industry stakeholders. Hundreds of scientific papers, technical documents, and scientific communications (abstracts) are published each year on the nutritional requirements of a large number of aquaculture species and on the chemical composition and nutritive value of an increasingly wide variety of feed ingredients. These activities and publications have been a cornerstone of the development of the aquaculture feed industry worldwide.

A Large but Fragmented Body of Knowledge

Nonetheless, for all this dynamism, the large number of aquatic animal species (> 300 species), life stages, production systems, essential or conditionally-essential nutrients (> 50 nutrients) and feed ingredients that need to be studied results in great dilution of the research efforts and significant fragmentation of the body of knowledge generated. This represents one of the great challenges of our field, notably compared to other animal productions.

Making sense of scientific and technical information and developing a wholesome understanding of "state-of-the-art" is not simple in aquaculture nutrition, especially given the great diversity of animal species studied, ingredients used and the complex interactions between dietary (nutritional), endogenous and environmental factors. Capture and meaningful integration and valorization of the knowledge generated each year by these hundreds of studies represent one of the great challenges but also one of the great opportunities for the aquaculture nutrition community.

Making Sense of State-of-the-Art

Significant efforts have been invested over the past two decades by my research team at the UG/OMNR Fish Nutrition Research Laboratory, as well as a small number of other research groups, to compile, audit, standardize and analyze data from hundreds of published studies.

To do so, we have used various approaches: mathematical modeling, statistical meta-analysis and nutritional modeling. These "knowledge capture and valorization" efforts proved to be valuable

since they have helped quantify the combined effect of different interacting dietary, endogenous and environmental factors. They also allowed the development of tools (e.g. models). Some models enable the optimization of feed composition to meet nutritional requirements of animals in a cost-effective fashion, while dealing with increasingly complex array of feed ingredients (e.g. digestibility models for various nutrients and species). Other models allow the prediction of feed requirement, biological feed conversion ratio (FCR) and waste outputs from animal populations.

What many of the knowledge capture and valorization efforts based on analysis of data from published studies have indicated is that when taken globally the research efforts in aquaculture nutrition have in the past been of highly unequal quality. In general, less than 50% of the published scientific studies surveyed contain sufficient information or have design and results that are sufficiently meaningful and credible to be used in modeling effort or statistical meta-analyses. These efforts have highlighted the need for improving the completeness and for rigorous auditing of the quality of published data. Nonetheless, quality of research has improved quite significantly over the past two decades in part through the hard work of editors and reviewers of scientific journals, a greater general awareness of proper scientific methods and the better training of scientists involved in the field. We, as a field, have made very significant progress and can be proud of this.

What's Missing? What's Next?

Tons of highly valuable information is generated each year by our community. Some results find some use but most are never fully valorized to their full potential. My group has spent countless hours going over and entering data from a variety of sources (our own experimental results, published studies, information from feed manufacturers, etc.) trying to extract valuable information. I often dream of a platform that would allow the systematic and effective compilation, analysis, interpretation and valorization of information generated by global aquaculture nutrition community. This system could be used to gather sufficient information allowing the development of more robust nutritional models applicable to the broad number of species our industry is producing. These models would be continuously evolving and improving as new information would become available. Efforts would need to be invested in developing accessible and user-friendly interfaces for the developed nutritional models so that researchers, feed manufacturers, and aquaculture producers can more easily use these tools and work cooperatively to meet current and future challenges in aquaculture. How farfetched is this dream?

Agree or disagree? Do you have any feedback or suggestions? Please contact me at dbureau@uoguelph.ca