INAUGURAL LECTURE OUTLINE
COASTAL FISHES UNDER THE MICROSCOPE: A MARINE BIOLOGIST'S JOURNEY

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WHAT INSPIRES SOMEONE TO BECOME A MARINE BIOLOGIST?

Introduction to subject matter that falls outside of the ordinary is imperative to showcase career opportunities. In my case, I was fortunate to grow up in a family with a generational history of fishing the wild coast of South Africa. Aside from this introduction there is a need for a passion for the environment and the plethora of creatures that occupy our environmental space and the aquatic ecosystems around us. Coupled with this we need inspirational people in our lives who notice our passions. In my case this was Ms Mary Bursey (Dr Mary Cole) who was the Malacologist (Conchology) at the East London Museum. She noticed me as a 13 year old spending many of my afternoons after school studying the shell and fish collections in the museum and learning the scientific names of all my favourite creatures. She invited me into her laboratory and showed me sea butterflies under the microscope and my passions for a career in marine science were confirmed. At university inspirational lecturers made an impression on my thinking and these were the charismatic ichthyologist Prof Hannes Marais, microfaunal expert Prof Johan Furstenburg who found a way to make embryology fascinating and Prof Ryno Naude in Biochemistry who left me studying the subject in awe. Of course, it is important to have an insatiable love of nature and being outdoors and in water as well as an insatiable passion for thinking and asking "why?" and "I wonder…"

MY CAREER INSPIRATIONS

My early leaders in science shaped my thinking and gave me the confidence to continue in a traditionally male dominated career. Special thanks for their inspiration and dedication to my cause is Dr Mary Cole, Prof Tris Wooldridge who introduced me to the wonderful microscopic world of plankton and supervised my Masters and co-promoted my PhD and Prof Alan Whitfield who served as my PhD promotor. His dedication and passion for fishes were inspirational. Considering that for most of my career many people had little exposure to my subject matter, you may wonder why study the early life history stages of fishes. For the love of ichthyology and in my case an accidental M.Sc. project that was in fact a scarce skill and earned me my first employment as a scientist. The discipline has a broad base in science: identification, taxonomy and systematics, fish reproduction and life history strategies, multiple habitats (rivers to ocean) while also providing important links to biodiversity, conservation, fisheries science and aquaculture. The identification process is much like solving a mystery and involves problem solving in order to link larval stages to adults. Fishes have life cycles that consist of four key phases. These are highlighted.

MOST VALUABLE SCIENTIFIC FACTS IN MY EARLY CAREER

These were twofold: The success of any fish population is dependent on the success of the larval phase and that fishes like Dusky kob, a sought after species in South Africa, has a slow growth rate, only starts reproducing after 1m in length yet minimum sizes were set at 40cm. This disconnect between science and regulations is an ongoing fish management problem and much is needed to provide more information for informed decision making when it comes to harvested fish resources.

My career work is overviewed in the context of a schematic showing how early stage fish research has grown under my leadership and where gaps in knowledge have been filled. This has been much like building a puzzle with certain pieces only becoming available over time. This will be followed with case studies of select research based on published works:

OCEAN HABITATS AS NURSERIES AND SPAWNING GROUNDS

- Community composition and assemblage dynamics in early stage fishes in the marine nearshore
- Angola and Kenya collaborations
- Longevity and reproductive biology in an important line fish species as a candidate for slot size limits – a first for South Africa
- New sampling techniques were devised that constitute a world first

SURF ZONES

- Community composition
- Microhabitat use
- Responses to estuary plumes
- Feeding

ESTUARIES

- Habitat use, feeding and movement in estuarine nurseries
- Value of temperate mangroves for juvenile fishes
- Mark-recapture study in mangrove creeks shows high residency of young fishes
- Assessing feeding on diatoms by a fish species in mangroves and a new species of diatom has been discovered
- Fish movement, migration barriers from marine fishes to reach river ecosystems
- Pollution in coast nurseries – showcase of heavy metal contamination in edible fishes in the Swartkops.
- Harmful algal blooms and the impacts on fish nurseries

RIVERS

Ocean-river connectivity is imperative and legislation does not fully cover the life history strategies that are impacting coastal fishes. The migration of marine fishes into rivers is hampered by alien fish introductions in the region. The Baakens River is highlighted as a case in point where human impacts threaten rare fishes. A potential new species of fish was discovered in the Baakens River.

SAFETY AND HEALTH

While endeavouring to study all these aspects of fish ecology, there is a largely unspoken truth that needs mentioning as it is a reality for all biologists - this is the dangerous working environment researchers and students must face. This includes working under severe weather conditions, rough seas, hypothermia, bodily injury and of course crime. As a woman in South Africa, the vigilance and preparedness that must come with fieldwork in remote locations, often at night with a small group of students can be daunting.

THINKING AND PERSPECTIVES

In the course of my career I have realised that human impacts also include how we think about our science and these have informed whole schools of thought. My work across habitat boundaries and working on the larval and juvenile stages of fishes has provided unique insight into the subject. Estuaries have received icon status in terms of effort and value in South Africa. Exploring adjacent ecosystems has shed light on our biases. The HALO EFFECT – Likeable/important people have effects on our thinking – and ANCHORING - ideas are set by influential people – are noteworthy in sealing our domain knowledge of things. Globally, many fishes are considered very dependent of estuaries but tagging information shows that individual fishes only spend up to 30% of their time in the estuary. What if we have missed something? It appears that in this discipline, whole schools of thought need to change. **It's a piece of a bigger picture of linked ecosystem use by fishes.** BIAS GIVES US A FALSE SENSE OF SECURITY in what we think we know. Sampling techniques, timing of sampling, how we view comparisons and statistical significance, our obsession with winners and losers and where we choose to sample affect the impression we leave in science. WE need to think out of the box at times and the case of the plastic nurdle spill in Durban harbour that is used as a surrogate for an oceanographic drift experiment is used. Often scientists provide information to policy makers and conservation/management authorities and if we are not cognoscente of bias, we don't provide the full picture. "Holy beliefs in the research findings of others and ourselves leads to holey thinking while inhibiting our understanding of wholly linked habitats and ecosystems"

THE MOST IMPORTANT WORK I DO ON THE SIDE THAT FEW KNOW ABOUT

Communicating science to the public and to children – this has been an important part of my career and a responsibility that I carry – examples are given

THE MOST IMPORTANT KNOWLEDGE I HAVE GAINED AS AN ACADEMIC

- This refers to the global crisis in marine fisheries and the myth of sustainability. We need to be knowledgeable on where seafood comes from and we need to invest in sustainable fish farming into the future. End user education is critical and the South African Sustainable Seafood Initiative (SASSI) is introduced.

- PhD's don't teach you financial or people management – this is a shortcoming.

I conclude with a hypothetical mathematical formula for what a successful career constitutes and this includes passion, hard work and life balance.