

Fransicella sp : A case study of a bacterial pathogen causing mortalities in farmed tilapia. Wider implications for increasing international movements of live tilapia fry and fingerlings.



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Fish Disease Status in Sub Saharan Africa

Historically not a major issue both in fisheries and aquaculture sectors compared to Europe, US and now Asia

EUS outbreak in wild fish - an exception?

Fish Disease and its impacts related to intensity of farming systems

We're lucky! Two main African farmed fish species Tilapia and Clarias very hardy and resistant to many fish pathogens different for shrimp/prawn/shellfish

Fish disease still not a major priority for most African Fish Farmers Not yet?



But its changing in sub Saharan Africa.....

Production systems now beginning to intensify

Hatcheries beginning to produce necessary millions of fry to develop aquaculture

Growth of Clarias farming industry in Nigeria

Commercial Tilapia Cage farms in Zimbabwe, Uganda, Ghana associated with pond sites and hatcheries

Now beginning to experience disease problems as a consequence of intensifying production systems

Increasing unrestricted use of antibiotics



These commercial companies now beginning to understand the importance and financial consequences

As aquaculture intensifies.....

Potential for more economically serious bacterial (or viral?) pathogens

They are now looking overseas to learn from experiences of tilapia industry as it has developed elsewhere

This case study such an example There are many others.....



Tilapia Production in the UK: A new industry

-Recent development since 2002

-Intensive Recirc Raceway /Systems

- Insulated buildings maintaining constant 26°C throughout 12 months

-Primarily On-growing to 500g +

-Sales mainly to supermarkets, wholesalers & niche markets

-Sites built for 20 – 200 Metric Tonne annual production

- 5 sites now producing 50 MT + Biggest producer 200MT



Current status

•13 farms mostly Independents

•Several mothballed systems not economically viable

•Potential 1000 tonnes plus total production for UK?

•First commercial UK hatchery set up 2009

•Before this most fry imported by air from hatcheries in France Belgium also S Asia.....



Disease Investigation Early 2008: Raceway Farm near York,

UK
 Initial Fry losses (0.5g to 5g) @ approx 20%. From batch of imported fry XXXX
 After one wk mortalities spread to 20-50g fish within same system

External:

- Flashing, fungal patches, exophthalmia, pale gills petechial haemorrhaging around pectoral fins, lethargy.

Internal:

- Empty intestines, enlarged gall bladder, enlarged granular spleens and several enlarged kidneys.

Water quality readings provided OK.

Water temp 25.9 °C



Lessons Learning

Fry bought in at 0.5 g from European tilapia hatchery

Farmer thought safe and ok

In reality - European hatchery had actually bought in originally as 0.1g fry from S Asian source

Lessons learnt - What is safe? – certified disease free?

Lessons learnt - Legal requirement to keep movement records

Lessons learnt - Buyer beware!! Keep any bought in fry in separate system

But also awareness for the regulator - loopholes in the regulatory system....



Sampling - January 2008 – carried out by Fish Diseases Inspectorate CEFAS Weymouth

- Live fish for Parasitology
- Bacteriology - TSA – RIVAOA
- Virology – Spleen, Kidney & Brain > Transport medium – FH's, CHSE's, SSN, BF & EP's & 20 & 25C
- Histology – Kidney, spleen, gill, liver, intestine, heart, eye, skin, muscle & Whole fish > NBF.

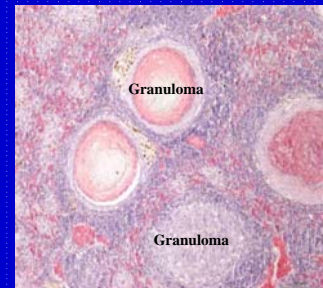


Initial Results January 2008

- Negative for Parasitology, Bacteriology, & Virology.

Histology

- Lesions present in most tissues of all fish sampled.
- Host response was formation of granulomas.
- Parasites and other pathologies not seen

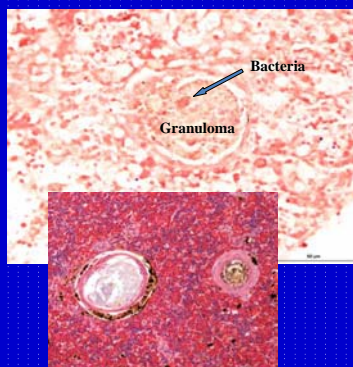


Granulomas shown in spleen tissue

Results (cont)

Histology

- Reminiscent of mycobacterium
 - Re-cuts & ZN staining = no acid fast bacteria
 - Some gram –ve bacteria associated with granulomas.
 - Necrotic material and macrophage aggregates (melanin) visible.
- Presumptive positive for *Francisella sp.*



Further Sampling 2nd Samples taken before which :

Literature search carried out:

- *Francisella sp* causing mortalities in Taiwanese, Indonesian & Central American tilapia culture
- *Francisella topical* in Cod farming (North sea wild cod)
- Google *F. tularensis* = Human pathogen ? Zoonosis?

Second samples taken

- Bacteriology – CHA & SKDMs
- Histology – Kidney, spleen, gill, liver, intestine, heart, eye, skin, muscle & Whole fish (NBF)
- Molecular biology - Spleen, Liver, Heart & whole fry (Ethanol) and onto ice.

Results – Second sample taken from fry and larger fish

- Additional sample = no evidence of *Francisella tularensis* -
- Bacteriology – culture of the organism was again unsuccessful. IMPORTANT FOR FUTURE!!!
- Histology – Granulomas again seen clearly in the spleen of affected fish

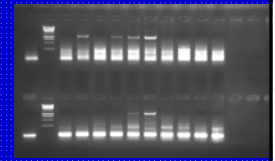
Molecular biology – Positive!!

- Products obtained from several fish

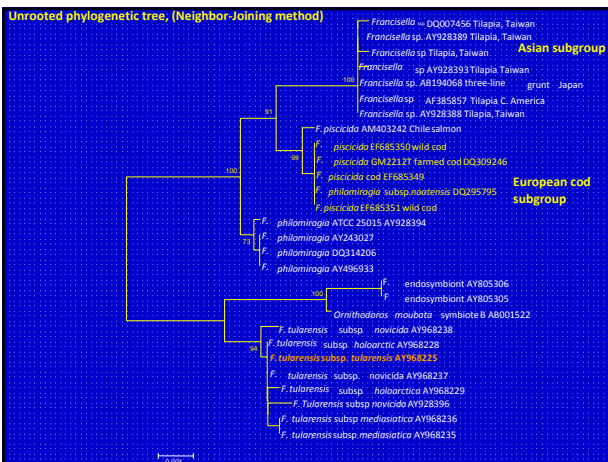
Results – Second sample

Molecular biology

- Products obtained from several fish
- 406 base Sequence obtained
- BLAST at NCBI
- 100% nucleotide identity with a *Francisella species* previously described in tilapia in SE Asia.
- Positive for *Francisella sp.*



First Presumptive Identification of this pathogen in tilapia in UK and to our knowledge Europe



Consequences for farmer & industry Sector

Voluntary cull & disinfection of whole farm by farmer supervised by CEFAS – considerable financial consequences to farmer

Site now sourcing fry from a single European hatchery site - with no outside introductions

Moving and buying in tilapia fry from outside/unknown sources in intensive tilapia systems Problems



Lessons Learnt , Observations , Conclusions Related to this meeting

- *Francisella sp* - a bacterial pathogen of tilapia causing significant mortalities in S Asia, C & S America - potential threat to African Aquaculture

- Inclusion on OIE list?

- Other bacterial* pathogens of tilapia? potential threats ? OIE over emphasis on EUS in Africa? Other diseases? - Learn from S Asia C and S America

-- Suggest – guidance from OIE S Asian , C & S American members – Production of Case studies? to advise and inform OIE African members - also fish farmer

Francisella sp disease agent was not able to be cultured by standard method Only positively identified by molecular methods – Implications for African countries, laboratories and allocation of diagnostic resources

- Treatment of the disease? Antibiotics? Potential vaccine? Experience in Asia ? S America?

Another commercially important bacterial disease of tilapia

Streptococcus :Epidemiology & transmission *S. agalactiae* & *S. iniae*

Epidemiology

All size of fish from 5g onwards
Bigger fish from 200g onwards are more prone to develop the disease

Disease pattern, virulence

Up to 30-40% overall mortality
Mainly chronic mortality in tilapia with acute peaks associated with high temperature

Transmission routes

Horizontal transmission. Bacteria is in the environment and become pathogenic when fish are stressed

The disease is associated with an estimated annual impact on aquaculture over USD\$100million

Zoo-onoses: Canadian processors experience

Eye exophthalmia



Lessons Learnt , Observations , Conclusions Related to this meeting

Disinfections of fish farms

When? Why? Legal necessity? How? Compensation for farmers ? OIE standpoint ? National countrys own legislation? Large greypoint here???

How to disinfest fish farms? In this case of a Recirculation system? However also Hatchery? Earthpond site? Raceway site? Cage site? Shellfish farm? Shrimp? Aquatic plants? Seaweeds?

Water catchment areas?

Need for clarification and setting of standard protocols to inform both African OIE reps but also fish farmers themselves – if not????

Learn here from our Asian, US , and European colleagues

Suggestion importance for training of OIE African representatives - include effective disinfection of sites



Learning from other countrys examples:

Bangladesh

In last 5 years Bangladeshi Tilapia culture now beginning to develop commercially



Earthpond and Cage culture ... Increasing intensity – unregulated movements of live fish throughout country - also fry coming in from Thailand and other S Asia

Commercial feeds & increasing in country hatchery production

In 2009 increasing mortalities reported on grow out sites initially cages then also earthpond sites

At time - unknown cause of mortalities

Environment al? Water quality ? Disease Pathogen?

Other country's examples Bangladesh continued

Although cause of mortalities unknown widespread treatments occurred

Lessons learnt

Despite extensive Fisheries Dept and research base :

Live – unsafe? fish fry movements from other Asian countries

Wide movements of fish/fry across country – well developed network of fry traders in Bangladesh

Little or no records kept of live fish movements by farmers Not a legal requirement ? Not implemented

Govt Fisheries and Veterinary Depts little idea of live fish movements

As a result almost impossible task for authorities to Monitor and then trace ?

Suggestion: Case studies from OIE S. Asian partners to Inform African OIE staff – also again fish farmers




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