



Venue: Puerto Varas, Chile
Dates: 8th – 11th October, 2019

Fish-killing algal blooms are of increasing concern to socio-economic interests linked to the sustainability and security of seafood and living resources. Development of fisheries and aquaculture as part of integrated coastal resource management are particularly susceptible to the threat of ichthyotoxic events and their consequences. Whereas these events are categorized as “fish-killing”, there are associated impacts on other components of coastal marine ecosystems, including wild fish populations, benthic macrofauna and macrophytes. Outside the aquaculture and fisheries industry sector, there has been inadequate consideration of fish-killing algae and the topic has not been systematically addressed within the scientific community on a global basis. Known ichthyotoxic marine algae are

usually identifiable as causative organisms, but there remain taxonomic and biogeographical uncertainties in the distribution of the species. The role of climate change leading to regime shifts and hence possible increased frequency, magnitude and biogeographical distribution of fish-killing algal blooms poses a challenge to understanding the future ocean. Knowledge of the environmental factors driving bloom dynamics are not fully understood, and this has hampered the development of predictive models for forecasting and risk assessment of fish-killing events. Even the proposed mechanisms whereby exposure to such blooms causes fish morbidity and mortalities are highly controversial and lack scientific consensus. Furthermore, there is only limited application and lack of standardization of current fish- or cell-based bioassay methods for assessing ichthyotoxicity. The Advanced International Colloquium and Technical Workshop, under the auspices of the IOC-IPHAS and as part the GlobalHAB science agenda, with the support of the government of Chile through CORFO and the collaboration of CREAM-IFOP, will comprehensively address these gaps in knowledge and will yield a synthesis of current state-of-knowledge linked to strategies for technological and scientific approaches to mitigating the impacts. As a way to strengthen the relationship with the local community, part of the considered activities in this Colloquium, a set of talks oriented to decision makers, professionals, academics and the general public, has been included.

MEETING PLACE: HOTEL CABAÑAS DEL LAGO: Salón Calbuco

General Programme & Session Themes

Taxonomy, biogeography, ecology, oceanography and dynamics of fish-killing algal blooms: relationships to fish mortality events

Topic 1: Climate change and fish-killing algae

Topic Coordinator: Gustaaf Hallegraeff, Australia

Key Issues: An exploration of the extent to which fish-killing algal events can be linked to climate changes in the recent past and scenarios for the future changing ocean

Topic 2: Taxonomy and molecular characterization of fish-killing algae

Topic Coordinator: Mitsunori Iwataki, Japan

Key Issues: New taxonomic descriptions and phylogenetic reconstruction of fish-killing algal taxa based upon morphological and molecular criteria

Fish-killing toxins, aetiology and specific mechanisms of fish morbidity and mortality

Topic 3: Current knowledge of ichthyotoxins produced by fish-killing microalgae

Topic Coordinator: Thomas Ostenfeld Larsen, Denmark

Key Issues: Developments in analytical and natural products chemistry leading to discovery and structural elucidation of fish-killing toxins: links to chemodiversity

Topic 4: Mechanisms of algal-induced fish-killing syndromes

Topic Coordinator: Per Juel Hansen, Denmark

Key Issues: Critical analysis of putative mechanisms for cell damage in fish-killing algal events – effects of ichthyotoxins, membrane disruptors, haemolysins, etc.: links to chemical ecological function in the producing algae

Topic 5: Development and validation of current fish- or cell-based bioassay methods for assessing ichthyotoxicity

Topic Coordinator: H el ene Hegaret, France; Jorge Mardones, Chile; Allyson Astuya, Chile.

Key Issues: Comparison of functional bioassays for ichthyotoxic assessment of whole-cell versus cell-fraction exposure: strengths and weaknesses of alternative techniques and potential for optimization and standardization of protocols

Management and mitigation of fish-killing algal events

Topic 6: Impact of fish-killing algal events on other components of coastal marine ecosystems

Topic Coordinator: Lincoln Mackenzie

Key Issues: Consideration of the broader ecological impacts of fish-killing algal blooms, including effects on wild fish populations, benthic assemblages, and other components of the pelagic zone: multi-stressors induced by nutrient deprivation or local organic enrichment via degradation, deoxygenation, released toxin components, or disruption of food web interactions

Topic 7: Assessment of mitigation strategies and their effectiveness

Topic Coordination: Don Anderson, USA

Key Issues: Current application and future opportunities for deployment of technological solutions for monitoring fish-killing algal blooms and mitigating their effects on fish in aquaculture operations and wild populations, e.g. early warning systems, physical displacement of cages, application of clay or other flocculants, physical enclosure with pumping (oxygenation), etc.

Meeting structure

CLOSED SESSIONS

Tuesday, 8th October (Day 1)

08:30 – 08:45 Welcome words Leonardo Guzmán

08:45 – 09:00 Opening Allan Cembella

09:00 – 09:35 Topic 1 (35 minutes for talk)

09:35 – 09:55 Key questions Topic 1 (20 minutes for questions and discussion)

09:55 – 10:30 Topic 2 (35 minutes for talk)

10:30 – 10:50 Key questions Topic 2 (20 minutes for questions and discussion)

10:50 – 11:10 Health break

11:10 – 11:45 Topic 3 (35 minutes for talk)

11:45 – 12:05 Key questions Topic 3 (20 minutes for questions and discussion)

12:05 – 12:40 Topic 4 (35 minutes for talk)

12:40 – 13:00 Key questions Topic 4 (20 minutes for questions and discussion)

13:00 – 14:30 Lunch

14:30 – 15:25 Discussion Topic 1 (55 minutes)

15:25 – 16:20 Discussion Topic 2 (55 minutes)

16:20 – 16:40 Health break

16:40 – 17:35 Discussion Topic 3 (55 minutes)

17:35 – 18:30 Discussion Topic 4 (55 minutes)

Wednesday, 9th October (Day 2)

09:00 – 09:35 Topic 5 (35 minutes for talk)

09:35 – 09:55 Key questions Topic 5 (20 minutes for questions and discussion)

09:55 – 10:30 Topic 6 (35 minutes for talk)

10:30 – 10:50 Key questions Topic 6 (20 minutes for questions and discussion)

10:50 – 11:10 Health break

11:10 – 11:45 Topic 7 (35 minutes for talk)

11:45 – 12:05 Key questions Topic 7 (20 minutes for questions and discussion)

12:05 - 13:00 Discussion Topic 5 (55 minutes)

13:00 – 14:30 Lunch

14:30 – 15:25 Discussion Topic 6 (55 minutes)

15:25 – 16:20 Discussion Topic 7 (55 minutes)

16:20 – 16:40 Health break

16:40 – 17:35 Discussion Topic 7 (55 minutes)

17:35 – 18:30 Introduction. Overview topics 1 to 7. Synthesis/future perspectives discussion. (55 minutes)

Evening 20.00: workshop dinner

Thursday, 10th October (Day 3)

09:00 – 11:20 Meeting to organize report, special issue, book or compilation. Outlines for future fish-killing workshops and/or events (Part 1)

11:20 – 11:50 Health break

11:50 – 13:00 Meeting to organize report, special issue, book or compilation. Outlines for future fish-killing workshops and/or events (Part 2)

13:00 – 14:00 Lunch

Open Conference: “Status of fish kills and its impacts in a changing environment”

(this activity will be open to professionals of the Fisheries and Aquaculture Undersecretary, Fisheries and Aquaculture National Service, researchers and students from Universities, and sectorial local authorities, including professionals from the salmoniculture sector, and interested people)

Simultaneous translation plus real time streaming will be available

14:00 – 14:30 Registration

14:30 – 15:45 **Per Juel Ilnsen & Thomas Ostenfeld Larsen**. Overview: fish killing mechanisms, ichthyotoxins, detection and identification methods and its standardization. Presentation + Questions (35 minutes for talk and 10 minutes for questions)

15:45 – 16:30 **Gustaaf Hallegraeff**. Climate change and fish killing algae. Presentation + Questions (35 minutes for talk and 10 minutes for questions).

16:30 – 16:50 Health break

16:50 – 17:35 **Don Anderson**. Current mitigation strategies and their effectiveness. Presentation + Questions (35 minutes for talk and 10 minutes for questions).

17:35 – 17:55 **Paulina Artacho**. HABs monitoring management in the Chilean salmon industry: advances and challenges. Presentation + Questions (15 minutes for talk and 5 minutes for questions)

17:55 – 18:20 **Alejandro Clément**. Distribution of HABf INDEX and Analysis of the Economic Impacts in Salmon Farming. Presentation + Questions (20 minutes for talk and 5 minutes for questions)

Friday, 11th October (Day 4)

08:00 – 13:00 Salmon farm visit

13:00 – 14:30 Lunch

Departure