

A-605 Hiroo GOUDA , Shiori SONOKI and Yoshiyuki TAKAYA

Timing of spore release of four kelp species, *Saccharina longissima*, *Saccharina coriacea*, *Costaria costata*, and *Alaria praelonga*, on the Pacific coast of eastern Hokkaido, Japan

We investigated the timing of spore release of *Saccharina longissima*, *S. coriacea*, *Costaria costata*, and *Alaria praelonga* on the Pacific coast of eastern Hokkaido. This was accomplished by quantifying the number of kelp spores in seawater, using membrane filters (analyzed using real-time PCR), and by estimating the density of young sporophytes by culturing the membrane filters. The maturation progress of adult *S. longissima* (in Nemuro), and *C. costata* and *A. praelonga* (in Kushiro) was observed to compare their respective spore release periods. The peak spore release period for each species was estimated to be from June to October for *A. praelonga*, August for *C. costata*, September for *S. longissima*, and October and November for *S. coriacea*. Many released spores were detected 2-3 months after the populations of each species began to mature. Seaweed removal operations to maintain populations of edible kelps were conducted in winter (November-February) on the coast of eastern Hokkaido. The present study revealed that only edible kelps (*S. longissima* and *S. coriacea*) peaked their spore release in autumn. This suggests that the seaweed removal operations in winter may improve environmental conditions (photon and water flow conditions) for gametophyte maturation and micro-sporophyte growth rather than create space for spores to settle.

A-606 Makoto KANAMORI , Masafumi NATSUIKE , Keisuke SETO , Atsushi SHIRAI , Ayumu KAWAI and Satoshi YOSHIDA

Long-term monitoring reveal mass mortality events of cultured scallops *Mizuhopecten yessoensis* in Funka Bay, Hokkaido

We summarized the long-term monitoring data and the production records of cultured scallops in Funka Bay accumulated since the early 1990s to reveal the mass mortality events. Mortality and shell deformity rates

of the scallops at the end of intermediate culture were correlated, and the average was 7.6% and 10.7%, respectively. Shell deformity was a more significant problem for the juvenile scallops, and that in the intermediate culture was a decline in the normality rate. The survival rate of scallops in harvest season can drop to below 20%. Therefore, the mass mortality events occurred after ear hanging in Funka Bay. We observed that the normality rate of juvenile scallops was closely related to the survival rate of harvested scallops in the subsequent year. The survival rate of harvested scallops determined the production for that year. These results indicate that the mass mortality event of cultured scallops in Funka Bay had two continuous phases: 1) the decline of the normality rate in the intermediate culture period and 2) the subsequent high mortality rate in ear-hanged scallops. We conclude that maintaining the normality rate of juvenile scallops at an elevated level is the most critical factor for stabilizing scallop production in this area.

A-607 Masafumi NATSUIKE , Yoshinori NISHIDA , Makoto KANAMORI ,
Masatoshi SATO and Kazuhiko HONKE

Field observations of the physical environment and behavior of culture cages during juvenile Yesso scallop (*Mizuhopecten yessoensis*) culture in Funka Bay, Hokkaido, Japan

Recently, a decline in the normality ratio of net-caged juvenile scallops and the subsequent mass mortality of adult scallops has become a serious problem in scallop aquaculture in Funka Bay. A decline in the normality ratio of juvenile scallops may result from increased vibrations of the culture net cages during summer. To reveal the relationship between physical environmental factors (such as waves and currents) and vibration of the net cages, continuous observations of the current velocity and vertical and horizontal accelerations, as well as the water levels of the net cages (pearl and lantern nets), were conducted in the scallop culture facility in Funka Bay from summer to autumn in 2020. Fluctuations in resultant acceleration and water levels of the net cages showed strong correlations with oscillating widths (as a result of wave action) of the significant current velocity. We conclude that strong wind-driven waves from the bay mouth are the leading cause of the vibration of the net cages. Furthermore, short-term meteorological disturbances due to the passage of low-pressure systems might cause

vibration in the net cages without the occurrence of strong waves.

A-608 Shingo ITO , Taihei MATUDA , Yoshitomo KATUMATA , Shoutarou NISHIKAWA and Shinya MIZUNO

Pathogenicity of *Pseudomonas anguilliseptica* to barfin flounder *Verasper moseri*

Rod bacteria were observed in the brains, kidneys, and spleens of barfin flounder, following a mass mortality event. Biochemical properties and genetic analysis of bacteria from the kidney identified the bacterial species as *Pseudomonas anguilliseptica*. We examined the pathogenicity of the isolated *P. anguilliseptica* in barfin flounder using immersion tests. Mortality rates (within 35 days from the start of the test) were 74% at 2.1×10^5 CFU/ml, 86% at 2.1×10^6 CFU/ml, and 73% at 2.1×10^7 CFU/ml. The onset of mortality occurred earlier when the number of bacterial counts was higher.

P. anguilliseptica was reisolated from the brains of all the dead fish. Since Koch's postulates were satisfied, we conclude that *P. anguilliseptica* is pathogenic to barfin flounder.

A-609 Keizo YOSHIMURA , Hiroshi YAMAGUCHI and Kazuhiko ITAYA

Validation of annual rings on the lapilli of barfin flounder *Verasper moseri*

The annual ring structure on the lapillar otolith of the barfin flounder (*Verasper moseri*) was validated, using juveniles and adults from the Pacific coast of Hokkaido. Microscopy of the left lapilli embedded in resin, revealed thin and clear growth lines resembling the outline of the otolith. The formation cycle of these growth lines was observed in 1-2-year-old fish, suggesting annual formation from May to June. The age-determination accuracy based on the lapilli was compared to two standard methods based on the sagittal otoliths using fishery-caught adults. In 2-10-year-old fish, ages estimated from sectioned sagittae closely coincided with the number of growth lines on the lapilli. However, among \geq four-year-old fish, the number of growth lines on the lapilli did not match the age estimated based on the surface of sagittae

in more than half of the assessed fish. These disagreements were probably caused by the difficulty in observing the surface of sagittae in older fish, as reported in other species. These results indicate that the growth lines on lapilli can be used for age determination of barfin flounder and are, comparable to the annuli on transverse-sectioned sagittae.

A-610 Kazutaka SHIMODA and Takashi FUJIOKA

Age -body size relationships for the Southern Hokkaido stock of the arabesque greenling, *Pleurogrammus azonus*, caught in fisheries (Note)

A-611 Mitsuru TORAO

Changes in body and fatty acid composition of chum salmon *Oncorhynchus keta* fry by fasting (Note)