

A-615 Hiroshi HOSHIKAWA, Akira SUGAWARA, Hiroya OKUMURA, Kanji NAKAJIMA
and Tatsuya UNUMA

Improving the gonad size and color of old sea urchins (*Mesocentrotus nudus*) by cultivation

On barren grounds, the sea urchin *Mesocentrotus nudus* has small and dark gonads of low commercial value from a lack of food. Efforts have been made to develop cultivation techniques to increase commercial value. However, the sea urchins on barren grounds are relatively old and fishermen believe that the small gonad size and dark gonad color of aged urchins are difficult to improve. Here, we fed urchins collected from barren grounds with sufficient *Saccharina japonica* and examined the gonad index and gonad color by age. It was found that by providing sufficient food, the gonad index of old urchins could be increased to the same level as that of young sea urchins. In addition, the dark gonad color can be brightened with the increase in the gonad index. This result could lead to the effective use of aged sea urchins in barren grounds.

A-616 Masafumi NATSUIKE and Makoto KANAMORI

Estimation of the elimination rate of paralytic shellfish toxins in the midgut glands of cultured Japanese scallops (*Mizuhopecten yessoensis*) in Funka Bay

In recent years, the period of self-restriction for the shipments of cultured Japanese scallops (*Mizuhopecten yessoensis*) in Funka Bay has increased owing to an increase in the occurrence of the toxic dinoflagellate *Alexandrium catenella* (Group I), and this has become a problem for planned shipments by farmers. Therefore, to predict the timing of the lifting of the self-restriction as early as possible, we estimated the elimination rate constant and biological half-life of paralytic shellfish poisoning toxicity in Japanese scallops (*Mizuhopecten yessoensis*) by analyzing data on the occurrence of *A. catenella* in Funka Bay and data on paralytic shellfish toxicity in the

cultured scallop midgut glands continuously monitored in one area of the bay during 2021 and 2022. The elimination rate constant and biological half-life were estimated at 0.0219 per day (equivalent to 2.19% of the toxin eliminated daily) and 31.7 days, respectively.

A-617 Masafumi NATSUIKE, Makoto KANAMORI and Isao KUDO

First occurrence and a red-tide event of harmful dinoflagellate *Karenia mikimotoi* in Funka Bay, Hokkaido

The occurrence of the harmful dinoflagellate *Karenia mikimotoi* in Funka Bay, south-western Hokkaido, in late July 2021, was firstly detected in seasonal samplings from April 2018 to March 2022, with the maximum cell density reaching 6.6 cells mL⁻¹. Strong thermal stratification due to record-breaking heat waves with higher nutrient concentrations in deeper layers, which has been considered favorable for the growth of *K. mikimotoi* in other areas, was observed in the bay in late July, 2021. *K. mikimotoi* was observed at low densities (<1 cells mL⁻¹) until September. Thereafter, the red tide of this species in the bay was first observed in Muroran Port, which is located at the mouth of the bay, with the maximum cell density reaching 4400 cells mL⁻¹ on October 11. The red tide extended outside the port temporarily, and relatively high densities of *K. mikimotoi* were detected in the nearby fishing port and scallop cultivation area in early October; the maximum cell densities reached 890 cells mL⁻¹ and 21 cells mL⁻¹, respectively. Warmer temperatures and higher precipitation than usual were observed during the growth period of the *K. mikimotoi*.

A-618 Akiyoshi SHINADA and Hayato SANEYOSHI

Effect of sea surface temperature on the migration pathways of salmon river return rates to the Teshio River, Hokkaido, Japan (Short Paper)

The contribution of sea surface temperature (SST) to variations in salmon river return rates was investigated in the Teshio River, located in the northern Sea of Japan, Hokkaido, Japan. SST rose faster on the Sea of Japan side than on the Sea of Okhotsk side from April to June,

indicating that a temperature gap of 2 to 3° C existed between the two areas. Spearman's correlation coefficients between the SST and salmon river return rates were positive from late April to mid-May in the Sea of Japan side. This suggests that the survival rate increases with higher SST immediately after sea entry. In contrast, on the Sea of Okhotsk side, a positive correlation was observed in early May and a negative correlation in late June, when SSTs were above the lower habitat limit (5° C) in early May and reached the upper habitat limit (13° C) in late June. The above results indicate that the variation in return rates may be related to the SST immediately after sea entry and the length of possible residence time on the Sea of Okhotsk side, which is the migratory pathway.

A-619 Mitsuru TORAO

Fasting alters school structure in chum salmon *Oncorhynchus keta* fry (short paper)

Chum salmon *Oncorhynchus keta* fry were reared for 5 days at three feeding rates (0%, 1%, and 3% of the total fish weight), and the distances between individuals were compared using video analysis to examine the effects of the nutritional status of on school structure. The inter-individual distance was significantly greater in the 0% feed group, suggesting that a decline in nutritional status affected the school structure of salmon fry.

A-620 Shingo ITO, Nozomi OKADA and Ryuya HASEGAWA

First isolation of *Aeromonas salmonicida* from Shishamo *Spirinchus lanceolatus*

In 2022, mortality from wobbly swimming and skinniness occurred in Shishamo. Many bacilli were observed in Safraninstained kidney smears. Kidneys of five fishes were cultured on Trypto-casein Soy Agar containing 1% sodium chloride and incubated at 15° C for 1 week. Many single colonies producing brown pigments were observed in four out of the five fish. The isolated bacteria were agglutinated with anti-*Aeromonas salmonicida* (As) rabbit serum, and the partial sequence of the 16SrDNA

region (1,422 bases) matched 100% with *As*. The biochemical analysis also identified the organism as an atypical *As*. This is the first report of *As* isolation from Shishamo.

A-621 Kodai MORITA, Daichi KUROKAWA, Yutaro SUZUKI and Kazuhiko ITAYA

Arabesque greenling *Pleurogrammus azonus* in young fish caught in the Sea of Japan and Okhotsk Sea around the Soya Strait (Note).

A-622 Masafumi NATSUIKE, Tetsuya KONISHI and Takuya MIZUKAMI

Occurrences of red tides and harmful algal species in the southern Hokkaido during 2021 and 2022 (Note)

A-623 Hiroshi SHIMADA, Daichi ARIMA and Hiroki ASAM

Long-term fluctuations in zooplankton biomass collected during six research cruises around Hokkaido (Review)

The results of the zooplankton research conducted by the Hokkaido Research Organization over the past 30 years were reviewed. To elucidate the fluctuations in lower trophic level production, we examined long-term changes in zooplankton biomass and species composition of samples collected using the NORPAC net almost six times a year around Hokkaido. Regarding the long-term fluctuation of zooplankton biomass, it was revealed that the biomass remained almost unchanged, although the annual fluctuations at each station were largely based on the wet weight dataset from 1989 to 2019 obtained from the subsurface layer (depth 150 m) at the six stations. However, the species composition of the dominant large copepods obtained from the mesopelagic layer (depth 500 or 300 m) from 2008 to 2019 varied by area. The dominant large copepod species were *Neocalanus* spp., *Eucalanus bungii*, and *Metridia* spp., which fluctuated significantly annually. Because these large copepods are cold-water species that prey on important fishery resources such as chum salmon,

walleye pollock, and arabesque greenling, it is important to monitor these large copepod species, considering the relationships among their biomass, ocean warming, and fishery resource status from a long-term perspective.

A-624 Hiroki ASAMI

Annual fluctuations and factors affecting the abundance of *Neocalanus plumchrus/flemingeri* in the Sea of Japan off northern Hokkaido

Annual fluctuations, i. e. , between winter and summer in the abundance of the calanoid copepod *Neocalanus* spp. (*Neocalanus plumchrus/flemingeri*) in the northern Sea of Japan were investigated at a station from 1989 to 2011. *Neocalanus* spp. increased from June to August. The maximum abundances increased continuously from 1998, and prominently high abundances were observed in 2001. Except for 2000, these years were characterized by low water temperatures in April. After 2001, high abundances were found in 2003, 2005 and 2010. The abundance peaks in these years corresponded with a sharp decrease in water temperature in April. Significant negative correlations between water temperature in April and the maximum abundances of *Neocalanus* spp. in each year were recognized, suggesting that water temperature was the most important factor for the abundances of *Neocalanus* spp.

A-625 Hiroki ASAMI and Hiroshi SHIMADA

Comparisons of zooplankton biomass and composition during the day and night in spring at a station in Ishikari Bay, western Hokkaido, with special reference to copepods (Note)