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Full Papers

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Interspecific competition for food resources between Dolly Varden (*Salvelinus malma*) and Rainbow Trout (*Oncorhynchus mykiss*) in the Satsunai River Reservoir, upper Tokachi River System, Hokkaido, Japan

Katsuya Misawa, Takao Yoneda, Satoshi Inoue, Yuuichi Tanigawa, Hiroaki Konagaya, and Akihiko Kimura

Abstract To clarify interspecific competition between Dolly Varden and rainbow trout, their habitat use and stomach contents were investigated in the Satsunai River Reservoir, upper Tokachi River System, Hokkaido, Japan, during 1998-2004. During low population-densities, both species were distributed in the surface layer, whereas at high densities, Dolly Varden were restricted to the bottom layer. When terrestrial insects were abundant on the surface, they were utilized by both species. When the former were less abundant, Dolly Varden fed mainly on bottom layer zooplankton and benthic animals, indicating a shift to specific feeding niches under conditions of high fish density and food shortage.

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Occurrence of summer upstream migration in Biwa salmon (*Oncorhynchus masou* subsp.)

Masayuki Kuwahara and Kei'ichiro Iguchi

Abstract Salmon (*Oncorhynchus masou*) of uncertain subspecific identity migrating upstream in inflowing rivers around Lake Biwa much earlier than the main autumn

migration of Biwa salmon (*O. m.* subsp.) raised the question of whether or not summer migrating Biwa salmon individuals might be mixed with the very similar red-spotted masu salmon (*O. m. ishikawae*). Accordingly, 17 individuals of summer migrating salmon were captured from inflowing streams of Lake Biwa from May to July in 1998 and 1999, and their morphological characters and mitochondrial DNA analyzed. Twelve individuals were found to be Biwa salmon and three to be red-spotted masu salmon, based on both morphological and DNA characters. The remaining two individuals could not be identified owing to discordant the morphological and molecular characters. The study confirmed the occurrence of summer upstream migration in Biwa salmon. Although the majority of Biwa salmon migrate upstream just before the breeding season in autumn, the possibility exists that summer migrating individuals might contribute to the genetic diversity of the Biwa salmon population.

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Early gonadal formation in *Chaetodon auripes* and hermaphroditism in sixteen Japanese butterflyfishes (Chaetodontidae)

Koji Kobayashi, Katsumi Suzuki, and Syozo Hioki

Abstract Histological observations on gonadal formation and hermaphroditism in 16 species (4 genera) of Japanese butterflyfishes (Chaetodontidae), included a detailed study of the former in *Chaetodon auripes* from central Japan. In this species, the gonads of 24 young specimens (< 36.4mm SL) were sexually undetermined, whereas those of 16 larger specimens (39.4 mm SL to 55.5mm SL) had begun initiall differentiation into an ovary, having formed an early parovarian type ovarian cavity. Sex changes occurred in immature ovaries, which initially became intersexual gonads with many seminal lobules forming in the ovigerous lamellae and eventually matured into secondary testes (each concurrently retaining an ovarian cavity). No specimens were found with gonads that had developed directly into a testis from a sexually undifferentiated stage. In *Forcipiger flavissimus*, three stages of gonadal sex succession, viz., ovaries with a parovarian type ovarian cavity, intersexual gonads and

secondary testes with a rudimentary ovarian cavity, were found. In *Hemitaurichthys polylepis* and *Heniochus diphreutes*, intersexual gonads of both ovarian- and testicular-types were found. Accordingly, the occurrence of normal, although non-functional, hermaphroditism and sex change from female to male is now established in all of the Japanese chaetodontid species studied.

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Ultrastructure of spermatozoa of two species of Myctophidae ; *Symbolophorus californiensis* and *Notoscopelus* sp.

Masako Hara

Abstract The ultrastructure of spermatozoa of two species of Myctophidae, *Symbolophorus californiensis* and *Notoscopelus* sp., was examined by scanning and transmission electron microscopes. The spermatozoa were characterized by (1) numerous small spherical mitochondria distributed in close contact with the nuclear membrane covering on S-shaped nucleus of ca 5 μm (L) x ca 1 μm (W), (2) two centrioles located about 1/3 along the long axis of the nucleus, giving rise to typical biflagellarity, and (3) biflagella ca 47 μm long, each component with an unusual 9+0 axonemal structure. It is suggested that a combination of these three apomorphic characters may be peculiar to Myctophidae.

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Sail-fin sandfish (*Arctoscopus japonicus*) collected off the Iwate area in February to March, 2004: evidence that they came from the Sea of Japan

Shigeru M. Shirai, Tomoaki Goto, and Taro Hirose

Abstract In February to March, 2004, 17 specimens of sail-fin sandfish, *Arctoscopus japonicus*, were collected off the Iwate area, Pacific coast of northern Honshu, Japan,

during research on fishery resources by Iwate Fisheries Technology Center. Using all the specimens, a sequencing analysis of the mitochondrial control region was performed, and we found that they have a genetic composition closely approximating to the western Japan population distributed north of Oki Islands, the Sea of Japan. These specimens were estimated to be three years old, belonging the 2001 year-class. This year-class from the Akita coast area became a very large resource, and this may have led to the expansion of their distribution. The occurrence of sandfish off the Iwate area in 2004, should be an event through the enlargement of distribution area of the 2001 year-class that hatched along the Akita coast area.

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Function of pectoral filaments of *Polynemus multifilis* (Perciformes: Polynemidae) observed in an aquarium

Toshio Doi, Shoko Ohtsuka, Naohisa Komoriya, and Keisuke Suzuki

Abstract The function of pectoral filaments (which are separate rays of the lower part of pectoral fin, and of which 3 pairs are longer and 11 pairs are shorter than the body length) of *Polynemus multifilis* was studied in an aquarium. When *P. multifilis* was swimming, the long filaments were spread out in front of and above the fish and the short filaments were spread downward like a rake being in contact with the bottom or wall. During 10 minute observations, the contact time of the short filaments with the bottom or wall (range, 506.8 – 599.1 sec.), was longer than that of long filaments (6.8 – 95.4 sec.). But the contact time of each type of filament was constant among the three feeding conditions (before feeding, while feeding and after being satiated). The contact rates (contact frequency of long or short filaments / total contact frequency of any filament) of the short filaments with falling defrosted prey (mean±SD, 69.3± 4.2 %) was higher than those of long filaments (30.7±4.2 %). The feeding rates (feeding frequency of the prey / contact frequency of filaments with prey) of short

filaments (95.7±5.3%) were higher than those of the long filaments (56.4±11.1%). The contact rates of the long filaments with obstacles, which were vinyl pipes placed on the tank bottom and wall, (63.0±10.7%) were higher than those of the short filaments (37.0±10.7%). The avoidance rates (avoidance frequency / contact frequency of filaments with obstacles) of the long filaments (55.0±18.9%) were higher than those of the short filaments (28.8±9.5%). The filaments may have functions to detect prey items, for use to swim along the bottom or wall and to sense obstacles, and the first and second functions were mainly the role of the short filaments and the last function was mainly the role of the long filaments.

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Seasonal dynamics of fish fauna on the reef in the Tsushima Current, northern Kyushu, Japan

Takashi Nishida, Akinobu Nakazono, Norio Onikura, Shin Oikawa. and Seiichi Matsui

Abstract Between July 2002 and June 2005, the fish fauna on the reef in the Tsushima Current, northern Kyushu, was surveyed on a monthly basis by SCUBA diving. A total of 138 species and 42,769 individuals occurred in the investigated area (1,200 m^2). Five fish species (*Halichoeres tenuispinnis*, *Chromis notata notata*, *Sebastes inermis*, *Siganus fuscescens* and *Girella punctata*) comprised approximately 53% of the observed individuals. The number of species and individuals increased in summer and autumn but, and decreased in winter. The water temperature strongly affected the fishes. Based on cluster analysis of the appearance patterns, the observed fishes were grouped into five types: (1) perennial type (Type P) comprising 36 species and 18,346 individuals, (2) spring type (Type S) comprising 17 species and 2,655 individuals, (3) summer-autumn type (Type SA) comprising 33 species and 17,613 individuals, (4) autumn type (Type A) comprising 47 species and 4,144 individuals, and (5) the others. In addition, differences in the species composition were observed during each season. Thus, fish fauna drastically changed according to the season,

which is similar to reefs in temperate waters of Pacific coast of southern Japan.

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Short Report

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The occurrence and distribution of nagaremon-charr, a morphotype of *Salvelinus leucomaenis japonicus*, in the Ane River system, Lake Biwa basin

Takeshi Kikko, Takuya Sato, Yuichi Kano, Yasushi Harada, and Yoshiaki Kai

Abstract The occurrence and distribution of the threatened nagaremon-charr, a morphotype of *Salvelinus leucomaenis japonicus*, were investigated in the Ane River system, Lake Biwa basin, Shiga Prefecture, central Japan, in August, 2005. The total numbers of nagaremon-type charr and typical-type charr captured were 20 and 38, respectively. The occurrence of nagaremon-type charr has dropped dramatically compared with the 1970s, suggesting that artificial transplantation might have obscured indigenous gene pools and modified evolutionary distinctions of that morphotype. Nagaremon-type charr were distributed further upstream than the typical-type, a significant only the former being captured above waterfall. These observations suggest that habitat restoration, prohibition of fishing and removal of *Salvelinus leucomaenis pluvius* are essential for practical conservation of the nagaremon-type charr.

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