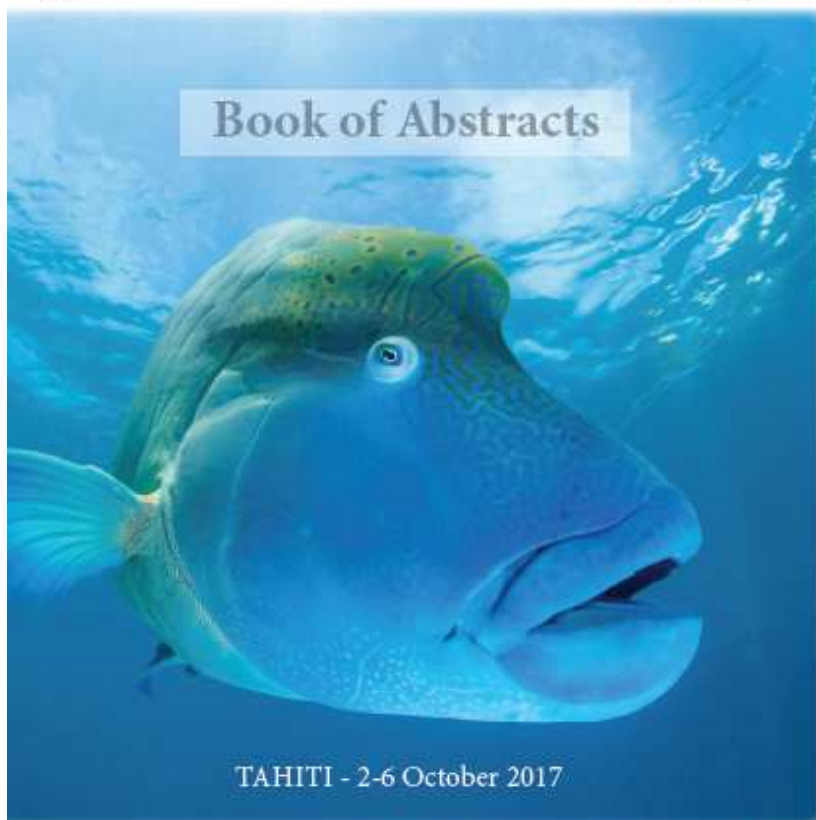




THE 10th INDO-PACIFIC
FISH CONFERENCE



Book of Abstracts



TAHITI - 2-6 October 2017



Polyploid evolution and functional genome diploidization in sturgeons

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Recent Acipenserid fishes exhibit three ploidy levels: species with a chromosome number ~ 120 , species with ~ 260 -270 chromosomes, and one species, *Acipenser breitensteini*, with ~ 372 chromosomes. Our studies proved that all species from the Pacific phylogenetic lineage have ~ 260 -270 chromosomes, whereas the species from the Atlantic lineage have less than 260 chromosomes. The karyological data presume at least three polyploidization events in the evolution of Acipenseridae. However, generally accepted allopolyploid origin suggests that polyploidization did not occur in different phylogenetic lineages, but rather resulted from the conjugation of phylogenetic lineages; in such a case, multiple polyploidization events should be presumed (Vasil'ev, 2009).

The problem of functional diploidization of genomes in polyploid sturgeons is of great interest foremost in connection with the rate of their general, chromosomal, and molecular evolution. We analyzed these problems by experimental crosses in hybrid sturgeons and subsequent karyological and microsatellite analyses of parental specimens and their progenies.

A fertile hybrid female was obtained from sturgeons with a different ploidy: sterlet *A. ruthenus* ($2n \sim 120$) (S) and kaluga *A. dauricus* ($2n \sim 260$) (K). Microsatellite and cytometric analyses revealed that the genome of this SxK female originated from the fertilization of the spontaneously diploidized sterlet egg with haploid sperm from kaluga: its genome includes a diploid genome of sterlet and a haploid (evolutionary diploid) set of kaluga. Back-cross hybrids (SxK)xS had ~ 185 chromosomes; that is, SxK female produced eggs with ~ 125 chromosomes. In this regard, it can be assumed that the chromosomes from sterlet grouped in 60 bivalents in meiosis, and the chromosomes from kaluga – in 65 bivalents; this pattern was confirmed by microsatellite analysis. The insemination of SxK eggs by inactivated sperm resulted in viable offspring with ~ 125 chromosomes. Therefore, we tried to obtain the offspring from unfertilized eggs of kaluga. As a result, a small number of viable larvae were obtained. Thus, a haploid, but evolutionarily diploid chromosome set of kaluga exhibits the properties of a normal diploid set and additionally proves very slow cytogenetic and molecular evolution in sturgeons. This can explain, along with polyploid origin, an extremely low morphological differentiation in this group.

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