

DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Sturgeons, due to caviar production, are one of the most economically important fish species. Currently, as a result of overfishing, poaching and degradation of breeding sites, these fish are one of the most endangered groups of animals in the world. Polish native population of Atlantic sturgeon went extinct in the 60' of XX century and for many years increased efforts are taken to restore it to places of their natural occurrence. The decline in numbers of sturgeons in natural populations led to dynamic development of the aquaculture of these fish, which took place over the last thirty years. It has been primarily associated with the growing demand for caviar, the need to diversify aquaculture products and as well as the need for the production of stocking material for restitution of endangered sturgeon species. The increased production of sturgeon also led to a rapid increase in demand for specialized feed necessary for rearing and breeding of these fish. Feed constitute the largest share in the cost of fish production, therefore growing trend to replace expensive ingredients of animal origin with cheaper plant origin equivalents - mainly soy and its derivatives is being observed. Sturgeons in natural environment feed on benthos (shellfish and larvae). Placing the plant origin components in sturgeon feed, because of the presence of high concentrations of plant hormones (phytoestrogens), may cause a number of disorders, mainly associated with the development of the gonads. Plant hormones are a heterogeneous group of compounds with weak estrogenic properties, which may have a different impact on the development of the gonads, causing both feminization and masculinization, and in extreme cases even can reduce fertility or lead to total sterility. Preliminary studies carried out at the Department of Ichthyobiology, Fisheries and Aquaculture Biotechnology, WULS, have shown that feeding sturgeon with commercial feed led to development of intersex gonads in 30% of the Russian and Siberian sturgeons, abnormal development of the gonads in approximately 10% of individuals, and in 4-year-old females even significant degeneration of the reproductive tissue. Content of soy and its derivatives, and other components of plant origin in sturgeon feeds is high, due to their high demand for protein. Therefore, during rearing fish are exposed to many different phytoestrogenic compounds in different concentrations, thereby preventing indication which ones and how, impair the development of the gonads. The aim of this project is to determine the effect of individual phytoestrogens, commonly found in feed for sturgeon rearing, on molecular and morphological mechanisms of development and differentiation of gonads in these fish. In order to establish the effect of the phytoestrogens on sturgeons reproductive tract a 350-day of experiment with usage of three feeds supplemented with synthetic daidzein, genistein and coumestrol is planned to conduct. During the experiment the changes caused by the influence of various plant hormones in the reproductive tissue will be assessed three times. The level of bioaccumulation of studied phytoestrogens will be assessed in the fish plasma using gas chromatography coupled with mass spectrometry. At the same time the expression of genes that are key factors of gonadal development and differentiation in vertebrates towards testicles or ovaries will be analyzed, which will enable assessing the molecular mechanisms of interaction of test compounds as feminizing or masculinizing agents and also as anti-estrogenic or androgenic factors. Genetic studies will also determine the specific genetic fingerprint of substances that cause certain problems in reproductive tissue, this will enable identifying the exposure of the fish to xenoestrogen substances having a similar effect or predicting the effects of the compounds having similar properties on reproductive tissue in this fish species. Moreover, this study will also allow to better understand the mechanisms related to sex differentiation in this highly valuable group of fish, that have been unknown for so far, by establishing disturbances in different molecular pathways leading to reproductive tissue dysfunction. Condition of sturgeon restitution programs success in the world, is to retain a high reproductive potential of fish released to support natural populations. The proposed study, therefore, will make an important contribution to the protection of wild populations of sturgeons and indirectly the development of aquaculture by identifying those dietary factors that may have negative effect on fish reproduction. A positive side effect of the project may also include developing a diet based on plant ingredients that will enable creating feminized stock to caviar production.