ANNOTATION

dissertation work of Maratova Guldana Maratkyzy on the topic " Formation of repair and broodstocks of sturgeon using genetic methods to increase the efficiency of artificial reproduction " specialty 6D080200 – "Technology for the production of livestock products"

Relevance of the research topic

Over the past 15-20 years, the natural reproduction of Caspian sturgeon fish has been in an unstable situation . The ichthyofauna is degrading, and the scale of natural reproduction is steadily declining. The current state of sturgeon stocks is of serious concern. A rational measure to facilitate the rapid restoration of sturgeon stocks and maintain them at a stable level is artificial breeding in sufficient quantities.

Maintaining the sturgeon population in at present depends almost entirely on artificial reproduction and release of juveniles sturgeon hatcheries (STF). Traditionally, to obtain juveniles, sturgeon spawners caught in spawning time. IN connection with catastrophic shortage of wild producers, in last years for obtaining juveniles ORZ are increasingly used by sturgeon RMS contained in artificial conditions. If earlier RMS were formed from domesticated individuals, then V in recent years factories use aquaculture fish grown "from caviar" and therefore often closely related . IN connection with This raises the problem of preserving and maintaining the genetic diversity of producers used for the purposes of reproduction of the natural population of sturgeon.

Carrying out genetic certification of broodstock, availability of a genetic passport each manufacturer allows fish farmers to compile available individuals the most optimal pairs with with the aim of preserving the high genetic diversity of the natural population and increasing the viability of offspring. The use of the principles of conservation genetics when compiling optimal pairs of crosses allows us to exclude genetic degeneration of the population due to inbreeding (inbreeding).

The purpose of the dissertation research is the formation of productive replacement and broodstocks of sturgeon using genetic methods to increase the efficiency of artificial reproduction .

Purpose of the study :

1) Formation of sturgeon broodstocks using the "from caviar" method in the conditions of a fish farm in the Mangistau region.

2) Formation of productive broodstocks using the "domestication" method in the conditions of the Atyrau region.

3) Development of biotechnical methods of selection and tagging in order to form productive broodstockof sturgeon fish.

4) Registration of genetic passports using the method of genotyping production RMC sturgeon fish.

5) Assessment of productive broodstocks based on fish-breeding biological, morphometric and reproductive indicators.

6) Development of effective biotechnical methods for increasing the productivity of sturgeon fish in the Mangistau region.

7) Development of effective biotechnical methods for increasing the productivity of sturgeon fish in the Atyrau region in the conditions of acute respiratory diseases.

8) Assessment of the quality of your own reared juveniles.

Research methods.

Research aimed at mastering and improving the biotechnology of forming replacement broodstock and reproduction of sturgeon fish was carried out on basic farms in the Mangistau and Atyrau regions.

To obtain a DNA preparation, 50-200 mg of the test sample is taken. DNA isolation is carried out using the Wizard ® SV Genomic DNA PurificationSystem DNA isolation kit (PromegaCorp .) or similar according to the instructions for the kit (Birstein VJ, Poletav AI, Goncharov BF). For genetic certification of sturgeons, a set of seven microsatellite loci (Afug41, Afug51, Afug135, Afug54, AoxD161, AoxD165, Ls19) previously published (Van Eenennaam AL, Murray JD, Medrano JF) was used. To determine the haplotype of the control region of mitochondrial DNA, a set of primers was used , given in the link. The amplification reaction is carried out in a C1000/ T 100 amplifier (Bio - RAD) or similar in accordance with the instructions for the device (N. S. Myuge, A. E. Barmintseva, S. M. Rastorguev, V. N. Myuge, V. Barmintsev. A.).

sequencing reaction is carried out using the BigDye ™ TerminatorKitv .1.1/3.1 reagent kit (AppliedBiosystems , USA) in accordance with the manufacturer's instructions in a reaction volume of 20 μl (Billington, N., and Hebert PDN).

sequencing reaction is carried out in a C1000/ T 100 amplifier (Bio - RAD) or similar in accordance with the instructions for the device. Fragment analysis, as well as DNA sequencing and determination of the nucleotide sequence, are performed on an automatic genetic analyzer Nanofor -05 (Syntol , Russia) in accordance with the developer's instructions (Welsh AB, Blumberg M., May B.).

For early diagnosis of gender and the formation of RMS, taking into account their gender, an ultrasound machine for animals of the Mindray brand was used DP - Vet with a frequency of 50–60 Hz and with the ability to adjust the scanning depth, as well as recording and archiving sonograms . Scanning was carried out in the longitudinal and transverse directions , the moment a clear image of the gonads was found was recorded on the monitor. To describe the stages of maturity of sturgeon gonads, the maturity scale of V.Z. Trusov was used (Podushka S., Chebanov M.S., Galich E.V., Trusov V.Z.) .

Statistical indicators were calculated using the methods of G.F. Lakin . using a standard computer program (Lakin G.F.).

During the spawning campaign, the working fecundity of females was determined by calculating the relative fecundity to the percentage of fertilization, the relative fecundity was calculated per 1 kg of fish weight (Kalaida, M.L., Korchunov A.A., Ponomareva E.N.). A visual assessment of ovulated unfertilized eggs was carried out (color, consistency, amount of ovarian fluid, appearance of

eggs, the presence of foreign inclusions), the simultaneity or prolongation of ovulation and the release of eggs (Ponomarev S.V., Gamygin E.A., Nokonorov S.I., Ponomareva E.N., Grozescu YN ., Bakhareva A.A.).

The selection and determination of hydrochemical indicators of water was carried out according to generally accepted methods (Alekin O.A.). Water temperature and oxygen content in water were measured using a MARK analyzer.

Methodological approaches and morphological deviations of the studied juvenile sturgeon fish were identified by comparing them with published materials used as norms or pathologies (Lepilina I.N., Boiko NE, Kornienko GG, Vorobyeva OA).

Binoculars were used for visual inspection of embryos, prelarvae and larvae. Olympus with Color camera View at magnifications of 3 × 20, 5 × 20, 10 × 20 and 20 × 100. Fry were examined without the use of optical instruments. For a more complete picture, in the age group 0+ of the juvenile period, the total (zoological) length (*TL*) was determined using a caliper, as well as weight using a Pocket electronic scale Scale TN-213 (weighing limits up to 50 grams, error 0.01 g). Photos were taken on a computer using the DC program Viewer , connected to the Photoshop image editing program of available versions (Akimova N.V., Goryunova V.B., Mikodina E.V., Nikolskaya M.P., Ruban G.I., Sokolova S.A., Shagaeva V. G. & Shatunovsky M.I.).

Basic rules (proven scientific hypotheses and other discoveries that are new knowledge).

1) Technological methods for forming the RMS of sturgeon fish using various methods (grading, tagging, selection, ultrasound scanning for the purpose of forming the RMS);

2) Genotyping of RMS sturgeon individuals for quality assessment and development of genetic passports;

3) Technological methods for the reproduction of sturgeon fish under RAS conditions (grading, wintering, keeping spawners, hormonal stimulation, selection of reproductive products, fertilization and degumming);

4) Technological methods for growing viable juvenile sturgeon fish in RAS.

Description of the main results of the study

For the first time, genetic passports of sturgeon fish have been developed using DNA markers (Afug 41, Afug 51, Aug 135, AoxD 161, AoxD 165.) on sturgeon farms in Kazakhstan " Kazakh osseter " and "Ural-Atyrau sturgeon plant".

An analysis of fish breeding and biological indicators of producers was carried out when assessing sturgeon fish and forming replacement and broodstocks:

- The period of puberty of producers raised “from eggs” on the basis of Kazakh LLP osseter " was mainly between stages III-IV, identified in individuals subject to resorption and with a high coefficient of fat accumulation, Fulton body condition was 18.8%, microchipped with electronic PIT tags.

- At the Ural-Atyrau sturgeon hatchery, the sexual maturity of “domesticated” sturgeons was between stages III-IV, resorbed individuals were

found in small numbers, Fulton fatness was 11.22%, and were microchipped with electronic PIT tags.

As a result of artificial reproduction, 3.6 kg of caviar was obtained from 34 females and 20 males, raised using the “from caviar” method on the basis of Kazakh LLP osseter ." At the Ural-Atyrau sturgeon hatchery, 4.5 kg of caviar was selected from “domesticated” producers, that is, from 22 females and 7 males.

During the spawning campaign “ Kazakh osseter " and the Ural-Atyrau sturgeon, the average fecundity of females was 33.9 - 21.8 thousand eggs.

At the Ural-Atyrau sturgeon hatchery, the fertility rate of wild-caught sturgeon is 40.2%, and at Kazakh osseter " - 28.6% in artificially grown fish, that is, aquaculture sterlet (Acipenser ruthenus), grown by the “from caviar” method, that is, they confirmed the possibility of forming productive replacement broodstock for stocking natural reservoirs and improving the quality of artificial reproduction in commercial sturgeon farms.

As a result of teratological analysis of various stages of early ontogenesis of sturgeon, resistance during the incubation period was 34% higher in the tail compared to Russian sturgeon (11.9%). Therefore, sterlet is the most effective object in aquaculture.

Justification of the novelty and significance of the results obtained.

For the first time in the Republic of Kazakhstan, the formation of repair and broodstocks of sturgeon fish was carried out, taking into account the genetic structure. For the first time, artificial reproduction of sterlet from its own broodstock was carried out under RAS conditions in the Mangistau region. Viable juveniles were obtained and genetic passports were compiled. Also, for the first time in Kazakhstan, the quality of juvenile sturgeon fish released from acute respiratory infections was assessed.

Directions for the development of science or compliance with government programs. This work was carried out under the 019 program “In the implementation of innovative experience in the cultivation and formation of a repair and broodstock of sturgeon fish through genotyping for the intensive development of fish farming in the Mangistau region ” 2018-2020 and under the scientific and technical program “Scientific and technological support for the integrated development of aquaculture in Kazakhstan through the development and implementation of innovative technologies and new fish farming facilities" (No. 10264236).

A description of the doctoral student's contribution to the preparation of each publication.

The doctoral student was directly involved in the preparation of scientific publications, design and submission of them for publication in domestic and foreign publications.

7 scientific works were published, including 4 scientific publications. Recommended by the Committee for Quality Assurance in the Sphere of Science and Higher Education of the Ministry of Education and Science of the Republic of Kazakhstan, 1 article - in publications included in the international Scopus

database , 3 articles - in collections of an international conference, 1 document of protection (utility model patent) was received.

As part of the dissertation work, a patent for a utility model was received: No. 5223 “Method for de-sticking sturgeon caviar”, author’s certificate, No. 108651

Scope and structure of the dissertation. The dissertation consists of an introduction, literature review, materials and research methods, research results, conclusion, proposals for production, a list of sources used and applications . The work is presented on 14 7 pages of a computer test, includes 53 figures and 6 1 tables, the list of sources used contains 1 70 titles.