CONVENCIÓN SOBRE EL COMERCIO INTERNACIONAL DE ESPECIES
AMENAZADAS DE FAUNA Y FLORA SILVESTRES

Vigésimo tercera reunión del Comité de Fauna
Ginebra (Suiza), 20-24 de abril de 2009

Esturiones y peces espátula

INFORME DE LA SECRETARÍA

1. Este documento ha sido preparado por la Secretaría.

2. En la Resolución Conf. 12.7 (Rev. CoP14), sobre *Conservación y comercio de esturiones y peces espátula*, se encarga a la Secretaría que facilite en cada reunión del Comité de Fauna un informe escrito, en el que se incluyan referencias a los documentos pertinentes, sobre sus actividades relacionadas con la conservación y el comercio de esturiones y peces espátula. Este documento constituye el segundo de estos informes y abarca el periodo comprendido entre abril de 2008 y enero de 2009. Se presentará una actualización oral de las actividades realizadas a partir del 1 de febrero de 2009, fecha en que se ha redactado este documento.

Cupos de exportación

3. En relación con los cupos de exportación correspondientes al periodo comprendido entre el 1 de marzo de 2008 y el 28 de febrero de 2009 para los stocks compartidos en el río Amur/Heilongjiang, el 29 de diciembre de 2007 la Secretaría recibió pormenores de los cupos de captura y cupos de exportación de carne y de caviar propuestos por China y la Federación de Rusia, junto con los datos científicos utilizados para establecer esos cupos.

4. Tras resolver una serie de consultas técnicas con los Estados concernidos, la Secretaría publicó los cupos correspondientes en el sitio web de la CITES el 22 de mayo de 2008, junto con algunos cupos de exportación voluntarios establecidos por China para el caviar producido en acuicultura.

5. En relación con los cupos de exportación correspondientes al periodo comprendido entre el 1 de marzo de 2008 y el 28 de febrero de 2009 para los stocks compartidos en el mar Caspio, a solicitud de los Estados concernidos, la Secretaría publicó en el sitio web de la CITES, el 22 de mayo de 2008, una aclaración de los cupos de exportación para Kazajstán y la Federación de Rusia. En esta aclaración se especifica el volumen de caviar que ambos Estados exportan en nombre de Turkmenistán.

6. Al determinar que no había habido acuerdo entre los Estados concernidos sobre los cupos de exportación para la carne de esturión, la Secretaría publicó un cupo de exportación nulo para la carne de todos los Estados que figuraban en el sitio web de la CITES el 23 de julio de 2008.

7. Al redactar este informe (1 de febrero de 2009), la Secretaría no había recibido ninguna propuesta sobre los cupos de exportación para el caviar y la carne de esturión para el periodo comprendido

entre el 1 de marzo de 2009 y el 28 de febrero de 2010, que cumpla los requisitos de la Resolución Conf. 12.7 (Rev. CoP14).

Fomento de capacidad y evaluación de las metodologías de valoración y supervisión utilizadas para los stocks compartidos

8. A fin de apoyar a los Estados del área de distribución en el desarrollo de una estrategia que incluya planes de acción para la conservación de los Acipenseriformes, y ayudar al Comité de Fauna a realizar una evaluación de las metodologías de valoración y supervisión utilizadas para los stocks compartidos de Acipenseriformes, la Secretaría estableció contacto con el Banco Mundial y la Organización de las Naciones Unidas para la Agricultura y la Alimentación (FAO). La FAO cuenta con un proyecto del Programa de Cooperación Técnica titulado "Creación de capacidad para la recuperación y gestión de la pesca del esturión del mar Caspio", con un presupuesto de 380.000 dólares de EE.UU, y el Banco Mundial ha establecido un proyecto sobre "Gestión de la pesca en el Caspio", con un presupuesto previsto de 990.000 dólares de EE.UU.

9. Ambas organizaciones organizaron un Cursillo técnico sobre pesca en el Caspio con los Estados del área de distribución en Roma, del 28 al 30 de abril de 2008. La Secretaría participó, en particular, para promover la celebración de un cursillo para revisar la metodología existente de evaluación del stock de esturión / de determinación de la captura total autorizada (TAC) y elaborar una metodología científica que sea aceptable internacionalmente, basándose en el examen de la FAO sobre la metodología de evaluación del stock del mar Caspio. El Comité de Fauna propuso este cursillo en su 23ª reunión (Ginebra, abril de 2008).

10. El Cursillo técnico sobre pesca en el Caspio acordó un *modus operandi* para el cursillo solicitado para revisar la metodología existente de evaluación del stock de esturión / de determinación de la captura total autorizada. Este cursillo se celebró en Roma, del 11 al 13 de noviembre de 2008, con la participación de un representante del Comité de Fauna y su informe figura en el documento AC24 Doc. 12.2. Los participantes acordaron, entre otras cosas, celebrar nuevas reuniones centrándose en los establecimientos de cría en viveros, luchando contra la pesca ilegal y el comercio internacional ilegal, y apoyando el desarrollo de normas para la prueba genética de productos de esturión que pueden utilizarse para reglamentar el comercio internacional y nacional de caviar e identificar unidades biológicas para la gestión de la pesca.

11. En cuanto a la evaluación del Comité de Fauna de las metodologías de valoración y supervisión utilizadas para los stocks compartidos de Acipenseriformes, otros que en el mar Caspio, la Secretaría ha recibido información sobre los stocks compartidos del mar de Azov Sea y del río Amur/Heilongjiang. Para el mar de Azov, la Comisión ucraniano-rusa sobre la pesca en el mar de Azov (Berdiansk, Ucrania, 22-24 de octubre de 2008) acordó en su 20ª sesión una "Técnica exhaustiva de la evaluación del stock y la determinación del TAC para las especies de esturión en el mar de Azov" que se adjunta en el Anexo al presente documento en el idioma en que fue recibida. En cuanto al río Amur/Heilongjiang, en la 18ª reunión del Comité mixto chino-ruso sobre pesca (Moscú, Federación de Rusia, 15-19 de septiembre de 2008), se encargó que se organizase una reunión de especialistas, que se celebró en Harbin (China, 18-20 de noviembre de 2008) y se acordó que el enfoque de evaluación presentado en el Anexo 2 del documento AC23 Doc. 13.2 (Rev. 1) se sigue aplicando y que esta metodología se confirmaría en una conferencia chino-rusa sobre pesca prevista en marzo de 2009. Para el stock compartido en la parte noroccidental del mar Negro y el bajo Danubio, la Secretaría no ha revisado otra información adicional que la incluida en el Anexo 3 del documento AC23 Doc. 13.2 (Rev. 1).

12. En su 23ª reunión, el Comité de Fauna recomendó que la evaluación de las metodologías de valoración y supervisión utilizadas para los stocks compartidos de Acipenseriformes mencionadas en el párrafo 10 anterior se revisen de forma semejante a la evaluación para el mar Caspio (por la FAO, en la medida de lo posible), y que la Secretaría fomente la celebración de un cursillo para revisar la metodología existente de evaluación del stock de esturión / de determinación de la captura total autorizada (TAC) y elaborar una metodología científica que sea aceptable internacionalmente. Mientras que la Secretaría se esforzará por hacer esto, señala que la responsabilidad de esta

evaluación incumbe al Comité de Fauna y que la Conferencia de las Partes no ha previsto la recaudación de fondos externos para realizar esta actividad.

Controles al comercio

13. El PNUMA-CMCM sigue ocupándose de la base de datos sobre el comercio de caviar y la Secretaría tiene sumo gusto en señalar que parece que en los últimos meses se ha mejorado la presentación de copias de permisos y certificados. Para que la base de datos sea eficaz es esencial que las Partes presenten los documentos a su debido tiempo.

14. La acuicultura sigue siendo una importante fuente, en aumento, de caviar para los mercados internacionales y la Secretaría continúa alentando a las autoridades nacionales a que supervisen estrechamente esos establecimientos. La Secretaría acogió con beneplácito la oportunidad que se le ofreció durante una misión a Arabia Saudita, en noviembre de 2008, de inspeccionar un establecimiento creado en fecha reciente en ese país.

15. El comercio ilegal de caviar, pese a no ser aparentemente tan activo como al principio de este decenio, sigue sin duda alguna existiendo y la Secretaría distribuye los datos confidenciales que se le remiten al respecto. La Alerta No. 33, publicada en enero de 2009, se refiere a una determinada forma de comercio ilegal de caviar.

Conclusión

16. Se invita al Comité de Fauna a tomar nota de este informe.

Comprehensive technique of the stock assessment and TAC determination for the sturgeon species in the Azov Sea

[As agreed by the Ukraine-Russian Commission concerning Fisheries in the Azov Sea at its 20th session (Berdiansk, Ukraine, 22-24 October 2008)]

Stock assessment

The sturgeon species stocks in the Azov basin were assessed with methods of biological statistics till the late 1960s (Makarov, 1970).

Since 1958, scientists have assessed the abundance of the Azov Sea demersal fish species through direct counts in trawl catches taken at particular stations during biomass surveys. In the early 1970s, this technique became the principal one in determination of abundance and biomass of the Azov sturgeon species.

The population abundance (N) is computed with a common formula (Mayskiy, 1967):

$$N = x \cdot F / f \cdot q, \text{ where} \qquad (1)$$

▯ is the mean catch at a given station,

F is the area of the sea (region),

f is the area covered by the given gear,

q is the catchability coefficient.

The trawling area is computed with the following formula:

$$f = v \cdot t \cdot l, \text{ where} \qquad (2)$$

v is the trawling velocity, m/min;

t is the trawling time, min;

l is the length of the trawl horizontal opening, m.

Empirically, we have found that the optimal time of trawling equals 30 minutes and the trawling velocity totals 1,5 m/s.

The length of the trawl horizontal opening (i.e. distance between the boards) depends on the trawl size and resistance, the board performance, as well as the trawl length, and could be determined with the help of the following techniques:

1. To test the angle (α) between warps with the known length (a): $l = 2a \cdot \sin(\alpha/2)$
2. To tie buoys to the boards and measure the distance between the buoys floating on the surface.
3. To tie the trawl boards with threads of the definite length and observe at what length the thread does not break.

Determination of the catchability coefficients is a rather difficult task. Table 1 summarizes catchability coefficients which have been used for the Azov sturgeon species for many years; these coefficients were estimated through comparison of biological statistics and direct counts, as well as determination of the fish abundance on basis of catches taken with mobile and stationary fishing gear.

Table 1 – Catchability coefficients of various fishing gear used to catch the Azov sturgeon species

Species	Catchability coefficients
	Trawl
Starred sturgeon	0.50
Russian sturgeon	0.50

Traditionally, the mean catch at a given station is computed as the arithmetic mean of catches taken at all the surveyed stations:

$$x = \frac{\sum_{i=1}^{n} x_i}{n}, \text{ where} \tag{3}$$

x_i is the catch at a station and

n is the number of the surveyed stations.

Here, the essential condition for use of the arithmetic mean is that fish is uniformly or normally distributed over the entire sea area. But as a rule, catches at the stations were distributed asymmetrically. J.W.Tukey showed that the more the actual distribution differed from the normal one, the less the arithmetic mean fitted the role of a reliable value of the distribution center (cited by Dubrov, 1978). To get a more reliable estimate of the mean catch of the sturgeon species we have also used other mean values.

1. Transformation of the asymmetric distribution to the normal one

First of all, we could normalize the asymmetric distribution through the following transformation (Klepikov and Sokolov, 1964):

$$y(x) = \int \frac{dx}{h(x)}, \text{ where} \tag{4}$$

x is the initial random variable,

$h(x)$ is the function which represents relationship between the mean deviation and the standard one for different samples from a general population:

$$\sigma_{x_i} = h(x_i) \tag{5}$$

Such relationships are often represented by the following expression:

$$h(x) = a + b \cdot x \tag{6}$$

Finally, we obtain the transformation formula:

$$y(x) = \frac{1}{b} \ln |a + b \cdot x| \tag{7}$$

After computing the arithmetic mean of the normalized series, we can translate the mean value into the initial data with the following formulas:

$$X_{cp} = \frac{1}{b} e^{b \cdot \left(y_{cp} + \frac{\sigma_y^2}{2} \right) - a}, \tag{8}$$

$$\sigma_x^2 = e^{2 \cdot y_{cp} + \sigma_y} \cdot e^{\sigma_y^2 - 1} . \tag{9}$$

2. Rule of "three σs".

Assuming that catches taken at different stations are normally distributed (which is sometimes true for some populations), we can use the rule of 3σs and reject extreme values which have significant influence on the mean value of the catch, but are highly improbable (Ventcel, 1970). First, we should find the arithmetic mean of catches taken at all the surveyed stations and the standard deviation, and then develop the confidence interval: $x_{mean} - 3\sigma <= x_i <= x_{mean} + 3\sigma$. The catch values which do not fit into the interval are rejected; the rest are used to reestimate the mean value and the standard deviation.

3. α - truncation.

The mean catch could be also assessed with the α - truncation and α - winsorization techniques (Gasukov, 1975). In accordance with the α - truncation method, the initial data are arranged in an ascending order and values of α are set in the interval (0.0, 0.5). The preset number of the extreme values [α*n] are rejected. The rest are used to compute the mean catch:

$$C_t(\alpha, n) = \frac{1}{n - 2 \cdot [\alpha \cdot n]} \cdot \sum_{i=1+[\alpha \cdot n]}^{n-[\alpha \cdot n]} y_i , \tag{10}$$

where [α*n] is the integral part of a number, determined as [α*n+0.5].

Dispersion is found with the following formula:

$$\sigma_t^2(\alpha) = \frac{1}{(1 + 2 \cdot \alpha)^2} \cdot \frac{1}{n \cdot (n-1)} \cdot \left(\sum_{i=[\alpha \cdot n]+1}^{n-[\alpha \cdot n]} (y_i - C_t(\alpha, n))^2 + 2 \cdot \alpha \cdot (y_{[\alpha \cdot n]+1} - C_t(\alpha, n))^2 \right) , \tag{11}$$

4. The α - winsorization method

Similarly to the above mentioned technique, there is an arrangement of the initial series with the choose of the α value. Then, the mean catch is found with the following formula:

$$C_w(\alpha, n) = \frac{1}{n} \cdot \left(\sum_{i=[\alpha \cdot n]+2}^{n-[\alpha \cdot n]-1} y_i + [\alpha \cdot n] \cdot \left(y_{[\alpha \cdot n]+1} + y_{n-[\alpha \cdot n]} \right) \right) \tag{12}$$

Dispersion is determined as follows:

$$\sigma_w^2(\alpha) = \frac{1}{n\cdot(n-1)}\cdot\left(\sum_{i=[\alpha\cdot n]+1}^{n-[\alpha\cdot n]}\left(y_i - C_w(\alpha,n)\right)^2 + [\alpha\cdot n]\cdot\left(y_{[\alpha\cdot n]+1} - C_w(\alpha,n)\right)^2 + [\alpha\cdot n]\cdot\left(y_{n-[\alpha\cdot n]} - C_w(\alpha,n)\right)^2\right) \quad (13)$$

The mean values obtained with formulas (10) and (12) are biased. To reduce the bias we should make additional transformations:

$$C_n^o = \frac{1}{n}\cdot\sum_{i=1}^{n} C_{n_i}^o; \quad (14)$$

$$C_{n_i}^o = n\cdot C_n\left(y_1, y_2 \ldots y_n\right) - (n-1)\cdot C_{n-1}\left(y_1, y_2 \ldots y_{i-1}, y_{i+1} \ldots y_n\right), \text{ where} \quad (15)$$

C_n is the mean value.

Besides, there is software which allows for the fish stock assessment without computing of the mean catch, e.g. SURFLINE based on the SURFER utility. The sea is divided into 650×650 squares, which allows for a fairly precise determination of the area of the surveyed region, the fish stock and areas with different density of the fish distribution, as well as the total stock. This tool produces a map of the Sea of Azov with distribution of the surveyed object either in the bay, or in the proper sea, or both in the bay and the proper sea, etc. We can even obtain zones of a high mortality of fish due to the oxygen deficit. SURFLINE produces a table which contains the stock levels, areas with the preset density, and the total stock size.

Another approach to the stock assessment without computation of the mean catch is the area method (e.g. FISHERY and Ichthyoanalyst software). This technique allows for drawing isolines of areas with the same density of the fish distribution.

With both these approaches, the input data are taken from the data base which comprises observations collected during ichthyologic surveys.

Upon the ichthyologists' requests, the same materials could be used to perform the following:

1. Stock assessment.

The assessment included eleven regions in the Sea of Azov:

1. The eastern bay;
2. The western bay;
3. The Kamyshivat region;
4. The Akhtarsk region;
5. The Achuev region;
6. The Temruk region;
7. The central region;
8. The south-western region;
9. The Obitochniy bay;

10. The Berdyansk bay;

11. The Belosaraysk bay.

The areas of the regions are determined automatically: the software uses the reference and adds together all areas of the squares in the given region. The mean catch at a station in the given region is represented by the arithmetic mean in the given region.

Abundance of different size groups of fish (i.e. commercial-sized fish, undersized fish, and yearlings) should be assessed separately.

The obtained values allow for determination of the age composition of the given population (either the total, or by regions). The following variables are computed:

- Abundance of fish in each age group;
- Percentage of fish of each age group;
- Abundance of mature fish; and
- Percentage of mature fish.

2. Composition of the size variation series.

The size variation series can be built on various scales: a fishing square, a region, or a total basin. Three kinds of requests are possible:

- abundance + percentage;
- abundance + weight; and
- mean variables.

There are two reports produced for each of the first requests: one on the fish of the commercial size and undersized fish and the other on yearlings. Our specialists have developed transfer of data to the Excel utility to be able to draw diagrams, etc.

3. Computation of mean variables.

It is possible to compute mean variables for each region and all the surveyed regions altogether. The results are presented as follows:

Size groups	L mean, cm	W mean, g
Commercial size	NNN	NNNNN
Undersized fish	NNN	NNNNN
TOTAL	NNN	NNNNN
Yearlings	NN	NNN

4. Determination of the age composition.

In this case, it is possible to obtain tables with the following variables for each age group:

i. Total: Abundance and percentage.
   - Females: Abundance and percentage.
   - Males: Abundance and percentage.
   - Non-identifiable sex (NIS): Abundance and percentage.

   Total: females, males, NIS: Weight and percentage.

ii. Mature fish (abundance and weight):
   - Females, percentage mature females of the total females,
   - Males, percentage mature males of the total males,
   - Both females and males, percentage of the total.

iii. Four groups (juvenile fish, females, males, and total for each age groups):
   - Mean length,
   - Mean weight,

- Abundance, and
- Percentage of the total abundance

iv. An extended request concerning the same four age groups could include the following variables:

- Mean length,
- The length range (min-max),
- Mean weight,
- The weight range (min-max),
- Abundance,
- Percentage of the total abundance,
- Weight,
- Percentage of the total weight, and
- Percentage of the mature fish (except the juvenile fish)

It is possible to make estimates for each preset region or for the entire selected area of distribution.

5. The size-at-age variation series.

The resultant tables are similar to the above mentioned ones, but in this case there is indication of a mean age for each size group.

For the age composition and the size-at-age variation series, it is possible to plot diagrams, charts, and histograms with one or four variables.

6. The size-at-age key.

Here, the table includes the percentage of fish in each size-at-age group. Additionally, there is the total percentage and abundance for each size group.

7. Feed stocks.

For each kind of feed organisms, the table presents frequency of occurrence separately in the proper sea and in the Taganrog Bay.

The total allowable catch (TAC) forecast for one or two years, or even longer terms requires evaluation of rates of natural and fishing mortality. If there is ample information about the age composition of the population and about commercial catches, the assessment will be quite easy. The computation is made with the common formulas (Zasosov, 1976). Rates of the instant mortality are found with the following formulas:

Total mortality:

$$Z = \ln (N_i/N_{i+1}), \text{ where} \quad (16)$$

Z is the rate of the total instant mortality,
N_i, N_{i+1} are the abundance of the generation at age I and in the subsequent year.

Natural mortality:

$$M = - \ln (N_{i+1} - C_{i+1}))/N_i, \text{ where} \quad (17)$$

M is the rate of the instant natural mortality,
C_{i+1} is the catch of the generation at age i+1.

Fishing mortality:

$$F = \ln (C_i/N_i). \quad (18)$$

Rates of the annual total, natural, and fishing mortality are calculated with the following formulas:

Total mortality:

$$\varphi = (N_i - N_{i+1})/ N_i. \quad (19)$$

Natural mortality:

$$\varphi_M = (N_i - C_i)/ N_i \qquad (20)$$

Fishing mortality:

$$\varphi_F = C_i / N_i \qquad (21)$$

Scientists have developed a program to compute rates of the instant and annual mortality (natural, fishing, and total). These rates are determined by age groups. As there are errors in the abundance assessment on the levels of both populations and generations, it has become conventional to decrease errors in computation of the mortality rates through finding mean rates for age groups of several generations which dwell in similar habitats. The mortality rates should be revised each time when there are any abrupt changes in feed stocks, fishery intensity, the fish stock abundance, reproduction conditions, etc.

Mortality rates of the Azov sturgeon species are computed for various periods and various levels of the year-class strength. Proceeding with the TAC forecast, an expert determines the population state and what rates of mortality are more appropriate.

FORECAST OF THE TOTAL ALLOWABLE CATCH

The essentials of the TAC forecast are generally the same for all fish species. One should know abundance, rates of natural and fishing mortality, mean weight in the age groups, maturation rates, and abundance of recruits in the given stock. Nevertheless, biological peculiarities of a fish species introduce some variations in forecast of the respective TAC.

The technique of the Azov sturgeon species TAC determination is a modification of 'conventional' biological statistics (see Babayan, 1985). The core of this technique is estimate of the expected catch of generations, which form the fish stock, under the preset catch level. Rates of fishing mortality are computed by age groups through the VPA analysis using data on the actual catch of generations and could be called weight factors, which make the basis for estimation of the rate of removal. Abundance of the generations in the fish stock is assessed with the use of the survey data.

The forecast abundance of individual generations is found with the following formula:

$$N_{t+1} = N_t \cdot e^{-(F_t + M_t)} \quad \text{, where} \qquad (22)$$

F_t, M_t are rates of instant fishing and natural mortality, respectively.

A catch from a generation is computed as follows:

$$C_{t+1} = \frac{N_{t+1} \cdot F_{t+1}}{F_{t+1} + M_{t+1}} \cdot \left(1 - e^{-(F_{t+1} + M_{t+1})}\right) \qquad (23)$$

VIF we know the abundance of generation R_{t+1} in year t+1 and the age distribution of the fishing mortality rate (F_i), we can determine the TAC:

$$TAC_{t+1} = w_i \cdot F^i_{t+1} \cdot R_{t+1} + \sum_{i=1}^{g-1} \frac{\left(w_{i+1} \cdot F^{i+1}_{t+1} \cdot N^i_t\right)}{F^{i+1}_{t+1} + M^{i+1}_{t+1}} \cdot \left(1 - e^{-\left(F^{i+1}_{t+1} + M^{i+1}_{t+1}\right)}\right) \cdot e^{-\left(F^i_t + M^i_t\right)} \quad \text{, where} \qquad (24)$$

i is the age group index,

g is the index of the eldest age group in the fish stock.

The overall rate of removal (F) is distributed between age groups in accordance with the following relationship:

$$F_i = \varepsilon_i \cdot F \quad (25)$$

To draw the curve of a balanced catch, we should determined catches at various values of the fishing mortality rate (F).

In case of sturgeon species, this calculation is made for males and females separately. Because the maturation of the sturgeon species comes late, the recruitment is determined with the survey data. The TAC estimate is based on abundance of the spawning stock.

The basic input data are:

- abundance of generations in the given population in the year of the forecast development;

- rates of fishing mortality by age groups obtained with the VPA;

- rates of natural mortality by age groups.

Because of the biological peculiarities of sturgeon species (difference in the maturation age between females and males), all the calculations are made separately, for mature and immature females and males. Hence we classify generations by sex and maturation. Here, we use the modeling results, i.e. percentages of females, mature females, and males in the population under various degrees of intensity of the fish stock exploitation. The intensity of removal is identified by the sex ratio in the biological samples from catches taken at the inspection points.

The input data for the TAC determination are:

- rates of natural mortality by age groups of immature fish;

- rates of natural mortality by age groups of mature fish;

- mean weight by age groups of mature and immature fish (classified by sex);

- percentage of mature females, males, and females in the population (by age groups);

- abundance of the population (by age groups);

- rates of fishing mortality;

- rates of fishing removal.

Here is a short algorithm for calculating the TAC of sturgeon species:

1. Determination of the female and male abundance in the population:

$$ZISSK_i = ZIS_i \cdot PRSK_i; \quad (26)$$

$$ZISSM_i = ZIS_i \cdot ZISSK_i, \text{ where} \quad (27)$$

ZIS_i is the abundance of age group *i*;

$ZISSK_i$, $ZISSM_i$ are the abundance of females and males in age group *i*, respectively;

$PRSK_i$ is the percent of females in age group *i*.

2. Determination of the mature female and male abundance:

$$ZISKZ_i = ZISSK_i \cdot ZRELSK_i; \quad (28)$$

$$ZISMZ_i = ZISSM_i \cdot ZRELSM_i, \text{ where} \quad (29)$$

$ZISKZ_i$, $ZISMZ_i$ are the abundance of mature females and males in age group *i*, respectively;

$ZRELSK_i$, $ZRELSM_i$ are the percent of mature females and males, respectively.

3. Determination of abundance of immature fish in the 1st year of the forecast term (this is the difference between the total abundance and the abundance of the mature stock).

4. Calculation of biomass of mature, immature females and males.

5. The preset overall rate of fishing mortality (*F* is the fishing intensity) is distributed between age groups in accordance with the following relationship:

$$F_i = \varepsilon_i \cdot F, \text{ where} \quad (30)$$

F_i is the rate of fishing mortality for age group *i*;
ε_i is the proportionality constant or the age factor of the fishery selectivity.

6. Catch in the current year is estimated for each age group in the mature stock..

$$CATCH_{i,j} = ZREL_{i,j} \cdot F_j/Z_j \cdot (1-\exp(-Z_j)). \quad (31)$$

7. Abundance of females and males for the subsequent year is calculated in accordance with the formula:

$$ZIS2_{i+1,j} = ZISN_{i,j} \cdot \exp(-yest_j) + ZREL_{i,j} \cdot \exp(-Z_j). \quad (32)$$

8. To determine abundance, biomass and catch of mature and immature fish follow steps 2-6.
Biomass is calculated with the weights by age groups of mature and immature females and males.

The determined values of possible catches at various rates of fishing mortality allow us to draw the curve of a balanced catch and to determine the TAC.

This technique was used by AzNIIRKh specialists to develop a program for Delphi.

Tables 2-11 summarize normative/reference data for Russian sturgeon and starred sturgeon which are used in the forecast development.

The program called "Model of populations of the Azov Russian sturgeon and starred sturgeon exploited with different intensity" provided the sex ratio and percentage of mature females and males. The mean weight of mature and immature females and males was based on the mean long-term data.

Table 2 – Mean weight of Russian sturgeon, Kg

Age	Females		Males	
	mature	immature	mature	immature
1	-	0.2	-	0.2
2	-	0.8	-	0.8
3	-	1.6	-	1.6
4	-	2.1	-	2.1
5	-	2.9	-	2.9
6	-	3.8	5.8	4.0
7	-	4.9	7.4	5.0
8	-	6.0	8.2	6.1
9	-	7.0	8.8	7.2
10	11.6	8.1	9.7	8.9
11	13.4	9.4	10.5	10.0
12	16.5	11.6	11.4	11.3
13	18.9	13.5	13.1	12.8
14	20.0	15.5	14.1	13.8
15	21.6	16.7	15.5	15.1
16	22.3	17.4	15.8	15.4
17	23.6	18.3	16.7	16.3
18	26.3	20.4	-	-
19	29.5	22.9	-	-
20	32.5	25.2	-	-
21	34.7	26.9	-	-
22	35.1	27.2	-	-

Table 3 – Number of females in the Russian sturgeon spawning stock, %

Age	Removed percentage									
	0.0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
11	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
12	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9
13	8.6	8.8	9.1	9.3	9.6	9.9	10.2	10.5	10.9	11.2
14	15.4	16.3	17.2	18.1	19.2	20.6	22.1	23.9	25.8	28.2
15	23.9	25.7	27.6	29.7	32.2	35.4	39.1	44.0	49.6	57.3
16	39.6	42.1	44.8	47.7	50.9	54.9	59.3	64.7	70.5	77.6
17	51.0	54.4	57.9	61.6	65.6	70.3	75.3	80.8	86.4	92.7
18	48.0	51.9	56.1	60.5	65.3	70.8	76.6	82.8	88.8	94.8
19	43.1	47.5	52.3	57.5	63.3	70.0	77.0	84.4	90.8	96.5
20	43.5	47.4	51.7	56.4	61.7	68.0	74.9	82.5	89.5	95.9
21	53.1	56.4	60.0	63.9	68.1	73.2	78.7	84.9	91.0	96.9
22	73.1	75.6	78.2	80.6	83.2	86.1	88.9	91.9	94.8	97.8
23	77.3	79.6	81.9	84.2	86.5	89.0	91.5	94.0	96.3	98.6
24	80.6	82.6	84.5	86.4	88.3	90.4	92.4	94.5	96.4	98.3
25	93.8	94.6	95.3	96.0	96.7	97.4	98.1	98.7	99.2	99.7
26	98.0	98.3	98.5	98.7	98.9	99.2	99.4	99.6	99.8	99.9
27	98.9	99.1	99.2	99.3	99.4	99.5	99.6	99.7	99.8	99.9
28	99.8	99.8	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0
29	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 4 – Number of mature females in the Russian sturgeon population, %

Age	Removed percentage									
	0.0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
12	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
13	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5
14	3.9	3.9	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
15	8.2	8.2	8.3	8.4	8.4	8.5	8.5	8.6	8.7	8.7
16	16.7	17.0	17.2	17.5	17.7	18.0	18.3	18.6	18.8	19.1
17	26.5	27.3	28.2	29.1	30.1	31.2	32.3	33.6	35.0	36.4
18	18.7	19.6	20.6	21.7	22.9	24.5	26.3	28.5	31.0	34.2
19	18.1	19.2	20.5	21.9	23.6	25.9	28.6	32.3	37.0	43.8
20	17.4	18.3	19.3	20.6	22.1	24.2	27.0	31.3	37.4	48.9
21	20.8	21.4	22.2	23.0	24.0	25.3	27.2	30.2	35.0	47.0
22	28.0	28.9	29.8	30.8	31.9	33.3	34.8	36.8	39.5	45.9
23	20.4	21.5	22.7	24.1	25.7	27.8	30.5	34.5	40.8	58.9
24	19.7	20.8	22.2	23.7	25.6	28.2	31.6	36.7	45.2	77.6
25	19.2	20.2	21.3	22.7	24.5	27.0	30.8	37.3	51.0	100.0
26	24.0	24.6	25.2	26.1	27.2	29.0	31.9	38.0	56.8	100.0
27	38.0	38.4	38.8	39.5	40.3	41.8	44.6	51.9	88.9	100.0
28	37.8	38.6	39.5	40.7	42.4	45.3	51.2	69.4	100.0	100.0
29	47.2	48.6	50.3	52.5	55.9	62.1	76.3	100.0	100.0	100.0

Table 5 – Number of mature males in the Russian sturgeon population, %

Age	Removed percentage									
	0.0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
7	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
8	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
9	7.6	7.6	7.6	7.6	7.7	7.7	7.7	7.7	7.7	7.7
10	12.9	13.0	13.2	13.3	13.4	13.6	13.7	13.8	14.0	14.1
11	22.3	22.8	23.4	23.9	24.5	25.1	25.7	26.4	27.1	27.8
12	23.4	24.3	25.3	26.3	27.5	28.8	30.3	32.1	33.9	36.1
13	26.4	27.6	28.9	30.3	31.9	34.0	36.5	39.7	43.4	48.5
14	22.2	23.0	24.0	25.0	26.3	28.1	30.3	33.5	37.9	45.2
15	27.2	28.0	29.0	30.0	31.1	32.6	34.4	36.8	40.3	46.8
16	27.4	28.8	30.2	31.9	33.8	36.3	39.4	43.8	50.3	64.0
17	28.4	29.6	31.0	32.6	34.4	36.8	39.9	44.2	50.5	65.9
18	24.7	25.5	26.4	27.5	28.8	30.7	33.3	37.5	44.9	73.2
19	33.8	34.3	34.8	35.5	36.3	37.6	39.6	43.4	52.3	100.0
20	42.7	43.4	44.2	45.3	46.6	48.8	52.3	59.7	81.5	100.0
21	52.2	53.1	54.1	55.4	57.1	60.0	65.3	79.7	100.0	100.0
22	53.6	54.9	56.6	58.8	62.2	68.6	83.5	100.0	100.0	100.0
23	59.6	62.1	65.5	70.8	80.1	100.0	100.0	100.0	100.0	100.0
24	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
25	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
26	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
27	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
28	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 6 – Number of females in the Russian sturgeon population, %

Age	Removed percentage									
	0.0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
6	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
7	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
8	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.1
9	50.0	50.1	50.1	50.2	50.2	50.3	50.4	50.4	50.5	50.5
10	50.0	50.3	50.6	50.8	51.0	51.3	51.6	51.8	52.1	52.4
11	50.1	50.7	51.3	51.9	52.5	53.1	53.8	54.4	55.1	55.8
12	50.2	51.4	52.6	53.8	55.1	56.5	58.0	59.5	61.1	62.8
13	50.4	52.2	54.1	56.0	58.0	60.3	62.8	65.6	68.4	71.5
14	50.7	53.1	55.7	58.4	61.2	64.6	68.3	72.4	76.6	81.5
15	51.1	54.0	57.1	60.3	63.7	67.8	72.2	77.1	82.1	87.8
16	51.8	55.1	58.7	62.4	66.4	71.0	75.9	81.2	86.4	92.1
17	52.8	56.4	60.2	64.2	68.6	73.7	79.0	84.7	90.2	95.9
18	55.0	58.4	62.1	66.0	70.2	75.2	80.6	86.4	92.0	97.5
19	58.5	61.7	65.1	68.7	72.6	77.3	82.3	87.9	93.3	98.4
20	65.4	68.1	71.0	74.0	77.3	81.1	85.2	90.0	94.9	98.0
21	74.0	76.2	78.6	81.0	83.6	86.6	89.9	93.7	96.7	98.5
22	83.9	85.5	87.1	88.8	90.6	92.7	95.1	96.9	97.9	99.0
23	90.9	91.9	92.9	94.0	95.2	96.7	97.2	97.8	98.4	99.1
24	95.5	95.8	96.1	96.4	96.7	97.1	97.5	97.9	98.3	98.7
25	98.7	98.9	99.0	99.1	99.2	99.3	99.4	99.5	99.6	99.7
26	99.5	99.6	99.6	99.7	99.7	99.8	99.8	99.9	99.9	99.9
27	99.6	99.6	99.7	99.7	99.7	99.8	99.8	99.8	99.8	99.9
28	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0
29	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 7 – The starred sturgeon mean weight, Kg

Age	FEMALES		MALES	
	mature	immature	mature	immature
1	-	0.1	-	0.1
2	-	0.8	-	0.8
3	-	1.6	-	1.6
4	-	3.3	3.4	3.2
5	-	3.9	3.8	3.7
6	6.0	4.5	4.5	4.3
7	6.6	5.3	5.3	4.9
8	7.3	6.0	5.9	5.4
9	8.0	6.5	6.5	5.9
10	8.7	7.1	6.9	6.2
11	9.4	8.0	7.2	7.1
12	10.2	8.4	8.0	7.9
13	11.6	9.4	8.5	8.4
14	12.2	10.5	9.0	8.9
15	13.0	11.4	9.6	9.5
16	13.6	12.5	10.2	10.1
17	14.3	13.4	10.6	10.5
18	15.1	14.7	12.2	12.1
19	15.9	15.4	12.7	12.6
20	16.6	16.1	13.2	13.1
21	18.7	18.1	13.7	13.6
22	19.7	19.1	14.2	14.1
23	20.7	20.1	14.7	14.6
24	21.7	21.0	15.2	15.0
25	22.7	22.0	15.7	15.5
26	23.7	23.0	16.2	16.0
27	24.7	24.0	16.7	16.5
28	25.7	24.9	17.2	17.0

Table 8 –Number of females in the starred sturgeon spawning stock, %

Age	Removed percentage									
	0.0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
7	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
8	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
9	4.0	4.0	4.1	4.1	4.2	4.3	4.3	4.4	4.4	4.4
10	14.8	15.5	16.3	17.2	18.2	19.2	20.5	21.9	22.4	23.2
11	35.8	37.9	40.3	43.0	46.1	49.5	53.6	58.5	60.5	63.3
12	40.5	43.0	46.1	49.4	53.4	58.0	63.6	70.5	73.4	77.5
13	53.0	55.8	59.1	62.5	66.4	70.7	75.5	81.0	83.1	86.1
14	55.4	59.0	63.0	67.1	71.5	76.1	80.8	85.8	87.7	90.0
15	51.3	55.6	60.5	65.6	71.2	77.0	82.8	88.6	90.6	93.0
16	53.9	57.5	61.8	66.2	71.4	76.9	82.9	89.1	91.3	94.0
17	58.1	61.2	64.8	68.5	72.8	77.4	82.4	87.9	90.0	92.6
18	75.3	77.7	80.3	82.8	85.5	88.1	90.8	93.4	94.4	95.7
19	78.8	81.2	83.8	86.1	88.5	90.8	93.1	95.2	95.9	96.9
20	90.5	91.8	93.1	94.3	95.6	96.7	97.7	98.6	98.9	99.2
21	93.2	94.0	94.8	95.6	96.4	97.1	97.8	98.5	98.8	99.1
22	96.2	96.6	96.9	97.3	97.7	98.0	98.4	98.8	98.9	99.1
23	98.8	99.0	99.1	99.3	99.4	99.5	99.6	99.7	99.7	99.8
24	99.3	99.4	99.5	99.6	99.6	99.7	99.8	99.9	99.9	99.9
25	99.3	99.4	99.5	99.5	99.6	99.7	99.7	99.8	99.8	99.9

Table 9 – Number of mature females in the starred sturgeon population, %

Age	Removed percentage									
	0.0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
7	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
8	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
11	13.6	13.6	13.7	13.8	13.8	13.9	14.0	14.1	14.1	14.1
12	17.6	17.9	18.2	18.5	18.8	19.1	19.4	19.8	19.9	20.1
13	24.9	25.8	26.7	27.6	28.7	29.8	31.1	32.4	33.0	33.6
14	20.1	21.3	22.6	24.1	25.9	27.9	30.3	33.2	34.4	36.0
15	18.9	20.2	21.7	23.5	25.7	28.4	32.0	36.8	39.0	42.3
16	21.6	22.3	23.2	24.2	25.5	27.3	29.9	33.9	36.0	39.5
17	22.1	22.6	23.4	24.2	25.2	26.6	28.6	31.9	33.8	37.1
18	29.9	30.9	32.0	33.3	34.8	36.6	39.1	43.0	45.2	49.3
19	26.6	27.8	29.2	30.8	32.7	35.1	38.3	43.3	46.2	51.7
20	33.9	35.2	36.8	38.8	41.3	44.8	49.9	59.5	65.9	80.4
21	31.8	33.0	34.6	36.5	39.3	43.5	51.0	70.0	87.6	100.0
22	41.3	42.5	44.2	46.5	50.0	56.0	69.4	100.0	100.0	100.0
23	44.2	46.3	49.2	53.2	60.1	73.8	100.0	100.0	100.0	100.0
24	56.6	60.3	66.0	74.8	93.5	100.0	100.0	100.0	100.0	100.0
25	65.1	74.1	91.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 10 – Number of mature males in the starred sturgeon population, %

Age	Removed percentage									
	0.0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
5	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
6	11.2	11.2	11.3	11.3	11.3	11.4	11.4	11.4	11.5	11.5
7	22.5	22.8	23.2	23.5	23.8	24.2	24.6	24.9	25.1	25.3
8	28.8	29.9	31.1	32.3	33.7	35.1	36.7	38.5	39.2	40.1
9	25.9	27.4	29.1	30.9	33.2	35.9	39.1	43.2	44.9	47.4
10	21.8	22.7	23.8	25.0	26.7	28.8	31.7	36.0	38.0	41.3
11	28.7	29.4	30.2	31.2	32.4	33.9	36.1	39.5	41.3	44.4
12	33.2	34.2	35.4	36.5	37.8	39.3	40.9	42.9	43.9	45.3
13	31.7	33.4	35.3	37.5	40.1	43.2	47.0	52.3	54.7	58.7
14	26.0	27.2	28.8	30.6	33.2	36.6	41.5	50.0	55.0	64.4
15	33.1	33.9	35.0	36.3	38.2	41.0	45.8	56.1	63.9	84.2
16	43.5	44.2	45.0	46.0	47.6	50.1	55.1	70.4	87.5	100.0
17	55.3	56.8	58.9	61.5	65.6	72.5	88.1	100.0	100.0	100.0
18	59.1	62.2	66.7	73.2	85.2	100.0	100.0	100.0	100.0	100.0
19	77.8	85.2	98.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0
20	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
21	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
22	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
23	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
24	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
25	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 11 – Number of females in the starred sturgeon population, %

Age	Removed percentage									
	0.0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
4	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
5	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
6	50.1	50.2	50.3	50.3	50.4	50.5	50.6	50.7	50.7	50.7
7	50.4	50.8	51.1	51.5	51.8	52.2	52.6	53.0	53.1	53.3
8	51.0	51.9	52.9	53.8	54.9	55.9	57.0	58.1	58.5	59.1
9	51.9	53.5	55.3	57.2	59.2	61.4	63.7	66.2	67.2	68.5
10	52.8	55.1	57.7	60.4	63.4	66.7	70.4	74.5	76.1	78.3
11	54.1	56.8	59.8	63.0	66.6	70.5	74.9	79.8	81.8	84.4
12	56.2	59.1	62.5	65.9	69.8	74.0	78.6	83.8	85.9	88.6
13	58.9	62.1	65.7	69.3	73.4	77.7	82.3	87.3	89.1	91.5
14	61.6	64.8	68.4	72.1	76.3	80.7	85.3	90.1	91.9	94.2
15	64.8	67.8	71.2	74.7	78.6	82.8	87.3	92.2	94.0	96.4
16	70.2	72.9	75.9	78.9	82.3	85.9	89.9	94.4	96.2	97.5
17	77.6	79.9	82.3	84.7	87.4	90.3	93.5	95.8	96.4	97.1
18	85.8	87.5	89.5	91.4	93.5	95.3	96.2	97.1	97.4	97.8
19	91.6	93.0	94.6	95.3	95.9	96.6	97.2	97.9	98.1	98.4
20	96.5	96.9	97.4	97.7	98.1	98.5	98.8	99.1	99.3	99.4
21	97.7	97.9	98.1	98.3	98.5	98.7	98.9	99.0	98.9	99.1
22	98.4	98.5	98.6	98.7	98.8	98.9	98.9	98.8	98.9	99.1
23	99.5	99.5	99.6	99.6	99.6	99.6	99.6	99.7	99.7	99.8
24	99.6	99.6	99.7	99.7	99.7	99.7	99.8	99.9	99.9	99.9
25	99.5	99.5	99.5	99.5	99.6	99.7	99.7	99.8	99.8	99.9

Reference: All citations are taken from the "Methodology of fishery and conservation studies in the Azov and Black seas" – Krasnodar, 2005, 352 p. in Russian.