
The Qualitative Index Assessment of Selective Sturgeon Gillnet Fishing for Sustainable Exploitation of the Caspian Sea Resources

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Abstract: In order to study the quality of the gillnets used for sturgeon fisheries in the estuaries leading to Caspian Sea, the fisheries co of Iran (SHILAT) launched a sampling program on the types of nets currently utilized by fisherman in Anzali, Babolsar and Turkman ports, in Guilan, Mazandran and Golestan provinces respectively.

Three types of nets were investigated as the following:

210 D/18/100/mm (used to catch sevruga fish)

210 D/24/150/mm (used to catch Sturgeons)

210 D/60/250/mm (used to catch Beluga)

Three types of nets were used to catch sevruga sevruga, Acetra and Beluga respectively.

There has been a noticeable decline in the quality of the nets, which was proportionate to the duration of their use in actual fishing operation. The nets were classified in terms of quality decline of new nets as (100%), nets used in one fishing season as (75%), nets used in two fishing seasons as (50%) and nets used for three fishing seasons as (25%).

After having 1. Cut meshes of transverse, normal and 10T × 10N, attempts were made to experiment the samples using dynamometer and twistmeter.

The experiment entailed qualitative indexes such as the breaking power of lines, elasticity, Z score of twist, S twist,

primary mesh bar and secondary mesh bar.

The results obtained, indicated that the average length of primary mesh bar for sevruga shows a meaningful difference at 95% of probability rate while the average secondary mesh bar for huso huso indicates difference at 99% of probability on the normal probability curve.

KEY WORDS:

Net, Gillnet, polyamide, Net quality, Caspian Sea.

An Introduction to Caspian Sea

The Caspian Sea occupies an area of 666,000 km² and is regarded as the biggest lake in the globe. It is only a shadow of former Giant Sea-Titis- in the second geological era and has since been formed into its present state.

The general characteristics of this sea include:

Max Length: 1205 km

Max Width: 550 km

Ave Width: 320 km

Circumference (length of coastline) 6550 km

Iranian coast 990 km

Volume of seawater 7900 km³

Depth at three places in northern Caspian Sea 42.3%

Depth at middle part 36.4%

Depth at southern Caspian Sea 39.3%

Salinity: 12.85%

The sea is currently surrounded by five littoral states: I.R Iran, Russian Federation,

Azarbaijan, Kazakestan and Turkemienia.

In south parts of the Caspian Sea, many rivers small; or big, seasonal or permanent;

flow into the Iranian side of the waters amount to 350 in number. These rivers provide a safe haven and nursery ground for many fish species of the Caspian Sea.

Commercial species of southern Caspian Sea

Of 114 species, sub - species and existing fish race in the Caspian Sea environment about 20 species are commercially utilized. These fish species are referred to as fishery species that can be categorized as follows:

1. Sturgeon

- -*Acipenser persicus* (Iranian sturgeon , Acetra)
- -*A. guldenstaedtii* Brandt (Russian sturgeon , Acetra)
- -*B. stellatus* (Stellate Sturgeon , Sevruga)
- -*Huso Huso* (Big stargean , Beluga)
- -*A. nudiventris* Lovetzky (Ship , Acetra)

2. Bony Fish

- -A. *Rutilus frisi kutum*
- -B. *Liza zuratus*
- -C. *Saliens*
- -D. *Rutilus Rutilus* Caspian
- -E. *Cyprinus carpio*
- -F. *Lucioperca lucioperca*
- -G. *Aspius aspius*
- -H. *Caspialosa* sp.

3. Kilka

- -A. *Clupeonella engrauliformis*
- -B. *Cl. Grimmi*
- -C. *Cl. delicatula*

Sturgeon Fisheries

Sturgeons are caught by fixed gillnets at sea.

Generally three types of nets are used to catch the sturgeons in Iranian Coastal waters:

1- Special nets for Beluga

- 2- Special nets for both Iranian & Russian sturgeon species and presumably for (*A. nudiventris lovetzky*) species as well.
- 3- Special net for Sevruga.

Sturgeon Fishing Season

Sturgeon Resources are typically tapped during three seasons: spring, summer and a period between autumn and winter.

The spring fishing season starts in late March till 31 May (Fishing station No 4) and ends on 21 June (in other areas). The summer / autumn fishing time begins on 1st Aug and ends on 22nd Oct each year (Area No 2, 3 & 5). This fishing period in fishing station No 4 starts on 23 Aug and lasts up to 21 Dec each year.

The wintertime fishing in all four different fishing stations commences on 9th Feb and ends on 21 March, but in fishing station No 4 fishing operation starts in January and ends on 21 March.

Material & methods

Materials:

In order to assess the quality of the nets used by SHILAT, sampling was made on these nets. Fisheries Co of Iran (SHILAT) generally utilizes three types of nets (in general) for four actual sturgeon Species.

The nets are referred to Beluga net, nets to catch both Iranian and Russian species of sturgeon and sevruga nets. In order to carry out research tests, attempts were first made to identify the sampling areas, as follows:

1. Area No 1- Fishing ground near Bandar Anzali – Gilan Province.
2. Area No 2- Fishing ground near Babolsar – Mazandaran Province.
3. Area No 3- Fishing ground near Bandar turkman– Golestan Province.

Table No.1: The particulars of gillnets used in sturgeon fisheries

Type of Gillnet	Type of line	Mesh size (a)	Number of mesh across net	Number of mesh along the net	Length in hanging position	Hanging ratio
Beluga	PE	250mm	8	15	18m	50%
Acetra	PE	150mm	18	120	18m	50%
Sevruga	PE	100mm	21-32	180	18m	50%

Sampling was then carried out of the types of fishing nets used in these areas. The net features were:

1. Beluga Net 219/60/250mm
2. Sevruga net 210D/24/150mm
3. Acetra net 19D/18/100mm

These nets are used for fishing Purposes at sea for approximately two years in such a way that each net can be effectively used during all fishing seasons with 3-4 months of actual operation.

Accordingly, all the other commonly used fishing nets rated 100%, 15% and 25% are affected by amortization. The definitions include:

1. New net or newly utilized nets (100%) are said to be the nets constructed of by fresh materials, which are new women. Such nets continue to be called "new "even after the end of one fishing season.
2. "Acceptable used Nets "(75%). This term refers to those nets that were used as new nets and are used for one fishing season. In fact, such nets have been declined in terms of their quality by 25%.
3. "Moderately USED NETS" (50%) entail those groups of 75% nets that have been utilized for another fishing season. Such nets are considered to have lost 50% of their optimum quality.
4. POOR QUALITY NETS 25%. The term embraces the 50% nets that undergo another fishing season. They are left with only 25% of quality for optimum fishing.
5. Worn – out nets (Burak)
6. These nets are those 25% nets that have undergone one fishing season and thus totally lose their fishing efficiency, but they may be used for other purposes.
7. Certain square shaped samples of nets with 15% , 50% and 25% utility used for Beluga, Sevrug & Acetra were prepared on the basis of the following formula: 10T 10N

Methods:

Two types of equipments, namely dynamometer and twistmeter were applied for carrying out various research experiments.

DYNAMOMETRE:

The breaking power of the lines and mesh as well as the elongation may be measured by dynamometer. The sampled out pieces of nets and meshes can be attached to clamps or other holding devices and are then stretched with a speed up to their full breaking point. The device is equipped with a recorder and a bargrapher with linear elasticity on a squared sheet of paper.

TWIST METERS:

Twist meters are applied to measure the degree of twist in the strands. This degree of twist is a determining Factor in overall quality of the strands. The measurement will be done separately for both fishing lines and pile of lines.

In other words, each of these lines possesses a primary as well as a secondary twist. In this respect, a piece of the line including the mesh bar is contained on both ends by twist meter and after cutting the two ends of mesh bar, the bar is (automatically) twisted and then twisted bar is removed out of the equipment . The number, which appears on the counter, indicates the number of secondary twist in the net line.

The number of primary twist in the net lines is similarly calculated.

Results:

The results obtained in various experiments include:

1- Experimental findings related to mesh size elongation.

- 1-1- Elongation in sevruga net mesh 75% is 21.34%.
- 1-2- Elongation in sevruga net mesh 50% is 19.54%.
- 1-3- Elongation in sevruga net mesh 25% is 21.44%.
- 1-4- Elongation in Acetra net mesh 75% is 20.99%.
- 1-5- Elongation in Acetra net mesh 50% is 21.26%.
- 1-6- Elongation in Acetra net mesh 25% is 21.30%.

- 1-7- Elongation in Beluga net mesh 75% is 29.24%.
1-8- Elongation in Beluga net mesh 50% is 23.96%.
1-9- Elongation in Beluga net mesh 25% is 24.35%.

2- The Experimental research findings related to strength of Nets

- 2-1 – sevruga net strength 75% is 19.06 kgf.
2-2- sevruga net strength 50% is 17.99 kgf.
2-3- sevruga net strength 25% is 120.02 kgf.
2-4- sevruga net strength 75% is 22.57 kgf.
2-5- sevruga net strength 50% is 21.21 kgf.
2-6- sevruga net strength 25% is 23.04 kgf.
2-7- sevruga net strength 75% is 55.93 kgf.
2-8- sevruga net strength 50% is 55.13 kgf.
2-9- sevruga net strength 25% is 46.78 kgf.

3- Experimental research findings related to primary line twist

(Strand turn)

Strands generally contain sturn or left turns whose numerical values are given for nets and various lines as follows:

- 3-1- No of primary turn in lines 210 D/18 net: 75% is approximately 403.07 turns per meter.
3-2- Number of primary turn in 210 D/18 net: 50% is approximately 367.4 turns per meter.
3-3- Number of primary turn in 210 D/18 net: 25% is 381.2 turns per meter.
3-4- Number of primary turn in 210 D/24 net: 75% is 367.4 turns per meter.
3-5- Number of primary turn in 210 D/24 net: 50% is 384.27 turns per meter.
3-6- Number of primary turn in 210 D/24net: 25% is 390.88 turns per meter.
3-7- Number of primary turn in 210 D/60 net: 75% is 356.47 turns per meter.
3-8- Number of primary turn in 210 D/60 net: 50% is 347.2 turns per meter.
3-9- Number of primary turn in 210 D/60 net: 25% is 341.13 turns per meter.

4- Research Finding Related to secondary turn

The fishing lines are generally of two types of turn, the results of which are presented for various nets:

- 4-1 – Number of secondary turn in line 210 D/ 18, 75% net is 220 turn per meter.
4-2 – Number of secondary turn in line 210 D/ 18, 50% net is 217 turn per meter.
4-3- Number of secondary turn in line 210 D/ 18, 25% net is 212 turn per meter.
4-4 – Number of secondary turn in line 210 D/ 24, 75% net is 189 turn per meter.

- 4-5 – Number of secondary turn in line 210 D/ 24, 50% net is 201 turn per meter.
4-6– Number of secondary turn in line 210 D/ 24, 25% net is 195 turn per meter.
4-7 – Number of secondary turn in line 210 D/ 60, 75% net is 168 turn per meter.
4-8 – Number of secondary turn in line 210 D/ 60, 50% net is 173 turn per meter.
4-9 – Number of secondary turn in line 210 D/ 60, 25% net is 174 turn per meter.

Discussion and Conclusion

Upon inspecting the net quality differences among Sevruga, Acetra and Beluga 75%, 50% & 25% in terms of variable such as experimental primary length, experimental secondary, net strength, primary, Z-turn strands and lines, the result of one – way variance analysis indicates that at 95% of probability curve, there is a significant difference between primary lengths of Sevruga nets. In addition, the secondary length of the net lines and the difference between primary lengths of the lines show a significant difference at 99% of probability rate. The results of analysis in other aspects of the Acetra Sevruga and Beluga nets do not indicate any significant difference.

This means that the quality loss in the lines and nets is not significant in nets with 75%, 50% and 25% of quality level. It is also found out that the quality of lines used by SHILAT is fairly acceptable which is well represented among various fishing nets.

Suggestions:

- Establishing and operationalizing the quality control laboratory for fishing gears and equipping it with more precise measurement devices and modern instruments.
- Formulation of quality standards and specifically designed fishing nets for Beluga, Sevruga and Acetra.
- Evaluating various types of fishing nets based on the results of test finding and contrasting them with the formulated standards.
- Replication of the research on other commonly applied fishing traps & nets in the Caspian Sea, Persian Gulf and Oman Sea.

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