Criteria for shrimp grading devices

Introduction
At the end of the sixties, awareness on the mortality of small shrimp and flatfish due to shrimp trawling was raised. In the Netherlands it was believed to implement mitigating actions which was guided by Dr. Boddeke of the Netherlands Institute for Fisheries Research (RIVO) Ijmuiden. This has led to the compulsory use of a shrimp grading device on board of shrimp trawlers. At the start (early seventies) it was told that legal criteria on these machines were laid down. At present however, no criteria are present although the valuable ecological contribution of these machines is recognized by the CVO. Therefore a start is made with reformulating criteria for the effective ecological application of these shrimp grading devices. The CVO hopes that awareness of the ecological value of these machines is created leading to a further perfection in future.

Methodology
The relevant literature regarding this subject was consulted whereby Dr. Boddeke was personally contacted. The three manufacturing companies for these grader machines have been informed about this initiative and have been visited. These were Kramer Machinebouw, Colijnsplaat (spoken with mr. John Kramer), Delmeco, Colijnsplaat (spoken with mr. Johan Wouters) and De Boer, Makkum (spoken with mr. Melle de Boer). After having consulted these sources, a concept list of criteria to above mentioned people. After having reached consensus, this set of criteria will be presented to through the GAC (shrimp advisory commission) to the fishery sector.

Results
The criteria are below mentioned in demands, recommendations and codes of conduct. The norms and codes of conduct are compulsory for certification. De recommendations are for the time being not compulsory, but merely aim at creating awareness in the fishery. Fishermen may use this information to improve pro-actively the ecological performance of their equipment. In addition, these recommendations may be made compulsory (demand) in the future, for which it seems sound to communicate the beforehand.

Demands
1. The catch bunker is flushed with water in order to keep the catch entirely wet and to transport the catch to the conveyor belt without manual interference.
2. A traditional vibrating sieve is no longer accepted.
3. The water pressure does not exceed 1 bar during operation; the static water pressure does not exceed 2 bars.
4. There are no self-propelled brushes to remove (by)catch items stuck in the sieve.
5. The rotation speed must be <35 RPM whereby the catch should not be moved upwards due to the rotation of the drum.
6. The minimum water flow amounts to 50 m$^3$ per hour.
7. The mesh size is at least 6,0 mm.
8. The outlet of the grading device is equipped with a special so called ‘crab-sieve’
9. If the sieve drum is equipped with rods pointing inwards, these must be smooth and rounded.

Recommendations
1. The sieve drum is to be kept clean with low pressure water only; not with brushes.
2. Prior to the shrimp grading device, shells are removed by means of a settling tank
3. Those parts of the machine that come in contact with the by-catch are entirely of stainless steel or any other material that is hard and smooth and demonstrably does not become rough.
**Code of conduct**

1. The entire set up and operation of the catch bunker and shrimp grader must accomplished according to a written and approved procedure present on board.
2. The by-catch shall not be put in the shrimp grader twice to recover some larger shrimp retained in the by-catch.
3. The grader must be periodically cleaned from e.g. sea weed in order to maintain a proper sieve function.

**Motivation**

**Demands**

1. The catch is stored for some time in the catch bunker which should support life conditions for the by-catch. Obviously, the by-catch should be protected against draught and oxygen depletion. Filling the entire bunker with water is not appropriate as oxygen depletion can only be prevented with very rapid water exchange. Continuous moistening whereby air contact remains allows sufficient oxygen supply and enables an efficient transport to the conveyor belt. Prerequisite is that the entire catch is kept wet over the whole surface of the bunker. In some trawlers, the catch is not moved onto the conveyor belt entirely by the water flow. The catch may lay unnecessarily long in the bunker until it is finally helped (with e.g a broom), an undesirable practice.

2. A traditional vibrating sieve does not possess any feature in order to safeguard the survival of the by-catch and can by no means be regarded as ‘best available technique’. Also since these devices are only used in very rear occasions, the CVO has decided that trawlers equipped with these obsolete devices cannot be accepted in the MSC management plan.

3. The sieve drums get clogged during operation with small fish and shrimp that remain trapped in the sieve. The must be pushed back without exerting excessive mechanical impact on them. This is preferably accomplished by the use water at low pressure. Although water at high pressure is more efficient for cleaning the sieve, it is undesirable from an ecological viewpoint. The maximum pressure measured with a pressure gauge during operation may not exceed 1 bar. The pump supplying the water should not yield more than 2 bars in a static situation (pump operating against a closed valve) in order to avoid elevated pressures in the machine due to variation or maladjustment in the set up. Before mentioned pressures have been claimed by the manufacturers as typical pressures for their machines to operate well.

4. In some cases, brushes are used to remove shrimp and small fish form the sieve drums, together with water. These brushed may only be passively propelled by the rotating sieve itself and shall not have autonomous drive systems as this will exert disproportional mechanical impact on the by-catch

5. The function of the rotating sieve is to spread and tumble the (by-)catch in order to present the animals continuously in a thin layer in various positions on the sieve, in order to optimize the sieve action. The additional mechanical impact experienced should however not impair their survival. The rotation should not lead to a upward moving of the catch, causing it to fall continuously from the top of the drum. The mentioned 35 RPM is presently the maximum rotation speed at which above mentioned principle can be met; downwards adjustments may be discussed in future.

6. A vast water flow promotes the transport of the by-catch thorough the drum and discharge drain, reduces the mechanical contact with the drum, provides humidity to the catch and helps keeping the drum clean in order to uphold the sieve action. For these reasons, a large flow is desired. The mentioned minimum limit of 50 m$^3$/h refers to the entire water supply to catch bunker, conveyor belt, shrimp grader and discharge drain.

7. The sieve width primarily determines which shrimp will eventually be caught, and which will be discarded alive back into sea. In addition, it determines which fraction of the small fish will
be cooked along with the shrimp. Larger sieve widths are more favorable from an ecological viewpoint. The shrimp graders should sieve the shrimp in order to obtain an as small as possible fraction (for CVO members <15%) after the cooking. Depending on made, type, and use is reveals not possible to state that one sieve width would give the same result on all trawlers. Together with the manufacturers of the shrimp graders it was agreed that the desired range would be between 6,0 and 6,3 mm. On basis of this, a minimum size of 6,0 as sieve width is therefore proposed. (Note: this size refers to the largest sieve in the drum in case of more sieve widths in one machine)

8. At the end of the shrimp grader, the shrimp together with equally sized by-catch will be diverted to the cooking device. The use of a so called ‘crab sieve’, or ‘separation spiral’ has proven that many other species in the by-catch of the same size may be separated from the catch at the end. As the majority of the machines already have (or can be equipped with) such a device, the application of such device is compulsory.

9. There is no complete consensus to allow radically mounted rods inside a sieve drum. These rods principally increase physical damage to the by-catch. On the other hand, these rods may in some occasions prevent the formation of agglomerations of weed and (by-)catch disturbing the sieve process. A minimum requirement is therefore laid down that such rods must be finished as to minimize damage to the by-catch.

Recommendations
1. See norm 3 and 4. The complete absence of brushes, as seen in some machines, is recommended.
2. Some shrimp grader installations separate the heavy and sharp shellfish prior to the grader by means of a settling tank. This prevents these shellfish to enter the sieve drum and exert additional physical impact on the by-catch. As this concept is already implemented in practice and has an ecological contribution, it is proposed here as recommendation.
3. Although predominantly stainless steel is being used, also plastic parts are being used that contact the (by-)catch. As stainless steel parts become more smooth and hence animal friendly after prolonged use, plastic parts may become more rough by forming sharp edges and hence become less animal friendly. In order to promote awareness to use only smooth materials that do not become rough, this is proposed here as recommendation.
4. The clogging of the sieve by weed and (by-)catch reduces the effectiveness of the sieving leading to less stringent sieve action. The machine should allow easy and instantaneous cleaning in order to promote that this actually happens.

Code of Conduct
1. To assure that shrimp graders are operated conform, the CVO mandates a written operation procedure per trawler. This procedure contains details with respect to e.g on/off switches, adjustment of valves, mounting of drains, controls, etcetera. The fisherman should provide such a procedure for his ship whereby the use of pictures is welcome. The whole installation and procedure shall be approved by the CVO. The procedure must be known to the crew and strictly be adhered to. During inspection, the crew awareness and correct use can be controlled.
2. Incidentally, some large shrimp may be present in the by-catch, leading to the desire of sieving the by-catch again. As this reduces the chance of survival, this practice is not allowed.
3. See also recommendation 5. In many occasions, the shrimp graders get contaminated with (by-)catch and weed after prolonged use. The sieve function is then reduced. The crew should check this visually and clean the machine at regular time intervals.