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**EUROPEAN OTTERS AND PREVENTIVE MEASURES IN FISH-FYKES
(ON THE MATTER OF THE PROPER MESH-WIDTH FOR STOP-GRIDS)**

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Abstract: Drowning in fish-fykes causes proportionally high mortality in a vulnerable otter population. Stop-grid mesh sizes recommended in Denmark and Great Britain assume that juveniles do not enter the nets unless following adults - this is not the case in the Netherlands. A smaller grid size is recommended, which may also improve the quality of eel catch.

Otters drowning in fish-fykes form a serious threat for the well-being of the population as a whole. In the period between 1965 and 1987 26 cases of otters drowned in fyke nets were recorded. This is 27% of the total of recorded mortality in the same period (van Moll & Christoffels, 1989).

Considering the low productivity of the European otter, this mortality cause has to be reduced as much as possible. European otters reach the age of reproduction only after 1.5 to 2 years. Otter cubs remain with their mother during a span of one whole year. This results in a reproduction of three litters as a maximum for every female otter whose average age (in the Netherlands) is estimated to be six years. The size of the litter also is small: average of 2.8 (Wijngaarden & Peppel, 1970). It may be concluded that drowning in fish-fykes forms one of the major direct threats to the otter in the Netherlands.

MOMENTARY APPLICATION OF PREVENTIVE MEASURES

A simple and effective solution to prevent otters from drowning in fish fykes is the application of stop grids. These are metal devices which are to be placed in the first compartment of the fyke. Of course, waterfowl and muskrats also will be prevented to enter the fyke by this device.

At this moment systematic application of stop-grids has taken place in Denmark (Madsen, 1986). Here also research has taken place of the catch-results and possible loss of catch by fishermen when the grid is used. The mesh which is used, is made of steel and knows a mesh-width of 85 x 85 mm. In Great Britain also a study on the fishing efficiency is made (Vincent Wildlife Trust, 1988). Included was the testing of different otter-guards. The report of the Vincent Wildlife Trust suggests that the use of other types of guards than the grid is recommendable depending on the situations and conditions in diverse areas.

In the Netherlands fishing efficiency has been tested in two nature-reserves of the Society 'Natuurmonumenten', named 'De Wieden' and 'de Nieuwkoopse Plassen' in the east and middle of the Netherlands. The test has been set up to determine the loss of catch. Here steel-grids were used with a mesh-width of 80 x 80 mm (pers. comm. Warden Natuurmonumenten).

MESH-WIDTH IN STOP-GRIDS (G-GUARDS)

A problem with the application of stop-grids arises with the mesh-width. In literature no consensus on the required mesh-width exists. In the Danish experiment a mesh-width of 85 x 85 mm is maintained. Jefferies et al.(1984) state that this size refers to the maximum width which is acceptable for adult otters. The choice in Denmark for this maximum size is inspired by the fact that in a period of five years (1980 - 1985) no juvenile otters were counted amongst the 36 otters drowned in fish-fykes (pers. comm. Aksel Bo Madsen) The report on otter-guards from the Vincent Wildlife Trust states following:

"In any guard allowing the ingress of eels but not otters, the size of the space or spaces need to be as large as possible but obviously need to be limited to dimensions slightly smaller than those of the smallest adult or independent immature otters. Fortunately, cubs need not to be taken into account in these dimensions because they follow the mother when being taught to swim and hunt and stay with her for a period of around ten months, by which time they are close to adult size and weight. Consequently, although family parties have been drowned in fykes (...), these consisted of the mother and cubs; no dependant-aged cubs have been found drowned individually. Thus if the mother can be prevented from entering this should largely prevent cub-mortalities. As the adult female is smaller than the adult male, it is her dimensions which are critical for the guards." (Vincent Wildlife Trust, 1986)

Unfortunately this is not true, in the Netherlands in diversion to the reports from Denmark and Great-Britain this certainly is not the case. For the Netherlands over a period of 22 years the following numbers are recorded:

Table 1: Otters drowned in fish-fykes in the period 1965 - 1987 in the Netherlands (van Moll & Christoffels, 1989)

Sex	Age			Total / %
	Adult	Juvenile	?	
Female	5	1	0	6 = 21.4%
Male	1	4	0	5 = 17.9%
?	2	7	8	17 = 60.7%
Total / %	8 = 28.5%	12 = 43%	8 = 28.5%	n = 28

Jefferies, Green and Green (1984) tell us that the diameter of the skull of adult female individuals varies between 74 - 80 mm and the diameter of the neck varies between 73 - 83 mm. The chest sizes also are given.

They do not mention the sizes of juvenile otters. For these only a mesh-width much smaller than 85 mm seems to be safe. On this Reuther (1980) speaking of stop-grids and stop-nets gives a maximum width of 50 mm to prevent juvenile otters from drowning. He makes no differentiation between grids and nets.

DETERMINATION OF THE MESH-WIDTH

Various factors play a role in determining the mesh-width of otter-guards. First of all the recorded cases of drowning. As can be concluded from above there is a difference in the findings from different countries. Secondly the anatomic development of otters. At the third place the relation between head and body. At this moment still it is not known whether and how otters might get stuck in a stop-grid or any other device, whatever size it has. The question can be put forward if this the case already as soon as an otter is able to stick his head through a mesh, or rather until he pushes through and gets stuck with his neck or body.

Also we have no information whether young, unexperienced individuals run a greater risk than more experienced otters.

As a principle one needs to start from the most secure norm for the mesh-width: this means on the basis of the skull-size, being the 'hardest' part of the body. After all it is better to have a too tight mesh, than a too wide.

SKULL-SIZES OF JUVENILE OTTERS

It is remarkable that in the otter-literature concerning skull-measurements and skull sizes of otters almost no data are available on juvenile otters. Kleijn and Van Bree (1966) though, do mention minimum-sizes to discern juveniles from adults. One of the measures they give is the zygomatic breadth, which could give us an indication of the size of the skull, with exclusion of the musculature.

Juvenile males have a zygomatic breadth up to 69 mm, juvenile females up to 64 mm. It is known that the size and length of an otter skull increase considerably from the moment of birth. Whereas the size

of the chest (body) at first will not surcumpass the size of the skull. The development of the otter skull and body nevertheless never have been described in full uptill now.

Starting from the norms established by Kleijn and Van Bree for the zygomatic breadth, we find in Fairley (1972) some measurements of juvenile otters. The smallest size amongst drowned fish-fyke casualties is for female 60 mm, for males 66.4 mm.

CONCLUSIONS AND DISCUSSION

Although elaborate and precise measurements of otter skulls to determine a safe mesh width are not at hand, in particular measurements of juvenile otters, it must be concluded that the mesh-width of 85 x 85 mm (Denmark) and 80 x 80mm (The Netherlands) do not take into account the sizes of juvenile otters

Records from the Netherlands do show that juvenile and subadult otters do most certainly drown individually in fish-fykes. A percentage of 43 of drowned otters were juveniles. This being more than half of the total casualties recorded amongst juveniles.

It is necessary when applying otter-guards to start from the principle of a mesh-width of 50 mm (cf Reuther, 1980) based on the 'hard' parts of the body of the otter. This as long as no precise information is at hand on the actual functioning of guards.

From the age of 3 to 4 months the fur of the cubs has become watertight. This means that juveniles run the chance to drown in a fyke before they have become independent. In their mutual closeness it did happen that complete otter-families drowned in eel-fykes. To illustrate this: in 1975 in "De Wieden"-area two juveniles and a female adult drowned. In July of that year one of the juveniles drowned in an eel-fyke at the Leeuwterveld. Only one month later at the very same location the other juvenile and its mother were hauled up together.

Positive effects on catch results by the application of stop-grids

Various positive side-effects are known when stop-grids are applied. Stop-grids (and other guards) guarantee a more selective catch in eel-fykes, more than ever before. We mention the following side-effects:

1. Stop-grids with a mesh-width of 60 mm will shut out musk-rats, which prevents damaging of the nets by a rat that will try to bite its way through the nylon in attempting to free itself;
2. By the application of stop-grids less water-birds will be caught indeliberately;
3. Stop-grids prevent the catch of larger coarse fish, which increases the catch of eel, which is no longer deterred by caught fish, struggling to escape

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