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International Council for the Exploration of the Sea

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C. M. 1975/Appendix to B:20 **)

Gear and Behaviour Committee.

# Report of the Working Group on Technical Aspects of Electrical Fishing.

*) Appendix to the Report of the Working Group on Research on Engineering Aspects of Fishing Gear, Vessels and Equipment.

**) Appendix to the Report of the Working Group on Reaction of Fish to Fishing Operations.

Chairman : G. VANDEN BROUCKE
Rapporteur : G. P. BOONSTRA.

1. Meeting time and place : 23 April 1975, Ostend.

2. Participants.

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| **Belgium** | |
| E. Borger | S. A. I. T. - Oostende. |
| F. Delanghe | Rijksstation voor Zeevisserij - Oostende. |
| E. Stoops | S. A. I. T. - Oostende. |
| G. Vanden Broucke | Rijksstation voor Zeevisserij - Oostende. |
| **Canada.** | |
| P. J. G. Carrothers | Biological Station, St. Andrews. |
| G. d'Entremont | Departement of the Environment - Ottawa. |
| **France.** | |
| G. Kurc | Institut des Pêches Maritimes - Nantes. |
| M. Le Men | Institut des Pêches Maritimes - Nantes. |
| A. Percier | Centre National pour l'Exploitation des Oceans - Paris |
| **Germany.** | |
| K. Lange | Institut für Fangtechnik - Hamburg |

*) General Secretary, ICES, Charlottenlund Slot, 2920 Charlottenlund, Denmark.

The Netherlands.

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| C. P. Boonstra | Neth. Inst. for Fishery Investigations - IJmuiden. |
| E. J. De Boer | Neth. Inst. for Fishery Investigations - IJmuiden. |
| S. J. de Groot | Neth. Inst. for Fishery Investigations - IJmuiden. |
| P. Korbee | Neth. Inst. for Fishery Investigations - IJmuiden. |
| R. C. Peeters | Lab. of Comparative Physiology, Univ. - Uitrecht. |
| A. Verbaan | Neth. Inst. for Fishery Investigations - IJmuiden. |

Norway.

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| I. Bjørkum | Inst. of Fishery Techn. Res., - Trondheim. |
| K. Olsen | Institut of Fisheries Research - Bergen. |

United Kingdom.

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| J. F. Foster | Industriel Development Unit, White Fish Authority-Hull. |
| A. R. Margotts | Fisheries Laboratory - Lowestoft. |
| C. S. Wardle | Marine Laboratory - Aberdeen. |

U. S. S. R.

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| V. P. Simbirov | Ministry of Fisheries of the U. S. S. R. - Moscow |
| A. I. Treschev | All Union Research Institute of Marine Fisheries and Oceanography - Moscow. |

3. Agenda.

1. Progress Report.
2. Pulsgenerator :
   technical specifications (optimum form of the pulses, length of the pulses and their frequencies in relation to the fish to be caught and power.
3. Power supply systems.
4. Electrodes and systems (riggings and insulation).
5. Security.
6. Static electrified barriers in salt water.
7. Other problems.

4. Progress reports.

Fed. Rep. Germany Mr. Lange reported that their new cutter "Solea" is fitted with a pulse-generator for electrical fishing. The special cable is stored on a net drum. The pulse generator develops high Voltage pulses which will be stepped down at the net. Species to be fished for are different flatfish species. Trials will start this year.

Canada.

Mr. Carrothers reported that no work was done in this field.

Scotland.

P. Stewart reported practical fishing experiments with a split beam trawl.
Behaviour studies of wild flatfish were carried out in a bay.
Pilot studies on a non moving electrified barrier are being carried out.
A new pulse generator (max. 450 V 7000 A) has been developed as well as a battery powered unit.

United Kingdom.

Mr. Margetts reported that no work on electrical fishing is done in England.

Norway.

Kj. Olsen reported that so far no work has been done in Norway.
An electrical barrier is being planned to close a fjord and keep the fish in.

USSR.

Mr. Treschev reported experimental work both in fresh- and in sea water.
No practical work except for the combined light electrical attraction which has been reported earlier.

France.

Mr. Le Men reported that no new large scale experiments were carried out.

New equipment is being tested to study the reactions of mullet to square pulses of different frequencies.

Great Britain.

J. F. Foster (WFA) reported no activities in this field.

The Netherlands.

G. P. Boonstra reported on 1973 and 1974 experiments on shrimp with a pulse generator mounted on the beam gear. During the last series of experiments a complete system was used meaning that the power supply cable ran via a self tensioning netsonde-winch.
Different electrode riggings were tried and a good one was found hanging from the beam with the electrodes woven through a light chain.
The experiments gave about the same average increase in shrimp catch as the year before. 30 - 40 % with a greater increase in clear water and less in turbid water. Although the system during the 15-week period of experiments gave a good insight in the technical possibilities of a complete electrical fishing system, it is unlikely that the system will be used for shrimp in the area where the tests were carried out, mainly because of the costs and secondly because of the importance of the by-catch which decreases with a decrease in speed. Due to the difficult situation in the flatfish fisheries, owing to fuel prices and prices of other materials, the main effort of the Dutch research will be directed at the electrical stimulation of flatfish with the objective of reducing cost and increasing selectivity and also increasing the survival chances of the discards.
A new pulse generator for this purpose is under construction and comparative fishing with a 400h. p. beam trawler is planned.

Belgium.

Mr. Vanden Broucke reported that comparative fishing with an otter trawl has been carried out with good results. At present the Research Station

is orientating itself on the manufacturing of a new pulse generator. A decision will have to be made whether this generator is to be placed on board or on the gear.

5. Discussion.

Mr. Treschev answered on request of P. Stewart that the USSR is designing equipment for electrification of a trawl. Electrical fishing for eel in fresh water is commercially used.

A S.A.I.T. representative on behalf of the Belgian Research Station asked for the resistance of electrode systems.
Both Boonstra and Stewart agreed that the resistance for a 8 - 9 meters beam trawl is in the order of 100 - 50 milli-ohms.

A question about electrode material to be used was answered by both Stewart and Boonstra who consider stainless steel as being the best material to be used for electrodes running over the bottom.

Mr. Le Men asked for the specification of the S.A.I.T. pulse generator used by the Belgian Research Station.
In this experimental pulse generator Voltage, pulse length and frequency can be varied over a wide range which made it rather bulky.

There was some discussion about the system which is being used on the German R.V. "Solea", but as none of the German experts in this field was present no definite answers were given.

P. Stewart remarked that pulse transformers would make the system very costly.

There was some discussion of power supplies to the pulse generators.

In the Netherlands up to now a rotary converter has been used as a power supply with AC 50 Hz fed to the pulse generator. In future the power source will be a Diesel-generator with a one phase 50 Hz source of 3 kW.
In Scotland an AC source is also being used.

After the progress reports and the discussion a number of slides were shown by G. P. Boonstra related to past experiments and in particular to those done in 1974.

The points which were emphasized were the use of the self tensioning winch, electrode rigging and the special power supply cable which is based on the same idea as a netsonde cable, only with less resistance. This construction was chosen because of the easy repair in case of a break in the cable.

Regarding future work in flatfish it was emphasized that one of the main ideas behind the electrical fishing for flatfish is that the fishing speed would have to be relatively slow to give the fish sufficient exposure time in the electrical field.

To give the discards a better survival chance a flatfish sorting machine is being developed based on the same principle as the rotating shrimp sieve.
P. Stewart asked if the plugs which were used were any good. Boonstra answered that the plugs which fed the electrodes were good, but the power supply plug gave trouble and would no longer be used.

G. Vanden Broucke gave a short review of a series of 16 comparative tows with an otter trawl. 8 tows were electrified and 8 tows were not. The increase in catch of roundfish was 50 %. The positive electrode was fitted on the ground rope. The two negative ones just behind the otter doors.
The pulse frequency which had been used was 5 Hz and the power consumption 2 kW.

P. Stewart presented his paper "Results of a comparative fishing experiment for flatfish using an electrified beam trawl". A copy of this paper will be added to this report. Stewart reported that the multicore cable used in the experiment is difficult to repair. As the breaks occur mostly near the gear, it mostly turns out that a piece is cut off and re-connected to the gear. This operation takes about an hour.
In the discussion Vanden Broucke asked whether the electrified net had any direct effect on the non-electrified one. The answer to this was that there was no effect.

There was a short discussion between Stewart and Boonstra about the electrodes touching ground. In the experiment of Stewart it was established that the electrodes did touch ground while in the Dutch experiment the electrodes appeared to lose touch with the bottom because of a higher fishing speed and weight had to be put on.

After lunch P. Stewart described a series of experiments in Burghead Bay on the reaction of flatfish to electrical stimulation. Slides were shown of the towed sledge with electrode array and a film of the installation moving over the bottom and the fish reaction as observed by the camera man. Many more observations were in fact recorded and presented in a diagrammatic presentation. Optimum results were recorded at 20 Hz and 80 V.

Mr. Le Men presented a film about laboratory experiments on the reaction of mullet. The pulses which were used were square pulses and the different reactions were explained.

Static barriers.

Stewart and Wardle explained that some small scale work has been done in Aberdeen on electrical barriers as a reinforcement to natural barriers.

Mr. Olsen (Norway) expressed his interest in this matter as his Institute is planning a barrier in a fjord.

Boonstra explained that his experiment to divert silver eel from their escape route by means of an electrical barrier had not been succesful. One of the reasons was the enormous surge on the power source even in brackish water. The second reason was the strong water current through the screen. He expressed, however, a great interest in the results from future experiments as there seems to be a need for fish screens in sea water.

Security.

Vanden Broucke asked about the safety of the Dutch system where 220 V AC will be brought down to the pulse generator on the gear. Boonstra explained that the electrical system is "floating" and that the cable is well insulated.
Steward also considers this system to be safe but that nevertheless special instructions should be given to the people handling the gear.
The general opinion was that as soon as a system becomes commercially available, specific instructions should be given to the users and everything should be done to prevent accidents.
Mr. Kj. Olsen asked about the safety of electrical barriers. Mr. Kurc explained that they are dangerous to swimmers.

Recommendations.

G. Vanden Broucke proposed that the Working Group on electrical fishing should report to the Engineering Working Group only.

He further proposed that the I. C. E. S. member countries using electrical fishing should meet and compile a manual of existing systems.

The general opinion on this last proposal was that all systems are in an experimental stage and that it is too early to make a manual at this time.

Regarding the first proposal Mr. Kurc regarded the meeting of both the technical experts and experts on behaviour at the same time as important as the work of both groups overlap.

Stewart and Margetts were of the same opinion.

J. Foster (W. F. A.) has the opinion that the Working Group should be kept in the Engineering Working Group.