Pulse trawl

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Background

Since 2009, more and more Dutch fishers have been switching from traditional beam trawling to pulse trawling. Beam trawling works by dragging tickler chains across the seabed to startle the fish and make them leap into the net. The most commonly used pulse trawling techniques are *pulskor* (pulse trawl) and *pulswing* (pulse wing). Both are based on a system which emits short electric pulses on a part of the seabed. This makes the muscles of the fish contract, whereupon the fish detach from the seabed and land in the net. The energy requirements for pulse trawling are lower than for traditional beam trawling, because the equipment is lighter, the speed is slower, and resistance is weaker since there is less contact with the seabed. Less fuel is needed to operate the equipment, making the entire process more economical.

Pulse trawling, a relatively new technology, is raising many questions about sustainability and economic feasibility, and has led to a large body of research in recent decades. This factsheet summarises the latest information on catches, discards, ecosystem effects, and economic viability in relation to the use of pulse trawling in flatfish fishing.

Policy and dispensations

So far (as at 2014), the use of electricity for fishing has been banned in the EU (EU Regulation 850/98). Since 2007, however, 5% of the beam trawl fleet of all Member States has had temporary dispensation in the southern North Sea. Accordingly, a few Dutch fishers have been using pulse technology since 2009. A part of the Dutch flatfish fleet currently have a dispensation; 42 vessels in 2013. The Dutch flatfish sector was granted dispensation for another 42 vessels in 2014. Sector representatives do not expect all these dispensations granted in 2014 to be used, given that the heavy investments involved in making the necessary adaptations to the vessels must first be shown to be financially feasible. Moreover, adequate sole quotas are needed, as larger quantities of sole are caught in pulse trawling. The sole quotas for the Netherlands are too low at present to allow all flatfish vessels to fish sole with pulse technology.

Pulse trawling compared with beam trawling

In 2012, fishing with pulse technique delivered better net results than fishing with the traditional beam trawl technique (Table 1): a net profit of 11 euros was realised for every 100 euros earned from pulse trawling, whereas a net loss of 7 euros was sustained for every 100 euros earned from beam trawling. The difference is explained by the fact that the total costs are lower for pulse trawling: though the costs of investment (depreciations) and equipment, and, above all, the catch-based pay for the crew were higher, the fuel costs were much lower, making for a better overall result.

Table 1. Index figures for beam and pulse trawling in terms of revenues, costs, and net result for 2012. Fishing with beam trawl technique makes a loss of 7 euros on every 100 euros earned, whereas fishing with pulse trawl technique makes a profit of 11 euros.

	Beam	Pulse
Revenues	100	100
Costs	107	89
Net result	-7	11

Source: Taal *et al.*, 2013

Beam trawl.

Pulse trawl.

In 2012, fuel consumption was, on average, 45% lower in pulse trawling than in beam trawling. This is probably because in pulse trawling, the fishing speed is usually one nautical mile per hour slower, and the equipment is lighter, causing less disturbance on the seabed.

In 2012, the net profit from pulse trawling was, on average, 578 euros per day-at-sea greater than from traditional beam trawling. Lower levels of fuel consumption resulting in lower fuel costs per day, plus the relatively higher yield in sole are largely responsible for this result.

Unwanted by-catch is lower for pulse trawling than for beam trawling (Table 2). Fewer undersized plaice are caught per hour and numbers of discarded benthos are lower.

Composition of the catch for pulse trawling

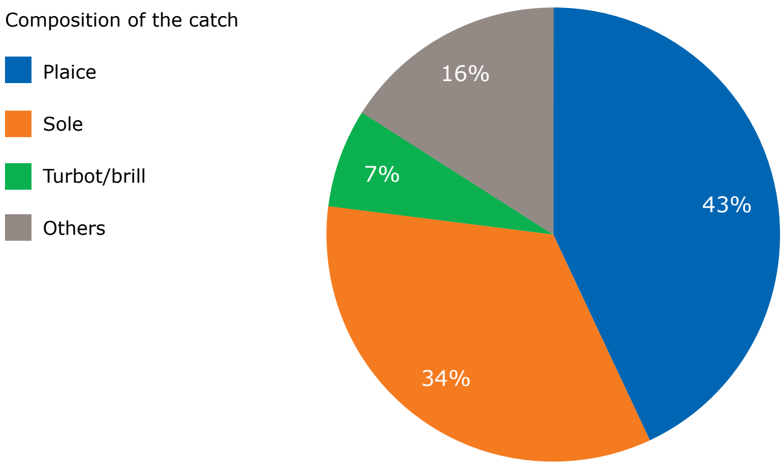
Fewer fish are caught with pulse trawling than with beam trawling (Table 2). The composition of the catch varies widely. The greatest difference is in the proportion of sole to plaice: in pulse trawling, sole accounts for 34% of the landings compared with 12% in beam trawling. Pulse technology therefore seems to be particularly suited to catching sole.

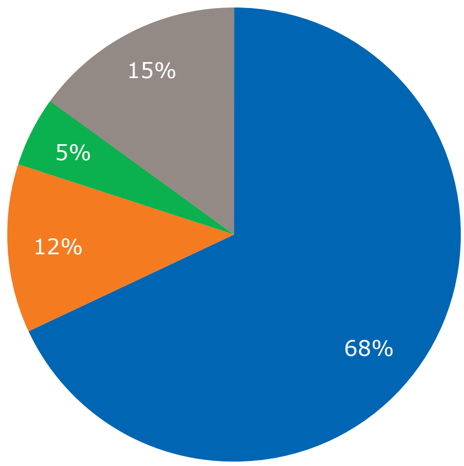
In 2012, 25 pulse trawlers, guided by IMARES, took samples of the composition of their catch for a year. Many differences emerged between vessels, seasons, and areas. According to the average scenario, 31% of the catch consists of landings, 10% of undersized plaice and sole, 7% of miscellaneous fish discards, 18% of benthos, and 34% of dead and inanimate material.

Table 2. Pulse technology compared with beam technology, 1,500 - 2,000 Hp. Figures are averages for 2012.

	Pulse trawling	**Beam trawling with chains**
Fishing speed	5.5 nautical miles/hour	6.5 nautical miles/hour
Fuel consumption	4,100 litres/day-at-sea 2.21 litres diesel/kg fish	7,400 litres/day-at-sea 2.36 litres diesel/kg fish
Landings	1,900 kg fish/day-at-sea	3,100 kg fish/day-at-sea
Returns on fish	2.17 euros/litre diesel	1.23 euros/litre diesel

Composition of the catch





Discards	Around 50% (63 kg/hour) of the total plaice catch and 12% (5 kg/hour) of the total sole catch is thrown back into the sea. Less benthos is caught and discarded in pulse fishing than in beam fishing with tickler chains. For example, there was a sixfold reduction in starfish and a twofold reduction in crabs.	Around 50% (87 kg/hour) of the total plaice catch and 17% (6 kg/hour) of the total sole catch is discarded. More benthos is caught and thrown back into the sea in beam fishing with tickler chains than in pulse fishing.

Sources:
Quirijns *et al*., 2013, information on fishing speed (average of 2 ships for pulse trawling, 1 for beam trawling);
Rasenberg *et al*., 2013, information on discards (average of 19 ships (>300 hp) for pulse trawling, 9 for beam trawling);
Taal *et al*., 2013, information on fuel consumption, landings, profit, and catch composition (average of 15 ships for pulse trawling and 10 for beam trawling across the whole of 2012).

Ecological impact of pulse trawling

The electric current released by the pulse can affect all the fauna that come into contact with it; but these effects differ according to conditions and species.
The way in which fish, sharks, and benthos respond to pulse trawling varies from one species to another.
The following effects have been studied in laboratories and/or at sea:

Seabed disturbance – the pulse trawl is lighter than the traditional beam trawl, so it does not penetrate as deeply into the seabed. In addition, as the fishing speed of pulse trawlers is slower, the trawled distance per hour is shorter and the overall fished surface is smaller.

Benthos – laboratory testing revealed that pulse trawling has only minor effects on the mortality of different benthic species. This may well explain why the direct morality rates for remaining benthos are lower after pulse trawling than after traditional beam trawling. Laboratory tests did, however, show that sandworms, crabs, and clams have reduced chances of survival after contact with an electric field similar to the one used in pulse trawling.

Cod with vertebral fractures – cod with vertebral fractures are not uncommon in pulse trawling. Laboratory tests also showed that the risk of vertebral fractures in adult cod is greater in pulse trawling.

Sharks and rays – very few effects have been ascertained so far for sharks and rays. A laboratory study indicated that cat sharks suffered no injuries from pulse trawling.
Possible effects on the electric sense of sharks and rays are currently being explored.

Survival chances of plaice and sole discards – tests at sea have shown that pulse trawlers inflict less injury on the caught fish than traditional beam trawlers. The superior quality of the fish caught by pulse trawling might enhance the survival chances of plaice and sole. This theory is, however, still to be researched.

Sources

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