Workshop on allocation of Economic Data at disaggregated level as related to the DCF

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TOR as suggested by STECF in the SGECA 10-03 final report

1. Identify needs of applications, e.g. Long Term Management Plans, Regional Analyses for funding purposes and Ecosystem Approach to Fisheries Management.
2. Identify methods to allocate earnings and costs (operating costs, labour costs, capital costs) at different aggregation levels. Consider the identification of cost drivers. Transversal variables could serve for this purpose. Consider vessels that may be active in more than one fishing metiér during the same year.
3. Propose a method to split economic variables among different areas when appropriate.
4. Assess data quality requirements of allocation methods with regard to particular characteristics of DCF data sources at each MS (e.g. logbooks).

1. Summary

The general purpose of workshops is to mutually gain insight in common practice as performed in different MS, exchange ideas and potentially derive some best practice. It is beyond the scope of a workshop to develop guidelines or common rules. The workshop was attended by 7 participants, representing France, Germany, Lithuania, The Netherlands and Poland. Templates for the provision of exemplary anonymised raw data by vessel for any MS had been requested ahead of the meeting. It turned out favourable to have a common format of input data for statistical analyses, thus allowing the application of standard routines. Datasets from the aforementioned countries were available for evaluation during the workshop.

The needs for disaggregation were presented from the perspective of the member states being represented at the workshop. Long Term Management Plans, the Marine Strategy Framework Directive, the Ecosystem Approach, the AER regional analysis and Marine Spatial Planning were stated as most common fields for which disaggregated data are required.

The general approach of disaggregation is to use correlated data which are available at higher resolution. One major task during the workshop was to compare different correlations between annual cost data and transversal variables (effort, landings) which are available at higher resolution. Experience, some advance information from personal communication and previous approaches (LTMP, AER) as well as common sense have been used to identify potential and meaningful correlations between effort and cost data. Crew costs are likely to be related to earnings from landings, whereas energy costs, repair and maintenance costs and other variable costs are more likely to be related to vessel size characteristics and effort.

It turned out that in several cases the data were not as closely correlated as expected. However, for certain fleets or fleet segments the correlation was quite reasonable. It has to be pointed out that scattering of data does by no means automatically mean that they are unreliable. Individual vessel characteristics can vary broadly, thus resulting in a wide range of data. However, as individual vessel data are usually raised to the according entity (fleet segment), some problems may be encountered when fleet segment data are disaggregated towards smaller units.

The use of VMS data to further disaggregate transversal data (effort and landings) has been discussed. A presentation was given showing the implementation of VMS data in marine spatial planning e.g. for the analysis of earnings from designated wind farm sites.

The workshop can be regarded only as an initial step to develop more specific methods. Future activities might address the identification of homogeneous fleet units (not necessarily DCF fleet segments) – also an international or regional perspective - , approaches to determine cost structures for certain activities, estimation for fleet segments or larger units from the samples, applicability of e.g. linear models to correlate multiple variables. It might also be conducive to investigate cost data at very high resolution (e.g. for single trips) for single vessels to draw further conclusions. Particularly

wages and fuel can often be determined per trip, while repair and maintenance costs usually do not accrue as frequently as would be necessary to assign them to single trips.

2. Initial remarks

The terms of reference have been discussed and somewhat altered for easier handling. ToR 3 is contained in ToR 2. As far as ToR 4 is concerned, it has been agreed that quality issues are a task beyond the scope of the workshop, taking into account the available personnel and temporal resources and the lack of further specifications. In general, quality issues can only be evaluated against specific targets, which were not available. Moreover, the analyses performed during the workshop do not allow for quantitative conclusions on data quality. The data provided have to be regarded as reliable, and scattering or poor correlation between data does not necessarily allow raising doubts about data quality. This issue has been further discussed. In addition, a compilation of data sources and their specifications has been elaborated for the member states represented at the workshop.

In its plenary report (PLEN-03-10, p.19), STECF stated:

> *In section 4.3 on the review of the SGECA 10-03 report STECF developed possible TOR for a workshop on possibilities to collect disaggregated economic data with an additional area code. Furthermore, it is intended that possibilities for collection of disaggregated costs data will also be assessed by that workshop. If such a disaggregated data collection is possible it will allow STECF to assign costs and earnings data to the different eco-regions.*

The issue of collection of disaggregated cost data had never been picked up again by STECF, neither in the referred section nor in the final version of the terms of reference. Therefore the point of altering the collection of cost data was not addressed during the workshop.

3. Identification of needs of application

The needs for disaggregation of economic data have been discussed with respect to the circumstances within the member states which were represented at the workshop. It turned out that the different applications do not necessarily require constant degrees of resolution, i.e. the characteristics as presented in table 1 are mainly exemplary, but might vary from case to case. The table does not claim to be exhaustive, but the examples proved to be relevant for several or all member states involved.

Table 1 Examples for applications which require disaggregation of economic data

application	variables	temporal resolution	spatial resolution	activity resolution
Long Term Management Plans (impact assessment, evaluation)	effort, landings, revenue, all variable cost data	total annual effort in related fishery	ICES (sub-) division	fishery on target species
Marine Strategy Framework Directive	effort, landings, revenue, all variable cost data	annually	Variable (e.g.ICES division)	DCF fleet segment, gear type
Ecosystem Approach to Fisheries Management	effort, landings, revenue, all variable cost data	annually	ecosystem (e.g. ICES rectangle)	variable
Regional analysis (AER)	effort, landings, revenue, all variable cost data	annually	region	DCF fleet segment
Marine Spatial Planning (e.g. wind farms, pipelines)	effort, landings, revenue, all variable cost data	annually (monthly)	several	fishery on target species/using specific gear

Table 1 also contains variables which are referred to as "transversal" under the DCF (effort, Landings, Revenue). These data have to be collected at higher resolution, which might or might not be sufficient for the application. In particular, Marine Spatial Planning might require data on areas which are much smaller than a statistical rectangle, e.g. wind farm areas.

Under the DCF cost data have to be collected only on an annual basis. There are examples (FRA, NLD) for the collection of some daily cost data – basically Crew cost and Fuel cost. Other costs may only accrue monthly or annually or even less often (e.g. repair), which impedes assigning data to smaller units (spatial or temporal).

It is remarkable that the DCF fleet segmentation according to Appendix III (EU Commission Decision 93/2010) matches the requirements of only one of the applications listed in Table 1 (i.e. the AER). Referring to length and main gear for segmentation is rather pragmatic and well manageable. However, it appears to have less relevance for a wider range of applications.

This phenomenon has also been discussed at the STECF meeting on present and future requirements of the DCF (EWG-11-04). In chapter 15.1 (p.63 ff.) of the meeting report a compilation of different requirements and further consideration is provided, corroborating the need for disaggregation.

4. Identification of methods to allocate earnings and costs

Earnings as addressed in the terms of reference are usually available at the highest resolution levels as to be provided under the DCF. Further disaggregation is therefore not feasible using only DCF data. The only method for further disaggregation which has been discussed in more detail during the workshop is the analysis of VMS data. However, that approach applies to the disaggregation of effort data as well. Therefore, as far as the earnings are concerned, it is to be referred to the application of VMS data.

As long as cost data are sufficiently closely correlated with effort data which are available at the required resolution, they can be estimated for the smaller temporal or spatial units.

Numerous plots of cost vs. transversal data have been generated and debated during the workshop. In the following chapters, a selection of these plots is being discussed in more detail in order to provide a broad overview.

Table 2 DCF cost variables and transversal variables which are likely to be correlated ("cost drivers")

DCF Variable	"Cost driver"
Wages and salaries of crew	Value of landings, days at sea, crew number
Imputed value of unpaid labour	Not identified
Energy costs	Days at sea, fishing days, type of activity, gross revenue, vessel size (GT, kW), fuel price
Energy consumption	Days at sea, fishing days, type of activity, gross revenue, vessel size (GT, kW)
Repair and maintenance costs	vessel size (GT, kW), age, days at sea, fishing days, area of operation, fleet segment
Variable costs (other)	Days at sea, fishing days, type of activity, gross revenue, vessel size (GT, kW), volume of landings
Non-variable costs	Vessel size (GT, kW), age,

National chapters' overview

The French example

The French fleet sample is composed of 93 vessels operating in the North Sea – Channel – Atlantic. Composition in terms of DCF fleet segments as defined in Appendix III, Commission Decision 2010/93, is:

Table 3 Overview over the analysed samples of the French fleet segments

Fleet segment	DFN	DRB	DTS	FPO	HOK	MGP	OTM	PGO	PGP	PMP
Sample size	13	10	41	12	6	2	1	2	2	4

Crew costs

Looking at the Revenue against the Crew costs for the whole sample (see Fig. 1), the correlation between those variables is quite evident. It is easily explainable by the fact that in most cases the crew cost is a share of the revenue. In terms of cost allocation at métier level, this means that one may rely on revenues to allocate crew costs

Looking at the Crew cost against the Vessel length, it can be found that those variables are also correlated as might be expected. Thus vessel length may also be taken into consideration as a cost driver.

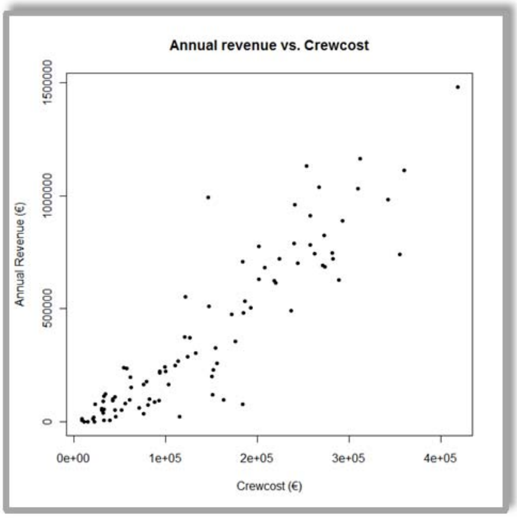

Fig. 1 Annual revenue vs. Crewcost

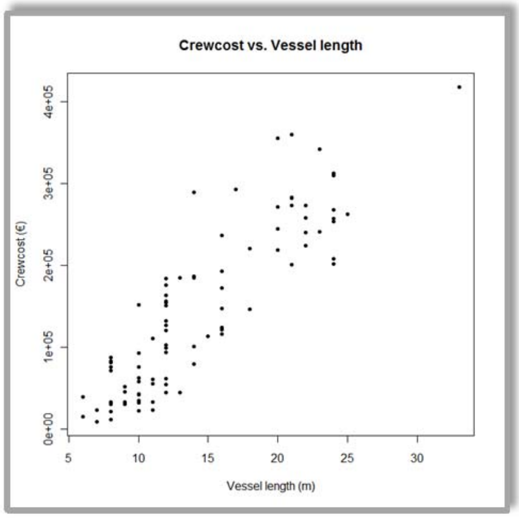

Fig. 2 Crewcost vs. Vessel length

Energy costs

It is expected that energy costs are correlated with days at sea and vessels characteristics (length, kW). Trying several combinations of variables, it turns out that seadays*kW is the best fit for energy costs for this sample (see Fig. 3)

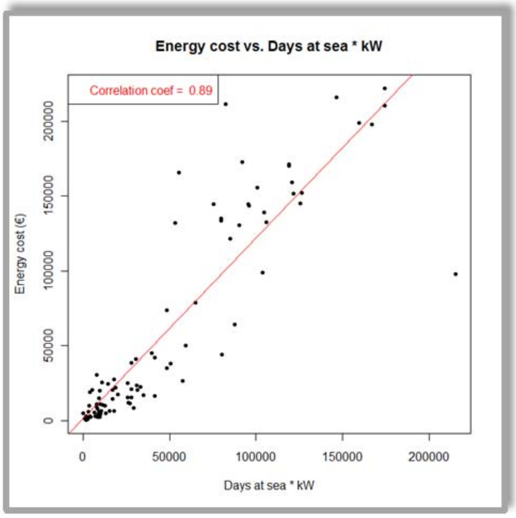

Fig. 3 Energy cost vs. Days at see*kW

Splitting up the sample into DCF fleet segments, the correlation still holds. The correlation coefficient for FPO is not as high as the other though, but it is only due to one value which may be considered as an outlier.

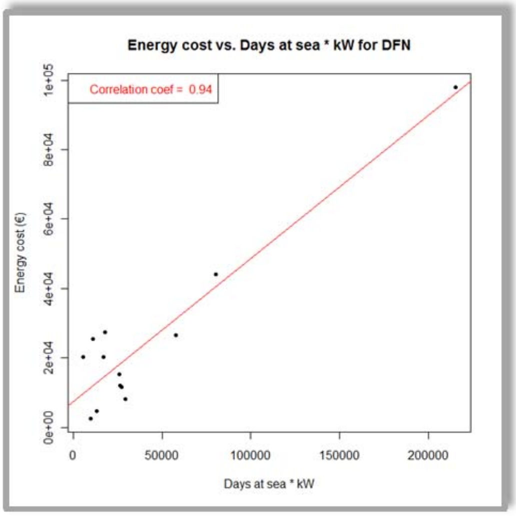

Fig. 4 Energy cost vs. Days at see*kW for DFN

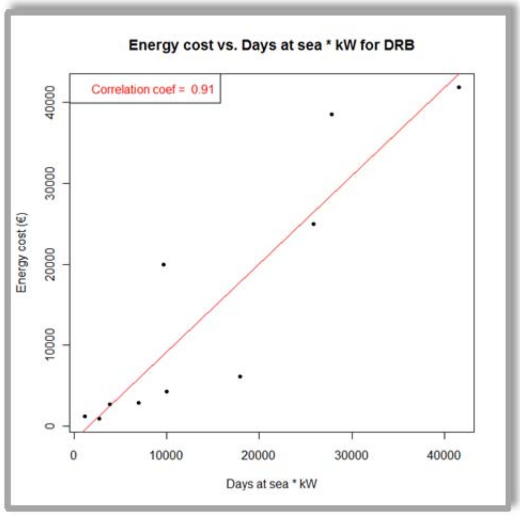

Fig. 5 Energy cost vs. Days at see*kW for DRB

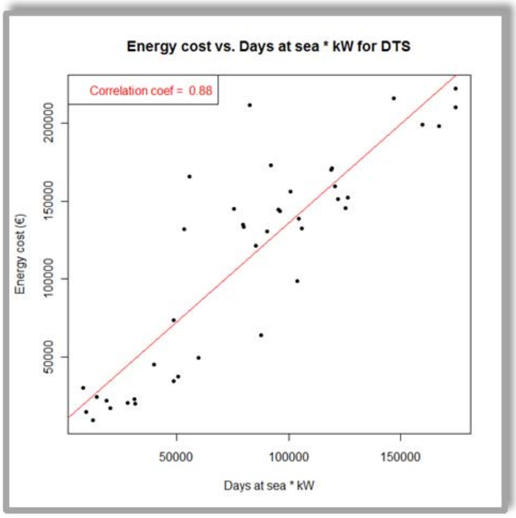

Fig. 6 Energy cost vs. Days at see*kW for DTS

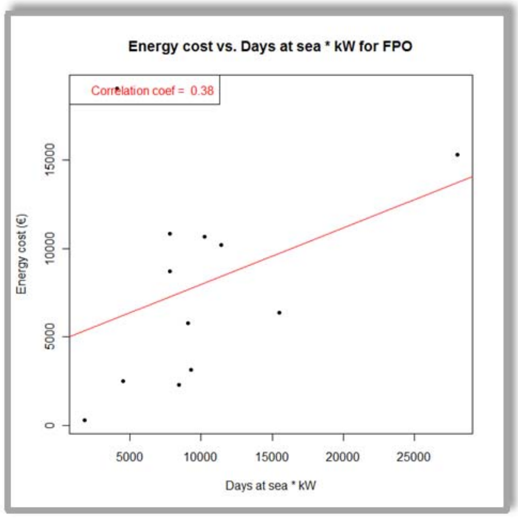

Fig. 7 Energy cost vs. Days at see*kW for FPO

Repair and maintenance costs

The Days at sea * kW is also correlated with Repair and maintenance costs. The variability increases when it comes to the highest values, which often is the case for those kinds of graphs.

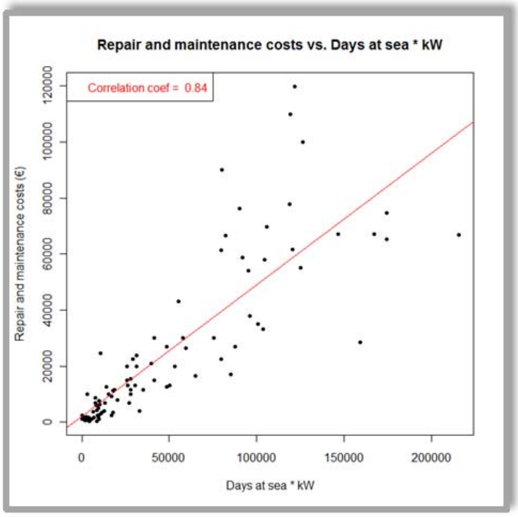

Fig. 8 Repair and maintenance costs vs. Days at sea *kW

Again, splitting up the sample by DCF fleet segment yields consistent correlations between Repair and maintenance costs and Days at sea * kW.

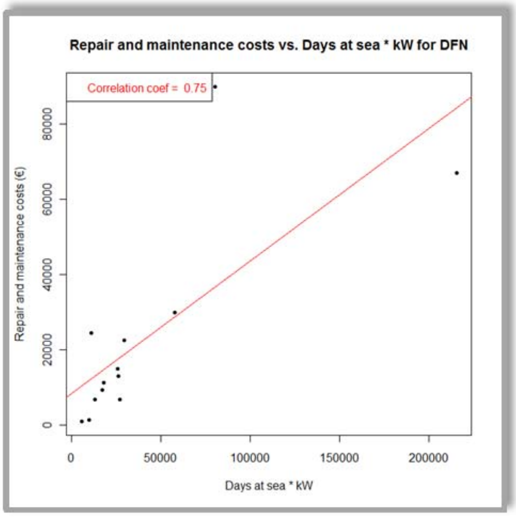

Fig. 9 Repair and maintenance costs vs.Days at sea*kW for DFN

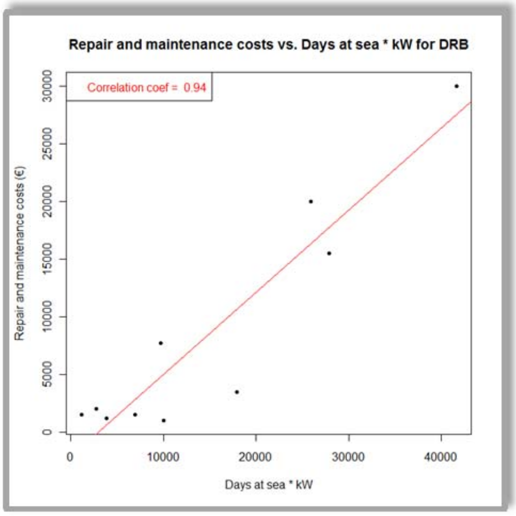

Fig. 10 Repair and maintenance costs vs.Days at sea*kW for DFN

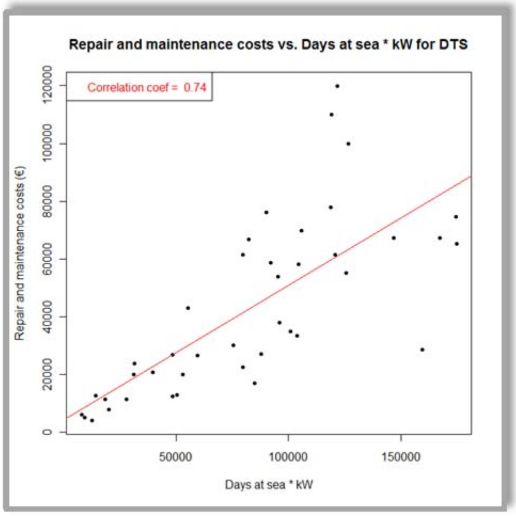

Fig. 11 Repair and maintenance costs vs.Days at sea*kW for DTS

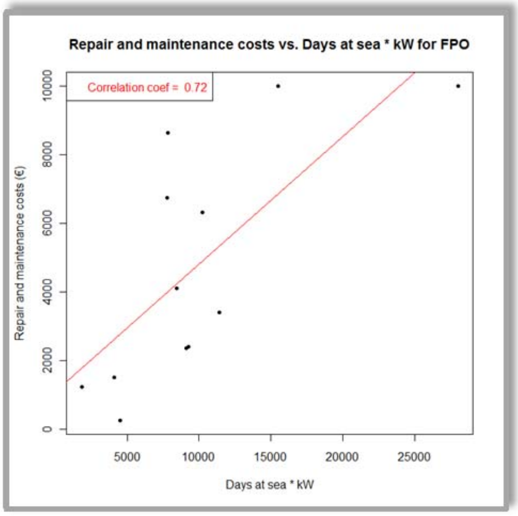

Fig. 12 Repair and maintenance costs vs.Days at sea*kW for FPO

Other variable costs

Finally, Days at sea * kW is also highly correlated the other variable costs, which still stands when looking by fleet segments:

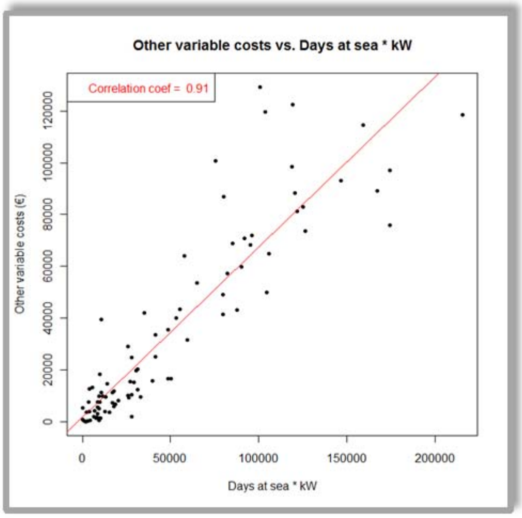

Fig. 13 Other variable costs vs. Day at see*kW

Summary

In a nutshell, it was found that:

- Crew cost is correlated to Revenue
- Energy cost, Repair and maintenance cost and Other variable costs are correlated to Days at sea * kW.

Table 4 Correlation coefficient table for the total French sample

	Revenue	Seadays * kW
Revenue	1	0,94
Crewcost	0,91	0,87
Energy cost	0,86	0,89
Repair cost	0,81	0,84
Othvarcost	0,9	0,91
Seadays * kW	0,94	1

Table 4 shows a close correlation between Revenue or Seadays*kW and all cost items (more than 80%). With such a sample of highly correlated data it appears worth using these variables to estimate the costs at disaggregated level. Since Days at sea were not available at disaggregated level, Revenue was used to exemplify how the costs could be disaggregated (temporally or spatially).

A close correlation between Revenues and Crew costs is in line with the expectations and there is also causation, as it is common to pay fishermen by a certain share of the earnings. However, it should be born in mind that correlation does not imply causation, i.e. the correlation between revenues and the remaining costs is not necessarily causal.

The formula applied to estimate each cost on the basis of Revenue for some smaller unit (trip) is:

$$COST_{smaller\ unit} = \sum_{trips \in smaller\ unit} \frac{revenue\ \ for\ smaller\ unit(trip)}{Vessel\ annual\ revenue} \times Vessel\ annual\ COST$$

Basically, it is assumed that, for a single vessel, the ratio of Revenue per smaller (temporal or spatial) unit versus total revenue is the same as the ratio of costs per unit versus total costs. For example, if we want to estimate the Fuel cost in Division IVb for each vessel that operates in this Division, the Revenue associated with this Division should be taken and divided by the annual Revenue of the vessel (i.e. the Revenue over all Divisions) and then multiplied by the annual Fuel cost of the vessel. The sum of all vessels will give an estimate on the total Fuel cost for Division IVb.

The following tables display the results of such estimations for Crew cost, Energy cost, Repair and maintenance costs, and Other variable costs by Division (Table 5) and by gear type (Table 6).

Table 5, comprising the costs at Division level, shows some interesting results. The relation of costs to Revenue for the whole sample (i.e. overall divisions) is as follows:

- Crew cost = 37% of Revenue
- Energy cost = 15% of Revenue
- Repair and maintenance costs = 6% of Revenue
- Other variable costs = 9% of Revenue
- Sum of costs = 67% of Revenue

Table 5 also shows a cost structure by Division which depends on the characteristics of the vessels that operate in each Division. The sum of costs can vary from 46% to 77% of the Revenue between Divisions. Of course, in order to get the actual costs breakdown by division it would be necessary to have data for the entire fleet and not only for a sample of vessels. But this shows us why it is important to look at cost breakdown at disaggregated levels.

The breakdown of total costs in Table 6 is the same as in Table 5 since the same sample was used for calculations. However, sums of costs for different gear types are in some cases higher than the Revenues, which raises some questions and needs further clarification. It may happen sometimes, so this does not necessarily mean that the data are of poor quality. On the other hand it could be the case that some trips are missing in the data and therefore the Revenue might be underestimated. However, it would be favourable to ensure the data completeness before using this method to get costs at disaggregated level.

Table 5 Estimated costs as shares of revenue at Division level

Division	Revenue	Crewcost	Energy cost	Repair cost	Othvarcost	Sum of costs	Crewcost (%Revenue)	Energy cost (%Revenue)	Repair cost (%Revenue)	Othvarcost (in %Revenue)	Sum of costs (%Revenue)
IVb	166670	53881	29224	13469	20513	117087	32	18	8	12	70
IVc	1226418	414769	186482	79970	133462	814683	34	15	7	11	66
VIa	598803	169040	39628	27093	47917	283678	28	7	5	8	47
VIIa	223	76	42	20	19	157	34	19	9	9	70
VIIb	5918	1671	392	268	474	2803	28	7	5	8	47
VIIc	145559	41091	9633	6586	11648	68957	28	7	5	8	47
VIId	3730941	1392414	680581	309094	472687	2854776	37	18	8	13	77
VIIe	7496510	3051901	1011736	378325	563036	5004998	41	13	5	8	67
VIIf	844682	240007	159253	52717	63487	515463	28	19	6	8	61
VIIg	2254633	667205	425840	184924	218657	1496626	30	19	8	10	66
VIIh	4789691	1647668	860586	342358	418617	3269229	34	18	7	9	68
VIIIa	10569148	4047842	1683102	636938	830630	7198511	38	16	6	8	68
VIIIb	3028617	1272666	248082	196650	233430	1950828	42	8	6	8	64
VIIIc	20449	7986	646	711	1357	10700	39	3	3	7	52
VIIId	354468	114857	62136	24045	35597	236635	32	18	7	10	67
VIIIe	7482	2249	1156	447	641	4491	30	15	6	9	60
VIIj	160753	47202	16889	8621	13201	85913	29	11	5	8	53
VIIk	192309	57004	25684	10830	16202	109719	30	13	6	8	57
Xa	3297	951	292	106	152	1502	29	9	3	5	46
XIIa	3085	876	525	122	428	1952	28	17	4	14	63
Total	35599656	13231355	5441908	2273291	3082154	24028708	37	15	6	9	67

These results are based on a sample of vessels and are not representative for the actual revenue and costs by division.

Table 6 Estimated costs as share of revenue at gear level

Gear	Revenue	Crewcost	Energy cost	Repair cost	Othvarcost	Sum of costs	Crewcost (%Revenue)	Energy cost (%Revenue)	Repair cost (%Revenue)	Othvarcost (%Revenue)	Sum of costs (%Revenue)
DRB	1689997	691963	135068	79073	122137	1028240	41	8	5	7	61
DRH	7356	14038	280	623	93	15035	191	4	8	1	204
FPO	956690	906571	101532	72376	67336	1147816	95	11	8	7	120
GEN	8154	18879	2067	103	1357	22406	232	25	1	17	275
GES	213	233	64	16	4	317	109	30	8	2	148
GN	116047	93555	10658	11145	14380	129738	81	9	10	12	112
GND	774	382	18	49	33	482	49	2	6	4	62
GNS	2076436	752217	124273	106503	156739	1139732	36	6	5	8	55
GTN	305617	212784	25172	33262	37637	308855	70	8	11	12	101
GTR	2622743	1236207	270911	127306	193451	1827875	47	10	5	7	70
HMS	95171	160114	7498	5880	7409	180901	168	8	6	8	190
LA	2284	695	438	347	235	1716	30	19	15	10	75
LHM	53826	44551	9600	500	7650	62301	83	18	1	14	116
LHP	25015	7045	1886	1115	1111	11157	28	8	4	4	45
LLD	132097	44971	14250	4628	6156	70005	34	11	4	5	53
LLS	930150	390927	41014	20818	61353	514112	42	4	2	7	55
LNP	2684	651	251	45	109	1056	24	9	2	4	39
LTL	66171	38724	7055	1055	3453	50287	59	11	2	5	76
NK	478607	219929	40990	47694	48809	357422	46	9	10	10	75
OTB	15960824	5018969	2841740	1031858	1437186	10329753	31	18	6	9	65
OTM	152631	47340	21466	11941	14997	95745	31	14	8	10	63
OTT	9170360	3082730	1669536	676470	838966	6267701	34	18	7	9	68
PTB	2223	505	134	23	104	766	23	6	1	5	34
PTM	546683	176890	81368	27655	38286	324199	32	15	5	7	59
TB	44486	15106	8473	3581	4166	31325	34	19	8	9	70
TBB	137237	49732	24897	8618	18473	101720	36	18	6	13	74
TBS	15180	5646	1269	607	524	8046	37	8	4	3	53
Total	35599656	13231355	5441908	2273291	3082154	24028708	37	15	6	9	67

These results are based on a sample of vessels and are not representative for the actual revenue and costs by gear type.

Open questions and suggested next steps are:

- Try to repeat similar calculation for an entire fleet.
- When data at disaggregated level are only available for a part of the fleet, is it reasonable to apply this method to available data and then apply cost structures to the rest of the fleet to get complete results? (sample rate threshold, significance should be discussed).
- Find some variables other than the Revenue (and available at disaggregated level) with close correlations to costs, which may be used for this method.
- Try a combination of variables (e.g. a linear model) if give better results.
- Make some comparisons between regions/member states.

The German example

Sample characteristics

Table 7 describes the composition of the German sample provided for data analysis at the workshop.

The cost data have been provided by an accountant's network. Capacity and effort data are derived from the fleet register and from logbooks.

Table 7 Characteristics of the sample for the German fleet

Length	DFN	DTS	FPO	HOK	PG	TBB	total
VL0010					75	6	81
VL1012		3			21	3	27
VL1218	4	24	1	1		57	87
VL1824	1	13				28	42
VL2440		7				1	8
total	5	47	1	1	96	95	245

Crew cost

The data sets show that for the entire sample Crew costs are to some extent correlated with the annual Revenues (Fig. 14). Several data points indicate that the Revenue is below the Crew costs, i.e. the Revenues do not even cover the expenses for labour. This is indicated by the blue line in Fig. 15 – which provides some evidence that also the Crew cost per crew member is somewhat correlated with the Revenue per crew member. Fig. 16 indicates that the Revenue per vessel can vary broadly even with the same crew size. In tendency, higher Revenue also requires a larger crew size.

It has to be kept in mind that the crew costs usually do not include the value of the owner's labour.

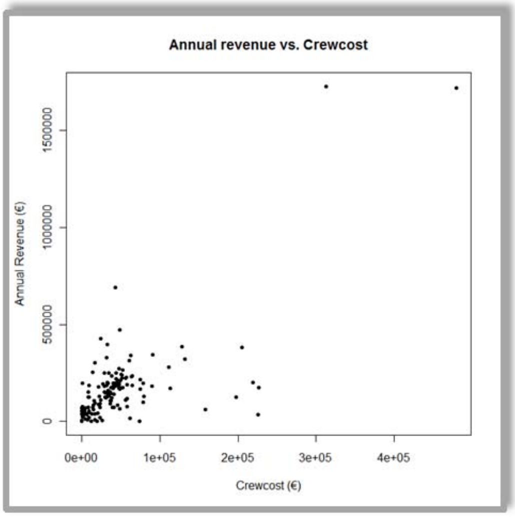

Fig. 14 Annual revenue vs. Crew costs

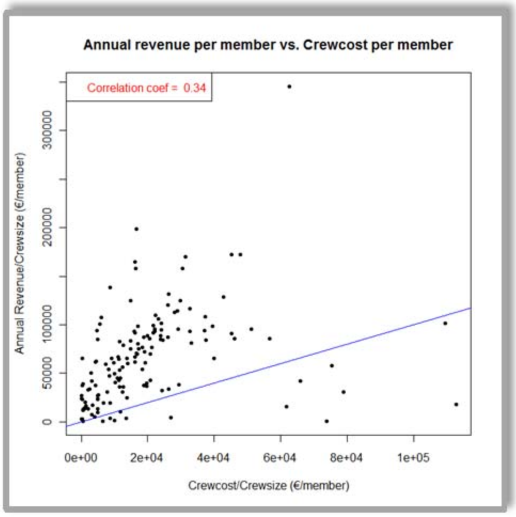

Fig. 15 Annual revenue per member vs. Crew costs per member

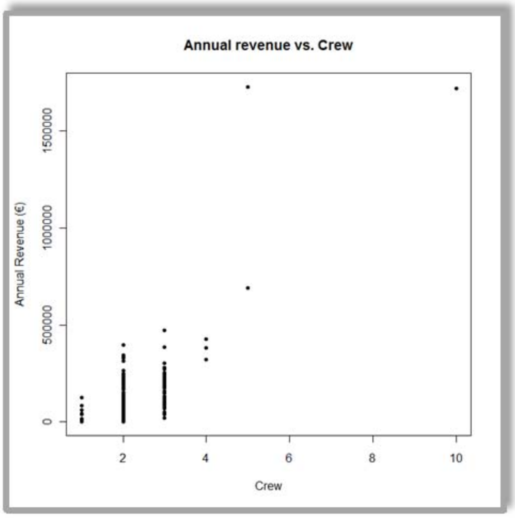

Fig. 16 Annual revenue vs. Crew size

Energy costs

The Energy costs in relation to the Days at sea times the kW show a tight correlation (Fig. 17) The more kW is used, the more Energy costs are produced. Energy costs are also dependent on the vessel length (Fig. 18)

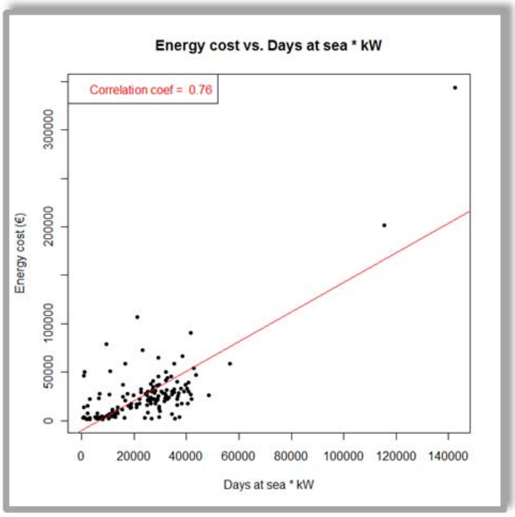

Fig. 17 Energy cost vs. Days at sea*kW

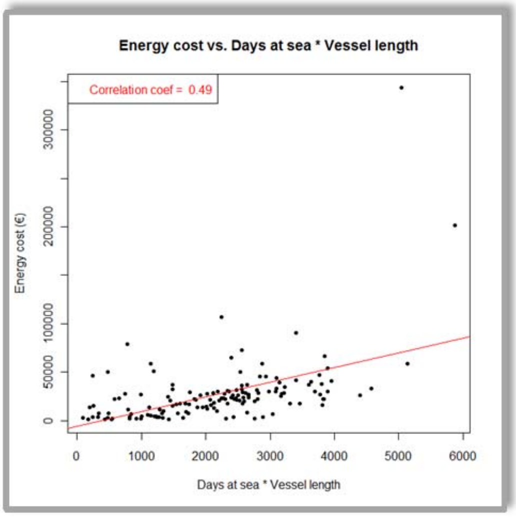

Fig. 18 Energy cost vs. Days at sea*Vessel length

For the fleet segment of the demersal trawlers and demersal seiners (DTS) the correlation between Energy costs and Days at sea *kW (Fig. 19) as well as Days at sea * Vessel length (Fig. 20) seems to be higher in comparison to other fleet segments. The capacity indicator 'kW' appears to slightly exceed the capacity indicator 'vessel length' as cost driver.

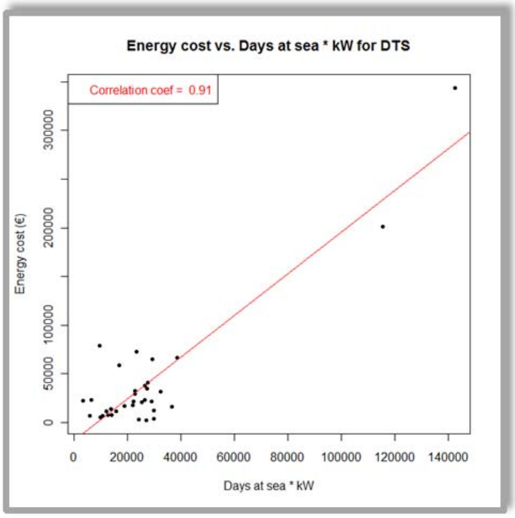

Fig. 19 Energy cost vs. Days at sea*kW for DTS

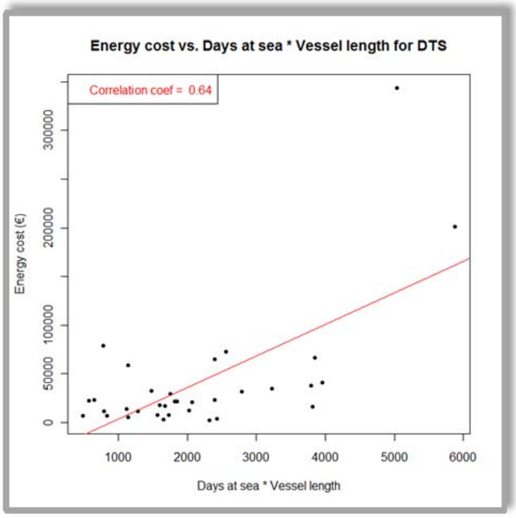

Fig. 20 Energy cost vs. Days at sea*Vessel length for DTS

For the Beam Trawlers (TBB), for example, there is no tight correlation (see Fig. 21and Fig. 22).

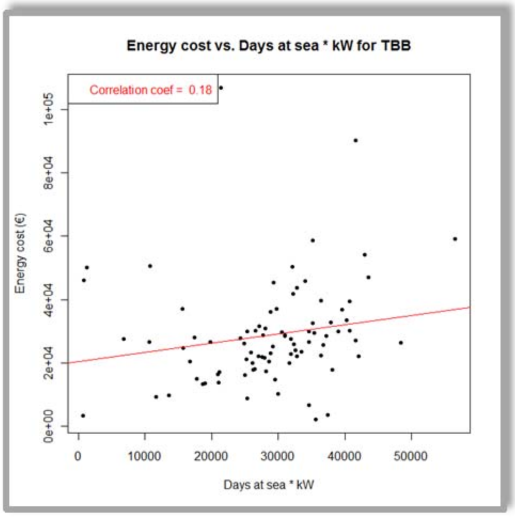

Fig. 21 Energy cost vs. Days at sea*kW for TBB

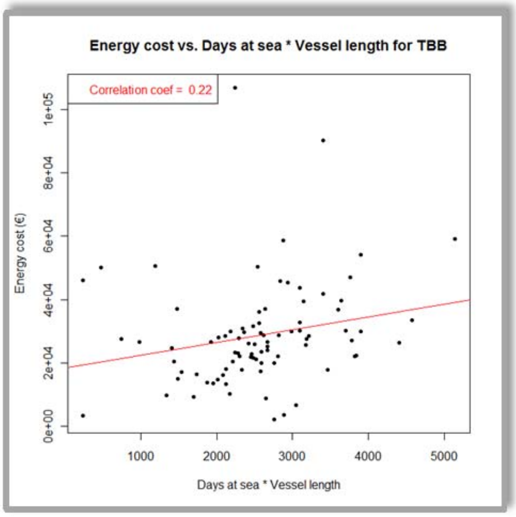

Fig. 22 Energy cost vs. Days at sea*Vessel length for TBB

Repair and maintenance costs

For the total fleet, the correlation between Repair and maintenance costs and the effort and capacity used (Fig. 23 and Fig. 24) bears a strong analogy to the correlations of Energy costs. This analogy is also reflected in the calculations of this variable for the demersal trawlers and seiners (Fig. 25), but not as clearly for beam trawlers (Fig. 26).

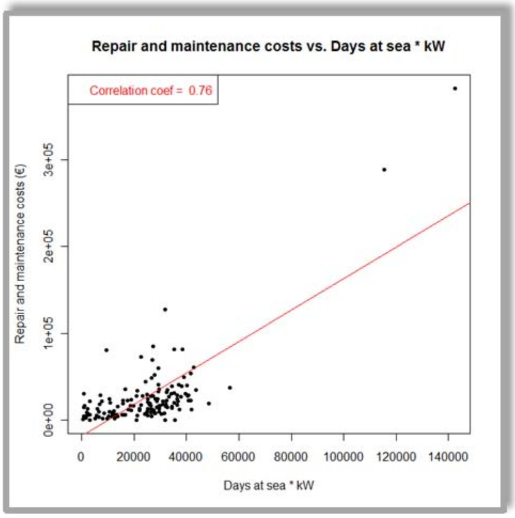

Fig. 23 Repair and maintanance costs vs. Days at sea*kW

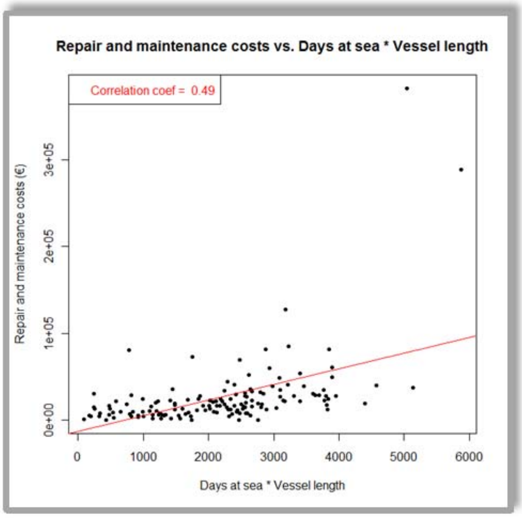

Fig. 24 Repair and maintanance costs vs. Days at sea*vessel length

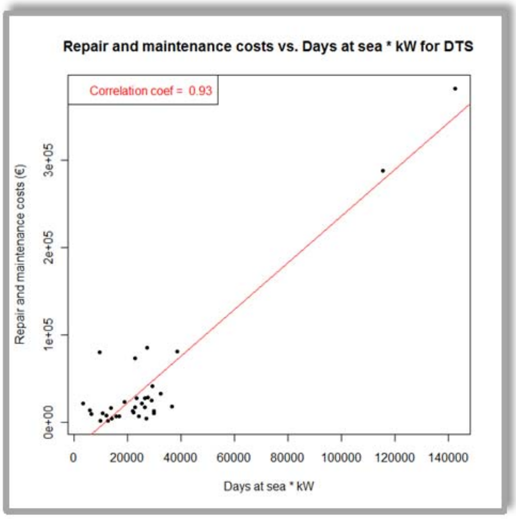

Fig. 25 Repair and maintanance costs vs. Days at sea*kW for DTS

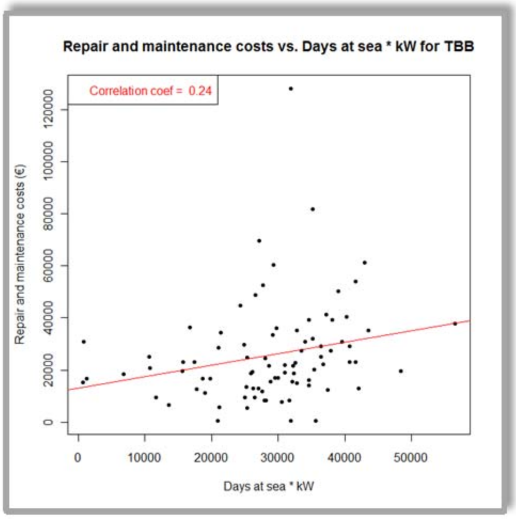

Fig. 26 Repair and maintanance costs vs. Days at sea*kW for TBB

Other variable costs

Other variable costs are somewhat correlated with capacity and effort as cost drivers as well (Fig. 27 and Fig. 28). It has to be mentioned that these only play a minor role in comparison to the other variables investigated.

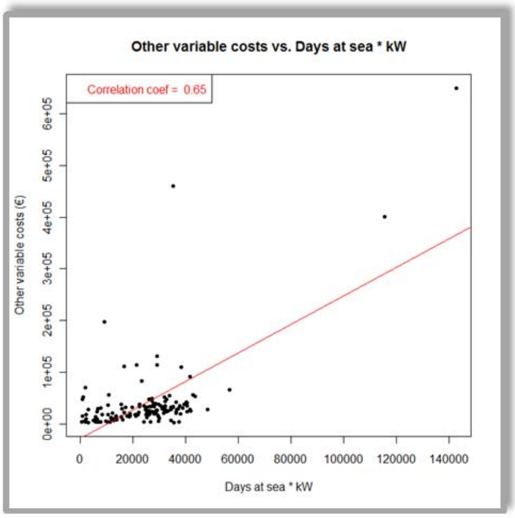

Fig. 27 Other variable costs vs. Days at sea*kW

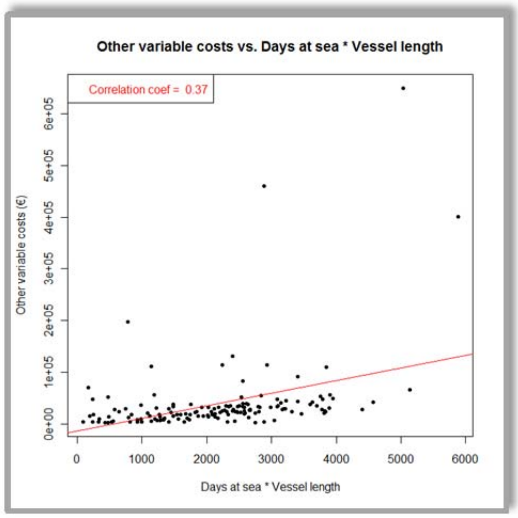

Fig. 28 Other variable costs vs. Days at sea*Vessel length

Summary

All in all, as in the French case, the following could be observed:

- Crew cost is correlated to Revenue.
- Energy cost, Repair and maintenance cost and Other variable costs are correlated to Days at sea * kW.

The correlation varies by segment. KW appears to be a better capacity indicator than vessel length.

The Lithuanian example

Data availability

At the workshop, Lithuania has provided data relating to effort, Landings, Revenue and cost for four vessels that operated in different métiers during 2009. Three of the vessels included within this sample were similar in capacity, whilst the other is several times larger. They are from two different fleet segments. The capacities of all four vessels constitute approximately two percent of the entire Lithuanian fleet. Effort, Revenue and Landings are derived from logbook and sale notes. Cost data are provided on the basis of statistical annual reports.

As the sample is of rather small size, the data are displayed more for illustrative purposes rather than for drawing profound conclusions.

Wages and salaries of crew

The data sets of annual Revenue against Crew cost reflect some correlation (Fig. 29) However, even within the same fleet segment Crew costs can vary by vessel. It is quite evident that the size of the vessel (vessel length) has a strong influence on the Revenue (Fig. 30)

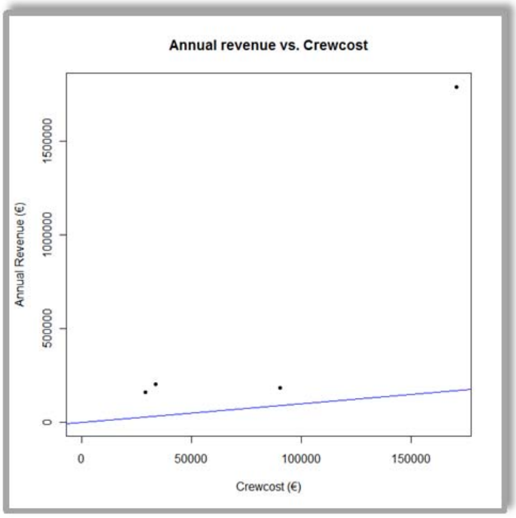

Fig. 29 Annual revenue vs. crew cost

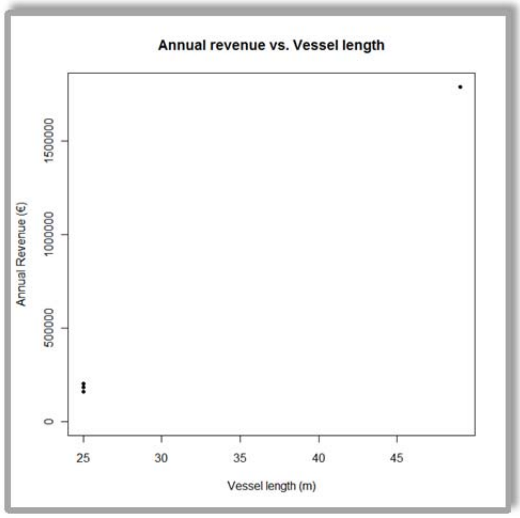

Fig. 30 Annual revenue vs. vessel length

Energy costs

High correlation coefficients between Energy costs and Day at sea*kW (Fig. 31) as well as between Energy costs and Days at sea* vessel length (Fig. 32) are observed, but they are also due to the low number of data.

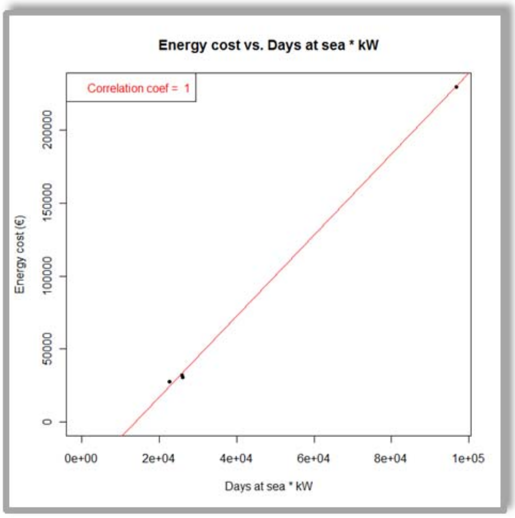

Fig. 31 Energy cost vs. Days at sea*kW

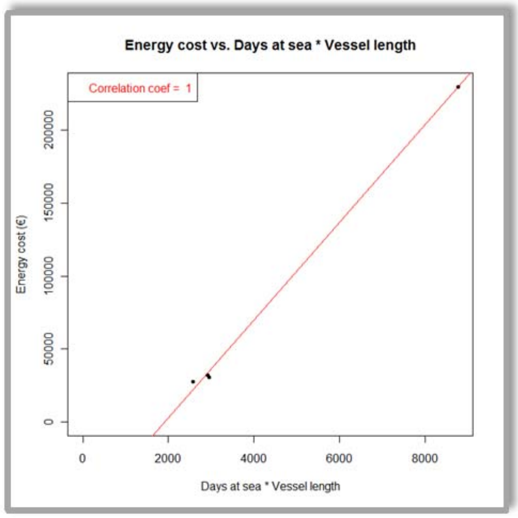

Fig. 32 Energy cost vs. Days at sea*Vessel length

Repair and maintenance costs

As expected due to the small sample size, correlation of Repair and maintenance costs against Days at sea* kW (Fig. 33) and Days at sea * vessel length (Fig.34) are high.

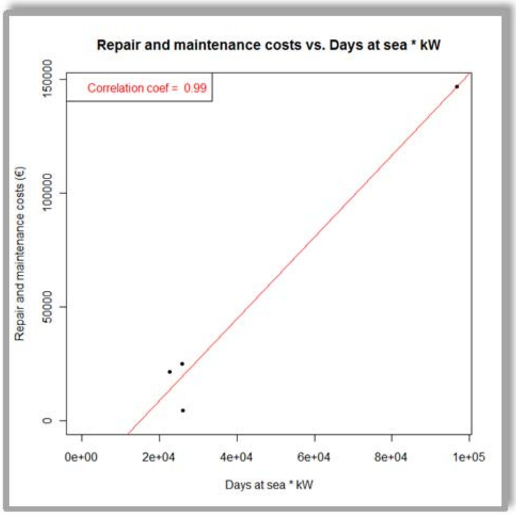

Fig. 33 Repair and maintenance costs vs. Days at sea*kW

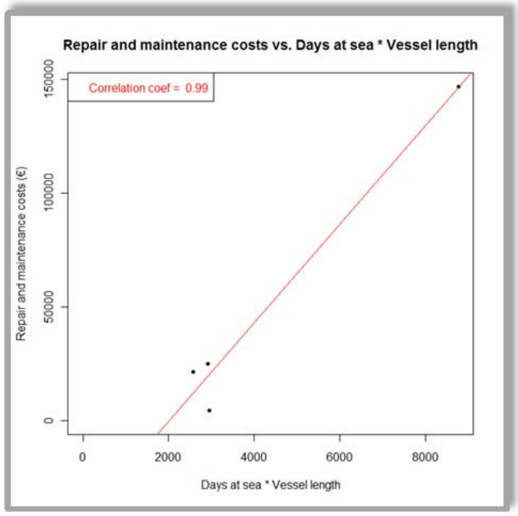

Fig.34 Repair and maintenance costs vs. Days at sea*Vessel length

Other variable costs

Analysis of the correlation between Days at sea* kW and Days at sea * Vessel length on Other variable costs are reflected in Fig. 35 and Fig. 36. As shown previously, there is perfect correlation. As the data provided came from only four vessels, there is insufficient information to make a final conclusion.

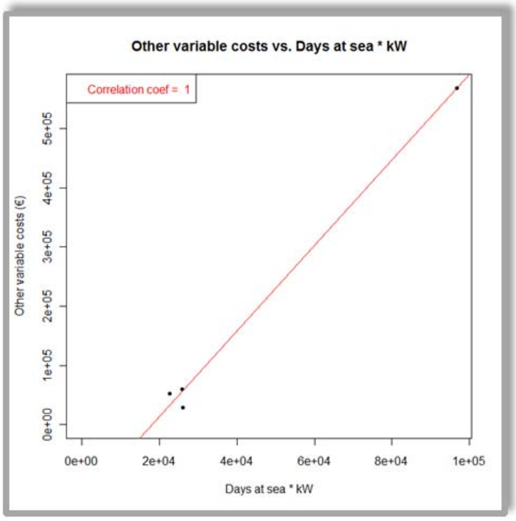

Fig. 35 Other variable costs vs. Days at see*kW

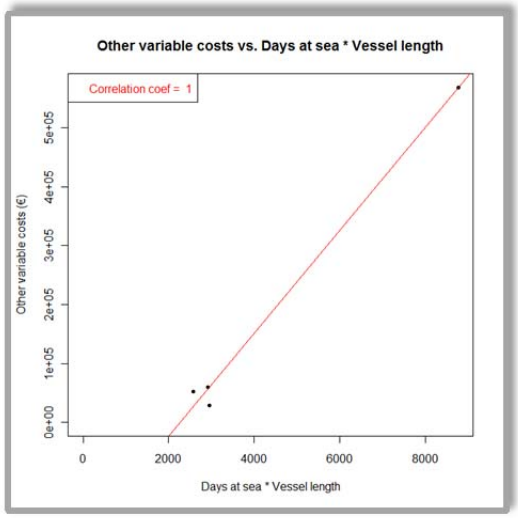

Fig. 36 Other variable costs vs. Days at see*Vessel length

Summary

The provided sample was quite small and does not allow drawing profound conclusions. However, the tendencies in correlation as observed in the examples from other member states can be supported.

The Netherlands' example

Wages and salaries of crew

There seems to be a quite tight correlation between the Crew costs and the annual Revenue (Fig. 37). The annual Revenues directly determine the Crew costs.

On the other hand, the correlation between the Days at sea and the Crew costs is not that clear (Fig. 38). This indicates that the Crew costs are dependent on another variable, e.g. the vessel size.

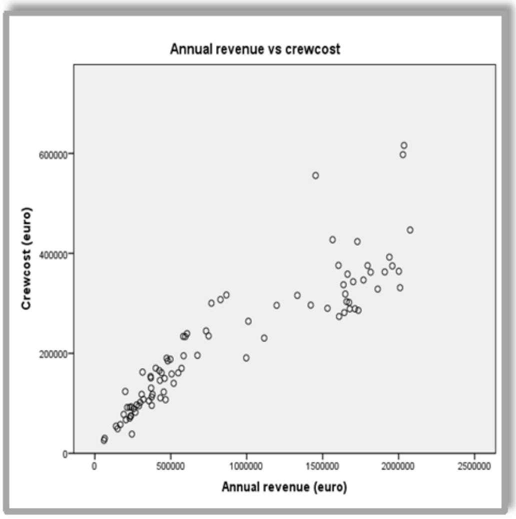

Fig. 37 Annual revenues vs. crew costs

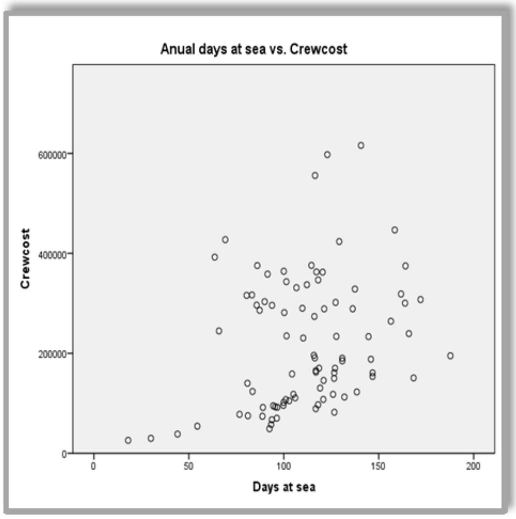

Fig. 38 Annual days at sea vs. Crewcost

Repair and maintenance costs

The Repair and maintenance costs and the kW of the vessels do not indicate a high correlation (Fig. 39) The fleet structure seems to consist mainly of vessels with about 250 kW and 1500 kW. Within these ranges, the Repair and maintenance costs exhibit a high variance.

There is a certain dependency between the Days at sea and the Repair and maintenance costs (Fig. 40). Still, the correlation structure is quite diverse. The Repair and maintenance costs are likely to depend on other variables as well, e.g., the technical constitution, age, and size of a vessel.

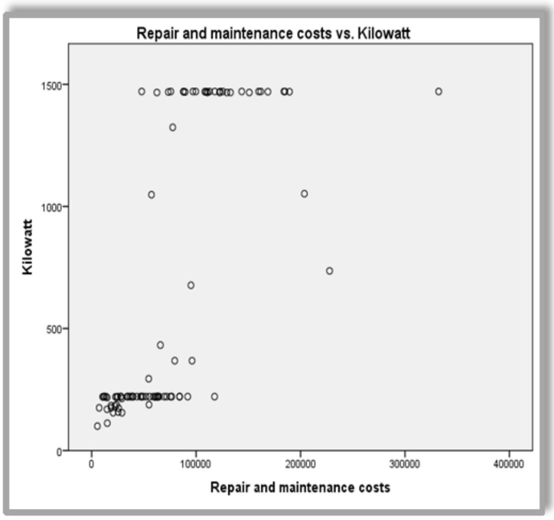

Fig. 39 Repair and maintenance costs vs.Days at sea*kW

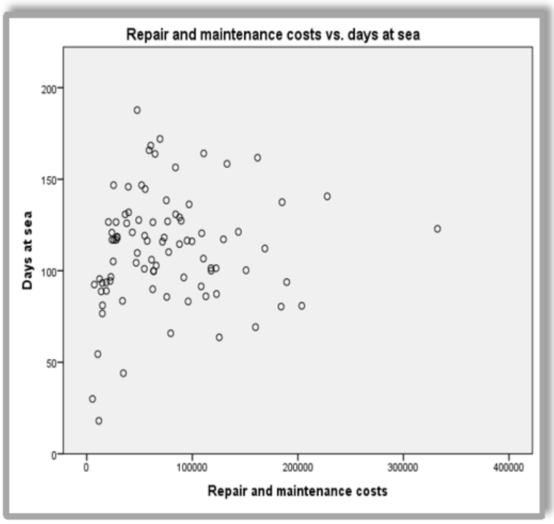

Fig. 40 Repair and maintenance costs vs.Days at sea

The correlation structure between the Repair and maintenance costs and the gross tonnage appears to be quite tight (Fig. 40). Again, this correlation reflects a concentration of the vessel structure within a gross tonnage range of about 80GT and 500GT.

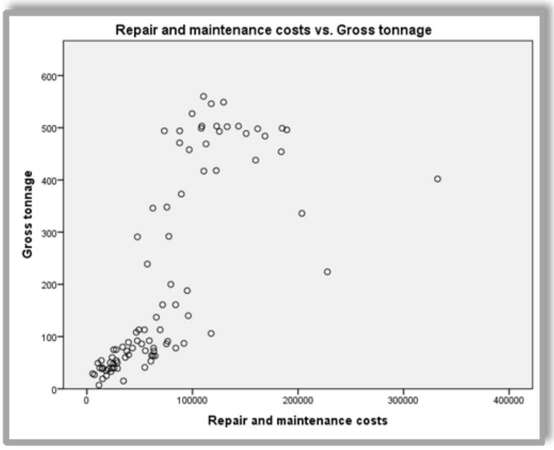

Fig. 41 Repair and maintenance costs vs. Gross tonnage

An analysis of the Repair and maintenance costs by gear is illustrated in the following.

The correlation between Days at sea and the Repair and maintenance costs is displayed in Fig. 42-Fig. 45, separated by fleet segments. Even though the correlation between the two variables does not appear to be very close, there is a clear and evident tendency of Repair and maintenance costs increasing with Days at sea. However, there are to be other factors influencing these costs, such as vessel size or vessel age.

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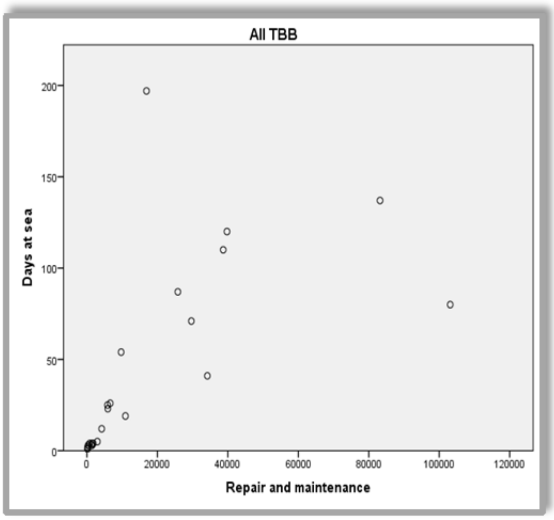

Fig. 42 Repair and maintenance costs vs. Days at sea for TBB

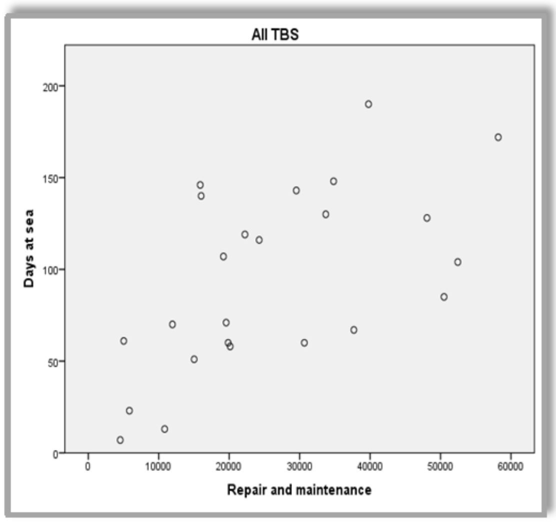

Fig. 43 Repair and maintenance costs vs. Days at sea for TBs

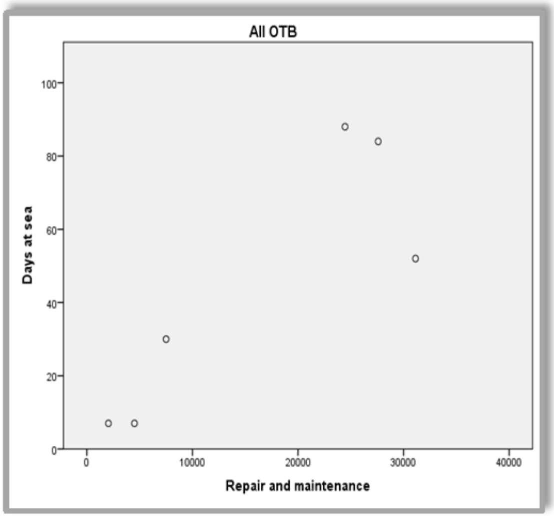

Fig. 44 Repair and maintenance costs vs. Days at sea for OTB

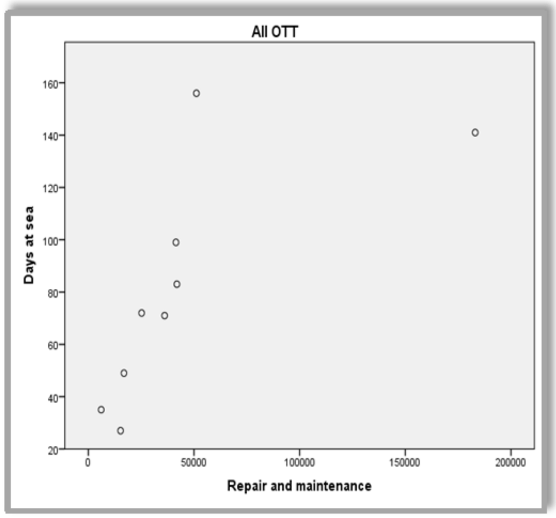

Fig. 45 Repair and maintenance costs vs. Days at sea for OTT

The following table gives an example of the data used. It comprises the total costs aggregated over the gear.

Table 8 Overview over the totals of the variables from the sampled vessels (Netherlands)

Fishing Technique	Days at sea	Repair and maintenance costs	Energy cost	Energy consumption	Revenue	Volume	Variable cost
OTB	268	97233	381082	745366	1341281	311776	219341
OTT	733	417139	926267	1582022	3364859	1162404	483456
TBB	1035	425275	1695011	3095810	5233789	1163459	691255
TBS	2269	625727	1563963	2796661	7595346	1649943	1249009

NB: OTT stands for otter twin trawl, and TBS is beam trawl on shrimp.

Summary

Repair and maintenance costs appear to rise when the number of Days at sea increases. While TBB have the highest Energy costs and also show the highest Energy consumption, the variable costs are highest for the TBS fleet segment. The latter appears to be as well the segment with the highest Revenues.

The Polish example

Data availability

Poland delivered capacity, effort, Revenue, Landings and cost data from 2009 for 207 vessels which constitutes about 30% of the total population. The coverage rate varied among fleet segments from 5% to 32% (table 1). Polish cost data are collected on annual questionnaires. Effort, capacity, Revenue and Landings are derived from administrative databases (logbook, sales notes and fleet register) and are available on a daily basis.

Only data for these vessels for which a sufficient level of confidentiality (i.e. more than 3 units in aggregation) was ensured could be provided. This caused that vessels of distinct technical characteristics could not be shown. In order to increase the number of available units GT and kW was rounded to the decimal (i.e. 154 kW = 150 kW).

Table 9 Number and capacity of the fleet subject of workshop test

		sample			% of total population		
Tech	**VesLen**	**No of vessels**	**GT**	**kW**	**No of vessels**	**GT**	**kW**
PG	VL0010	159	456	4180	32%	26%	25%
	VL1012	9	100	590	14%	13%	12%
HOK	VL1218	6	190	720	16%	14%	12%
DFN	VL1218	7	240	790	28%	32%	26%
DTS	VL1218	5	100	430	10%	7%	5%
	VL1824	1	40	120	5%	3%	2%
	VL2440	1	140	420	10%	12%	14%
TM	VL2440	19	2800	7820	31%	32%	32%
TOTAL		207	4066	15070	27%	23%	21%

Small vessels with an overall length not exceeding 10 m, using passive gears dominated in the analyzed data, which more-less reflects the relative structure of the total Polish fleet. In case of these vessels Crew costs can be underestimated due to the problem of unpaid labour of the fishing vessel owner. A very small number of units belonging to HOK (6 vessels) DFN (7 vessels) or DTS (7 vessels) makes it difficult to draw common conclusions.

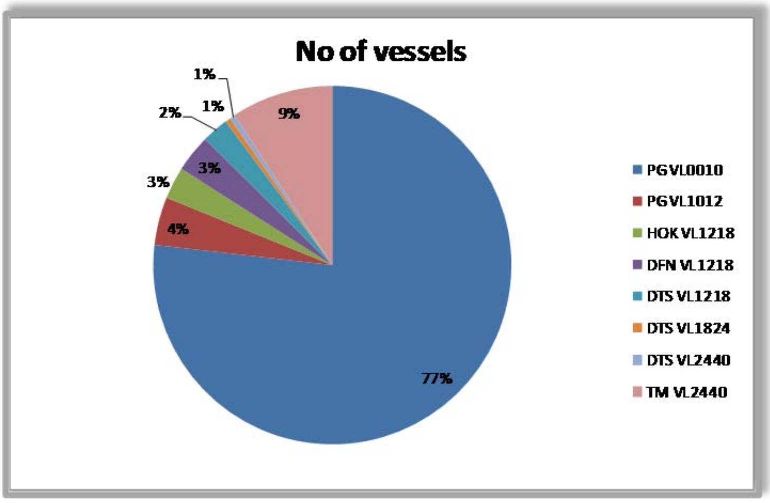

Fig. 46 Relative number of vessel analyzed by fleet segment.

Crew costs

The calculations proved a high correlation between annual Crew costs and annual Revenues produced by the vessels. This should not be surprising since in Poland the remuneration is often a share of the value of the catch. Nevertheless, as pointed out above, in case of small vessels the Crew cost may be underestimated (limited to social security costs only) or zero Crew costs are reported. This explains why so many observations on the graph are close to zero (Fig. 47). Moreover, some correlation between vessel length and crew costs has been observed (Fig. 48) which is rather straightforward since bigger vessels produce usually higher revenues.

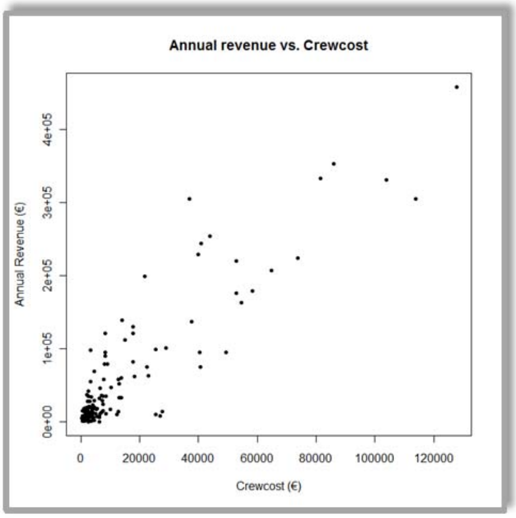

Fig. 47 Annual revenue vs. Crewcost

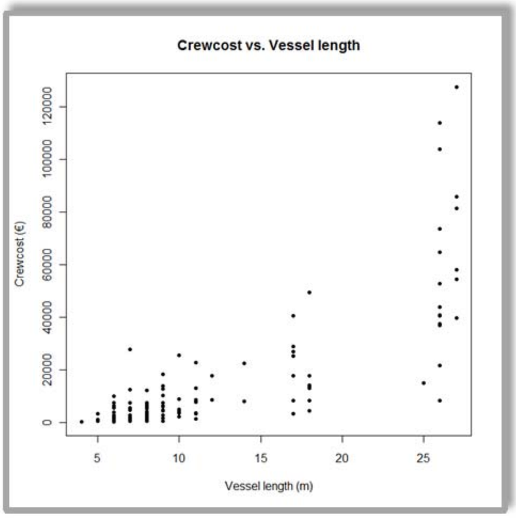

Fig. 48 Crewcost vs. Vessel length

Energy costs

Very high correlation (close to 1.00) between vessel size and Days at sea versus Energy costs was observed (Fig. 49). Since Days at sea and engine power (kWdays) are available at high resolution level they may serve as very good indicators for allocating Energy costs to different métiers. Correlation coefficients remained at high level (0.9) for two segments (DTS, TM) and 0.8 for HOK. Two segments are characterized by low correlation - DFN (0.31) - and PG (0.34). Additional tests may be useful to check whether it is the result of different fishing techniques applied i.e. passive gears, or whether it can be explained by a small number of observations for DFN as well as underestimated Energy costs for the PG segment, for which data are usually not derived from bookkeeping or any other formal records.

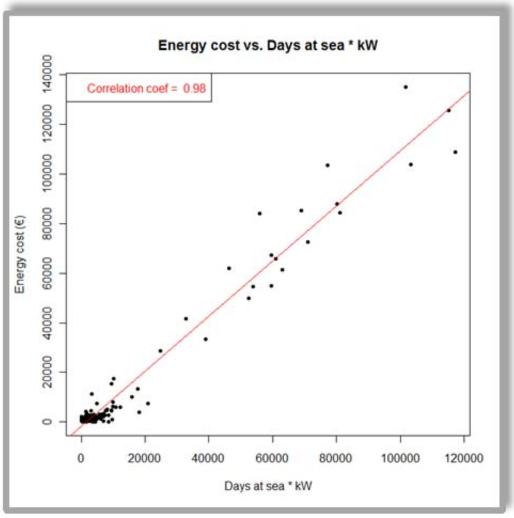

Fig. 49 Energy cost vs. Days at see*kW

Repair and maintenance costs

Repair and maintenance costs were check against Days at sea and vessel size (kW and length). Poor correlations were observed for all analyzed fleet segments. Achieved results are presented in Fig. 50 - Fig. 52. For the Polish sample, Days at sea do not appear to be an explicit driver for Repair and maintenance costs. Despite of some vessel repairs (often minor) that are made during the year, the most costly ones may occur once every couple of years and as such may not reflect the intensity with which vessel was used during the year but also years prior to the repair. Another explanation may be the specific cod quota allocation system that was in use in Poland in 2009 which caused that a part of the fleet had to suspend cod fishery and got a financial compensation in return. These vessels might use additional non fishing days for repairs using compensation money. If it is the case, Repair and maintenance costs may be even negatively correlated with Days at sea.

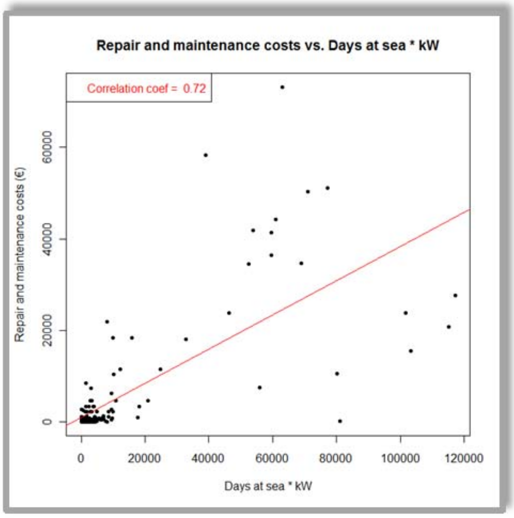

Fig. 50 Repair and maintenance costs vs.Days at sea*kW

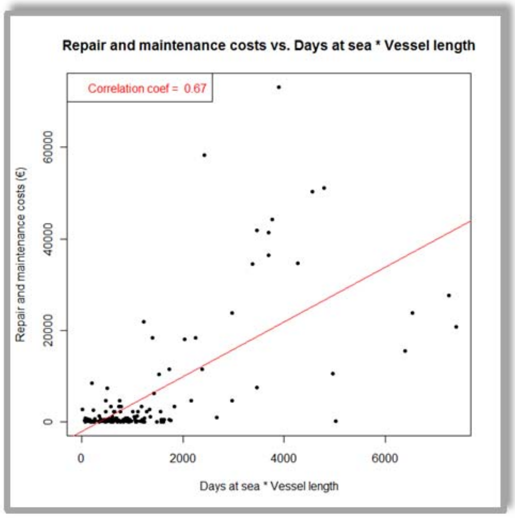

Fig. 51 Repair and maintanance costs vs. Days at sea*vessel length

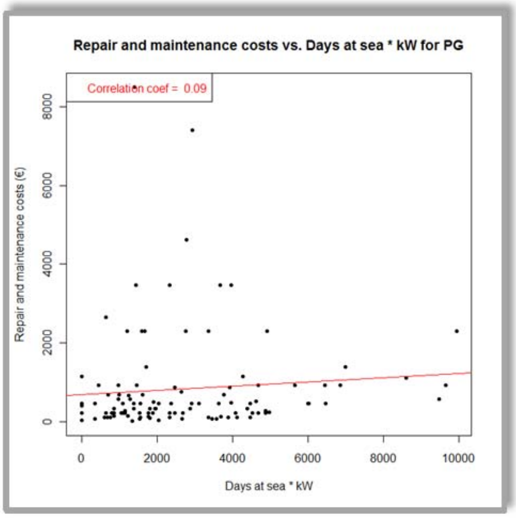

Fig. 52 Repair and maintenance costs vs.Days at sea*kW for DFN

Other variable costs

In the Polish case, Other variable costs mainly constitute of costs for fishing gear (40%), food (17%), ice (15%), protective clothes (5%) and other materials (23%). For all tested vessels this cost item, similarly to energy costs, correlates with time that vessels spend at sea and its size (either measured by length or engine power – see Fig. 53 and Fig. 54).

The results for specific segments were similar to those achieved from the analysis of Energy consumption. Other variable costs

No or low correlation were observed for DFN (negative value) or PG (0.29-0.41). These are vessels segments that deploy mainly passive gears. A quite high correlation (0.83-0.85) was observed for data on TM segments, which seem to be the most reliable (based on book keeping information).

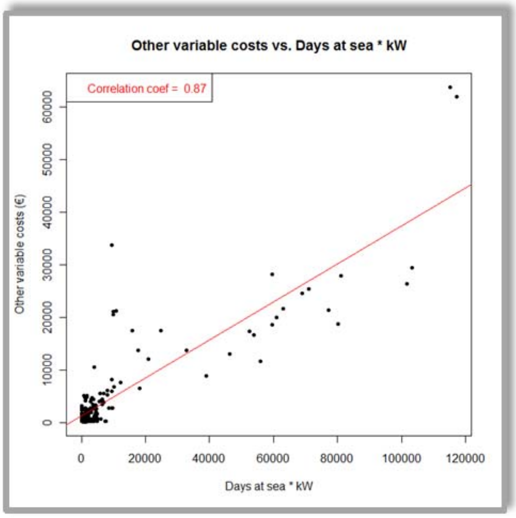

Fig. 53 Other variable costs vs. Days at sea*kW

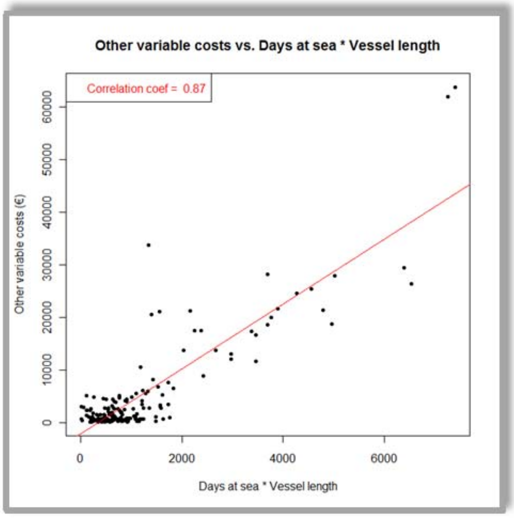

Fig. 54 Other variable costs vs. Days at sea*Vessel length

5. Data quality and availability

Plots of transversal vs. cost data have indicated moderate or strong scattering. Three main reasons have been discussed.

Firstly, it is likely that vessels/companies vary by certain characteristics. For example, an older vessel might operate less fuel-efficiently than a newer one, even though both are of the same size. There might be also differences in steaming behavior between similar vessels, which will also affect the Fuel consumption and therefore Fuel cost.

Secondly, some costs might incur at lower frequencies than the sampling. For instance, the class has to be renewed only every 4 years. This can imply particularly high Repair costs and class fees in one year, but considerably lower amounts in the intermediate years. This phenomenon refers mainly to costs which accrue at longer intervals. Thus it will be less likely in the case of Crew cost and Fuel cost. But even in these cases some expenses might be accounted for out-of-period, for instance if fuel has been bunkered in the precedent year or if bills have been paid in the subsequent year.

Thirdly, scattering can be caused by wrong data. The reasons for that might be manifold and range from typographic errors to lack of accounting and imprecise estimates by the vessel owner, ambiguous wording in questionnaires, misunderstandings and intentional misreporting. A typical case of evidently wrong data is a vessel with some effort but zero Fuel cost. A special case is related to Crew cost. For some vessels, Crew cost is accounted for without the owner, for other vessels the owner's salary might be included.

Mistakes might occur in both transversal and cost data. Transversal data (capacity, Landings and effort) are in most cases collected under certain legally binding regulations, which are associated with the option of enforcement and fines. Under these circumstances it is at first glance more likely that these data are more reliable. In contrast, in several member states there is no legal obligation for fishing companies to provide cost data. In these cases no measure of enforcement or fining is established, and data are provided on a voluntary basis.

Table 10).

Table 10 Availability of data under consideration in the context of disaggregation and some characteristics

MS	variable	source	comments	temporal resolution	spatial resolution
all	effort, species, gear characteristics, region	logbook	not available for vessels <8m (Baltic), <10m, most of MED, BS, French overseas depts.; see Implementation of Control Reg no. 2011/404, (for NLD: available for all vessels)	daily (hourly)	statistical rectangle (but if a trawl crosses several rectangles, only one rectangle is reported)
all	effort, species, gear characteristics, region	surveys, panel (NL except for region),	in case logbooks are not available (mandatory to provide in LTU)	monthly (LTU), trip (NLD)	none (can be derived from port for small vessels)
all	capacity	fleet register	exhaustively available	daily	NR
all	species, revenue, weight	sales notes, landings declaration	exhaustively available, except for French overseas departments	as logbook or effort source	as logbook or effort source
FRA	species, revenue, weight	surveys	MED, French overseas departments	daily (sample per trip)	none (can be derived from port for small vessels)
LTU	all variable cost data (crew, fuel, rep&maint., other var. cost)	business statistics	legal obligation to provide data	annual	NA
NLD	all variable cost data (crew, fuel, rep&maint., other var. cost)	panel	some segments ("medium size")	daily	NA
POL, FRA, NLD, DEU	all variable cost data (crew, fuel, rep&maint., other var. cost)	survey	(POL: legal obligation to provide data)	annual	NA
NLD, FRA, DEU	all variable cost data (crew, fuel, rep&maint., other var. cost)	accountants' network	some segments ("medium size")	annual	NA

6. The use of VMS data for allocation of effort and earnings

An approach of using vessel monitoring system (VMS) data to enhance the spatial resolution of effort and landings has been presented. The procedure is based upon the analysis of position, speed and heading information as provided with the VMS data. Trawling is identified through the velocity profile, and the total catch, which is derived from logbooks. The approach is being used to assign effort and landings to 3 nm squares, i.e. an ICES rectangle is being disaggregated into 100 squares. A typical example for the application of this method is marine spatial planning. Given a close correlation with effort/landings, also cost data can be estimated for smaller spatial units. For details see H. Fock: Fisheries in the context of Marine Spatial Planning: Defining principal areas for fisheries in the German EEZ. Marine Policy 32, 728-739 (2008).

7. Further issues

A presentation on cost accounting was given. Several issues have been illustrated, e.g. the differentiation of direct and indirect costs, the identification of cost drivers or the suitability of activity based cost accounting.

The Dutch procedure for determination of the métier for a fishing activity has been presented. Most of the information required is derived from logbooks (gear, target assemblage, mesh size group). An encoding table is required to transfer logbook entries into the code as required under the DCF métier specification.

List of figures

List of tables

8. <u>Appendix: the templates distributed in preparation of the workshop to request exemplary input data for analysis</u>

Instruction sheet

The attached tables should serve as templates for providing data which can be used for exemplary calculations. It is always helpful to have data available in the same format. We do not need data for the entire fleet, just a reasonable set as basis for further analysis.	
General	
file name	please replace "MS" in the file name by your 3-letter country code
vessel selection	choose vessels for which all data are available
currency	provide all values in Euro, if feasible
vessel ID	use an unambiguous and anonymous ID for each vessel, starting with 3-letter country code
sheet "capacity"	from fleet register, segmentation as in DCF appendix III
Nat	use 3-letter country code
LoA	length over all **<u>(rounded to meters)</u>**
GT	gross tonnage (if gross tonnage allows to identify the vessel, please alter it slightly)
kw	kilowatt (if kW allows to identify the vessel, please alter it slightly to ensure confidentiality)
crew	number, from fleet register
Tech	use 3(2)-letter code as in data call
VesLen	Vessel Length class; use "VL…." as in data call
sheet "cost"	as defined in DCF appendix VI
crewcost	wages and salaries of crew
fuelcost	energy costs
fuelcons	energy consumption, in litres
repmaint	repair and maintenance costs
othvarcost	variable costs (other operational costs)
sheet "land_effort"	
trip_ID	6 digit number to unambiguously identify each trip
volume	live weight of total catch considered
revenue	referring to total catch considered
hrsfished	hours fished, where applicable, see Appendix VIII DCF
seadays	days at sea as defined in DCF
fishdays	fishing days as defined in DCF
division	Level 3 (or 4, where available) stratification, see Appendix I and https://datacollection.jrc.ec.europa.eu/web/dcf/wordef/fishing-area
metier	preferably use coding as provided in http://www.ices.dk/pubs/crr/crr296/CRR%20296.pdf page 34 ff e.g. "GNS_DEF_110-156_0_0"; see also DCF appendix IV

Capacity sheet, header

Nat	Vessel_ID	LoA	GT	kw	crew	Tech	VesLen

Cost sheet, header

Vessel_ID	crewcost	fuelcost	fuelcons	repmaint	othvarcost

Landings and effort sheet, header

Vessel_ID	trip_ID	volume	revenue	hrsfished	seadays	fishdays	division	metier

NB: it turned out that it would have been beneficial to provide landings and effort data in separate tables.