

# Survey of Finnish coastal area wreck diving practices

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## 1. Introduction

The cultural heritage of the Baltic Sea is exceptional, and it harbors an abundance of shipwrecks from centuries of intense trade and conflict and various other traces of the area's history (Interreg Baltic Sea Region Project library 2019). This survey was conducted by Metsähallitus Parks & Wildlife Finland and it is part of the BalticRIM project which is funded by the Interreg Baltic Sea Region program. BalticRIM aims to highlight the value of underwater cultural heritage sites and integrate cultural heritage management into maritime spatial planning in the Baltic Sea area. Coastal and underwater cultural heritage such as shipwrecks and archaeological sites are not systematically included in maritime spatial plans in the Baltic Sea area even though they can help cities and regions to brand themselves and promote tourism (Interreg Baltic Sea Region Project library 2019). The BalticRIM project helps to identify significant maritime cultural heritage. The European Commission has selected BalticRIM as a project under the European Year of Cultural Heritage 2018 and the project has also received the status of Flagship Project of the priority area of the EU Baltic Strategy.

Promoting Baltic Sea tourism by raising awareness of underwater cultural heritage is an important part of the project. This survey was targeted to wreck divers and the aim of this survey was to collect information on wreck diving in the Finnish coastal areas and the development needs connected to wreck diving. Emphasis was in the perspectives and opinions of the divers especially on general developmental needs and on wreck sites that need development as well as preferred wreck sites. The information gathered in this survey is important when developmental needs for the Finnish coastal areas are assessed in general terms and can be used to develop and foster tourism in the Baltic Sea.

## 2. Methods

The survey was conducted online through Maptionnaire ([maptionnaire.com](http://maptionnaire.com)). Maptionnaire is a map-based survey tool which allows the participants to visualize map-based data and mark their own specific sites on the map in addition to answering more conventional survey questions. The questions and layout of the survey was planned by Metsähallitus with the valuable help provided by The Finnish Heritage Agency and the Finnish Divers' Federation (Sukeltajaliitto ry).

The survey was open for online participation from 13.5.2019 until 17.7.2019 and it was advertised online through the official website of Metsähallitus and social media channels of Metsähallitus. The Finnish Divers' Federation advertised the survey on their website and further informed their members about the survey in two newsletters sent out in May and in June. The link to the survey was also shared on Facebook's popular diving related group 'dyykkiremmi' and on the Finnish Divers' Federation Facebook page. Additionally, the Finnish public service media YLE News wrote a small article about the survey and BalticRIM project and the survey was further advertised in YLE radio news. Participation in the survey was made possible in three languages: Finnish, Swedish and English and the questionnaire can be found in the attachments both in Finnish and English.

The questionnaire included background questions, actual topic questions and a map-based section. Background questions included questions about participants' age, diving experience in years and diving experience in dives made, diving intensity i.e. the amount of wreck dives made per year, home town, gender and education. Actual questions can be divided into following groups:

1. Questions on wreck diving areas on the Finnish coast and wreck diving areas elsewhere in the Baltic Sea (other Baltic Sea countries).
2. Questions about the factors that affect wreck site selection. Factors were divided into 3 groups: factors related to the wreck itself, factors related to the location and surroundings of a wreck and factors related to nearby services. The questions were Likert scale questions and participants chose

how any specific factor affects their wreck site choice (e.g. question 'there are no strong currents at the wreck dive site' with answering options 'very big effect', 'rather big effect', 'not big or small effect', 'quite small effect', 'very small effect' and 'I cannot say'). All the separate factors that were queried can be found in the questionnaire in the attachment and in Fig. 6, 7 and 8 in the results.

3. Questions related to advantages in wreck diving: participants were asked how they feel that their wreck diving experience is affecting their overall health and well-being. Questions were in the form of propositions: 'my social well-being increases (e.g. improvement in ability to work, strengthening relationships, enjoying working together or being alone)'; 'my psychological well-being increases (e.g. satisfaction in life, improvement in general mood, recovery from stress, learning new things)'; 'my physical well-being increases (e.g. maintaining physical fitness, acquiring new skills, physically feeling good)'. The questions were Likert scale questions and options were 'strongly agree', 'agree', 'neutral', 'disagree', 'strongly disagree'.
4. The features of a good dive site were asked about in an open field question ('describe in three words which features make a good wreck diving site'), and travelling to dive site was queried with 3 options ('by dive club's boat', 'by my own or friend's boat', 'by commercial operator's boat')
5. General opinions if wreck sites should have buoys, marked underwater routes and underwater information boards were asked with 'yes' and 'no' question type. Participants could also write in an open field a wreck site's name that in their opinion would need any one of those.
6. Readiness to use services provided by a commercial dive company was queried by a 'yes' and 'no' question type and participants could also write in an open field in which areas they would be willing to use services provided by a commercial dive company.
7. Participants were asked with 'yes' and 'no' question type whether in their opinion Finnish coastal areas should have artificial reefs to supplement the natural wreck collection (in this context artificial reefs denote deliberately sunken ships for wreck diving purposes).
8. An open field was provided so that participants could provide extra information on how wreck diving in Finnish coastal areas could be further improved in their opinion.

In map-based section participants could mark 1-3 favorite wreck dive sites and 1-3 sites that need development (development could be related to any factor, both in terms of accessibility, lack of nearby accommodation, or lack of information available on the wreck). The base map included spatial information of all known wrecks in Finnish coastal areas so locating certain wrecks was made easier for participants. The wreck data was loaded as a shapefile in Maptionnaire and all wrecks could be identified by the name of the wreck. A pop-up window appeared after the wreck was marked and participants were asked to answer additional questions. Regarding favorite wreck sites, these questions included: 'what makes this place a good wreck diving destination?' (answering options can be seen in results-section in Fig. 10); 'Do you think that some factors can pose a threat to this dive site?' (answering options can be seen in results-section in Fig. 11); and open answer questions 'What kind of services you find important are available in the area near the wreck site?' and 'Is there a possibility of accommodation near the dive site (e.g. Berth/sheltered pier, rental cottages/camping facilities). If so, where?' and 'Is there anything else you would like to mention about this dive site or how its accessibility could be further improved?'. Regarding development needs, these questions included: 'What kind of development would this dive site need?' (answering options can be seen in results-section in Fig. 12) and open answer question 'You can also share more development ideas here'. The survey data was processed in Microsoft Excel and ArcGIS software by Esri.

## 2.4 Statistical analysis

Data of this survey was not weighted because of a small sample size and lack of information on the population. Data can be often weighted with surveys that have thousands of respondents but with small sample sizes the accuracy is reduced greatly (Dorofeev & Grant 2006). Age data and the number of dives

were classified into groups for statistical testing. Age data was skewed so uneven group ranges were used. Response distributions were examined at the whole data level as well as by sex and age group, and diving experience and diving intensity group. Additionally, differences between sea areas were examined. For nominal, ordinal and not normally distributed data nonparametric tests were used. Alpha level of 0.05 (5%) was used in hypothesis testing.

A chi-square test for independence was used to test a relationship between two categorical variables. It compares two variables in a contingency table to see if they are related by using expected frequencies and observed frequencies. In cases where expected frequencies were too small, a Fisher's exact test was used (Fisher 1934). A Fisher's exact test was also used in cases of two-group variables (e.g. women/men; Ranta, Rita & Kouki 2002).

Likert data was treated as ordinal data and handled as Likert item data. Nonparametric tests were used to test relationships between independent variables: Mann-Whitney U test (comparing two groups) and Kruskal-Wallis test (comparing multiple groups). The Kruskal-Wallis test can analyze a model analogous to a one-way analysis of variance. Pairwise comparisons after a significant Kruskal-Wallis test was made by a Dunn post-hoc test with p-values adjusted with Bonferroni correction. The Dunn test is appropriate for groups with unequal numbers of observations (Zar 2010). The Bonferroni correction was conducted to protect from type I errors (when conducting multiple analyses on the same variable, the chance of committing a type I error increases, thus increasing the likelihood of a significant result by chance).

Nonparametric tests, instead of testing differences in means like parametric tests, test whether the ranks in one group are typically larger or smaller than the ranks in the other groups. Nonparametric methods are most appropriate when the sample sizes are small (Ranta, Rita & Kouki 2002). Groups of unequal number of observations can affect the reliability of tests and this is taken into consideration in discussion. Statistical testing and data editing were made in RStudio. The `DunnTest` function from the `FSA` package uses the Dunn method of multiple comparisons (Dunn 1964).

### 3. Results

#### 3.1 Background information and diving habits

The questionnaire survey received answers from 211 participants in total and 223 map answers in total (189 favorite wreck dive sites and 34 wreck dive sites that need development were marked on the map). Not all questions were answered by all participants. Of the 211 participants 113 marked the gender information: 97 male (86%), 15 female (13%) and 1 other (1%). 31% (34) of the participants had a master's degree or equivalent, 31% (33) had the high school/trade school diploma, 18% (19) had the bachelor's degree or equivalent, 10% (11) had junior college diploma, 5% (5) had the doctoral degree, 4% (4) elementary school/secondary school diploma and 2% (2) elementary school diploma (n=108, Fig. 1). In total 54% of participants had a higher education degree (the bachelor's degree, master's degree or doctoral degree).

Of the participants, 98 provided information of their home city. Of this number, 22 were from Helsinki, 20 from Espoo, 6 from Vantaa, 4 from Turku and 3 from Tampere. The rest (43) were from 37 different cities or towns with frequencies of 1-2. These included Asikkala, Hämeenlinna, Ii, Inari, Jyväskylä, Kemi, Kirkkonummi, Kokkola, Lappeenranta, Lahti, Kotka, Lohja and Seinäjoki among others. Information about the year of birth was given by 88 participants and for statistical analysis this data was classified in 4 groups: born 1940-1960, born 1961-1970, born 1971-1980 and born 1981 to 2000. Most of the participants were born 1961-1970 (n=28) and 1971-1980 (n=31). Because of fewer participants in 1940-1950 (n=2) and 1951-1960 (n=6) these were combined (n=8), as well as in 1981-1990 (n=17) and 1991 to 2000 (n=4) these were combined (n=21). The average age of the participants was 47 years (SD ± 10.7 years).

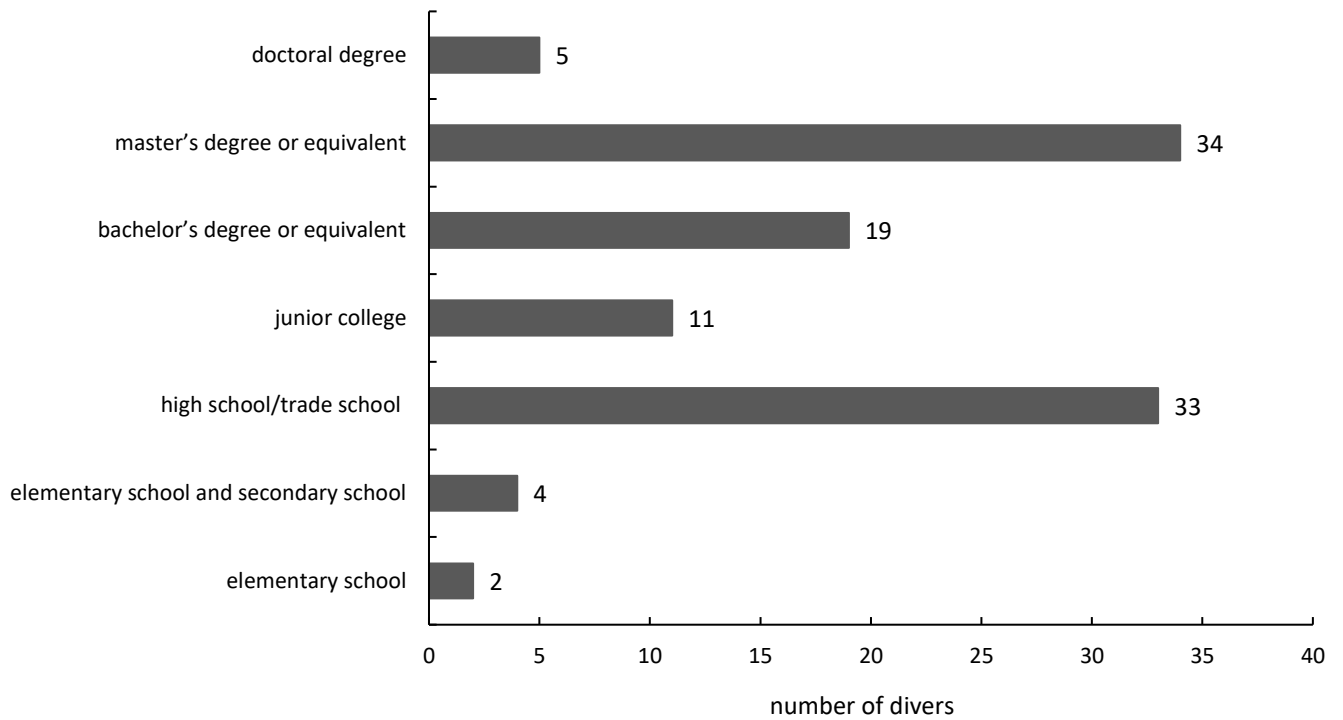


Figure 1. Educational background of participants. 'Number of divers' denotes the frequencies, n=108.

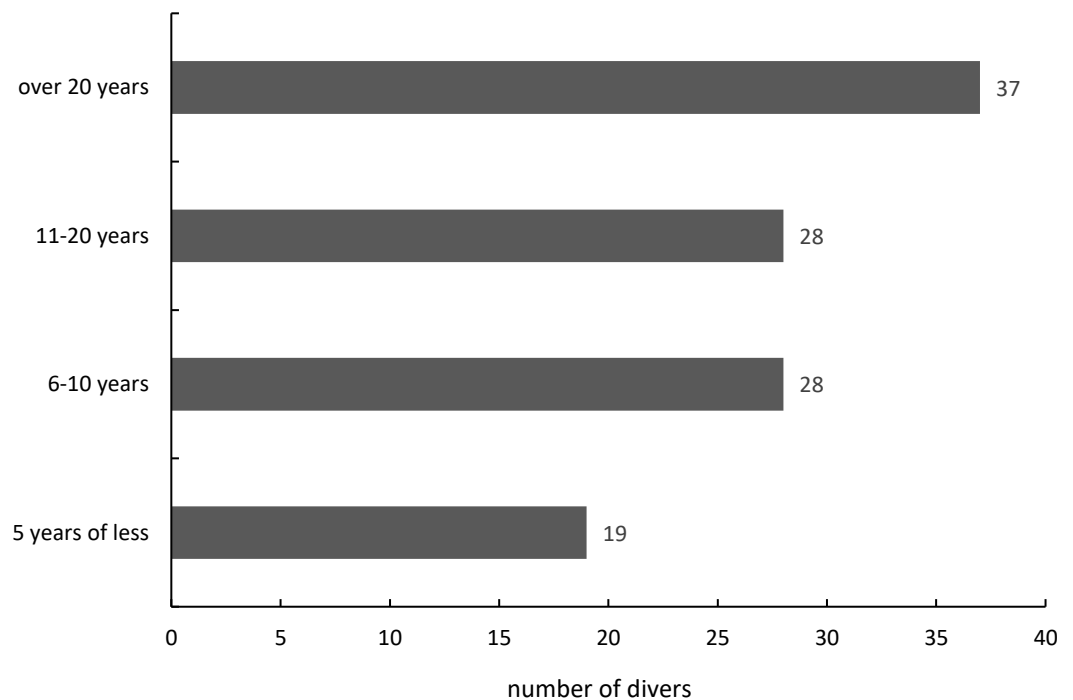


Figure 2. Diving experience of participants in years. 'Number of divers' denotes the frequencies, n=112.

112 participants gave information on their diving experience (Fig. 2) 33% (37) having more than 20 years of experience, 25% (28) having 11-20 years of experience, 25% (28) 6-10 years of experience and 17% (19) 5 years or less experience. Additionally, the number of dives was also asked about as it provides further information of the experience level of the participants and 96 participants provided this information. Of the 96 participants, 19 had marked their number of dives either with 'ca.' or 'more than' and these were rounded

to the closest number. Because of a large dispersion in the answers (range of 27-3000 dives) the average number of dives in this survey was 600 but with standard deviation of 596. Thus, a median of 420 dives is more representational. Participants were grouped by the number of dives into three groups for statistical testing. The groups were 1: 400 or less dives (n=46), 2: 401 to 800 dives (n=27), 3: 801 dives or more (n=23). Number of dives was used as a background variable rather than years of experience as it reflects better the experience level of the divers.

The question of average amount of dives on wrecks or other underwater cultural heritage sites per year was answered by 211 participants (Fig. 3) with 42% (88) participants doing 10-30 dives a year, 37% (79) doing less than 10 dives, 12% (26) doing 31-50 dives a year and 9% (18) doing more than 50 dives a year. The number of dives per year on wrecks and other underwater cultural heritage sites was used as a background variable in statistical analysis as it describes the intensity of the diving hobby. Diving in the southern part of Finnish coastal areas is much more common than in the northern parts of coastal areas (Fig. 4) as 45% of participants marked Gulf of Finland, 32% marked the Archipelago Sea and 12% marked the Sea of Åland as their diving area (together amounting to 89%) while only 4% marked the Bothnian Sea, 2% Kvarken and 4% Bothnian Bay as their diving area.

When asked about wreck diving in other sea areas in the Baltic Sea apart from Finland, 55 participants identified themselves as having been diving in Estonia in the past five years and 30 as having been diving in Sweden (Fig. 5). Two had been diving in Russia, two in Poland and two in Denmark. Only one had been diving in Germany and none of the participants had been diving in Lithuania or Latvia.

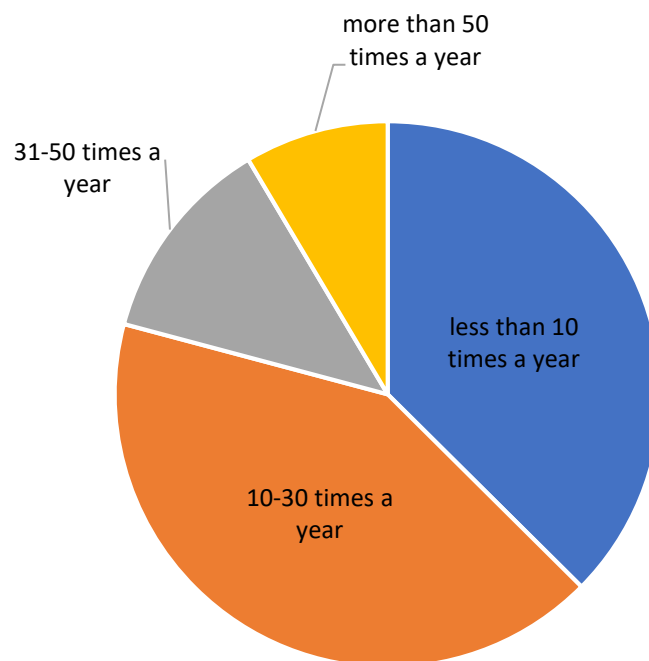


Figure 3. The average amount of dives on wrecks or other underwater cultural heritage sites per year. Less than 10 times a year (37%), 10-30 times a year (42%), 31-50 times a year (12%) and more than 50 times a year (9%), n=211.

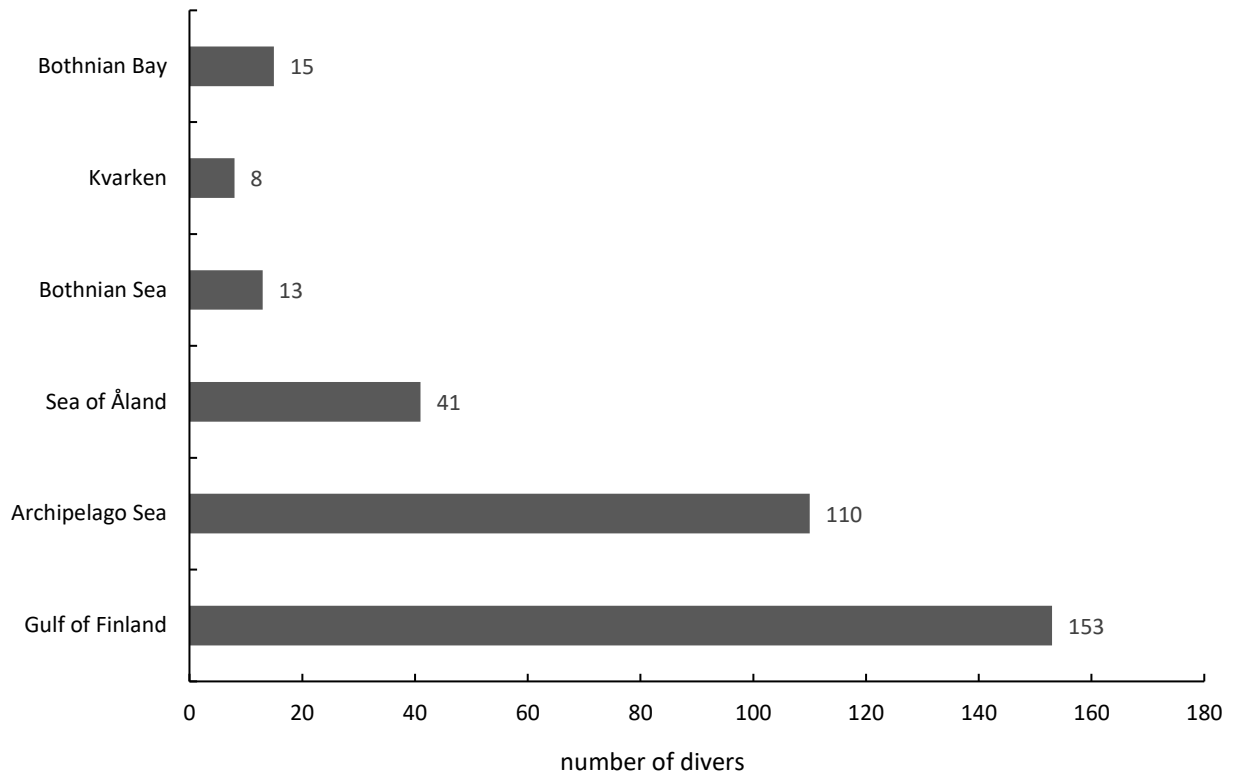


Figure 4. Sea areas where participants dive on wrecks or other underwater cultural heritage sites on the Finnish coastal area. Participants could mark more than one sea area.

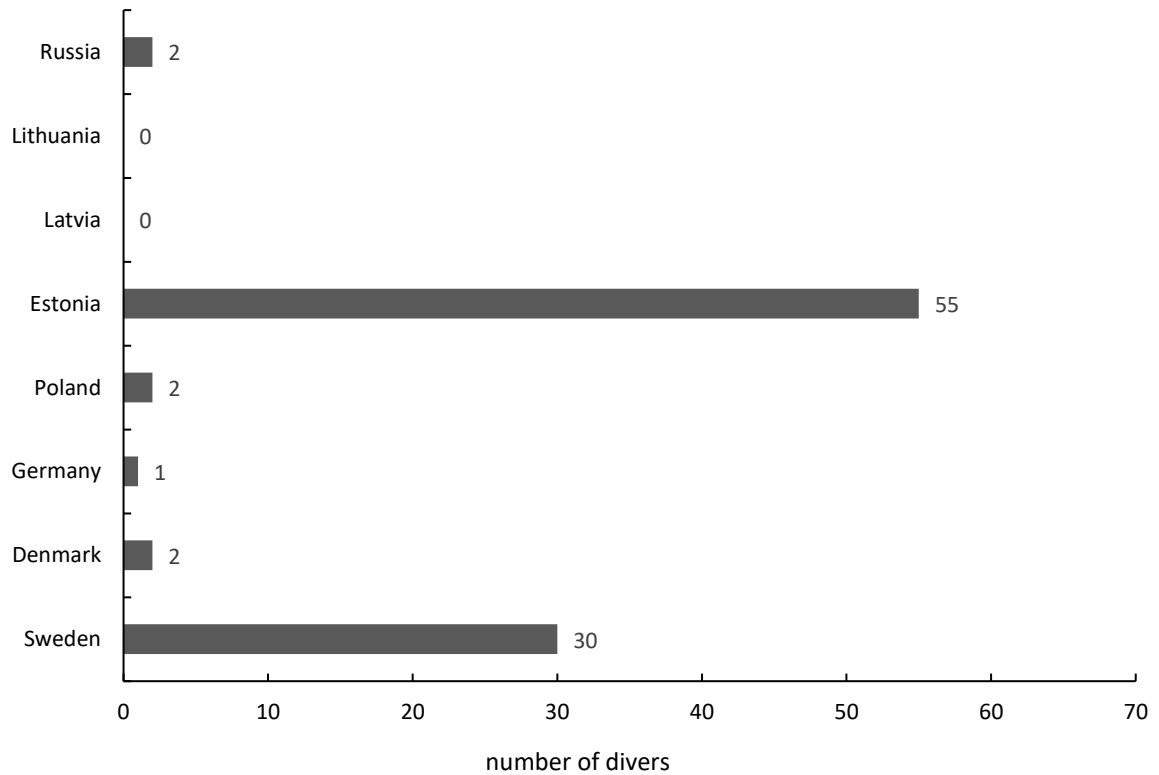


Figure 5. Other sea areas in the Baltic Sea where participants had been wreck diving in the past five years. Participants could mark more than one sea area.



## 3.2 Factors affecting wreck choice

### 3.2.1 Factors related to the wreck itself

Factors that affect how a specific wreck site is chosen to be visited were separated to factors related to wreck itself, factors related to the location and surroundings of a wreck and to factors related to nearby services. When looking at the factors related to wreck itself, the most important factors (Fig. 6) were a buoy (32% of participants marked 'very big effect', 39% marked 'rather big effect',  $n=171$ ), uniqueness of the dive site (24% 'very big effect', 36% 'rather big effect',  $n=168$ ), information of the wreck's history can be found online (28% 'very big effect', 43% 'rather big effect',  $n=167$ ), wreck is intact and ship-like (22% 'very big effect', 41% 'rather big effect',  $n=171$ ) and the history or the 'story' of the wreck is known (20% 'very big effect', 40% 'rather big effect',  $n=171$ ).

The factors that seemed to have the least significance in wreck site selection were info board of the wreck underwater at the site (33% 'very small effect', 20% 'quite small effect',  $n=168$ ) and the popularity of the wreck (19% 'very small effect', 31% 'quite small effect',  $n=165$ ). More participants ranked shallow sites to be more important in site selection compared to deep sites (40% marked that shallowness has a positive effect,  $n=164$ ; and 25% marked that deepness has a positive effect on site selection,  $n=167$ ). Many of the participants marked also that the depth in general has no effect (32% for the shallow and 40% for the deep) and 26% marked that the shallowness has negative effect and 33% marked negative effect for deep dive sites. Opinions of the significance of the age of the wreck were distributed quite evenly between positive effect and negative effect (32% positive effect, 34% negative effect, 34% no effect). Safety of the wreck and 3D models and maps had quite an intermediate significance in wreck site selection (safety: positive effect for 46%; and 3D models and maps: positive effect for 39%). A buoy differed significantly (Kruskal-Wallis  $X^2=285$ ,  $df=12$ ,  $p<0.05$ ) from all except from ship-like, history, history info online and uniqueness ( $p>0.05$ ). For ship-like, history, history info online and uniqueness, the results were the same with two exceptions: in addition, they did not differ significantly from shallow and safe (for all  $p>0.05$ ).

When comparing to background variables, significant differences were found within 'wreck is safe' when gender was the background variable (Mann-Whitney U-test,  $p=0.01$  two-tailed) and women ( $n=15$ ) saw the safety of a dive site more important factor for wreck site selection than men ( $n=92$ ). Dive sites' shallowness differed significantly within diving intensity (Kruskal-Wallis  $X^2=13.01$ ;  $df=3$ ,  $p=0.005$ ) but only between groups with less than 10 dives a year ( $n=50$ ) and more than 50 dives a year ( $n=13$ ,  $p=0.005$ ). A frequency table examination showed that for those who dive less than 10 dives it is more important that the dive site is shallow (less than 30 m) while those who dive more than 50 dives a year the shallowness is not important (54% of participants who dive less than 10 dives a year marked that shallowness had a very or rather big effect and 15% of participants who dive more than 50 dives a year marked that shallowness had a very or rather big effect in dive site selection).

Popularity of the wreck differed significantly within diving intensity (Kruskal-Wallis  $X^2=20.68$ ;  $df=3$ ,  $p<0.001$ ) between groups less than 10 dives ( $n=55$ ) and 10-30 dives a year ( $n=76$ ,  $p=0.04$ ), less than 10 dives and more than 50 dives a year ( $n=13$ ,  $p<0.001$ ), and 10-30 dives and more than 50 dives a year ( $p=0.03$ ). A frequency table examination showed that in dive site selection, the popularity of the wreck has more significance for those who dive less than 10 times a year than for those who dive 10-30 times or more than 50 dives a year (wreck's popularity had rather big or very big effect: for 24% of participants in group less than 10 dives a year, 14% or participants in group 10-30 dives and 0% of participants in more than 50 dives). Of participants in the group with more than 50 dives a year, 91% marked that the wreck's popularity had a quite small or very small effect (in relation to 32% and 54% of participants in group less than 10 and 10-30, respectively). Additionally, 43% of participants in group less than 10 dives a year and 30% in group 10-30 dives a year marked that a wreck's popularity is neutral considering dive site selection while only 8% of participants in group more than

50 dives a year marked it neutral. All pairwise comparisons were made by Dunn test with Bonferroni corrections.

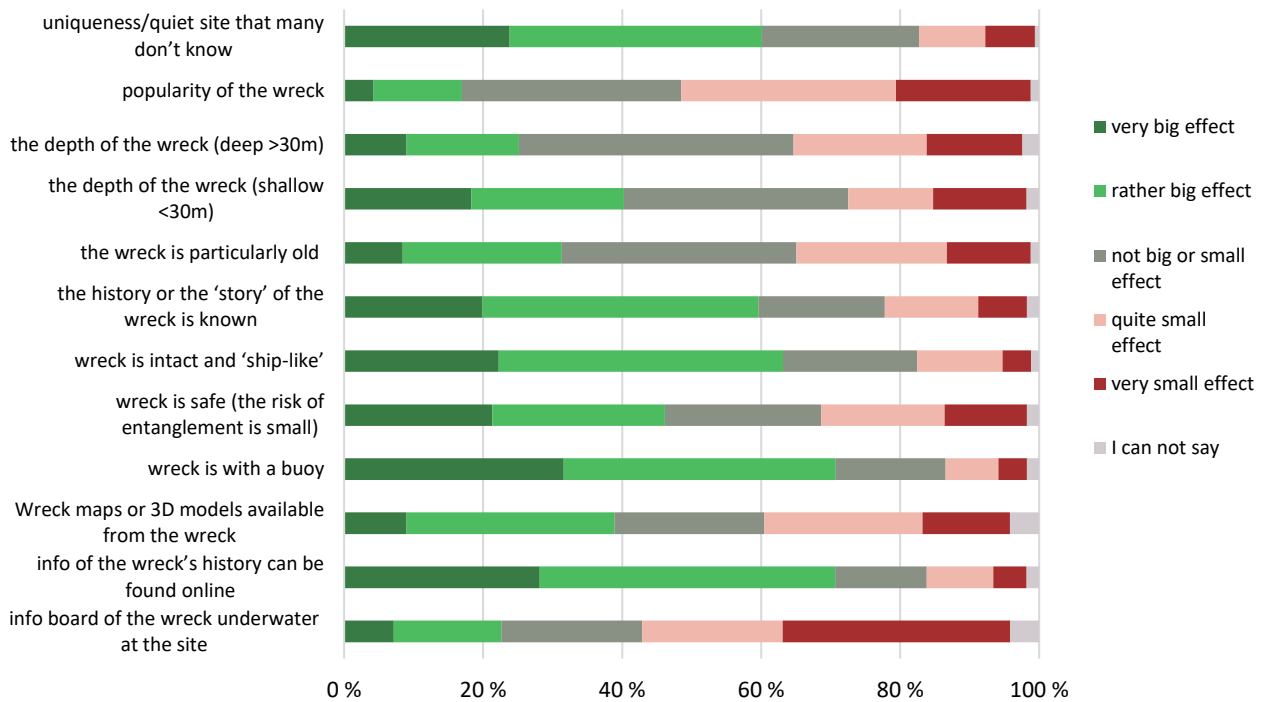


Figure 6. Factors related to wreck itself and how they affect the choice of a dive site. Green color describes positive effect divided into 'very big effect' and 'rather big effect' and red color describes negative effect divided into 'quite small effect' and 'very small effect'. Grey describes neutral effect and light grey 'I can not say'. Sample sizes starting from the top of the figure 'uniqueness/quiet site' are n=168, n=165, n=167, n=164, n=166, n=171, n=171, n=169, n=171, n=167, n=167 and n=168 (info board).

### 3.2.2 Factors related to the location and surroundings of a wreck

From the factors related to the location and surroundings of a wreck (Fig. 7) the most important factors in choosing a dive site are the exact available coordinates of the wreck (42% of participants marked 'very big effect', 43% marked 'rather big effect', n=152), used vessel defines the wreck site that can be visited (35% 'very big effect', 37% 'rather big effect', n=148), good accessibility to the wreck (22% 'very big effect', 52% 'rather big effect', n=152), good visibility at the site (19% 'very big effect', 47% 'rather big effect', n=149) and close proximity to the wreck (16% 'very big effect', 48% 'rather big effect', n=151). The factors that seemed to have the least significance in wreck site selection were plants and organisms at the site (31% 'very small effect', 27% 'quite small effect', n=147) and suitability of the site for everyone regardless of skill level (23% 'very small effect', 18% 'quite small effect', n=150).

Of the participants, 44% marked that they select diving sites where there is no need to apply permission for diving while 24% marked that the applying for a permit had neutral effect. Another 32% marked that applying for a permit has a small or very small effect implying their wish to dive specific sites exceeds the trouble to fill applications. A potential place to find a new wreck also seemed to be rather important factor for many (18% 'very big effect', 32% 'rather big effect', n=149) as well as sheltered locations (5% 'very big effect', 41% 'rather big effect', n=146). Positive and negative effects were quite evenly distributed in strong currents (35%

positive effect, 39% negative effect, 26% neutral effect, n=148) and familiarity of the site (37% positive effect, 30% negative effect, 33% neutral effect n=149).

From the factors related to the location and surroundings of a wreck, coordinates differed significantly (Kruskal-Wallis  $X^2=357.65$ ;  $df=11$ ,  $p<0.05$ ) from all except accessibility and vessel ( $p>0.05$ ). For vessel and accessibility, the results were the same with two exceptions: in addition, they did not differ significantly from visibility and close proximity to the wreck (all  $p>0.05$ ). Visibility and close proximity to the wreck were not seen having quite as important effect in dive site selection compared to coordinates, vessel and accessibility. Visibility differed significantly from all except accessibility, close proximity to the wreck, the potential to find a new wreck and vessel ( $p>0.05$ ). Close proximity to the wreck differed significantly from all except dive permission, accessibility, visibility, the potential to find a new wreck and sheltered site ( $p>0.05$ ).

Reviewing distributions in terms of background variables, women and men differed significantly in their answers within underwater plants and organisms, sheltered site, currents and vessel (Mann-Whitney U-test,  $p<0.05$  two-tailed). Frequency table examination showed that for woman (n=15) plants and organisms had an effect for wreck site selection more often than for men (n=93; 'very big or rather big effect': 28% of woman and 14% of men). Also, woman saw plants and organisms more often as neutral (43% in relation to 23% of men) in dive site selection while 64% of men saw that it had quite small or very small effect (in relation to 29% in women). Regarding sheltered conditions in dive site selection, albeit significant difference between woman (n=14) and men (n=94), the trend was similar in both groups with most participants valuing sheltered conditions (71% in woman and 40% in men). The biggest difference was that in men 29% and in woman only 7% saw that sheltered conditions had a quite small or very small effect. Regarding currents in dive site selection, for 64% of woman (n=14) it is important that there are no strong currents at the dive site while the same applies only for 28% in men (n=94; 42% of men and 14% of woman saw that currents have quite small to very small effect in dive site selection). For vessel, albeit there was a significant difference between woman (n=14) and men (n=94), the trend was very similar in both groups with most participants marking that available vessel defines the wreck site that can be visited (92% of woman and 70% of men). The biggest difference was that in men 18% said that vessel has a quite small or very small effect in comparison to 0% in woman.

Reviewing distributions in terms of background variables, diving intensity groups differed significantly within sites suitable for everyone, familiar site, plants and organisms and currents. Factor 'sites suitable for everyone' differed between groups with less than 10 dives (n=50) and more than 50 dives a year (n=12; Kruskal-Wallis  $X^2=17.41$ ;  $df=3$ ,  $p<0.001$ ), and between 10-30 (n=67) and more than 50 dives a year ( $p=0.006$ ). A frequency table examination showed that for those who dive less than 10 or 10-30 dives a year it is more important that the wreck site is suitable for everyone regardless of skill level (26% of participants in group less than 10 and 25% in group 10-30 dives a year marked rather big or very big effect in dive site selection) while those who dive more than 50 dives a year 0% marked that suitability for everyone has an effect in dive site selection. Another 46% in the group with less than 10 dives, 36% in the group with 10-30 and 17% in the group with more than 50 dives a year marked it as neutral in dive site selection and for those who dive more than 50 dives a year 82% marked that suitability for everyone has quite or very small effect (in relation to 28% in the group with less than 10 and 38% in the group with 10-30 dives a year). Regarding familiar site, only significant difference was between groups less than 10 dives (n=49) and more than 50 dives a year (n=12; Kruskal-Wallis  $X^2=8.9$ ;  $df=3$ ,  $p=0.02$ ). Frequency table examination showed that for those who dive less than 10 dives a year it is more important that the wreck dive site is familiar ('rather big or very big effect' in dive site selection: 45% of participants in group less than 10 dives and 17% of participants in group more than 50 dives). 33% in group less than 10 dives marked it as neutral in dive site selection opposed to 0% in group more than 50 dives and 22% in group less than 10 dives marked it as quite small or very small effect opposed to 83% in group more than 50 dives. In respect of plants and organisms, diving intensity differed significantly

only between groups less than 10 dives (n=48) and more than 50 dives (n=12; Kruskal-Wallis  $X^2=8.15$ ;  $df=3$ ,  $p=0.03$ ). From frequency table it was seen that all participants in the group with more than 50 dives had marked a quite small or very small effect regarding plants and organisms while in the group with less than 10 dives 50% marked a quite small or very small effect, 31% neutral, 19% rather big or very big effect in dive site selection. Opinions towards currents in dive site selection differed significantly between groups with less than 10 (n=49) and more than 50 dives a year (n=12; Kruskal-Wallis  $X^2=15.31$ ;  $df=3$ ,  $p=0.004$ ) and between 10-30 dives (n=66) and more than 50 dives a year ( $p=0.02$ ). A frequency table examination showed that for those who dive less than 10 or 10-30 dives a year it is more important that there are no strong currents at the dive site than for those who dive more than 50 dives a year (no strong currents 'rather big or very big effect': 47%, 33% and 8%, respectively). 26% in the group with less than 10 dives, 34% in the group with 10-30 dives and 91% in the group with more than 50 dives marked that strong currents had a quite small or very small effect.

Of the background variables, diving experience differed significantly within currents. A significant difference in diving experience was between groups with 400 or less dives (n=46) and 801 or more dives (n=23; Kruskal-Wallis  $X^2=11.26$ ;  $df=2$ ,  $p=0.005$ ) and frequency table showed the same outcome as diving intensity: for those who dive less it is more important that there are no strong currents at the dive site than for those who dive more (no strong currents 'rather big or very big effect': 44% in group with 400 or less dives and 22% in group with 801 or more dives). Another 21% in the group with 400 or less dives and 61% in the group with 801 or more dives marked that strong currents had quite small or very small effect. All pairwise comparisons were made by Dunn test with Bonferroni corrections.

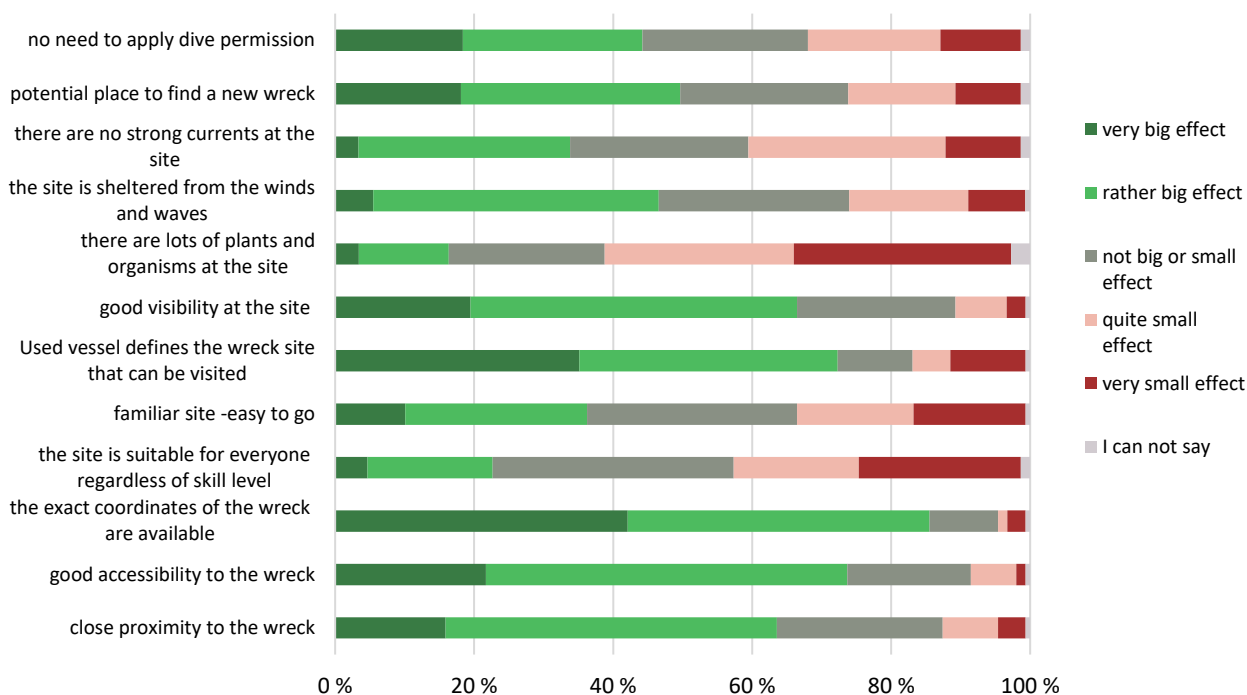


Figure 7. Factors related to the location and surroundings of a wreck and how they affect the choice of a dive site. Green color describes positive effect divided into 'very big effect' and 'rather big effect' and red color describes negative effect divided into 'quite small effect' and 'very small effect'. Grey describes neutral effect and light grey 'I can not say'. Sample sizes starting from the top of the figure 'no need to apply dive permission' are n=147, n=149, n=148, n=146, n=147, n=149, n=148, n=149, n=150, n=152, n=152, and n=151 (close proximity to the wreck).

### 3.2.3 Factors related to the nearby services

From the factors related to the nearby services in choosing a dive site, even the most positively rated option 'berth close to accommodation' was only rated so by 31% of respondents while 46% of respondents saw it with a small effect related to choosing a dive site (n=147, Fig. 8). The scuba cylinder's air refill possibility was marked by 30% as having an effect in choosing a dive site and 47% marked it having quite a small or very small effect in choosing a dive site (n=143). Accommodation was marked by 26% as having an effect in choosing a dive site and 50% saw it having a quite small to very small effect in choosing a dive site (n=147). Restaurant, refueling possibility, sauna and self-catering facilities can be seen as slightly less important services compared to berth, air refill and accommodation considering the combined effect of positive and negative scores (restaurant 17% positive, 52% negative; refuel 21% positive, 51% negative; sauna 21% positive, 53% negative; self-catering 20% positive, 53% negative). In general, the combined effect of services was seen rather important or very important in dive site selection by average of 23% ( $\pm 5.7\%$ ) of respondents and quite unimportant or very unimportant by average of 50% ( $\pm 2.8\%$ ) of respondents.

From the factors related to the nearby services in choosing a dive site, none of the individual services differed significantly from each other (Kruskal-Wallis  $X^2=7.04$ ;  $df=6$ ,  $p=0.32$ ). Reviewing distributions in terms of background variables (age, gender, diving experience, diving intensity), none of the participant groups differed significantly from each other (Kruskal-Wallis  $X^2$ , all  $p$ -values $>0.05$ ).

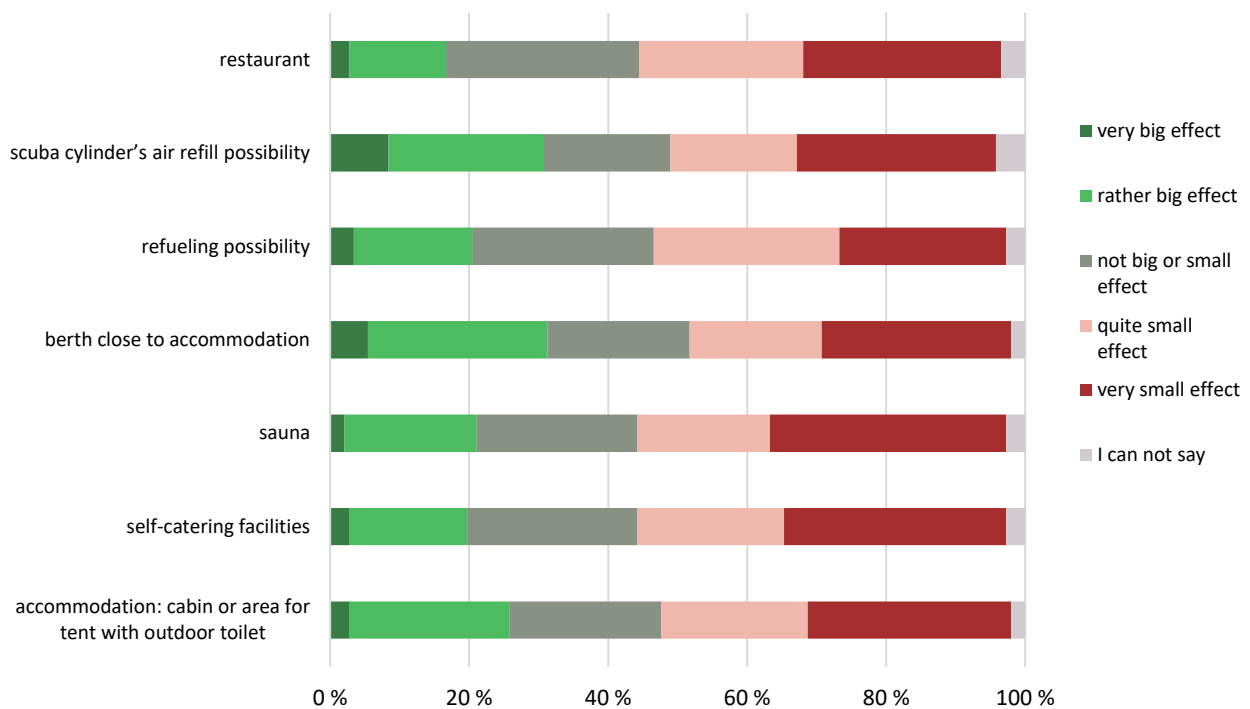


Figure 8. Factors related to nearby services and how they affect the choice of a dive site. Green color describes positive effect divided into 'very big effect' and 'rather big effect' and red color describes negative effect divided into 'quite small effect' and 'very small effect'. Grey describes neutral effect and light grey 'I can not say'. Sample sizes starting from the top of the figure 'restaurant' are n=144, n=143, n=146, n=147, n=147, n=147 and n=147 (accommodation).

Additionally, participants were asked to provide extra information on factors affecting dive site selection in an open field question and 29 participants gave an answer. In these answers, weather and wind was the most common answer (21%) related to dive site selection, followed by a buoy (14%), dive permission (10%),

available vessel (10%) and untouched wrecks (7%). In 2 answers considering dive permissions, it was mentioned that more clear information of the application process is needed, especially about from where to apply, what information is needed in the application and how long the application process takes.

### 3.3 Favorite wreck dive destinations and wreck dive sites that need development

In total 189 favorite wreck dive destinations were marked on the map by 93 separate participants (Fig. 9). One wreck was marked in Swedish territorial waters and one in a lake, so these two points were excluded from the data and total of 187 was analyzed. The reasons for what make these wrecks good diving destinations are summarized in Fig. 10. The most popular reason amongst the participants was that the wreck is intact and ship-like with 29% (88) of the answers. In 25% of the answers (77) wrecks were chosen for their history and in 19% of the answers (58) for their easy access. In 8% of the answers (25) the reason that made that specific wreck a good destination was the services (accommodation) near the wreck. Beautiful underwater landscape was reason in 7% of the answers (20) and underwater plants and organisms only in 2% of the answers (6). In 27 answers the reason was marked 'other' and these answers included: visibility (5), a buoy (4), depth (3), personally found/dive club found wreck (2), many wrecks near (2), wreck park (2), beautiful wreck (2), new wreck (1), familiar area (2), often seals in the area (1), challenging (1), beautiful nature harbor (1) and info boards (1). Participants were asked what kind of services that they find important are available in the area near the wreck site and 45 answers were given: services in Utö (5), services in Hango (3), air refill missing (2), no services (2), services are irrelevant (2), services in Örö (2) and services in Mariehamn (2). Other single answers included home, Turku, Kotka, nearby islands and Porkkala, etc. Participants were also asked whether there is a possibility of accommodation near the dive site and where (e.g. Berth/sheltered pier, rental cottages/camping facilities) and 40 answers were given. These included: Utö (5), no there isn't (5), Porkkala (3), Hango (3), Predium harbor (3), Örö (2), Fäliskäret (2), Jussarö (2). Other single answers included Helsinki, Sundskär, Lappohja, Rödjan, Byxholmen, Tammisaari, Selkä-Sarvi, Mariehamn, Kotka, etc.

An open field for answers was provided in case participants wanted to specify some other information on how to further improve a wreck's accessibility and 32 answers were given. Of these, 16 stated that a proper buoy is needed for the wreck site and 5 stated their worry that, without a buoy, anchors will break the wreck. The scuba tank's air refill possibility was hoped for at Utö (1) and refueling possibility was hoped for at Utö (1). In one answer the wreck was said to be in a very good shape and the probable reason for this was assessed to be that diving in the wreck requires an official permit thus limiting the number of visitors. Other single answers provided information on the beauty of the wrecks or nearby areas.

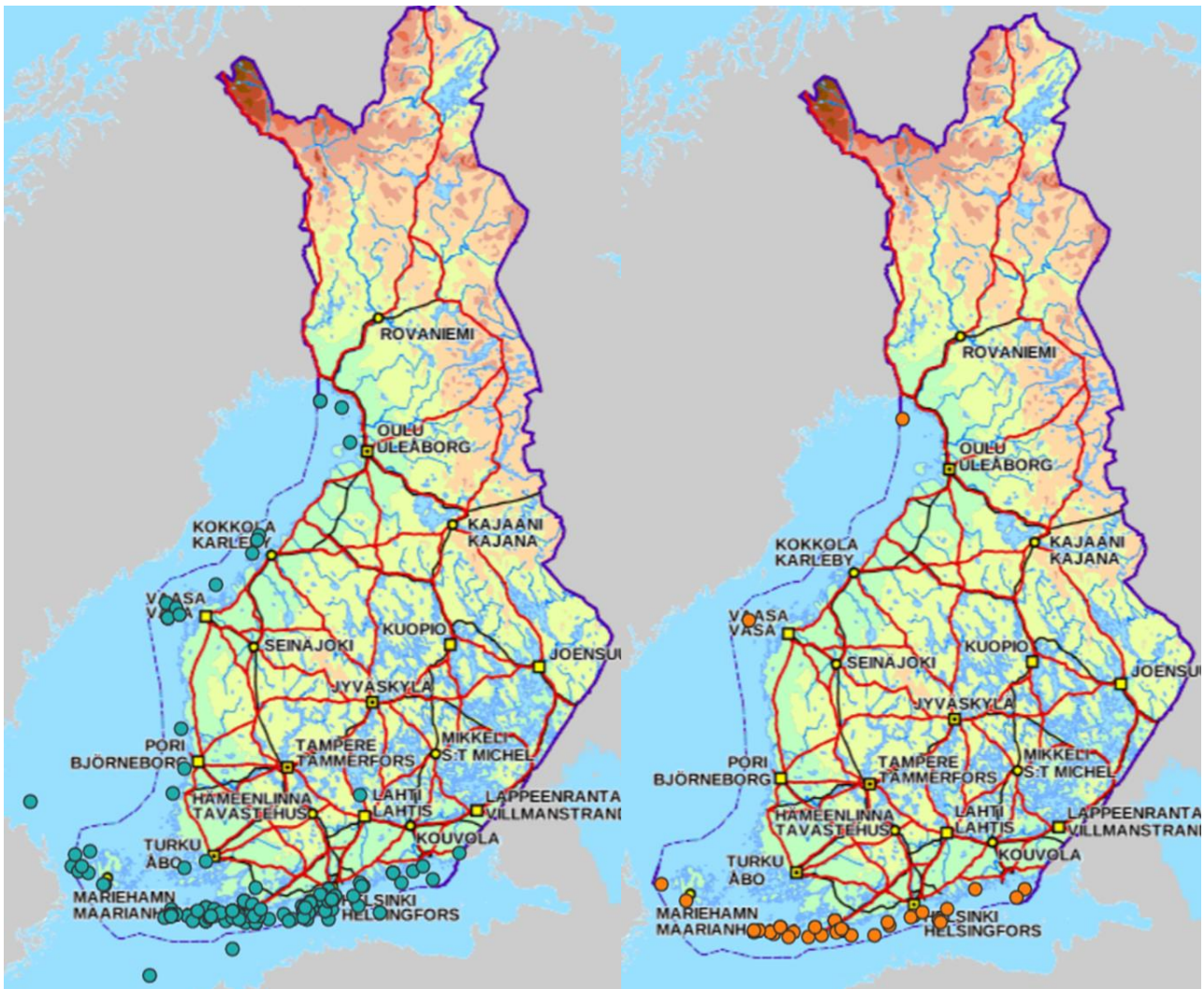


Figure 9. Favorite wreck dive sites (left) and wreck dive sites that need development (right) marked by participants ©National Land Survey of Finland 10/2019.

Additionally, risks were queried about regarding favorite wreck sites. The biggest threat was seen in other divers as in 40 answers careless behavior of the divers was stated as a risk for the wreck (Fig. 11). The second biggest threat seen by the participants was wreck-robbing (marked 28 times). In 20 answers the threat was assessed to be eutrophication and in 17 answers too many divers. Boat traffic or ports, pollution, fishing and trash were considered intermediate in their level of risk posing (in 14, 11, 9, 6 answers, respectively) and the smallest threat were estimated to be climate change, construction or dredging, other reasons, renewable energy facilities and tourism (in 3, 3, 5, 1, 1 answers, respectively). Other reasons were stated to be the damage by the anchors (4) and slipstream (1).

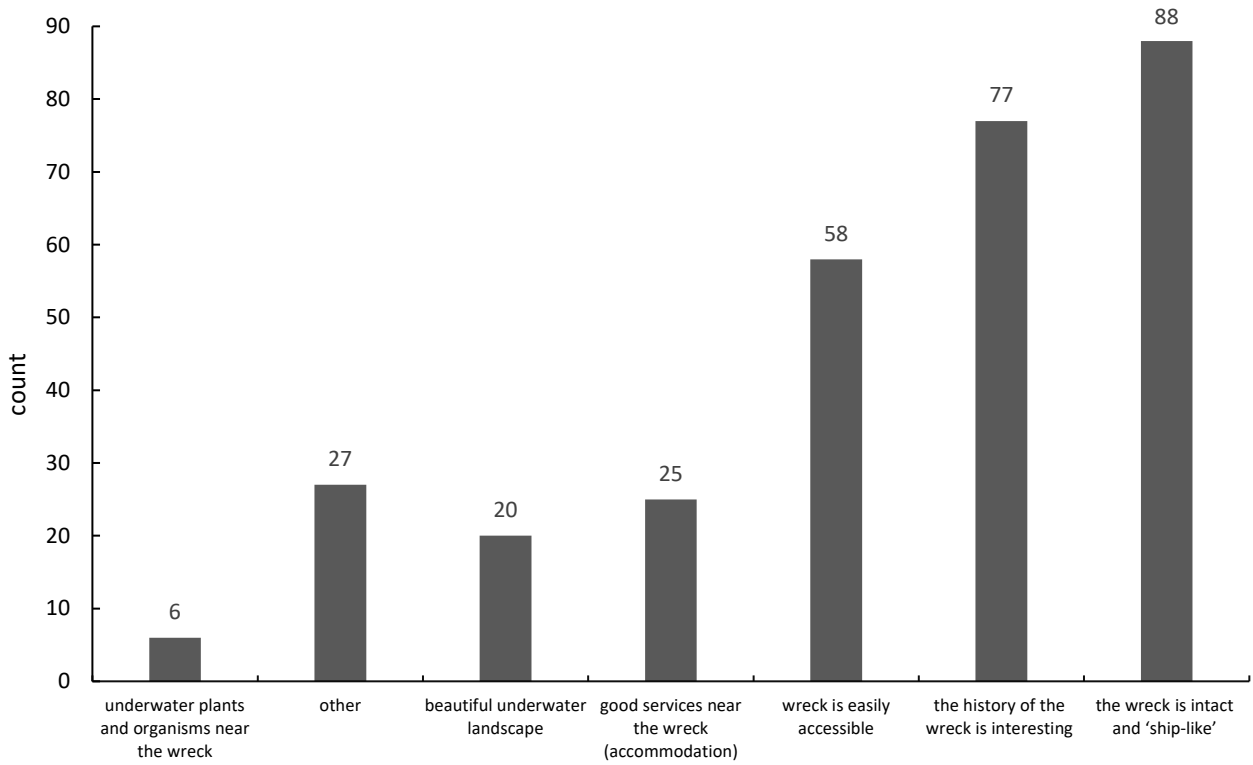


Figure 10. Reasons that make the favorite wreck diving sites good diving destinations. Participants were allowed to mark more than 1 reason.

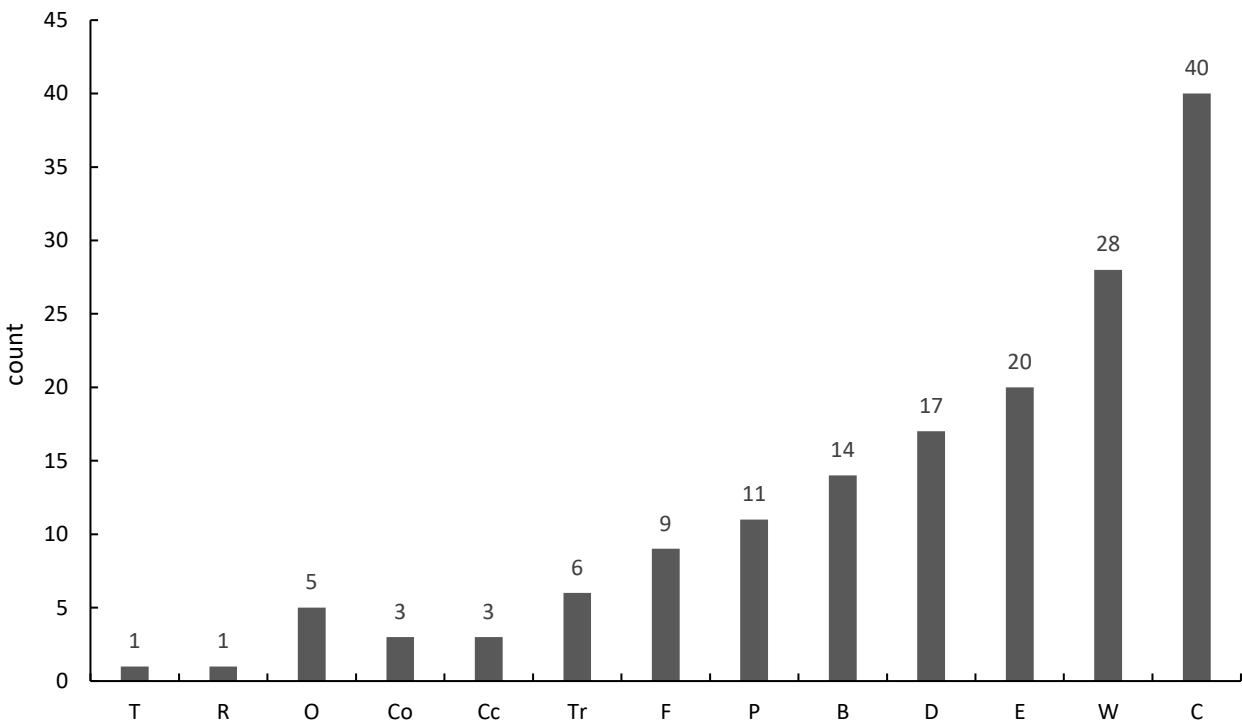


Figure 11. Perceived threats to favorite wreck diving sites. T=tourism, R=renewable energy facilities, O=other, Co=construction or dredging, Cc=climate change, Tr=trash, F=fishing, P=pollution, B=boat traffic or ports, D=too many divers, E=eutrophication, W=wreck-robbing and C=careless behavior of divers. Participants could mark more than one threat.



Of favorite wreck sites, 83 were marked in the Gulf of Finland, 78 in the Archipelago Sea, 9 in the Sea of Åland, 3 in the Bothnian Sea, 9 in the Kvarken and 7 in the Bothnian Bay. A comparison of sea areas was only possible between the Gulf of Finland and the Archipelago Sea as other sea areas had sample sizes that were too small. Comparing the reasons that make wrecks good diving destinations, the only significant difference was in intact/ship-like wrecks as in the Archipelago Sea it was chosen more often than in the Gulf of Finland ( $X^2=4.31$  (df=1, n=105),  $p=0.037$ ). However, even though significant, the difference was not big: 33% (42) of participants marked it as a reason for good diving destination in the Archipelago Sea and 27% (33) in the Gulf of Finland. When comparing the threats, the only significant difference was in boat traffic or ports (Fisher's exact test,  $p=0.016$ ) as it was seen more often as a threat for wrecks in the Gulf of Finland than in the Archipelago Sea (13% (10) of participants marked it as a threat in the Gulf of Finland and 3% (1) marked it as a threat in the Archipelago Sea).

Participants marked much less wreck dive sites that need development than favorite sites, in total 34. Of these, 28 were marked on top of specific wrecks and two wrecks were marked more than once (St. Mikael and Granbusken were marked twice, Table 1). Four marks were on top of islands/areas that need development and 2 marks were on top of unidentified wrecks, so they were excluded from the analysis. Seventeen were in the Gulf of Finland, 11 in the Archipelago Sea, 2 in the Sea of Åland, 1 in the Kvarken and 1 in the Bothnian Bay. A buoy was the most common development need marked for wrecks as it was proposed to be needed in 22 wrecks (65% of wrecks marked with development need, Fig. 12). A scuba cylinder's air refill possibility was the second common independent need marked but only with 5 votes (15% of wrecks marked with development need). Berth in some nearby island was marked as needed in 4 wrecks (12%), accommodation/camping possibility in 3 wrecks (9%), refueling possibility in 2 wrecks (6%) and other in 6 wrecks (18%). Other development needs included: allowing diving through dive permit (4), more research on the wreck's history (1) and developing Rysäkari's services (1). Allowing diving through dive permit was hoped for St. Mikael wreck (2), Vrouw Maria wreck (1) and Skeppsbådarna itäpuoli wreck (1). St. Mikael and Vrouw Maria are protected and diving in these wrecks is prohibited. Skeppsbådarna itäpuoli wreck is inside Archipelago National Park in an area where entering is prohibited.

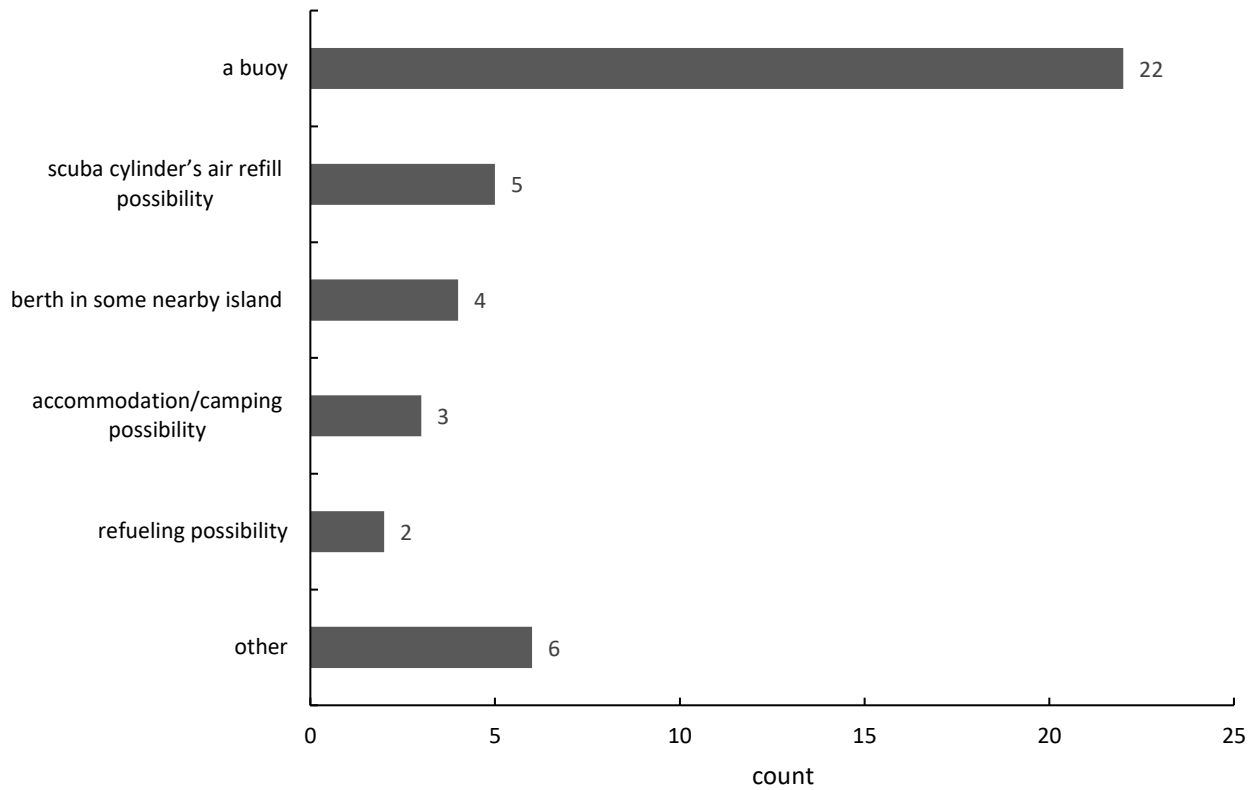


Figure 12. Development needs in marked wrecks (34 wrecks in total). Participants could mark more than one development need per wreck.

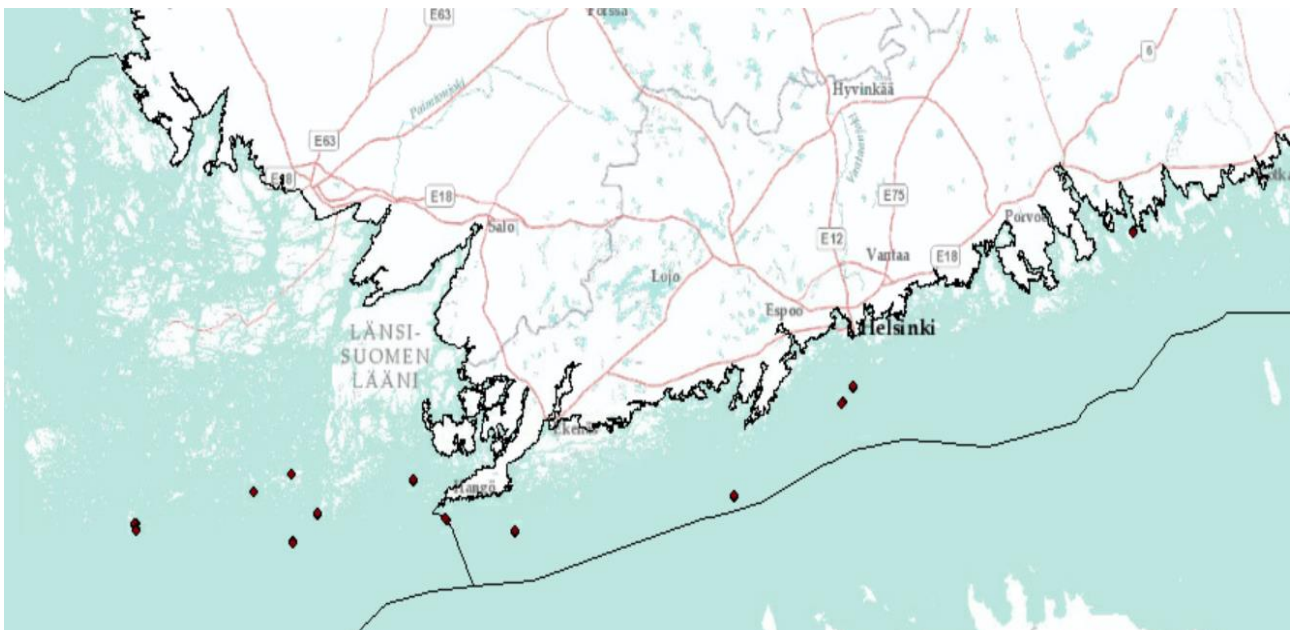


Figure 13. The locations of wrecks that were marked more than two times in the survey by participants ©ArcMap by Esri.

Table 1. Wreck sites and nearby areas that need development. Number of participants that marked the site is shown in 'count'. Sea area: GF= Gulf of Finland, AS= Archipelago Sea, SÅ= Sea of Åland, Kv= Kvarken, BB= Bothnian Bay. Development needs: A= a buoy, B= accommodation/camping possibility in some nearby island, C= scuba cylinder's air refill possibility in some nearby island, D= berth in some nearby island, E= refueling possibility in some nearby island, F= other. Specified development needs are marked in the table in cases when data included them.

Name of the wreck	Sea area	Diving	Count	Development need	Specified development need
Punaparrat	GF	allowed	1	A	
Kronprins Gustav Adolf	GF	allowed	1	B,C,D,E	Developing Rysäkari
Coolaroo	GF	allowed	1	A	
T-54 Kljuz	GF	allowed	1	A	
Munin	GF	allowed	1	A	
Gunvor	GF	allowed	1	A	
Fortuna	GF	allowed	1	A	
-	GF	-	1	C	Islands near Södra Klovaskär, Båkgundet, Norra Klovaskär
-	GF	-	1	C	Islands near Furuskär, Kalvholmen, Skallotholmen, Rovholmarna
-	GF	-	1	C	Islands near Rönnskär, Salmen, Mossaskär
Remmarudden	GF	allowed	1	A	
Granbusken	GF	allowed	2	A,D	
Sokea-Tonttu	GF	allowed	1	A,D	
Östergaddenin eteläpuoli	GF	allowed	1	A	
Mologna	GF	allowed	1	A	
Wasa	GF	allowed	1	A	
Skeppsådarna itäpuoli	AS	not allowed	1	F	Allowing diving
St. Mikael	AS	not allowed	2	F	Allowing diving
Vrouw Maria	AS	not allowed	1	F	Allowing diving
Blänkan	AS	allowed	1	A	
Gaddarna	AS	allowed	1	B	Islands near Gaddarna, Kirsgaddarna, Sundgadden, Utö
Park Victory	AS	allowed	1	A, C, E	Island near Utö
Ladoga	AS	allowed with permission	1	A,B,C,D,E	Islands near Örö
Morgonlandet lounaispuoli	AS	allowed	1	A	
Siivo	AS	allowed	1	A	
Keulakuvahylky	AS	allowed	1	F	More information on wreck
Nederland	SÅ	allowed	1	A	
-	SÅ	-	1	A	More buoys in the Sea of Åland
Buitron	Kv	allowed	1	A	
Lahian laivaloukku	BB	allowed	1	F	More research

In order to recognize sites with development needs, wrecks that had more than 2 points marked in them were grouped. Grouping was made in ArcMap using a 500-meter radius as a grouping factor in order to include all points for any specific wreck. Groupings were reviewed so that all points were grouped correctly

to specific wrecks. Additionally, all multiple answers by any one participant for the same wrecks were deleted (unless the answers were one for favorite wreck and one for development needs in which case both answers were kept). In total 13 multiple answers were deleted. One group (3 points) in the Archipelago Sea had to be removed from the analysis as it was unclear for which wreck the points were marked. After clearing the data, 11 wrecks that contained more than 2 points were detected (Table 2 and Fig. 13). Five of them were in the Gulf of Finland and 6 of them were in the Archipelago Sea. Other sea areas had no wrecks with more than 2 points marked.

Table 2. Wrecks that were marked more than two times (n=11). Wreck marks included both 'favorite wreck' and 'development need' -sites and counts are shown in the table. Services and accommodation near the wrecks are marked in the table in cases when data included them. Keulakuva is a commonly known nickname for a wreck that is known for its figurehead.

Name of the wreck	Sea area	Diving	Wreck type	Count of favorite	Count of development	Services near	Accommodation near
Coolaroo	Gulf of Finland	allowed	metal	2	1		
Klaus Oldendorf	Gulf of Finland	allowed	metal	3	0		
Eira	Gulf of Finland	allowed	metal	6	0		Predium
Kronprins Gustav Adolf	Gulf of Finland	allowed	wood	5	1	Helsinki (n=2), Rysäkari needs development (n=1)	Helsinki (n=2)
Russarö northwest	Gulf of Finland	allowed with permission	wood	3	0	Hanko (n=2), nearby islands (n=1)	
Keulakuva	Archipelago Sea	allowed	wood	6	1	Hanko (n=2)	
Ladoga	Archipelago Sea	allowed with permission	metal	6	1	Harbor in Örö (n=1)	Anchorage in Örö (n=1)
Park Victory	Archipelago Sea	allowed	metal	16	1	Utö: sauna, restaurant, shop (n=4)	Utö (n=4), Sundskär (n=1)
Siivo	Archipelago Sea	allowed	wood	2	1		
St. Mikael	Archipelago Sea	not allowed	wood	1	2		
Alfred	Archipelago Sea	allowed	wood	4	0	Vänö (n=1)	

Park Victory was marked 17 times and was the most liked wreck in this survey (16 marks for favorite wreck, 1 development need regarding a better buoy). Utö was marked as the closest island for services and accommodation from Park Victory. The second most liked wrecks were Keulakuva, Ladoga and Eira with 6 marks for favorite wrecks. Services and accommodation were marked in Hanko for Keulakuva, Örö for Ladoga and Predium for Eira. Kronprins Gustav Adolf was marked 5 times as a favorite wreck, Alfred 4 times, Klaus Oldendorf 3 times and Russarö northwest 3 times. The reasons for what make these wrecks good diving destinations are summarized in Fig. 14. Relations are shown in frequencies for better comparisons. ‘Underwater plants and organisms’ was not marked as a reason for any of the wreck groups and it is omitted from the Fig. 14. For Park Victory, history (count of 11) and the intact wreck (11) were major reasons why this wreck is considered a good diving destination, and additionally accessibility (9) was considered important. In 6 answers services were also marked important for Park Victory. For Keulakuva (6), Ladoga (5) and Eira (5) the intact wreck was the major reason why these wrecks are considered to be good wreck dive sites. Accessibility (4), services (3) and history (3) were also seen quite important for Keulakuva and history and services for Ladoga (3, 2, respectively) and Eira (2, 2, respectively). For Kronprins Gustav Adolf history (4) and accessibility (3) were most important reasons and for Alfred accessibility (3) and intact wreck (2). For Klaus Oldendorf the most important reasons were history (3) and intact wreck (2) and for Russarö northwest history (3), intact wreck (3), accessibility (2) and services (2).

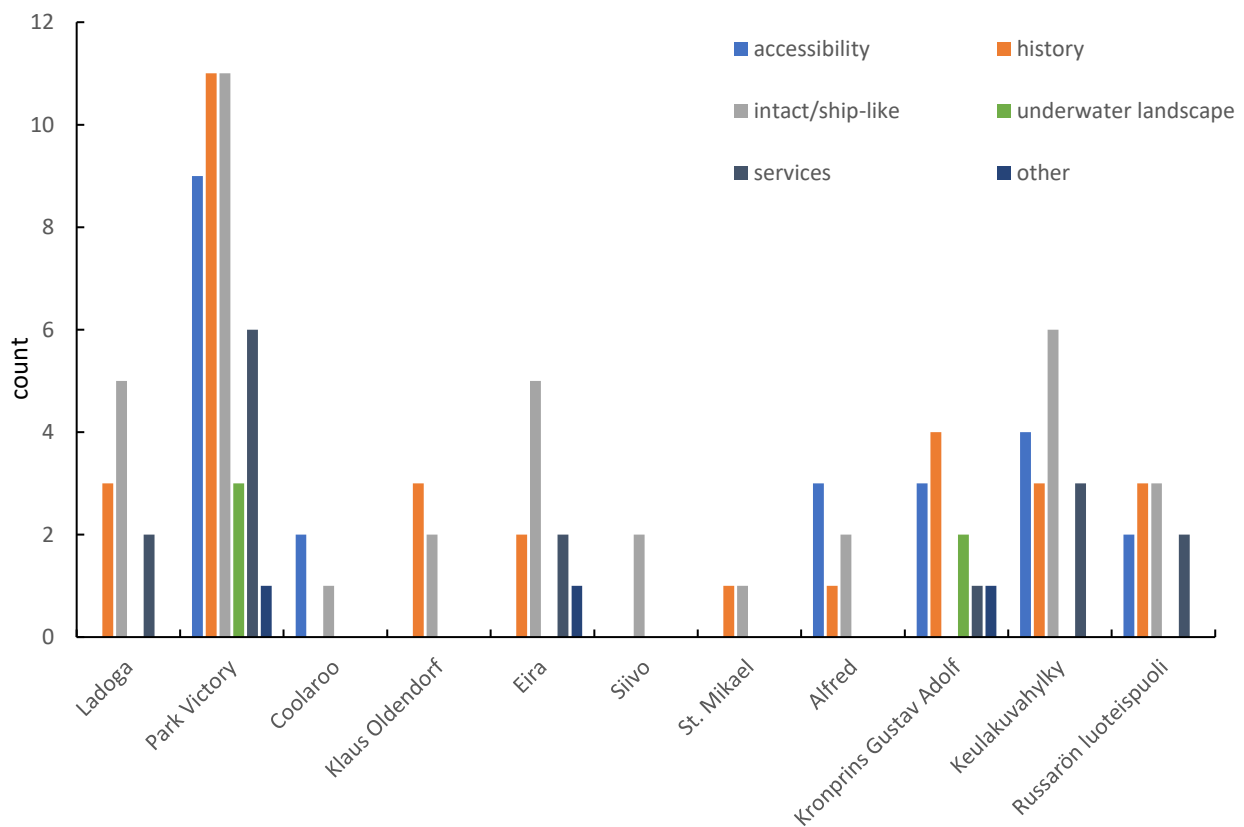


Figure 14. Reasons that make the favorite wreck diving sites (wrecks that are marked more than 2 times) good diving destinations. Participants could mark more than 1 reason.

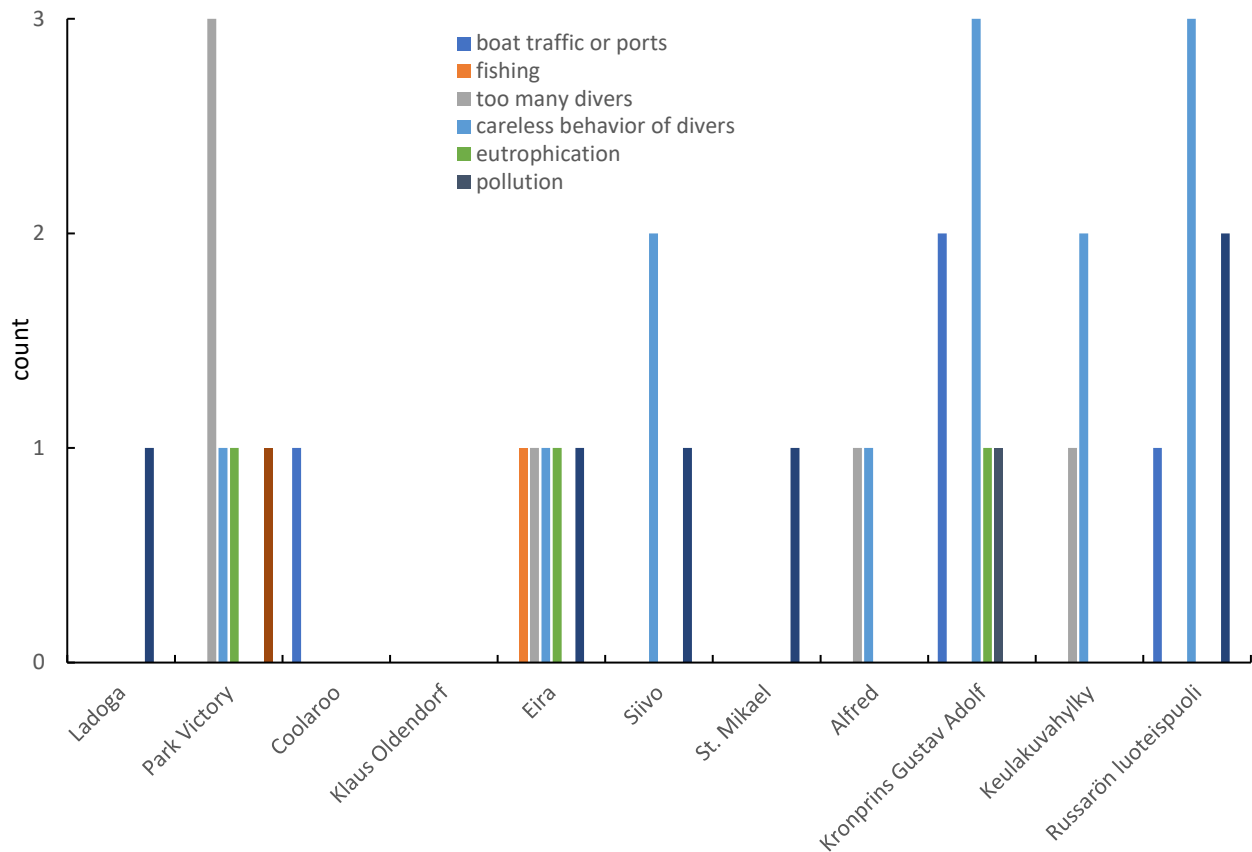


Figure 15. Threats to grouped favorite wreck diving sites (sites that are marked more than 2 times).

Threats to wreck groups were not marked as often as the reasons that make a good wreck diving site (note small number of counts in Fig. 15). Careless behavior of divers was seen as the biggest threat in Kronprins Gustav Adolf (count of 3), Russarö northwest (3), Keulakuva (2) and Siivo (2). Too many divers was seen as biggest threat in Park Victory (n=3). Boat traffic or ports as second biggest in Kronprins Gustav Adolf (n=2) and pollution as second biggest in Russarö northwest (n=2). Other marked risk factors only included single answers.

Development needs for wreck groups were marked for Ladoga, Park Victory, Coolaroo, Siivo, St. Mikael and Kronprins Gustav Adolf but all development needs were single answers except for the protected St. Mikael wreck for which the development need in 2 answers was marked as allowing diving through a dive permit. A buoy was hoped for at Ladoga, Park Victory, Coolaroo and Siivo (all count of 1). Accommodation near wreck was hoped for at Ladoga and Kronprins Gustav Adolf (both count of 1). A scuba tank's air refill possibility was hoped near wrecks Ladoga, Park Victory and Kronprins Gustav Adolf (all count of 1). A berth in a nearby island was hoped for at Ladoga and Kronprins Gustav Adolf (both count of 1) and refueling was hoped for near wrecks Ladoga, Park Victory and Kronprins Gustav Adolf (all count of 1).

### 3.5 Advantages of wreck diving and features of a good wreck diving site

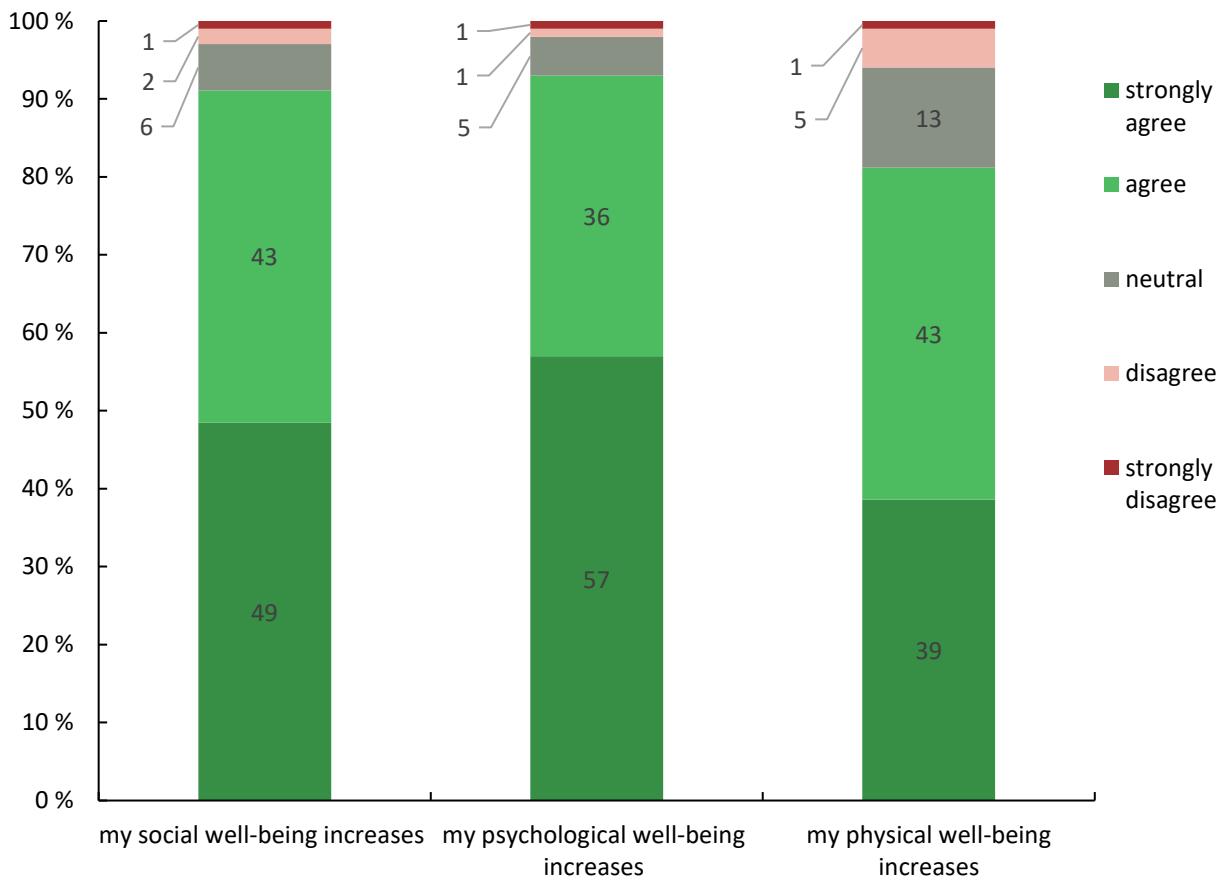


Figure 16. The effects of wreck diving on social well-being (e.g. improvement in ability to work, strengthening relationships, enjoying working together or being alone, n=108), psychological well-being (e.g. satisfaction in life, improvement in general mood, recovery from stress, learning new things, n=107) and physical well-being (e.g. maintaining physical fitness, acquiring new skills, physically feeling good, n=110).

Social well-being was seen strongly as an effect of wreck diving by participants (Fig. 16). Especially psychological well-being was seen as meaningful as 57% (61) strongly agreed and 36% (39) agreed with it increasing related to wreck diving. For social well-being 49% (53) strongly agreed and 43% (46) agreed that it increases with wreck diving. Physical well-being was not seen quite as meaningful as social and psychological well-being but still 39% (43) strongly agreed and 43% (47) agreed that it increased with wreck diving, with the addition that 13% saw the effect as neutral. For social well-being, 1% (1) strongly disagreed and 2% (2) disagreed that there is a connection between increasing social well-being and wreck diving. Percentages for psychological and physical well-being were similar (1% (1) strongly disagreed, 1% (1) disagreed; 1% (1) strongly disagreed, 5% (5) disagreed, respectively). A Kruskal-Wallis Test was conducted to examine the differences between groups ( $X^2=9,75$ ,  $df=2$ ,  $p=0.008$ ) and psychological well-being and physical well-being differed significantly from each other ( $p=0.006$ ) while social well-being and physical well-being ( $p=0,149$ ), and social well-being and psychological well-being ( $p=0,785$ ) did not differ significantly. Pairwise comparisons were made by a Dunn test with Bonferroni corrections. Social, psychological or physical well-being were not connected to any of the background variables (gender, diving intensity, diving experience, age; Kruskal-Wallis chi-squared,  $df=3$ , all  $p$ -values $>0.05$ ).

Participants were asked to describe in 3 words which features make a good wreck diving site and 50 answers were given. In these answers, history, intact/ship-like wreck and visibility were mentioned several times (24,

16 and 10 times, respectively). Details of the wreck were mentioned 8 times, safety 4 times, location 3 times and a buoy 3 times. Other features which had only 1 to 2 reference included authenticity, landscape, sea, pristine, old, challenging, wreck's big size, suitable depth, coldness and darkness.

### 3.6 Transportation, commercial services, artificial reefs and general development needs

Of participants, 114 provided information on how they usually travel to wreck diving sites. Dive clubs seem to be the most common provider for transportation as 63% (72) of the participants use a dive club's boat, 24% (27) use a private boat and 13% (15) use a commercial operator's boat. Of participants, 77% (85, n=111) would be willing to use services provided by a commercial dive company and 23% (26) would not be willing. Readiness to use commercial services was not connected to any of the background variables (gender, diving intensity, diving experience, age; all  $p > 0.05$ ). The significance was tested with  $\chi^2$  and with Fisher's exact test if the test conditions for  $\chi^2$  were not met. Asked to specify in which areas would commercial services be needed 28 answers were given. Six answers stated that they would use a commercial dive company's services in all areas where their own dive club doesn't go. In 3 answers the Sea of Åland was mentioned and in 3 answers the Archipelago Sea was mentioned. In 6 answers trips that take the whole day (distant sites) was mentioned. Additionally, protected wrecks (2), Ladoga wreck (1), Park Victory wreck (1), difficult sites (1), lakes (1), Hanko (1), Porkkala (1) and all sea areas (2) were mentioned. When asked about the need for artificial reefs in Finnish coastal waters, the answers were quite evenly distributed as 59 participants said yes and 55 said no (n=114) but there was no connection between the background variables (gender, diving intensity, diving experience, age; all  $p > 0.05$ ) and wish for artificial reefs. The significance was tested with  $\chi^2$  and with Fisher's exact test if the test conditions for  $\chi^2$  were not met. Additionally, in two answers it was stated that artificial reefs could be used for practicing by new divers and this could alleviate visitor pressure and damage on historically valuable wrecks.

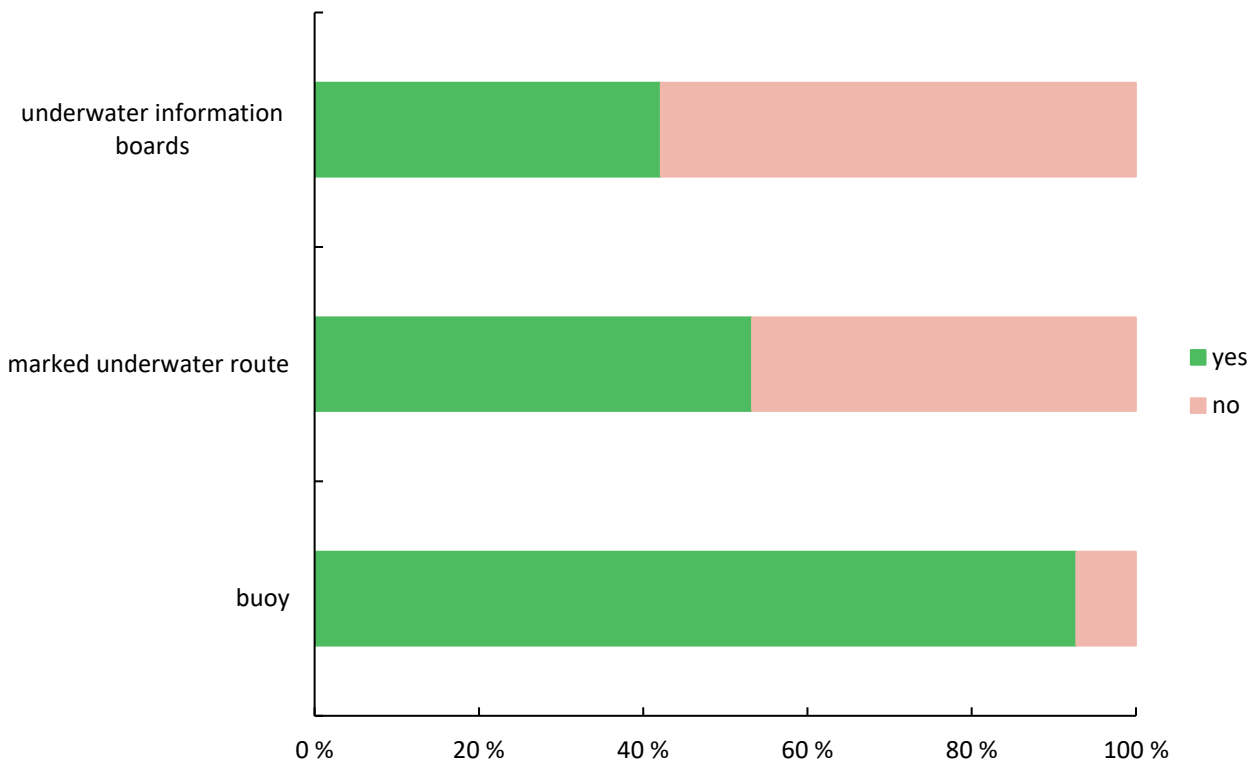


Figure 17. Participants' opinions whether a notable wreck site should have underwater info boards (n=102), marked underwater route (n=107) or a buoy (n=110).



Participants were asked whether in their opinion underwater information boards, marked underwater routes or buoys are needed in notable wreck sites (Fig. 17). From this question, 93% (102) answered that notable wreck sites should have a buoy and only 7% (8) said that a buoy is not needed (n=110). There was also no connection in the participants need for a buoy and any of the background variables (gender, diving intensity, diving experience, age) which was expected with a small amount of 'no' answers. The significance was tested with  $X^2$  and with Fisher's exact test if the test conditions for  $X^2$  were not met (used significance level 0.05). Underwater information board and marked underwater route were divided quite evenly regarding yes and no answers (42% (43) yes and 58% (59) no, n=102; 53% (57) yes and 47% (50) no, n=107, respectively). Regarding info boards and marked routes there was no significant connection with any of the background variables (gender, diving intensity, diving experience, age). The significance was tested with  $X^2$  and with Fisher's exact test if the test conditions for  $X^2$  were not met (used significance level 0.05). Additionally, an open answer field was provided should participants want to specify a site where they think one of these is needed and 17 answers were given. Parkki Plus, Korsö, Park Victory, Marhällan, Signilskär were all mentioned once and for needing a buoy, info boards and underwater route. Kultakaleeri was mentioned once and for needing a buoy. Other answers emphasized a general need for buoys and marked routes (3) but some also stated that manmade structures diminish the authentic experience of wreck diving (2).

Participants could give their recommendations and comments on how to further develop wreck diving in Finnish coastal areas and 22 answers were given. More buoys for wrecks was mentioned in 8 answers, more accurate coordinates in 2 answers, more artificial reefs in 2 answers, bigger fines for wreck-robbers in 2 answers and advertisement of close and easy sites in 2 answers. Single answers included alleviating diving permission in Åland, removing all diving restrictions in Finnish waters, helping businesses in the archipelago, developing the hylt.net site to work as a mobile application, making the dive permit application process more straightforward and more commercial services.

## 4. Discussion

The results of this survey showed that

- 1) most wreck divers are middle-aged men from Southern Finland and have many years of diving experience and rather high diving intensity;
- 2) wreck diving is strongly concentrated to the Gulf of Finland and the Archipelago Sea, and Estonia and Sweden are the most visited countries in the Baltic Sea regarding wreck diving tourism;
- 3) factors that most affect wreck site selection are a buoy for attaching the vessel and finding the wreck, uniqueness of the dive site, the wreck's known history, a ship-like wreck, info of the wreck's history is found online, good visibility, an available vessel for reaching the site, exact coordinates, accessibility and close proximity of the wreck, and differences were detected in the answers between genders and diving intensity;
- 4) reasons that make popular wreck diving sites attractive diving destinations were well preserved and a ship-like wreck, interesting history and easy access while underwater plants and landscapes had little significance;
- 5) services near the wreck are not important for most of the wreck divers in Finland in dive site selection and there was no strong wish for better services;
- 6) the need for more buoys was the most important development need and it was further emphasized by many participants throughout the survey;
- 7) the biggest threats to wrecks were seen in careless behavior of divers and in wreck-robbing;
- 8) Park victory was the most liked wreck in this survey while no one specific wreck stood out as most votes for development need;
- 9) in particular, the psychological advantages of the hobby are seen important amongst wreck divers;

- 10) dive clubs' boats are the most common transportation form to the wrecks and most participants would be willing to use services provided by commercial dive company;
- 11) answers concerning the need for more artificial reefs (i.e. deliberately sunken ships), underwater information boards and underwater routes were contradictory as they were preferred by roughly half of the participants while the other half were against them.

The socio-demographic findings of this survey are consistent with other similar studies of divers and wreck divers (Edney 2011, Holecek & Lothrop 1980). These findings involve a relatively high level of education, a predominance of males and a rather high age of divers. The level of education and age distribution in this survey are very similar to Edney's (2011) survey on wreck divers in Australia and Chuuk Lagoon. Also, the level of education of wreck divers is slightly higher compared to the Finnish average (OECD 2017). The average age of recreational scuba divers can be lower (Ong & Musa 2012) but this is at least partly explained with the remark that wreck diving requires improved skills and experience (Garrod & Gossling 2007) hence naturally implying higher age amongst the wreck divers. The participants' years of experience is skewed towards over 20 years of experience and as the median number of dives was 420, it can be presumed that a big part of wreck divers in Finland are skilled and experienced as divers. The sample size in this survey was not big, which affects the reliability of the data, but it is important to note that Finland is a small country and wreck divers as a group is not expected to be large. The sampling method can also create potential sources of bias in the results. The survey was open for a limited time and it favored the participation of those who use diving related sites on the internet on a regular basis and came across the advertisements of the survey. It can be assumed that those who dive more and are more associated with wreck diving encountered the survey online more likely than those who dive wrecks rarely. Additionally, those who dive more on wrecks can be more eager to participate in the survey than those who dive less, and it is conceivable that these divers could differ in their opinions from the divers who participated. The home towns of the divers were concentrated in the southern part of Finland which was expected considering the population distribution of Finland but it was also interesting that many divers were from various small towns. The concentrated population density in Southern Finland was predictably reflected in the Gulf of Finland and the Archipelago Sea being the most visited sea areas for wreck diving. However, due to the long history of intense trade and settlement in the south, more wrecks are also concentrated in these waters.

The factors that most affect wreck site selection are to some extent expected but also provide valuable information on how to further improve accessibility of wreck sites and foster tourism. For the participants in this survey the history of the wreck and also the availability of this information online seem to play an important role in site selection. Hence it would be expected that with more scientific research on wrecks and by providing more information on the wrecks' history online to the public, wreck tourism could increase. An intact and ship-like wreck also seem to be an important factor in wreck site selection but perhaps with interesting knowledge on a wreck's history, more degraded wrecks could also attract more wreck divers. Historically significant sites, artefacts and marine life were the primary reasons for divers visiting wrecks in Australia and Chuuk Lagoon (Edney 2011). Wreck divers in Finland appear to be more focused on wrecks per se as nearly 60% of the participants found plants and organisms having negligible effect on site selection and amongst reasons for good dive sites plants and organisms were mentioned only in 2% of the answers. However, this may also be related to the fact that marine life in northern Baltic waters is less impressive due to the low number of species and small size of organisms.

Data in this survey show that accessibility could be further improved by providing more accurate coordinates on wrecks and marking more wrecks with buoys. Buoys would also diminish the damage made by anchors on historically valuable wrecks, especially if suitable for vessel mooring. There were also some inconsistencies in the answers as participants hoped for more buoys, more exact coordinates and better accessibility to the wrecks while also stating that unique sites that many don't know have a great impact on their wreck site

selection. This discrepancy delineates the nature of diving as divers want to see mystique and hidden sites (Seesmeri 2018) but yet are limited by the practical constraints of the hobby.

Gender and diving intensity revealed interesting differences amongst participants regarding dive site selection. For women safety-related factors seemed to be more important in dive site selection than for men. Women's dive site selection is affected more by the safety of the site, sheltered site and no strong currents at the site compared to men. Additionally, plants and organisms at the site appeared to be more important for women than for men and the same was detected in the wreck diver survey conducted by Edney (2011).

Diving intensity of the participants in this survey revealed differences in answers regarding factors that affect site selection and these differences can be connected to the experience level of the divers. Those who dive more per year can be expected to be more experienced and more familiar and at ease with diving and it affects how they choose a dive site. Those who dive less than 10 dives a year more often chose sites that are shallower, are suited for everyone regardless of skill level, and have no strong currents at the site compared to those who dive more than 50 dives a year. Those who dive less per year are also more prone to select familiar sites and their attitudes towards popular sites and plants and organisms are more positive and neutral compared to those who dive more than 50 dives per year. This indicates that as diving intensity increases, and hence experience increases, familiar and popular sites are more likely to be avoided and diving becomes more 'serious' where wrecks are the more focused attraction and diving is often done in experienced company as site selection is not affected by skill level. However, diving experience as a background variable did not show similar significant results as diving intensity contrary to expectations. The reason for this could be that the range used for grouping the number of dives was too wide and thus potential differences between groups were not detected. Also diving experience does not correlate directly with diving intensity, in this case dives made per year, as divers who have been active in diving in the past, hence having perhaps many years of diving experience, may not be so active today which could mean that they are not so at ease with diving at this point in time. This could explain why there are no clear differences within diving experience groups. Furthermore, these results concerning dive site selection within different background variables should be treated with caution for two reasons. The sample size in this study was small, so drawing general conclusions that apply to whole wreck diver population in Finland is problematic. Men are shown to be overrepresented amongst wreck divers around the world (Holecek & Lothrop 1980, Edney 2011) so the small amount of woman participants in this survey was expected however this shortage creates problems in statistical testing between genders as group sizes vary drastically.

According to this survey, services play a very small role in dive site selection which could infer that in Finnish coastal areas the availability of services for most wreck divers is not important. Also, regarding development needs, services did not stand out which means that there is no strong wish for more services amongst participants. The biggest development need concerned buoys. However, the low need for services could also be the outcome of very few services available for divers at present which has resulted in finding ways to manage the sport without them and thus diminishing the significance of services for the hobby. In this case it does not directly mean that services would not be used should more be available but based on the results it is not possible to predict what kind of services would be most needed and used in each area.

The participants found biggest threats for wrecks in careless behavior of other divers and in wreck-robbing. Most divers value the cultural heritage of the wrecks and wish for wrecks to last for generations to come. Divers and diving-related activities are amongst the biggest threats to wrecks worldwide (Edney 2016, Edney 2006, Fors & Björndal 2013) and in her survey, Edney (2011) found that wreck divers in Australia and Chuuk lagoon strongly agreed that harsh penalties should be imposed on divers who collect items from wrecks, and that divers should be required to have special permits to dive some wrecks. Also, in open answers in this study, bigger fines for wreck-robbers were desired, more careful behavior of divers was called for and the concern about anchor-imposed damage to wrecks was brought up. Wreck divers in Finnish coastal areas also

saw eutrophication as a rather high risk to wrecks. However as mentioned by Fors & Björddal (2013) no direct effects of eutrophication on wrecks are known and as the highly eutrophic Baltic Sea experiences strong algal blooms in the summer time this worry could be related to the impaired visibility and otherwise noxious effect of eutrophication for the well-being of the Baltic Sea.

Park Victory was the most liked wreck in this survey and factors that make it a good wreck diving site were stated to be history, ship-like appearance and easy access. These factors are also amongst the factors that most affect wreck site selection in general. For Park Victory rather many participants also brought up that nearby services at Utö Island make this site a good wreck diving destination which does indicate that better services could attract more wreck divers. No one specific wreck or place stood out as needing the most development. Although the most needed development concerned more buoys, this need was scattered to various wrecks implying that even though the need seems to be urgent it is not unanimous to any one place.

Most participants (77%) would be willing to use services provided by commercial dive companies even though no specific site or area where there would be need for these were mentioned above others. In many answers it was stated that commercial diving services would be used in areas that are not visited by dive clubs. Thus, especially areas where adjacent towns have no active dive clubs could be potential niches for commercial operators. More artificial reefs, underwater information boards and underwater routes were hoped for by roughly half of the participants while the other half were against them. In open answers few participants pointed out that wreck diving is about searching mysterious and pristine sites and objects and that extra man-made structures would ruin the unique experience. The opposition towards artificial reefs however could be linked more to the aspect that these divers would not want to use them instead of them truly being against artificial reefs. Artificial reefs can be used to reduce diver impacts on historic shipwrecks (Edney 2016) and they can provide a safe and easy site for practicing wreck diving and thus decreasing damages on valuable wrecks. If looking for fostering wreck diving tourism in the Baltic Sea, more artificial reefs should be considered as a tool for sustainable tourism. Further, when considering development needs for Finnish coastal areas, it would be important that the opinions above are considered by keeping some wrecks from all extra human structures and concentrating possible marked routes and information boards on specific wrecks.

## References

- Dorofeev, S., & Grant, P. 2006. Statistics for real-life sample surveys: Non-simple-random samples and weighted data. Cambridge University Press.
- Dunn, O.J. 1964. Multiple comparisons using rank sums. *Technometrics* 6:241-252.
- Edney, J. 2016. A framework for managing diver impacts on historic shipwrecks. *Journal of maritime archaeology*, 11(3), 271-297.
- Edney, J. 2011. Understanding wreck divers: Case studies from Australia and Chuuk Lagoon. In *Proceedings of the Asia-Pacific Regional Conference on Underwater Cultural Heritage: 8–12 November* (pp. 575-587).
- Edney, J. 2006. Impacts of recreational scuba diving on ship-wrecks in Australia and the Pacific, a review.
- Fisher, R. A. 1934. *Statistical methods for research workers*, 5th edn. Oliver & Boyd, Edinburgh.
- Fors, Y., & Björddal, C. G. 2013. Well-preserved shipwrecks in the Baltic Sea from a natural science perspective. In *Interpreting Shipwrecks. Maritime Archaeological Approaches*.
- Garrod, B., & Gosling, S. (Eds.). 2007. *New Frontiers in Marine Tourism*. Routledge.

- Holecek, D. F., & Lothrop, S. J. 1980. Shipwreck vs. nonshipwreck scuba divers: characteristics, behavior, and expenditure patterns.
- Interreg Baltic Sea Region Project library. 6.9.2019. Baltic Sea Region Integrated Maritime Cultural Heritage Management. <https://projects.interreg-baltic.eu/projects/balticrim-133.html>.
- OECD. 2017. OECD Indicators: Education at a Glance 2017.
- Ong, T. F., & Musa, G. 2012. Examining the influences of experience, personality and attitude on SCUBA divers' underwater behaviour: A structural equation model. *Tourism management*, 33(6), 1521-1534.
- Ranta, E., Rita, H., & Kouki, J. 2002. *Biometria*. 8. painos. Helsinki: Yliopisto.
- Seesmeri, L. 2018. Maisema, johon voi uppoutua. *Kolumni 2/2018*. Sukeltaja-lehti.
- Zar, J.H. 2010. *Biostatistical Analysis*, 5th ed. Pearson Prentice Hall: Upper Saddle River, NJ.

## Attachment 1

### Questionnaire in Finnish

#### Suomen rannikkoalueen hylkysukelluksen kehittämiskysely

Tällä kyselytutkimuksella kerättävää tietoa käytetään hyväksi vedenalaisen kulttuuriperinnön saavutettavuuden ja tunnettavuuden kehittämisessä. Keräämme tietoa hylkysukelluksesta Suomen rannikkoalueilla sekä hylkysukelluksen kehittämistarpeista. Toivotamme tervetulleiksi kaikki viime vuosina Suomen rannikkoalueilla hylkysukellusta harrastaneet taitotasosta riippumatta vastaamaan ja vaikuttamaan Suomen rannikon hylkysukelluksen kehittämiseen. Kyselyyn vastataan nimettömänä ja vastaaminen vie noin \_\_\_ minuuttia. Kysely on avoinna \_\_\_ asti.

Kysely on osa BalticRIM-hanketta, jonka tarkoituksena on tuoda esille vedenalaisen kulttuuriperinnön arvoja ja määritellä niitä osaksi merialuesuunnittelun prosessia. Hankkeessa on kartoitettu Itämerellä erilaisia hylkyesiintymiä, ja Itämeren matkailun edistäminen nostamalla vedenalaisen kulttuuriperinnön tunnettavuutta on tärkeä osa hanketta.

#### *Sukelluksen määrä ja sukellusalueet*

Kuinka usein sukellat hyljillä tai muilla vedenalaisilla kulttuuriperinnön kohteilla Suomen rannikolla?

alle 10 kertaa vuodessa

10-30 kertaa vuodessa

30-50 kertaa vuodessa

yli 50 kertaa vuodessa

Millä merialueilla sukellat hyljillä tai muilla vedenalaisilla kulttuuriperinnön kohteilla? (Voit valita usean vaihtoehdon).

Suomenlahden alueella

Saaristomeren alueella

Ahvenanmeren alueella

Selkämeren alueella

Merenkurkun alueella

Perämeren alueella

Oletko viimeisen 5 vuoden aikana harrastanut hylkysukellusta muualla Itämerellä kuin Suomessa? (Voit valita usean vaihtoehdon).

Ruotsi

Tanska

Saksa  
Puola  
Viro  
Latvia  
Liettua  
Venäjä

### *Hylkykohteen valinta osa 1*

Mitkä hylkyyn liittyvät tekijät vaikuttavat sukelluskohteeksi päätyvän hyllyn valintaan ja kuinka suuri merkitys eri tekijöillä on? (Vastaa jokaiseen kohtaan ja valitse se vaihtoehto, joka parhaiten kuvaa tuntemuksiasi). Vaihtoehdot: erittäin suuri vaikutus, melko suuri vaikutus, ei suuri eikä pieni vaikutus, melko pieni vaikutus, erittäin pieni vaikutus, en osaa sanoa.

hylystä tietoa infotauluissa paikan päällä hylkypuistomaisesti

hyllyn historiasta löytyy tietoa hylt.net- tai kyppi.fi -sivustoilta tai muualta internetistä

hylystä saatavilla hylkykartat tai 3D-mallit

hylky on poijutettu

hylky on turvallinen (riski jäädä kiinni johonkin on pieni)

hylky on ehjä ja "laivamainen"

hyllyn historia ja "tarina" tiedetään

hylky on historiallisesti arvokas kohde

hylky on erityisen vanha

hyllyn syvyys (matala kohde <30m)

hyllyn syvyys (syvä kohde >30m)

hyllyn yleinen suosio/tunnettuus

hyllyn ei-tunnettuus/ainutkertainen kohde, jota monet ei tiedä

### *Hylkykohteen valinta osa 2*

Mitkä hyllyn sijaintiin ja ympäristöön liittyvät tekijät vaikuttavat sukelluskohteeksi päätyvän hyllyn valintaan ja kuinka suuri merkitys eri tekijöillä on? (Vastaa jokaiseen kohtaan ja valitse se vaihtoehto, joka parhaiten kuvaa tuntemuksiasi). Vaihtoehdot: erittäin suuri vaikutus, melko suuri vaikutus, ei suuri eikä pieni vaikutus, melko pieni vaikutus, erittäin pieni vaikutus, en osaa sanoa.

hyllyn läheinen sijainti

hylky helppo saavuttaa/hyvä saavutettavuus

hylystä on saatavilla tarkat koordinaatit  
kohde sopii kaikille taitotasosta riippumatta  
hyllyn "helppous" (helppo mennä, koska tuttu kohde)  
sopivan tukialuksen saatavuus määrittelee hylkykohdetta  
hyllyllä on usein hyvä näkyvyys  
hyllyn läheisyydessä on paljon vedenalaisia kasveja ja eliöstöä  
kohde on suojaisa ja sinne pääsee joka säällä  
hyllyn läheisyydessä ei kovia virtauksia  
potentiaalinen paikka löytää uusi hylky

### *Hylkykohteen valinta osa 3*

Mitkä palveluihin liittyvät tekijät vaikuttavat sukelluskohteeksi päätyvän hyllyn valintaan ja kuinka suuri merkitys eri tekijöillä on? (Vastaa jokaiseen kohtaan ja valitse se vaihtoehto, joka parhaiten kuvaa tuntemuksiasi). Vaihtoehdot: erittäin suuri vaikutus, melko suuri vaikutus, ei suuri eikä pieni vaikutus, melko pieni vaikutus, erittäin pieni vaikutus, en osaa sanoa.

palvelut hylkykohteen lähellä (majoittuminen: esim. mökki tai telttapaikka ulkoilualueilla)

palvelut hylkykohteen lähellä (ruuanlaittomahdollisuus)

palvelut hylkykohteen lähellä (sauna)

palvelut hylkykohteen lähellä (venepaikka majoituspaikan lähellä)

palvelut hylkykohteen lähellä (veneeseen tankkausmahdollisuus)

palvelut hylkykohteen lähellä (ilmantäyttömahdollisuus majoituspaikalla)

palvelut hylkykohteen lähellä (ravintolapalvelut)

Onko jotain muuta, mitä haluaisit mainita erikseen hylkykohteen valintaan vaikuttavista tekijöistä? (Avoin vastauskenttä).

### *Parhaat hylkykohteet*

Mitkä kohteet ovat mielestäsi parhaita hylkysukelluskohteita Itämerellä Suomen rannikolla. Merkitse kartalle 1-4 mieleisintä hylkysukelluskohdetta Itämerellä Suomen rannikolla.

1. Lähennä ensin kartta niin, että alue sijoittuu mahdollisimman oikein. Lähennä- ja loitonna-työkalut ovat kartan oikeassa yläkulmassa (+ ja -). Voit liikuttaa karttaa hiirellä raahaamalla tai pistettä hiirellä raahaamalla.

2. Valitse paikannustyökalu ja merkitse alue kartalle.



3. Ensimmäisen kohteen valinnan jälkeen voit merkitä lisää kohteita painamalla uudestaan ”mieleinen hylkysukelluskohde” -paikannustyökalua.

Karttakohteen valinnan jälkeen esille tulee ponnahtusikkuna, johon voit kertoa lisää kyseisestä hylkykohteesta. Jos oikean kohdan löytäminen kartalta on haastavaa, merkitse kohta lähimmäksi sitä paikkaa, jossa oletat kohteen olevan ja kirjoita kohteen merkitsemisen jälkeen esille tulevaan ponnahtusikkunaan mahdollisimman tarkasti kohteen nimi ja muut tiedot. Suomen merialueen hylkykohteet näkyvät kartalla violetteina ympyröinä ja hylkykohdetta painamalla näet hyllyn nimen.

*Ponnahtusikkuna:*

Kirjoita kohteen/hyllyn nimi (esim. Museoviraston muinaisjäännösrekisterin kohdenumero tai muu nimi, jolla kohteen tunnet). (Avoin vastauskenttä).

Mikä tekee tästä paikasta hyvän hylkysukelluskohteen? (Voit valita usean vaihtoehdon)

hylky on helposti saavutettavissa

hyllyn historia on mielenkiintoinen

hylky on ehjä ja ”laivamainen”

hyllyn läheisyydessä on paljon kasveja ja eliöstöä

hyllyn ympäristössä on hieno vedenalainen maisema

hyllyn lähellä on hyvät palvelut (majoittuminen)

muu

jos muu, mikä? (Avoin vastauskenttä).

Millaisia sinulle tärkeitä palveluita hylkykohteen läheisellä alueella on saatavilla? (Avoin vastauskenttä).

Onko sukelluskohteen lähellä majoitusmahdollisuutta (esim. venepaikka/suojaisa laituri, vuokramökkejä/telttailumahdollisuus). Jos on, niin missä? (Avoin vastauskenttä).

Onko jotain muuta, mitä haluaisit mainita kyseisestä sukelluskohteesta tai siitä, kuinka sen saavutettavuutta voisi entisestään parantaa? (Avoin vastauskenttä).

Koetko joidenkin tekijöiden olevan riski kyseisen hylkykohteen säilymiselle? (Voit valita usean vaihtoehdon)

laivaliikenne tai satamat

uusiutuvan energian käyttöön liittyvät rakennelmat esim. tuulivoimalat

kalastus

ilmastonmuutos

kävijäpaine (liikaa sukeltajia)

sukeltajien varomaton käyttäytyminen hyllyllä

rakentaminen tai ruoppaus

rehevöityminen

saastuminen

roskaantuminen

turismi

hylvynryöstäjät

muu

jos muu, mikä? Voit myös avata edellisiä kohtia sanallisesti. (Avoin vastauskenttä).

*Ponnahdusikkuna loppuu tähän.*

#### *Kehittämistä kaipaavat hylkykohteet*

Mitkä hylkysukelluskohteet Itämerellä Suomen rannikolla kaipaavat mielestäsi erityistä kehittämistä? Kehittäminen voi liittyä mihin tekijään tahansa niin kohteen saavutettavuudesta, lähellä olevan majoituksen puuttumiseen tai hylystä saatavilla olevan tiedon puutteeseen. Kaikki kehitysideat kiinnostavat meitä!

Merkitse kartalle Suomen rannikolla 1-4 hylkysukelluskohdetta, jotka mielestäsi kaipaisivat eniten kehittämistä.

1. Lähennä ensin kartta niin, että alue sijoittuu mahdollisimman oikein. Lähennä- ja loitonna-työkalut ovat kartan oikeassa yläkulmassa (+ ja -). Voit liikuttaa karttaa hiirellä raahaamalla tai pistettä hiirellä raahaamalla.

2. Valitse paikannustyökalu ja merkitse alue kartalle.

3. Ensimmäisen kohteen valinnan jälkeen voit merkitä lisää kohteita painamalla uudestaan ”kehitettävä hylkysukelluskohde” -paikannustyökalua.

Karttakohteen valinnan jälkeen esille tulee ponnahdusikkuna, johon voit kertoa lisää kyseisestä hylkykohteesta. Jos oikean kohdan löytäminen kartalta on haastavaa, merkitse kohta lähimmäksi sitä paikkaa, jossa oletat kohteen olevan ja kirjoita kohteen merkitsemisen jälkeen esille tulevaan ponnahdusikkunaan mahdollisimman tarkasti kohteen nimi ja muut tiedot.

#### *Ponnahdusikkuna:*

Minkälaista kehittämistä tämä sukelluskohde kaipaisi? (Voit valita usean vaihtoehdon)

poiju hyllylle

majoittumismahdollisuus jollekin lähisaarelle

sukellussäiliön täyttömahdollisuus jollekin lähisaarelle

venepaikka jollekin lähisaarelle

veneeseen tankkausmahdollisuus

muu

jos muu, mikä? Voit kertoa lisää kehittämisideoita sanallisesti. (Avoin vastauskenttä)

*Ponnahdusikkuna loppuu tähän.*

### *Hylkysukelluksen hyödyt*

Miten koet hylkysukelluksen vaikuttavan yleiseen terveydentilaasi ja hyvinvointiisi seuraavilla osa-alueilla? (Vastaa jokaiseen kohtaan ja valitse se vaihtoehto, joka parhaiten kuvaa tuntemuksiasi). Vaihtoehdot: täysin samaa mieltä, melko samaa mieltä, ei samaa eikä eri mieltä, melko eri mieltä, täysin eri mieltä.

sosiaalinen hyvinvointini lisääntyy (esim. työkyvyn paraneminen, ihmissuhteiden lujittuminen, yksin tai yhdessä tekemisestä nauttiminen)

psykykinen hyvinvointini lisääntyy (esim. tyytyväisyys elämään, mielialan kohentuminen, palautuminen uupumuksesta, uuden oppiminen)

fyysinen hyvinvointini lisääntyy (esim. fyysisen kunnan ylläpito, uusien taitojen omaksuminen, fyysinen hyvä olo)

Kuvaile kolmella sanalla ominaisuuksia, jotka tekevät hylkykohteesta mieleisen sukelluspaikan. (Avoin vastauskenttä).

Kuinka liikut useimmiten hylkykohteille? Valitse yksi.

sukelluseuran veneellä

omalla tai kaverin veneellä

kaupallisen toimijan veneellä

Pitäisikö merkittäväällä hylkykohteella mielestäsi olla seuraavia? Vaihtoehdot: kyllä, ei.

poiju

vedenalainen merkitty reitti

vedenalaisia opastetauluja

Jos jokin hylkykohde mielestäsi kaipaisi jotain näistä, niin kirjoita alle paikka sekä puute. (Avoin vastauskenttä).

Olisitko valmis käyttämään kaupallisen sukellusyrittäjän tarjoamia palveluita Suomen rannikkoalueilla?  
Vaihtoehdot: kyllä, ei.

Millaisilla kohteilla/alueilla haluaisit käyttää kaupallisen sukellusyrittäjän palveluita? (Avoin vastauskenttä).

Minkälaisilla tekijöillä hylkysukeltamista voitaisiin Suomen rannikkoalueilla mielestäsi parantaa? (Avoin vastauskenttä).

Kaipaisitko tarkoituksella upotettuja hylkyjä (artificial reefs) täydentämään Suomen rannikkoalueen hylkytarjontaa? Vaihtoehdot: kyllä, ei.

*Taustatiedot - Taustatietoja tiedustellaan vastausten tilastollista käsittelyä varten.*

Sukupuoli

nainen

mies

muu

Syntymävuosi

Sukelluskokemus vuosina

5 vuotta tai alle

6-10 vuotta

11-20 vuotta

yli 20 vuotta

Tehtyjen sukellusten määrä

Koulutus

kansakoulu/alle

perus/keskikoulu

lukio/ammattikoulu

opistoaste

alempi korkea-aste

ylempi korkea-aste

tutkijakoulutus

Kotikunta/asuinkunta

Mikäli haluat esittää muita ajatuksiasi, niin kirjoita niitä tähän. (Avoin vastauskenttä).

Kiitos osallistumisesta

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Suomesta hankkeeseen osallistuvat Museovirasto, Turun yliopisto sekä Metsähallituksen Luontopalvelut. Liitännäisorganisaationa mukana ovat myös Ålands Landskapsregering Kulturbyrån, Kymenlaakson Liitto ja Suomen Sukeltajaliitto.

Metsähallitus osallistuu erityisesti hankkeen tiedonkeruuseen ja kenttätöihin yhteistyössä Museoviraston kanssa. Hanke on saanut EU:n Itämeristrategian kulttuurin prioriteettialueen lippulaivahankkeen statuksen ja Euroopan komissio valitsi BalticRIMin Kulttuuriperinnön eurooppalaisen teemavuoden 2018 hankkeeksi.

Kiitos kyselyyn vastaamisesta ja mukavaa sukelluskevättä ja -kesää!

## Attachment 2

### Questionnaire in English

#### Questionnaire survey of Finnish coastal area wreck diving

The information gathered through this questionnaire survey is used to develop the accessibility and general awareness of underwater cultural heritage sites in Finnish coastal areas. We collect information on wreck diving in the Finnish coastal areas and on the development needs connected to wreck diving in Finland. Everyone who has been wreck diving in the Baltic Sea in Finnish coastal areas in recent years is warmly welcomed to participate in this survey regardless of diving skill level. The survey is anonymous and it takes around 10 minutes to answer the questions. The survey is open until 17 July 2019.

This survey is part of the BalticRIM -project which aims to highlight the values of underwater cultural heritage sites and to define them as part of the maritime spatial planning process. Several wreck sites in the Baltic Sea have been mapped and identified within the project. Additionally, promoting Baltic Sea tourism by raising awareness of underwater cultural heritage is an important part of the project.

#### *Number of dives and diving sites*

How often do you dive on wrecks or other underwater cultural heritage sites on the Finnish coastal area?

less than 10 times a year

10-30 times a year

31-50 times a year

more than 50 times a year

In which sea areas do you dive into wrecks or other underwater cultural heritage sites? (You can select multiple options)

Gulf of Finland

Archipelago Sea

Sea of Åland

Bothnian Sea

Kvarken

Bothnian Bay

In the past five years, have you been wreck diving in other sea areas in the Baltic Sea other than in Finland? (You can select multiple options)

Sweden

Denmark

Germany

Poland

Estonia

Latvia

Lithuania

Russia

Which factors related to wreck itself affect the choice of a dive site and how important are the different factors? (Reply to each point and choose the option that best describes your feelings). Options: very big effect, rather big effect, not big or small effect, quite small effect, very small effect, I cannot say.

info board of the wreck underwater at the site

info of the wreck's history can be found online (e.g. [hylyt.net](http://hylyt.net) or [kyppi.fi](http://kyppi.fi))

wreck maps or 3D models available from the wreck

wreck is with a buoy

wreck is safe (the risk of entanglement is small)

wreck is intact and 'ship-like'

the history or the 'story' of the wreck is known

the wreck is historically valuable

the wreck is particularly old

the depth of the wreck (shallow <30m)

the depth of the wreck (deep >30m)

popularity of the wreck

unpopularity of the wreck/a unique and quiet site than many don't know

Which factors related to the location and surroundings of a wreck affect the choice of a dive site and how important are the different factors? (Reply to each point and choose the option that best describes your feelings). Options: very big effect, rather big effect, not big or small effect, quite small effect, very small effect, I cannot say.

close proximity to the wreck

good accessibility to the wreck

the exact coordinates of the wreck are available

the site is suitable for everyone regardless of skill level

familiar site -easy to go

the availability of a suitable vessel defines the wreck site that can be visited

good visibility at the site

there are lots of underwater plants and organisms at the wreck site

the site is sheltered from the winds and waves and can be reached in any weather

there are no strong currents at the wreck site

potential place to find a new wreck

Which factors related to services affect the choice of a dive site and how important are the different factors? (Reply to each point and choose the option that best describes your feelings). Options: very big effect, rather big effect, not big or small effect, quite small effect, very small effect, I cannot say.

services near the wreck site (accommodation: cabin or area for tent with outdoor toilet)

services near the wreck site (self-catering facilities)

services near the wreck site (sauna)

services near the wreck site (berth close to accommodation)

services near the wreck site (refueling possibility)

services near the wreck site (scuba cylinder's air refill possibility)

services near the wreck site (restaurant)

Is there anything else you would like to mention about the factors that affect the choice of a wreck dive site. (Open answer field).

*Which wreck sites in Finnish coastal area are the best ones in your opinion*

Which destinations do you think are the best wreck diving sites in the Baltic Sea off the Finnish coast? Mark 1-3 of your favorite wreck diving sites on the Finnish coast on the map

1. First, zoom the map so that the area is positioned as correctly as possible. The zoom-in and zoom-out tools are located in the top right corner of the map (+ and -). You can move on the map by dragging either the point or the map with your mouse.

2. Select the location tool below and mark the wreck on the map (place the blue mark on top of the wreck you have chosen).

3. After selecting the first point on the map you can mark more wrecks by pressing again the 'favorite wreck dive site' button.

After choosing the point on the map, a pop-up window will appear and you will be asked to share more details of the wreck dive site. The wreck sites along the Finnish coast are shown on the map as circles. You can see the name and number of the wreck by pressing the circle. If the wreck you are looking for cannot be found on the map, mark the point closest to the place where you expect the specific wreck to be, and



after the point is tagged, enter the name of the wreck and other information as accurately as possible in the pop-up window that appears.

If the wreck was not already marked as a circle on the map, write down the name of the wreck (e.g. the item number of The Finnish Heritage Agency's relic register or any other name that you know of the wreck).

*Pop-up window:*

Name of the wreck

What makes this place a good wreck diving destination? (You can select multiple options)

wreck is easily accessible

the history of the wreck is interesting

the wreck is intact and 'ship-like'

there are lots of underwater plants and organisms near the wreck

the wreck is surrounded by a wonderful underwater landscape

there are good services near the wreck (accommodation)

other

If other, what? (Open answer field).

What kind of services you find important are available in the area near the wreck site? (Open answer field).

Is there a possibility of accommodation near the dive site (e.g. Berth/sheltered pier, rental cottages/camping facilities). If so, where? (Open answer field).

Is there anything else you would like to mention about this dive site or how its accessibility could be further improved? (Open answer field).

Do you think that some factors can pose a threat to this dive site. (You can select multiple options)

boat traffic or ports

renewable energy facilities e.g. wind power stations

fishing

climate change

too many divers

careless behavior of divers

construction or dredging

eutrophication

pollution

trash

tourism

wreck robbing

other

If other, what? (Open answer field)

*Pop-up window ends here.*

### *Wreck dive sites that need development*

In your opinion, which wreck dive sites on the coast of Finland need special development? Development can be related to any factor, both in terms of accessibility, lack of nearby accommodation, or lack of information available on the wreck. All development ideas are of interest to us!

Mark 1-3 wreck diving sites that need development on the Finnish coast on the map

1. First, zoom the map so that the area is positioned as correctly as possible. The zoom-in and zoom-out tools are located in the top right corner of the map (+ and -). You can move on the map by dragging either the point or the map with your mouse.
2. Select the location tool below and mark the area on the map.
3. After selecting the first point on the map you can mark more wrecks by pressing again the 'wreck dive site that needs development' button.

After choosing the point on the map, a pop-up window will appear and you will be asked to share more details of the wreck dive site. If finding the right spot on the map is challenging, mark the point closest to the place where you expect the specific wreck to be, and after the point is tagged, enter the name of the wreck and other information as accurately as possible in the pop-up window that appears.

*Pop-up window:*

What kind of development would this dive site need? (You can select multiple options)

a buoy

accommodation/camping possibility in some nearby island

scuba cylinder's air refill possibility in some nearby island

berth in some nearby island

refueling possibility in some nearby island

other

If other, what? (Open answer field)

You can also share more development ideas here. (Open answer field).

*Pop-up window ends here.*

### *Advantages in wreck diving*

How do you feel that wreck diving is affecting your overall health and well-being in the following areas? (Reply to each point and choose the option that best describes your feelings). Options: strongly agree, agree, neutral, disagree, strongly disagree.

my social well-being increases (e.g. improvement in ability to work, strengthening relationships, enjoying working together or being alone)

my psychological well-being increases (e.g. satisfaction in life, improvement in general mood, recovery from stress, learning new things)

my physical well-being increases (e.g. maintaining physical fitness, acquiring new skills, physically feeling good)

Describe in three words which features make a good wreck diving site. (Open answer field).

How do you usually travel to wreck diving sites? Choose one.

by dive club's boat

by my own or friend's boat

by commercial operator's boat

Do you think that a notable wreck site should have the following? Options: yes, no.

a buoy

marked underwater route

underwater information boards

If some wreck in your opinion needs these, write down the name and the item needed. (Open answer field).

Would you be willing to use services provided by a commercial dive company in Finnish coastal area? Options: yes, no.

In which areas would you be willing to use services provided by a commercial dive company? (Open answer field).

What kind of general factors could improve wreck diving in Finnish coastal areas in your opinion? (Open answer field).

Do you think we should have artificial reefs to supplement the natural wreck collection in Finnish coastal areas? Options: yes, no.

*Background information - Background information is collected for statistical analysis purposes.*

Gender:

Woman

Man

Other

Year of birth

Diving experience in years:

5 years or less

6-10 years

11-20 years

over 20 years

Total number of dives

Education:

elementary school

elementary school and secondary school

high school/trade school

junior college

bachelor's degree or equivalent

master's degree or equivalent

doctoral degree

City of residence

If you have any comments or thoughts you would like to share, please write them here. (Open answer field).

Thank you for participating

BalticRIM project is funded by the Interreg Baltic Sea Region programme between years 2017-2020 and it is directed by the archaeological department of the state of Schleswig-Holstein in Germany. A total of 13 partners from Germany, Finland, Estonia, Lithuania, Poland, Denmark and Russia participate in the project.

The Finnish Heritage Agency, the University of Turku and Metsähallitus' Parks & Wildlife participate in the project from Finland. The Ålands Landskapsregering Kulturbyrå, Kymenlaakson Liitto and the Finnish Divers' Federation are also involved. Metsähallitus participates in data collection and field work in cooperation with The Finnish Heritage Agency.

Thank you for participating and have a good time diving this spring and summer in Finland!

## Attachment 3

Specified data on the wrecks that were marked more than two times in the survey. Water temperature is summer average. Vessel density stands for number of crossings.

Name of the wreck	Longitude	Latitude	Depth (m)	Seabed slope	Secchi depth (m)	Substrate	Salinity	Oxygen mg/L	Water temp. °C	BSPI*	Nature conservation area	Vessel density	Fishing vessel density
Coolaroo	24,8757748	60,0175559	-9,3	0,61	3,6	Rock & boulders	5,32	7,23	19,1	1,81	no	1	0
Klaus Oldendorf	24,3470737	59,8278242	-38,9	0,36	4,0	Restricted data	5,24	6,75	8,5	2,66	no	1207	0
Eira	23,2699417	59,7541147	-23,4	2,44	4,2	Mud to muddy Sand	5,71	7,41	11,0	1,99	yes	2	0
Kronprins Gustav Adolf	24,9261677	60,0506655	-19,7	0,29	3,5	Mixed sediment	5,22	7,15	14,9	2,44	no	1020	0
Russarö northwest	22,9282800	59,7807759	-20,2	3,12	4,3	Restricted data	5,84	7,41	12,8	2,30	no	0	0
Keulakuva	22,7689492	59,8612301	-10,0	0,41	4,0	Mixed sediment	5,80	7,53	19,4	2,39	yes	2	0
Ladoga	22,2977543	59,7904319	-41,0	1,16	4,5	Restricted data	5,99	7,46	9,7	2,65	no	26	26
Park Victory	21,4027186	59,7708465	-20,4	1,45	5,2	Restricted data	6,06	7,86	13,1	1,65	no	0	0
Siivo	22,1786827	59,7331650	-22,5	4,17	4,6	Mud to muddy Sand	5,96	7,69	10,7	2,42	yes	0	0
Alfred	22,1677226	59,8731612	-5,4	7,29	5,0	Mud to muddy Sand	6,04	7,16	19,8	2,69	no	0	0

\*The Baltic Sea Pressure Index (BSPI) is a straightforward measure of the geographical distribution and intensity of anthropogenic pressures on the Baltic Sea marine environment (HELCOM). The scale for the index is 0 (low pressure) to 10 (high pressure).

References for attachment 3:

National Board of Antiquities Finland: Wrecks

VELMU-project/Finnish Environment Institute: Depth, Slope, Secchi depth, Surface salinity, Oxygen, Bottom temperature

HELCOM: BSPI, Vessel density (AIS) 2016, Fishing vessel density (AIS) 2016

Geological survey of Finland: Seabed substrates