litteR - Analysis of Litter Data

2023-08-31 18:21:06

Introduction

This tool performs the following types of data analysis on beach litter data, or any other type of litter data: data quality control, outlier analysis, descriptive statistics, and trend analysis.

This report can best be viewed with the latest versions of web browsers like Google Chrome, Mozilla Firefox, Chromium, or Safari. Its contents does not render well in some versions of Microsoft’s Internet Explorer.

Settings

- period: from 2013-01-01 to 2021-12-31
- percentage of total count to analyse: 100%
- files:

    - project directory: ‘C:/Users/evbl/Desktop/IB2024_OS’
    - settings: ‘settings_OS.yaml’
    - data: ‘Data_file.csv’
    - types: ‘Category_file.csv’
- location codes: ‘Malarhusen’, ‘Nybrostrand’, ‘Sjauster’, ‘Tofta’, ‘Nattaro’, ‘Storsand’, ‘Rullsand’ and ‘Karehamn’
- region codes: ‘OS’
- group codes: ‘PLAST’, ‘TYG’, ‘METALL’, ‘PAPPER.KARTONG’, ‘GUMMI’, ‘TRA’, ‘GLAS.KERAMIK’, ‘SANITET.MEDICINSKT’, ‘ORGANISKT’, ‘KEMISKA.FORORENINGAR’, ‘OLIKA.MATERIAL’, ‘SUP’ and ‘FISH’
- type names: not specified
- figure quality: ‘high’
- cutoff count axis in plots: 100%

Data Quality Control

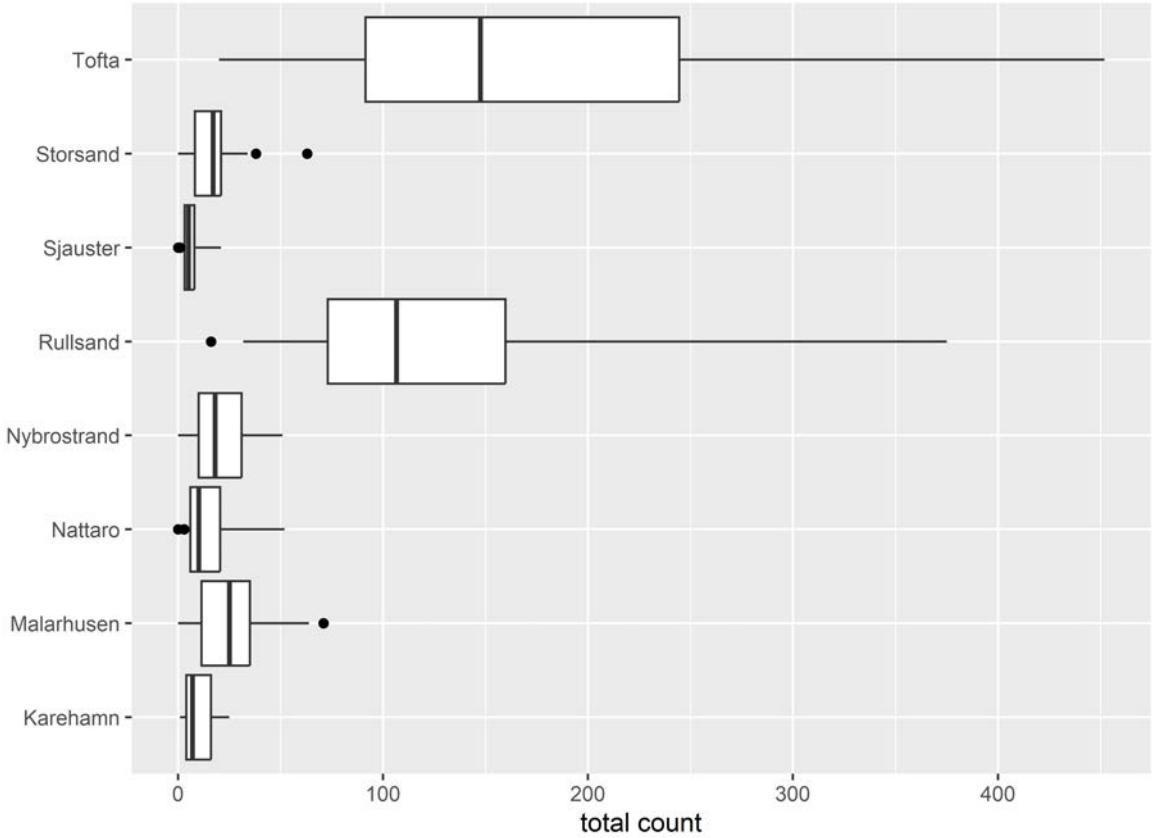
In this section, litter data will be read and validated. Warnings will be printed if they occur. See also the log-file for more details.

```
Warning: The following columns will be excluded from analysis:
'kat_ot01'
```

```
Warning: The following record(s) contain(s) only zeroes:
 35,  48, 103, 164 and 204.
Please, verify if this correct.
These record(s) will be included in the analysis.
```

Outlier analysis

For each `location_code` , adjusted boxplots (https://dx.doi.org/doi:10.1016/j.csda.2007.11.008) are given of the total count for outliers (https://en.wikipedia.org/wiki/Outlier) detection in the period 2013-01-01 to 2021-12-31. Outliers are given as dots (if any) in the adjusted box-and-whisker plots below. Note that outliers are not necessarily errors.



Outliers, if available, are listed in the table below. In addition, also the number of surveys `n` is reported. Litter experts should decide if outliers are errors and need to be excluded from analysis. Note, however, that due to its non-parametric nature, `litteR` is fairly robust for outliers.

location_code	date	n	total count
Malarhusen	2016-10-28	27	71
Nattaro	2015-04-27	27	0
Nattaro	2014-04-27	27	3

location_code	date	n	total count
Rullsand	2016-10-19	26	16
Sjauster	2017-07-31	26	0
Sjauster	2017-10-18	26	1
Sjauster	2021-05-01	26	1
Storsand	2015-04-29	22	38
Storsand	2021-08-01	22	63

Descriptive statistics

Basic statistics

The number of years and the number of surveys for each `location_code` should not be too small, otherwise the calculations in this report will be less reliable. In addition, the surveys should ideally also be evenly spread in time.

Note that **litteR** does not enforce a minimum number of years or surveys. That is the responsibility of the user. As a guideline, we advise a minimum of 5 years and 10 surveys, evenly distributed in time.

The table below gives the number of surveys and the number of years for each `location_code`.

region_code	location_code	number of years	number of surveys
OS	Karehamn	7	21
OS	Malarhusen	9	27
OS	Nattaro	9	27

region_code	location_code	number of years	number of surveys
OS	Nybrostrand	7	21
OS	Rullsand	9	26
OS	Sjauster	9	26
OS	Storsand	8	22
OS	Tofta	9	26

For each location code and group/type name, the following statistics have been estimated for the period 2013-01-01 to 2021-12-31:

- mean count (`mean`):, *i.e.*, the arithmetic mean (https://en.wikipedia.org/wiki/Arithmetic_mean) of the counts for each litter type;
- median count (`median`), *i.e.*, the median (https://en.wikipedia.org/wiki/Median) of the counts for each litter type;
- relative count (`%TC`): the contribution of each litter type to the total count of litter types (%);
- coefficient of variation (https://en.wikipedia.org/wiki/Coefficient_of_variation) (`cv`): the ratio of the standard deviation to the mean of the counts for each litter type (expressed as a fraction);
- ratio of mad (https://en.wikipedia.org/wiki/Median_absolute_deviation) and median (https://en.wikipedia.org/wiki/Median) (`rmad` , expressed as a fraction);
- number of surveys (`n`);
- Theil-Sen slope (https://en.wikipedia.org/wiki/Theil%E2%80%93Sen_estimator) (slope): a robust non-parametric estimator of slope (litter counts / year);
- p-value (https://en.wikipedia.org/wiki/P-value): the p-value associated with the one-tailed Mann-Kendall test (https://en.wikipedia.org/wiki/Kendall_rank_correlation_coefficient) to test the null hypothesis of
    - no monotonically *increasing* trend in case the Theil-Sen slope is greater than zero;
    - no monotonically *decreasing* trend in case the Theil-Sen slope is smaller than zero;

These statistics will be estimated for litter types with the greatest counts making up 100% of the total count for each location and for all groups specified in ‘Category_file.csv’.

> These statistics have been stored in file ‘litteR-results-20230831T182106.csv’.

The statistics for the litter groups are given in the table below. These group statistics are based on *all* litter types and not only on those types with the highest counts.

location_code	from	to	group_code	%TC	mean	median	cv	rmad	n	slope	p-value
Karehamn	2015-04-20	2021-10-27	TC	100	9.476	7	0.8069	0.8472	21	0	0.5483
Karehamn	2015-04-20	2021-10-27	PLAST	63.16	6.333	4	0.8937	1.112	21	0	0.4517
Karehamn	2015-04-20	2021-10-27	SUP	13.87	1.524	1	1.29	1.483	21	0	0.1192
Karehamn	2015-04-20	2021-10-27	METALL	9.711	0.7619	0	1.239	NA	21	0	0.7360
Karehamn	2015-04-20	2021-10-27	TYG	8.452	0.4286	0	1.892	NA	21	0	0.1172
Karehamn	2015-04-20	2021-10-27	TRA	8.233	0.6667	1	1.095	1.483	21	0	0.0361
Karehamn	2015-04-20	2021-10-27	FISH	6.158	0.8571	0	1.394	NA	21	0	0.3822
Karehamn	2015-04-20	2021-10-27	GUMMI	3.351	0.4286	0	2.03	NA	21	0	0.5000
Karehamn	2015-04-20	2021-10-27	ORGANISKT	2.745	0.2857	0	1.962	NA	21	0	0.4349
Karehamn	2015-04-20	2021-10-27	GLAS.KERAMIK	2.616	0.2857	0	1.962	NA	21	0	0.5972
Karehamn	2015-04-20	2021-10-27	PAPPER.KARTONG	1.731	0.2857	0	2.51	NA	21	0	0.3442
Karehamn	2015-04-20	2021-10-27	OLIKA.MATERIAL	0	0	0	NA	NA	21	0	NA
Karehamn	2015-04-20	2021-10-27	SANITET.MEDICINSKT	0	0	0	NA	NA	21	0	NA
Malarhusen	2013-04-19	2021-11-07	FISH	NaN	4.296	3	1.375	0.9884	27	0	0.3916
Malarhusen	2013-04-19	2021-11-07	GLAS.KERAMIK	NaN	0.7037	0	1.71	NA	27	0	0.1521

location_code	from	to	group_code	%TC	mean	median	cv	rmad	n	slope	p-value
Malarhusen	2013-04-19	2021-11-07	GUMMI	NaN	0.7778	0	2.179	NA	27	0	0.9981
Malarhusen	2013-04-19	2021-11-07	METALL	NaN	0.8148	0	1.598	NA	27	0	0.5647
Malarhusen	2013-04-19	2021-11-07	OLIKA.MATERIAL	NaN	0.2963	0	3.351	NA	27	0	0.1975
Malarhusen	2013-04-19	2021-11-07	ORGANISKT	NaN	3.556	0	2.429	NA	27	0	0.8172
Malarhusen	2013-04-19	2021-11-07	PAPPER.KARTONG	NaN	0.8148	0	1.598	NA	27	0	0.4529
Malarhusen	2013-04-19	2021-11-07	PLAST	NaN	16.96	13	0.7413	0.9124	27	0.7342	0.2016
Malarhusen	2013-04-19	2021-11-07	SANITET.MEDICINSKT	NaN	0.5185	0	2.694	NA	27	0	0.8741
Malarhusen	2013-04-19	2021-11-07	SUP	NaN	4.296	3	0.9871	0.9884	27	0	0.6629
Malarhusen	2013-04-19	2021-11-07	TC	NaN	26.44	25	0.7225	0.771	27	1.053	0.2865
Malarhusen	2013-04-19	2021-11-07	TRA	NaN	0.963	0	1.425	NA	27	0	0.4530
Malarhusen	2013-04-19	2021-11-07	TYG	NaN	1.556	1	1.045	1.483	27	0	0.8309
Nattaro	2013-05-05	2021-10-28	FISH	NaN	0.6296	0	1.178	NA	27	0	0.1542
Nattaro	2013-05-05	2021-10-28	GLAS.KERAMIK	NaN	0.4444	0	2.279	NA	27	0	0.5230
Nattaro	2013-05-05	2021-10-28	GUMMI	NaN	0.4444	0	2.101	NA	27	0	0.7777
Nattaro	2013-05-05	2021-10-28	METALL	NaN	1.407	1	1.102	1.483	27	0	0.8486
Nattaro	2013-05-05	2021-10-28	OLIKA.MATERIAL	NaN	0	0	NA	NA	27	0	NA
Nattaro	2013-05-05	2021-10-28	ORGANISKT	NaN	0.8889	0	2.192	NA	27	0	0.7555
Nattaro	2013-05-05	2021-10-28	PAPPER.KARTONG	NaN	1.037	0	2.473	NA	27	0	0.2230
Nattaro	2013-05-05	2021-10-28	PLAST	NaN	9.63	6	0.8689	0.7413	27	0.9243	0.0147
Nattaro	2013-05-05	2021-10-28	SANITET.MEDICINSKT	NaN	0.5926	0	2.257	NA	27	0	0.8009
Nattaro	2013-05-05	2021-10-28	SUP	NaN	6.63	4	0.956	1.112	27	0.6645	0.0365
Nattaro	2013-05-05	2021-10-28	TC	NaN	15.67	10	0.8739	0.7413	27	1.006	0.0096

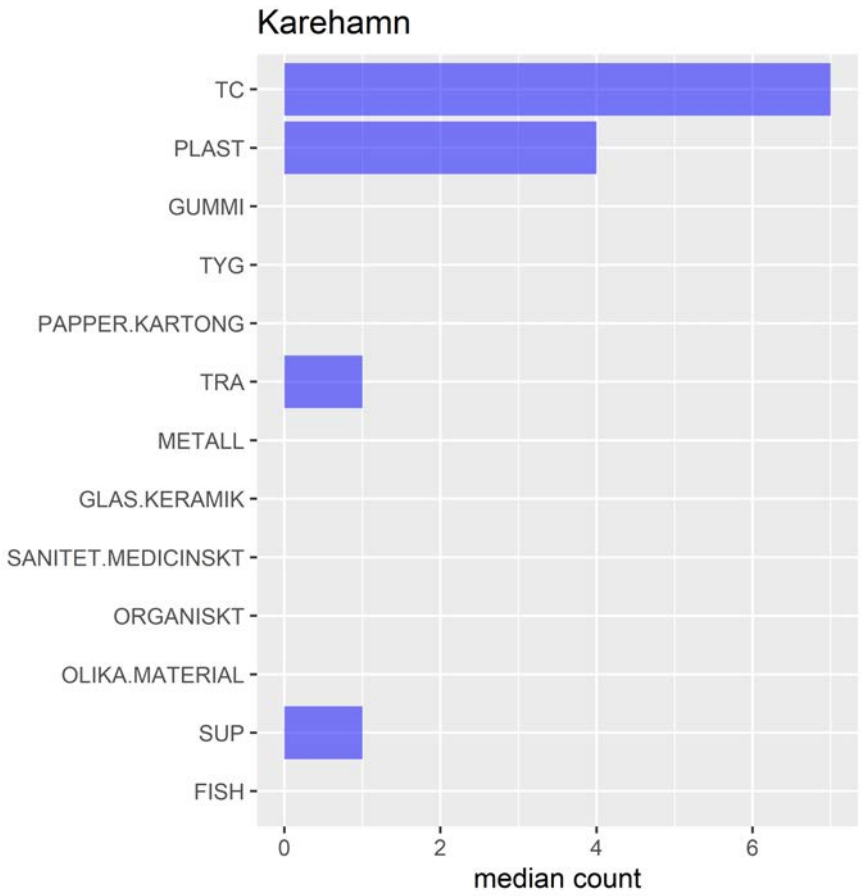
location_code	from	to	group_code	%TC	mean	median	cv	rmad	n	slope	p-value
Nattaro	2013-05-05	2021-10-28	TRA	NaN	0.8148	0	1.737	NA	27	0	0.1085
Nattaro	2013-05-05	2021-10-28	TYG	NaN	1	0	1.797	NA	27	0	0.8719
Nybrostrand	2015-04-21	2021-10-23	FISH	NaN	1.619	1	1.288	1.483	21	-0.4161	0.0017
Nybrostrand	2015-04-21	2021-10-23	GLAS.KERAMIK	NaN	1.048	1	1.431	1.483	21	-0.2057	0.0133
Nybrostrand	2015-04-21	2021-10-23	GUMMI	NaN	0.5238	0	1.872	NA	21	0	0.0584
Nybrostrand	2015-04-21	2021-10-23	METALL	NaN	1.857	1	1.081	1.483	21	-0.6019	0.0022
Nybrostrand	2015-04-21	2021-10-23	OLIKA.MATERIAL	NaN	0.04762	0	4.583	NA	21	0	0.2544
Nybrostrand	2015-04-21	2021-10-23	ORGANISKT	NaN	0.381	0	2.555	NA	21	0	0.5794
Nybrostrand	2015-04-21	2021-10-23	PAPPER.KARTONG	NaN	0.5714	0	1.62	NA	21	0	0.0060
Nybrostrand	2015-04-21	2021-10-23	PLAST	NaN	13.24	11	0.6807	1.078	21	-2.993	0.0027
Nybrostrand	2015-04-21	2021-10-23	SANITET.MEDICINSKT	NaN	0.2381	0	1.833	NA	21	0	0.3399
Nybrostrand	2015-04-21	2021-10-23	SUP	NaN	5.762	5	0.7279	0.593	21	-1.343	0.0012
Nybrostrand	2015-04-21	2021-10-23	TC	NaN	20.43	18	0.6866	0.8237	21	-4.399	0.0007
Nybrostrand	2015-04-21	2021-10-23	TRA	NaN	1.81	2	1.114	1.483	21	-0.3916	0.0189
Nybrostrand	2015-04-21	2021-10-23	TYG	NaN	0.9524	1	1.075	1.483	21	0	0.2015
Rullsand	2013-05-06	2021-10-24	TC	100	132.5	106.5	0.6687	0.6473	26	10.15	0.0259
Rullsand	2013-05-06	2021-10-24	PLAST	67.88	89.12	71	0.6743	0.5847	26	9.731	0.0025
Rullsand	2013-05-06	2021-10-24	SUP	27.58	39.27	27.5	0.9725	0.8356	26	3.423	0.0248
Rullsand	2013-05-06	2021-10-24	METALL	8.85	9.846	8.5	0.5982	0.6105	26	-0.1532	0.3129
Rullsand	2013-05-06	2021-10-24	TRA	7.855	9.115	7.5	0.7098	0.6919	26	0	0.4559
Rullsand	2013-05-06	2021-10-24	PAPPER.KARTONG	6.678	12.15	5	1.434	0.8896	26	0.7992	0.0219
Rullsand	2013-05-06	2021-10-24	FISH	4.835	5.731	4	0.9436	1.112	26	1.118	0.0004

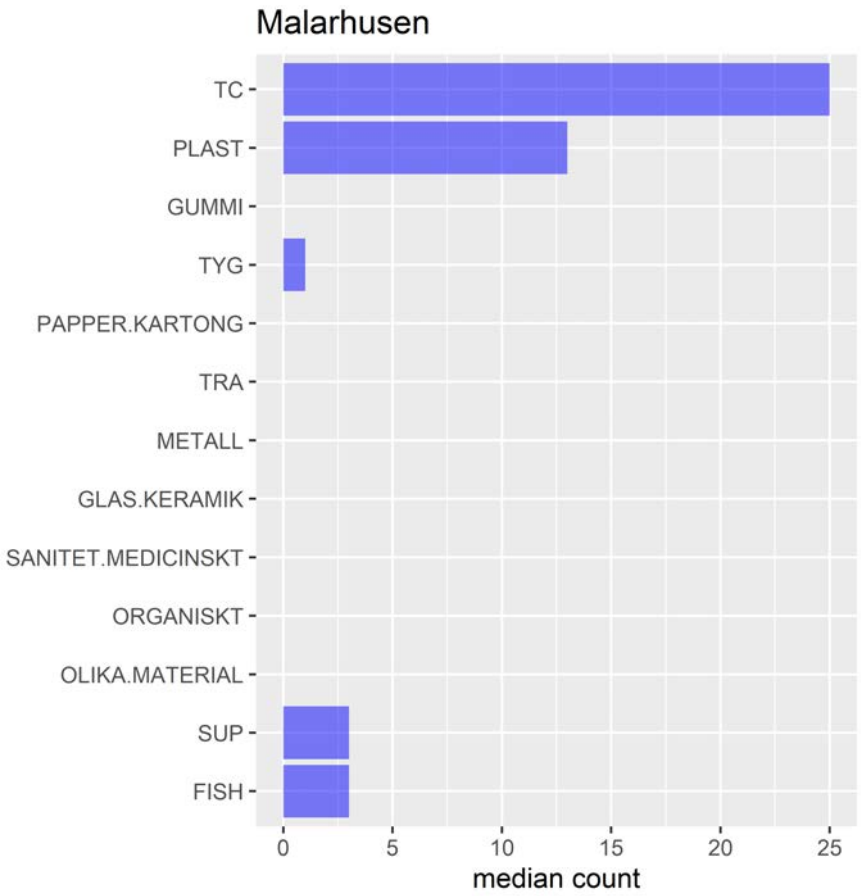
location_code	from	to	group_code	%TC	mean	median	cv	rmad	n	slope	p-value
Rullsand	2013-05-06	2021-10-24	SANITET.MEDICINSKT	3.503	4.923	3	1.163	1.235	26	0.6964	0.0006
Rullsand	2013-05-06	2021-10-24	ORGANISKT	3.022	4.923	3	1.335	1.483	26	0.572	0.0145
Rullsand	2013-05-06	2021-10-24	TYG	2.41	3.269	2	0.8931	1.483	26	0.2438	0.1278
Rullsand	2013-05-06	2021-10-24	GUMMI	1.474	2.154	1	1.257	1.483	26	0.3296	0.0024
Rullsand	2013-05-06	2021-10-24	OLIKA.MATERIAL	1.355	1.615	0	3.958	NA	26	0	0.1079
Rullsand	2013-05-06	2021-10-24	GLAS.KERAMIK	0.4717	0.3462	0	2.576	NA	26	0	0.3255
Sjauster	2013-05-31	2021-10-27	FISH	NaN	0.3077	0	2.722	NA	26	0	0.0024
Sjauster	2013-05-31	2021-10-27	GLAS.KERAMIK	NaN	0.2308	0	2.229	NA	26	0	0.5387
Sjauster	2013-05-31	2021-10-27	GUMMI	NaN	0.07692	0	3.533	NA	26	0	0.5000
Sjauster	2013-05-31	2021-10-27	METALL	NaN	0.2308	0	1.862	NA	26	0	0.3575
Sjauster	2013-05-31	2021-10-27	OLIKA.MATERIAL	NaN	0.2308	0	2.229	NA	26	0	0.0562
Sjauster	2013-05-31	2021-10-27	ORGANISKT	NaN	0.1538	0	3.017	NA	26	0	0.2740
Sjauster	2013-05-31	2021-10-27	PAPPER.KARTONG	NaN	0.2692	0	2.888	NA	26	0	0.7766
Sjauster	2013-05-31	2021-10-27	PLAST	NaN	4.077	4	0.8607	0.9266	26	-0.487	0.0214
Sjauster	2013-05-31	2021-10-27	SANITET.MEDICINSKT	NaN	0.1923	0	2.949	NA	26	0	0.8416
Sjauster	2013-05-31	2021-10-27	SUP	NaN	1.115	1	1.143	1.483	26	0	0.1918
Sjauster	2013-05-31	2021-10-27	TC	NaN	6.577	5	0.7695	0.593	26	-0.6617	0.0184
Sjauster	2013-05-31	2021-10-27	TRA	NaN	0.3846	0	2.448	NA	26	0	0.0284
Sjauster	2013-05-31	2021-10-27	TYG	NaN	0.9231	0	1.333	NA	26	0	0.1127
Storsand	2014-10-28	2021-10-19	FISH	NaN	2	1	1.371	1.483	22	0	0.1162
Storsand	2014-10-28	2021-10-19	GLAS.KERAMIK	NaN	0	0	NA	NA	22	0	NA
Storsand	2014-10-28	2021-10-19	GUMMI	NaN	0.1818	0	2.756	NA	22	0	0.8417

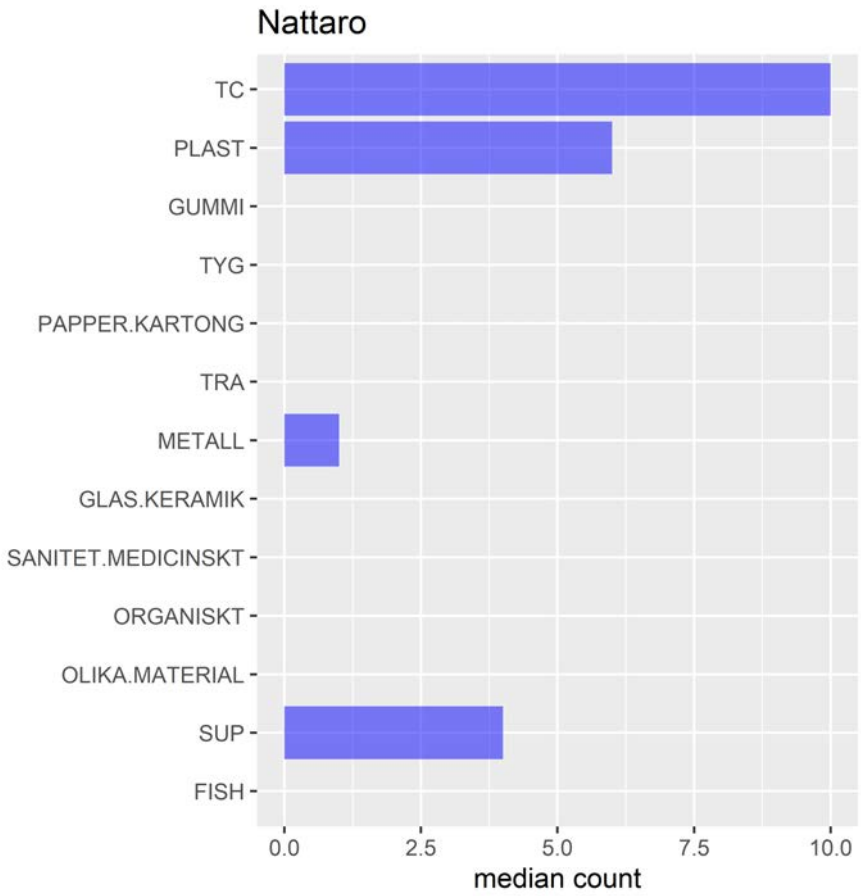
location_code	from	to	group_code	%TC	mean	median	cv	rmad	n	slope	p-value
Storsand	2014-10-28	2021-10-19	METALL	NaN	0.4545	0	1.887	NA	22	0	0.1021
Storsand	2014-10-28	2021-10-19	OLIKA.MATERIAL	NaN	0.04545	0	4.69	NA	22	0	0.6532
Storsand	2014-10-28	2021-10-19	ORGANISKT	NaN	2.727	1	1.532	1.483	22	0	0.8306
Storsand	2014-10-28	2021-10-19	PAPPER.KARTONG	NaN	2.5	2	1.208	1.483	22	0	0.1757
Storsand	2014-10-28	2021-10-19	PLAST	NaN	10.86	9.5	0.7812	0.7023	22	-0.9208	0.1230
Storsand	2014-10-28	2021-10-19	SANITET.MEDICINSKT	NaN	0.1818	0	3.655	NA	22	0	0.9614
Storsand	2014-10-28	2021-10-19	SUP	NaN	4.045	3	0.9264	1.483	22	0	0.4320
Storsand	2014-10-28	2021-10-19	TC	NaN	18.18	17	0.7617	0.7413	22	-1.284	0.1684
Storsand	2014-10-28	2021-10-19	TRA	NaN	0.9545	0	1.725	NA	22	0	0.0780
Storsand	2014-10-28	2021-10-19	TYG	NaN	0.4545	0	2.859	NA	22	0	0.7204
Tofta	2013-05-31	2021-10-27	TC	100	168.3	147.5	0.6157	0.7237	26	6.193	0.3457
Tofta	2013-05-31	2021-10-27	PLAST	65.16	105.6	95	0.6248	0.7179	26	5.218	0.0929
Tofta	2013-05-31	2021-10-27	SUP	34.85	55.46	55	0.6265	0.337	26	1.507	0.2265
Tofta	2013-05-31	2021-10-27	METALL	12.25	20.69	17	0.8732	0.8721	26	0	0.5264
Tofta	2013-05-31	2021-10-27	PAPPER.KARTONG	8.184	16.46	9	1.514	1.318	26	-0.6647	0.1206
Tofta	2013-05-31	2021-10-27	ORGANISKT	4.479	7.308	4	1.366	1.297	26	-0.6093	0.0459
Tofta	2013-05-31	2021-10-27	TRA	4.409	8.269	7	1.286	0.7413	26	-0.1421	0.2317
Tofta	2013-05-31	2021-10-27	SANITET.MEDICINSKT	2.173	4.115	2	1.462	1.483	26	0.568	0.0219
Tofta	2013-05-31	2021-10-27	GLAS.KERAMIK	1.929	2.962	2	0.9621	1.112	26	0	0.5534
Tofta	2013-05-31	2021-10-27	TYG	1.727	3.115	2	1.044	1.112	26	-0.2631	0.0487
Tofta	2013-05-31	2021-10-27	FISH	1.387	1.192	0	1.256	NA	26	0	0.9640
Tofta	2013-05-31	2021-10-27	GUMMI	1.266	2.346	1.5	1.175	1.483	26	0.4681	0.0073

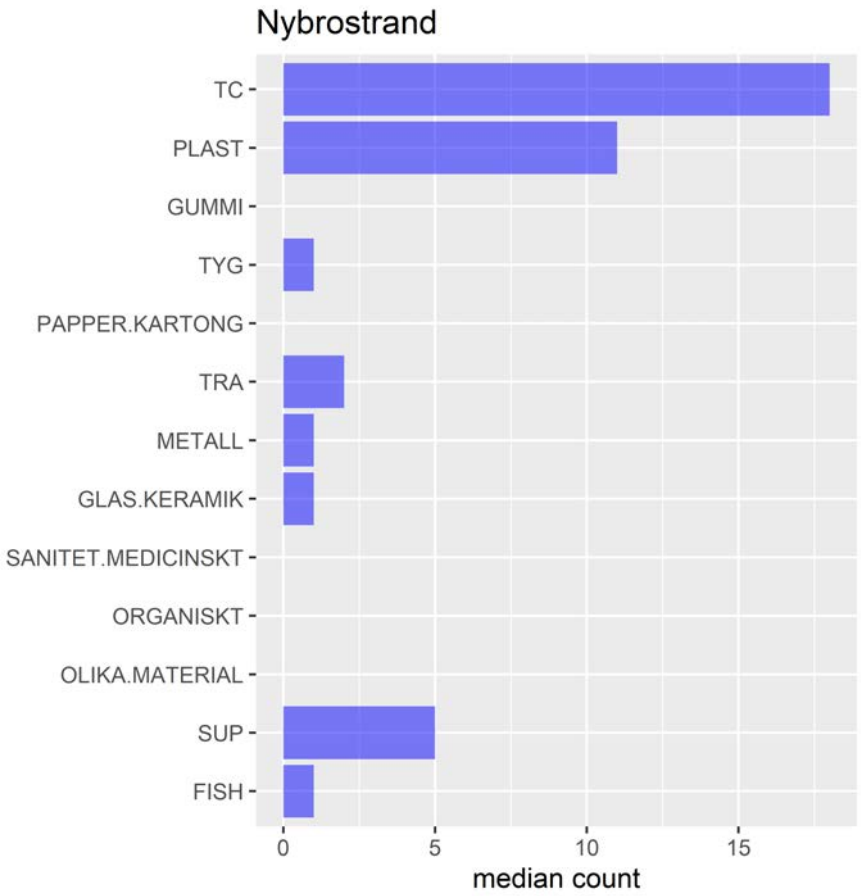
location_code	from	to	group_code	%TC	mean	median	cv	rmad	n	slope	p-value
Tofta	2013-05-31	2021-10-27	OLIKA.MATERIAL	0.5926	1.538	0	3.371	NA	26	0	0.2489

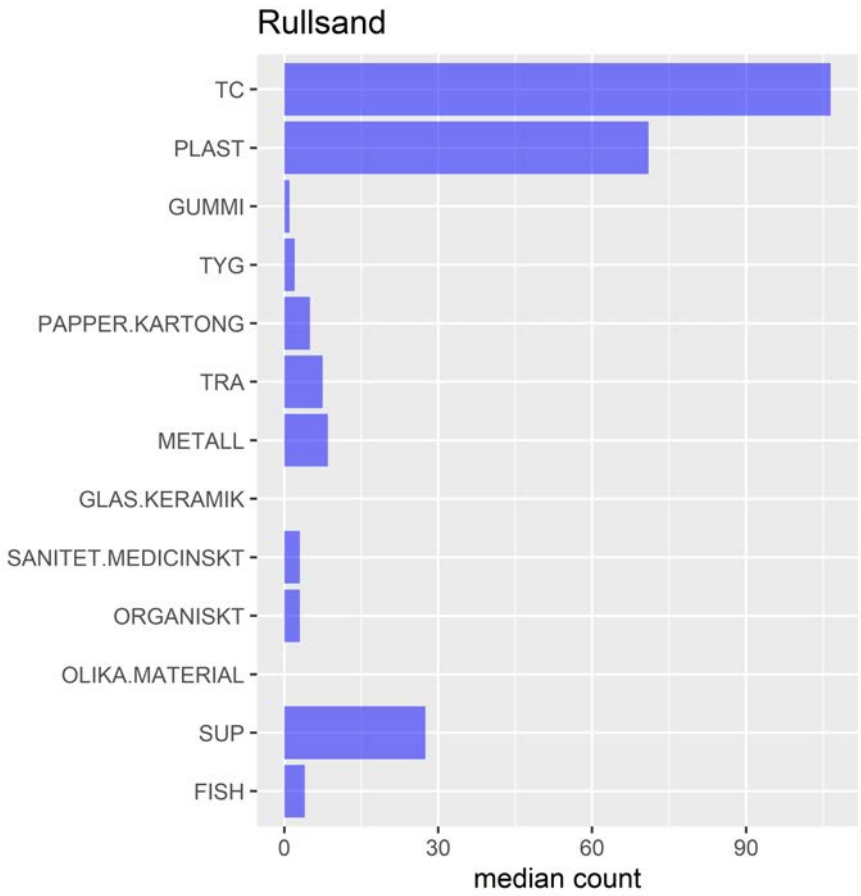
The figures below show for each location code the median count for each group.

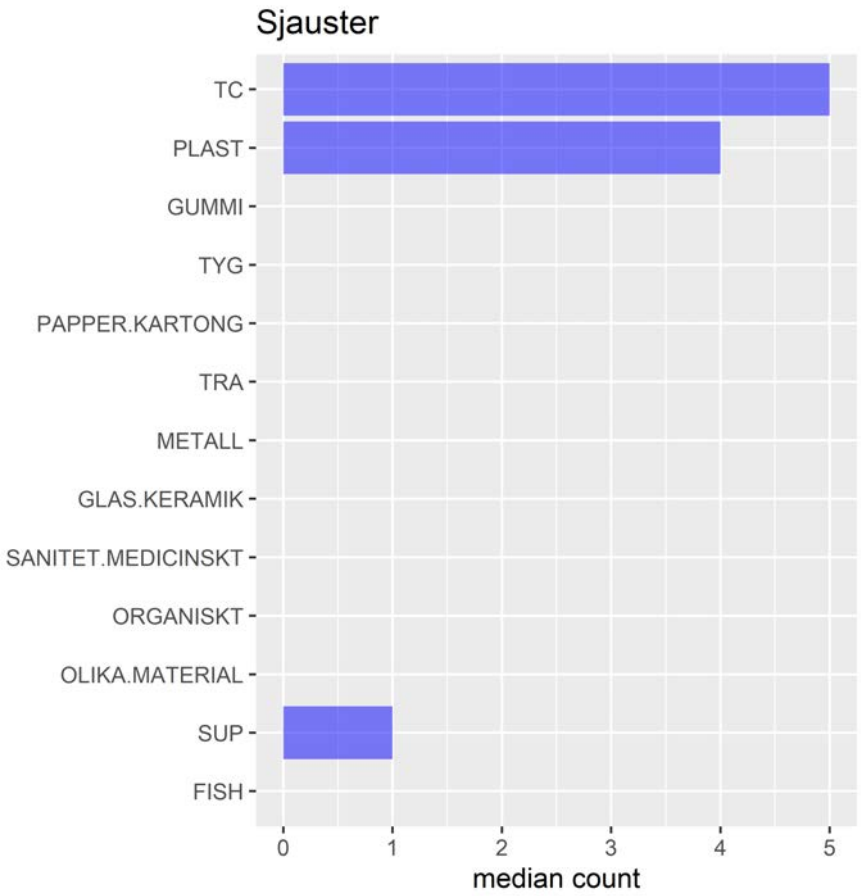

Karehamn
TC
PLAST
GUMMI
TYG
PAPPER.KARTONG
TRA
METALL
GLAS.KERAMIK
SANITET.MEDICINSKT
ORGANISKT
OLIKA.MATERIAL
SUP
FISH
0
2
4
6
median count

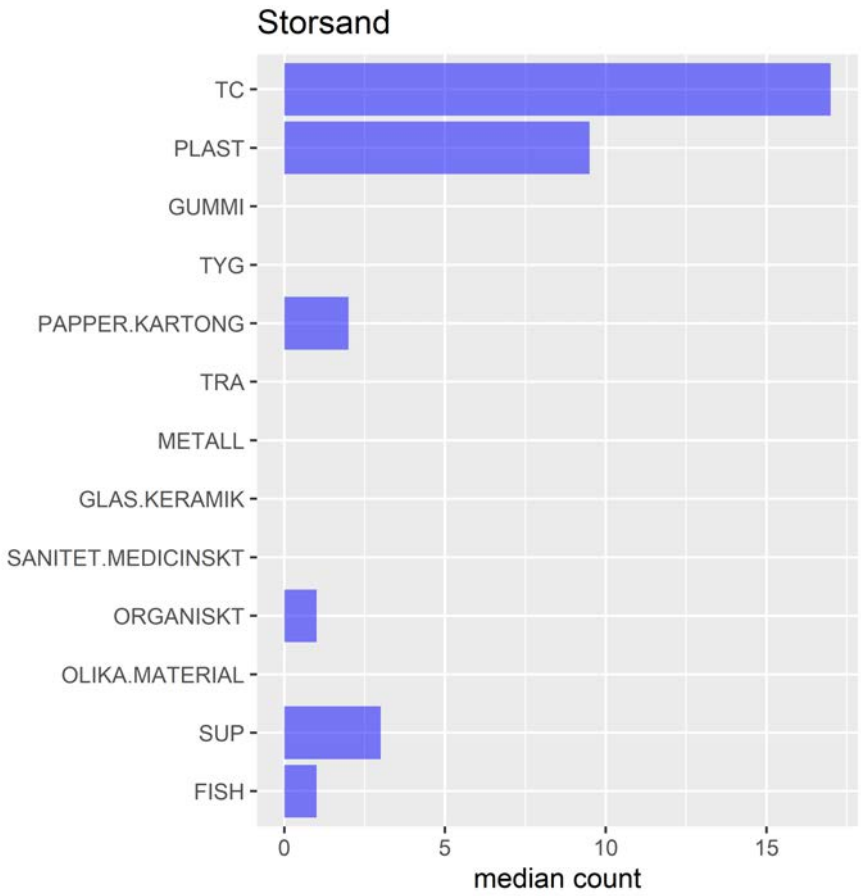

Malarhusen
TC
PLAST
GUMMI
TYG
PAPPER.KARTONG
TRA
METALL
GLAS.KERAMIK
SANITET.MEDICINSKT
ORGANISKT
OLIKA.MATERIAL
SUP
FISH
0
5
10
15
20
25
median count

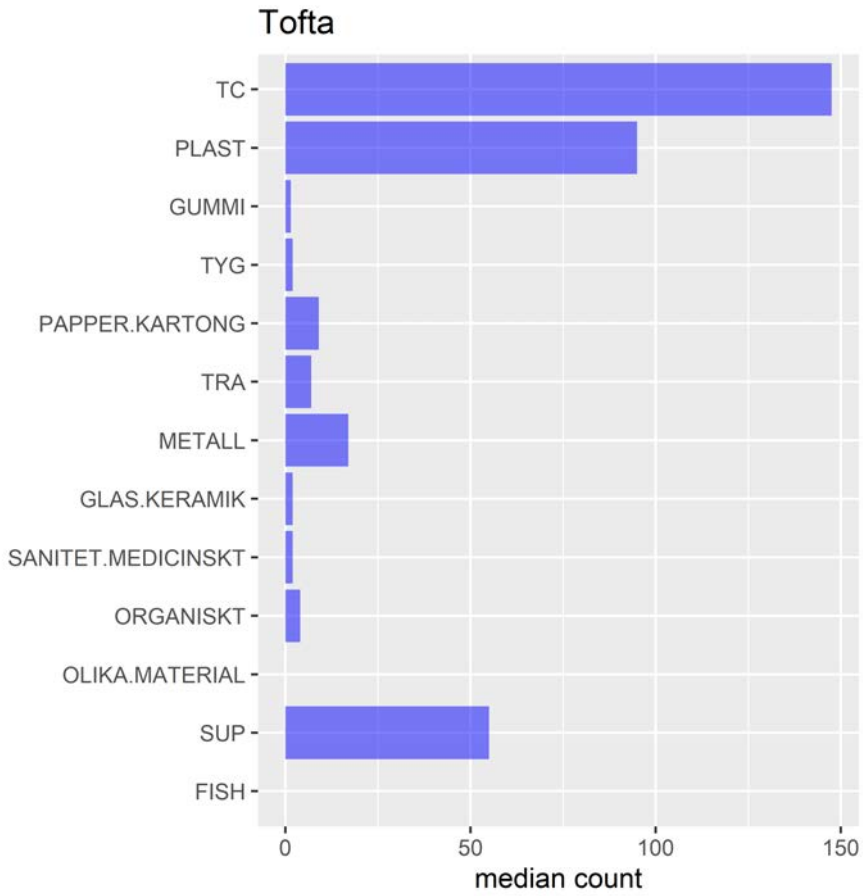

Nattaro
TC
PLAST
GUMMI
TYG
PAPPER.KARTONG
TRA
METALL
GLAS.KERAMIK
SANITET.MEDICINSKT
ORGANISKT
OLIKA.MATERIAL
SUP
FISH
0.0
2.5
5.0
7.5
10.0
median count


Nybrostrand
TC
PLAST
GUMMI
TYG
PAPPER.KARTONG
TRA
METALL
GLAS.KERAMIK
SANITET.MEDICINSKT
ORGANISKT
OLIKA.MATERIAL
SUP
FISH
0
5
10
15
median count


Rullsand
TC
PLAST
GUMMI
TYG
PAPPER.KARTONG
TRA
METALL
GLAS.KERAMIK
SANITET.MEDICINSKT
ORGANISKT
OLIKA.MATERIAL
SUP
FISH
0
30
60
90
median count


Sjauster
TC
PLAST
GUMMI
TYG
PAPPER.KARTONG
TRA
METALL
GLAS.KERAMIK
SANITET.MEDICINSKT
ORGANISKT
OLIKA.MATERIAL
SUP
FISH
0
1
2
3
4
5
median count





Top 10

The table below gives for each location the top 10 of litter types, *i.e.*, the 10 litter types with the highest median litter counts.

location_code	rank	type_name	median count
Karehamn	1	kat_pl24	1.0
Karehamn	2	kat_cl01	0.0
Karehamn	3	kat_cl02	0.0

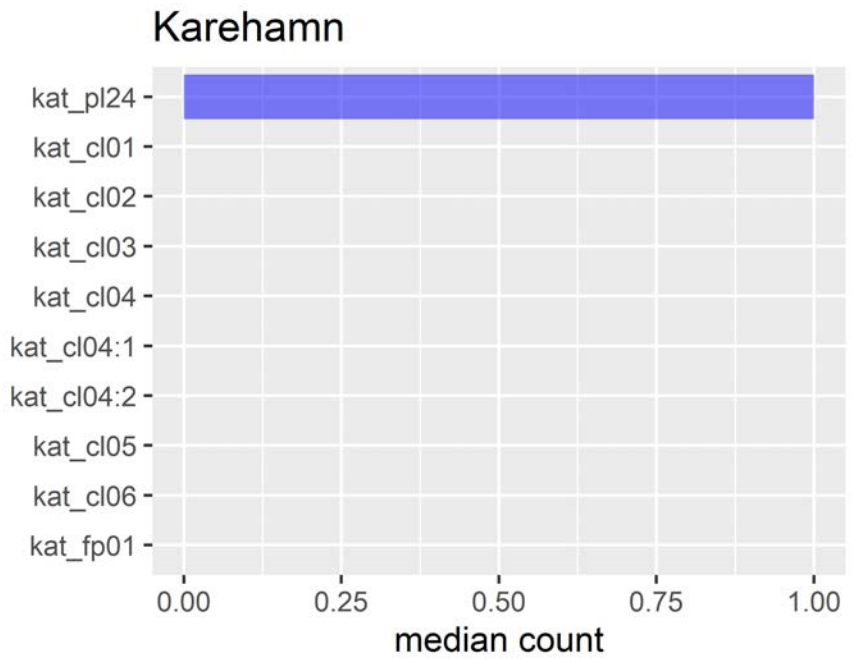
location_code	rank	type_name	median count
Karehamn	4	kat_cl03	0.0
Karehamn	5	kat_cl04	0.0
Karehamn	6	kat_cl04:1	0.0
Karehamn	7	kat_cl04:2	0.0
Karehamn	8	kat_cl05	0.0
Karehamn	9	kat_cl06	0.0
Karehamn	10	kat_fp01	0.0
Malarhusen	1	kat_pl24	2.0
Malarhusen	2	kat_cl06	1.0
Malarhusen	3	kat_pl01	1.0
Malarhusen	4	kat_cl01	0.0
Malarhusen	5	kat_cl02	0.0
Malarhusen	6	kat_cl03	0.0
Malarhusen	7	kat_cl04	0.0
Malarhusen	8	kat_cl04:1	0.0
Malarhusen	9	kat_cl04:2	0.0
Malarhusen	10	kat_cl05	0.0
Nattaro	1	kat_cl01	0.0
Nattaro	2	kat_cl02	0.0
Nattaro	3	kat_cl03	0.0
Nattaro	4	kat_cl04	0.0
Nattaro	5	kat_cl04:1	0.0

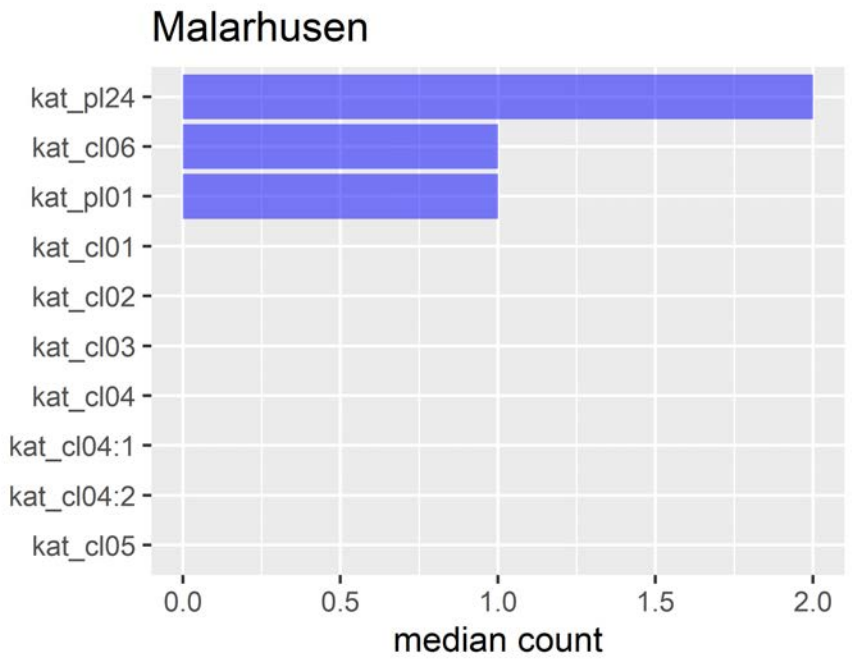
location_code	rank	type_name	median count
Nattaro	6	kat_cl04:2	0.0
Nattaro	7	kat_cl05	0.0
Nattaro	8	kat_cl06	0.0
Nattaro	9	kat_fp01	0.0
Nattaro	10	kat_fp02	0.0
Nybrostrand	1	kat_pl01	2.0
Nybrostrand	2	kat_pl04	1.0
Nybrostrand	3	kat_cl01	0.0
Nybrostrand	4	kat_cl02	0.0
Nybrostrand	5	kat_cl03	0.0
Nybrostrand	6	kat_cl04	0.0
Nybrostrand	7	kat_cl04:1	0.0
Nybrostrand	8	kat_cl04:2	0.0
Nybrostrand	9	kat_cl05	0.0
Nybrostrand	10	kat_cl06	0.0
Rullsand	1	kat_pl24	22.0
Rullsand	2	kat_pl06	7.0
Rullsand	3	kat_wd03	7.0
Rullsand	4	kat_pl04	4.0
Rullsand	5	kat_pl01	3.0
Rullsand	6	kat_me02	2.0
Rullsand	7	kat_or03	2.0

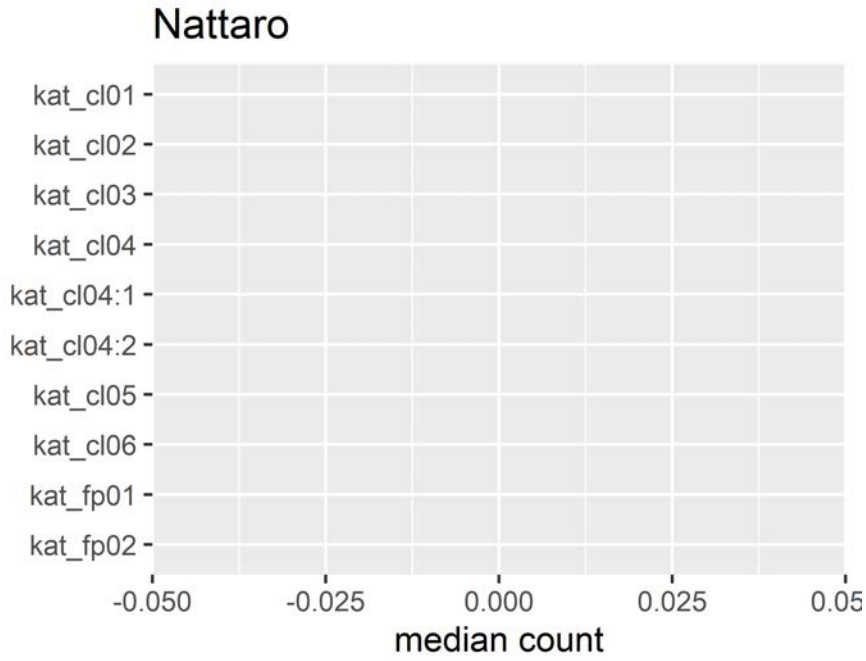
location_code	rank	type_name	median count
Rullsand	8	kat_cl06	1.0
Rullsand	9	kat_me03	1.0
Rullsand	10	kat_me06	1.0
Sjauster	1	kat_cl01	0.0
Sjauster	2	kat_cl02	0.0
Sjauster	3	kat_cl03	0.0
Sjauster	4	kat_cl04	0.0
Sjauster	5	kat_cl04:1	0.0
Sjauster	6	kat_cl04:2	0.0
Sjauster	7	kat_cl05	0.0
Sjauster	8	kat_cl06	0.0
Sjauster	9	kat_fp01	0.0
Sjauster	10	kat_fp02	0.0
Storsand	1	kat_or03	1.0
Storsand	2	kat_pl19	1.0
Storsand	3	kat_pl24	1.0
Storsand	4	kat_cl01	0.0
Storsand	5	kat_cl02	0.0
Storsand	6	kat_cl03	0.0
Storsand	7	kat_cl04	0.0
Storsand	8	kat_cl04:1	0.0
Storsand	9	kat_cl04:2	0.0

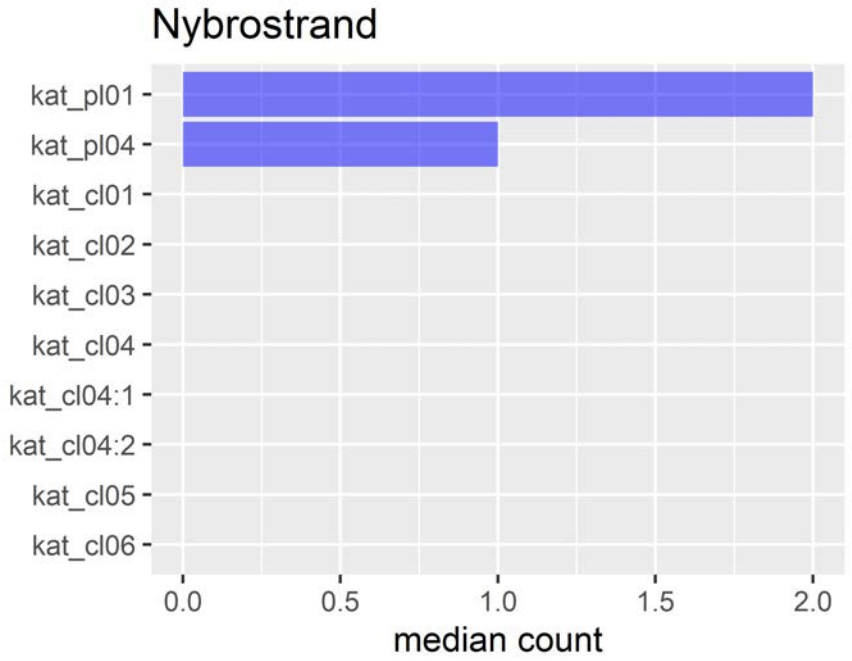
location_code	rank	type_name	median count
Storsand	10	kat_cl05	0.0
Tofta	1	kat_pl24	25.0
Tofta	2	kat_pl04	12.5
Tofta	3	kat_pl06	9.0
Tofta	4	kat_me02	8.0
Tofta	5	kat_pl01	5.0
Tofta	6	kat_pl07	5.0
Tofta	7	kat_wd03	4.5
Tofta	8	kat_me06	2.5
Tofta	9	kat_pc05	2.5
Tofta	10	kat_or03	2.0

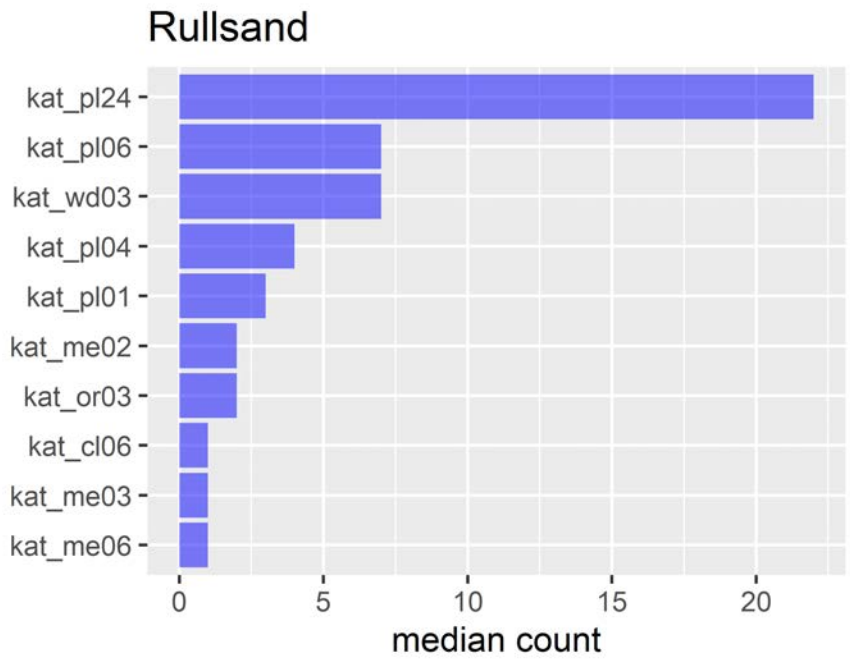
The figure(s) below show(s) for each location the top 10 of litter types.

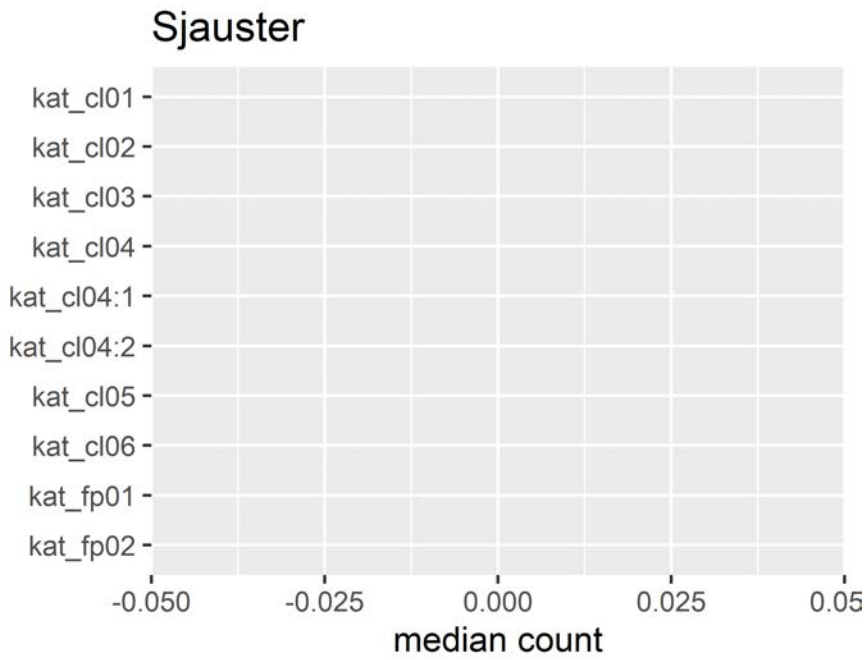

Karehamn
kat_pl24
kat_cl01
kat_cl02
kat_cl03
kat_cl04
kat_cl04:1
kat_cl04:2
kat_cl05
kat_cl06
kat_fp01
0.00
0.25
0.50
0.75
1.00
median count

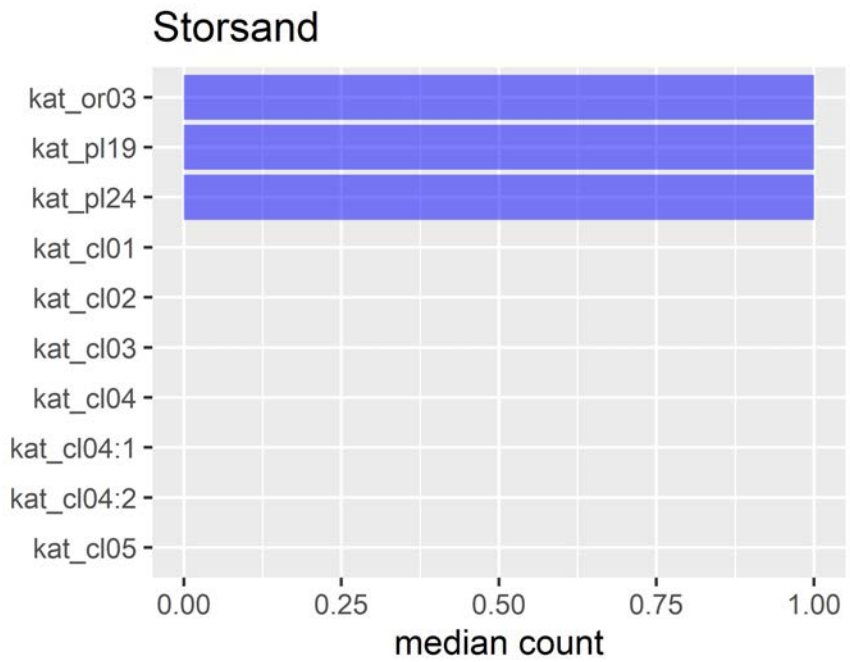

Malarhusen
kat_pl24
kat_cl06
kat_pl01
kat_cl01
kat_cl02
kat_cl03
kat_cl04
kat_cl04:1
kat_cl04:2
kat_cl05
0.0
0.5
1.0
1.5
2.0
median count

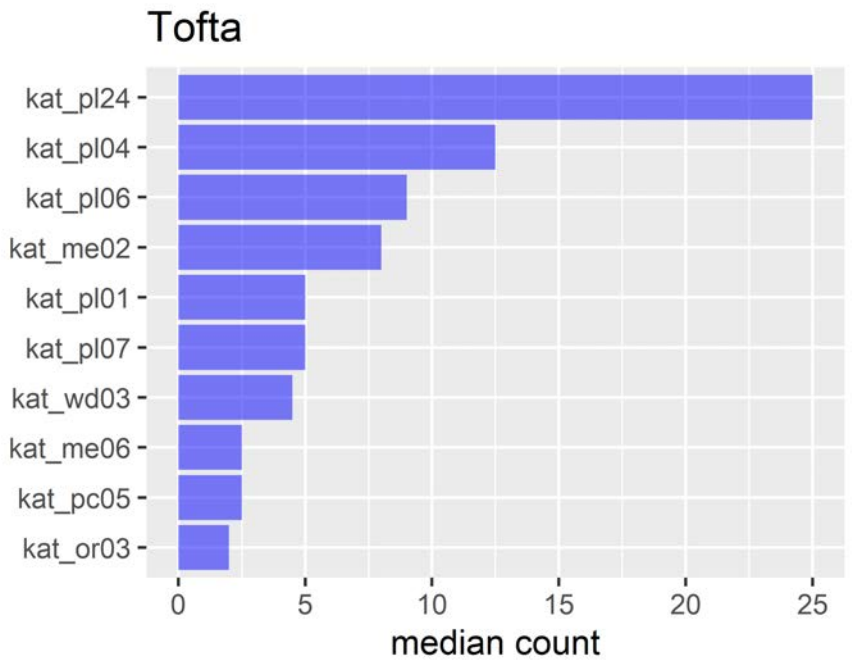

Nattaro
kat_cl01
kat_cl02
kat_cl03
kat_cl04
kat_cl04:1
kat_cl04:2
kat_cl05
kat_cl06
kat_fp01
kat_fp02
-0.050
-0.025
0.000
0.025
0.05
median count


Nybrostrand
kat_pl01
kat_pl04
kat_cl01
kat_cl02
kat_cl03
kat_cl04
kat_cl04:1
kat_cl04:2
kat_cl05
kat_cl06
0.0
0.5
1.0
1.5
2.0
median count


Rullsand
kat_pl24
kat_pl06
kat_wd03
kat_pl04
kat_pl01
kat_me02
kat_or03
kat_cl06
kat_me03
kat_me06
0
5
10
15
20
median count


Sjauster
kat_cl01
kat_cl02
kat_cl03
kat_cl04
kat_cl04:1
kat_cl04:2
kat_cl05
kat_cl06
kat_fp01
kat_fp02
-0.050
-0.025
0.000
0.025
0.05
median count


Storsand
kat_or03
kat_pl19
kat_pl24
kat_cl01
kat_cl02
kat_cl03
kat_cl04
kat_cl04:1
kat_cl04:2
kat_cl05
0.00
0.25
0.50
0.75
1.00
median count


Tofta
kat_pl24
kat_pl04
kat_pl06
kat_me02
kat_pl01
kat_pl07
kat_wd03
kat_me06
kat_pc05
kat_or03
0
5
10
15
20
25
median count

Regional descriptive statistics

Basic statistics

The regional statistics for the litter groups are given in the table below. They all (except for the p-value) have been estimated in a stepwise fashion:

1. compute the statistic for each individual location within a specific region (see also previous section);
2. compute the same statistic for the results in step 1.

Note that these statistics are all so called intra-block statistics, *i.e.*, data from individual beaches are not merged. Instead, first the beach statistics are calculated and these are then aggregated as described below. Also note that these statistics, in fact, only describe the individual beaches within a region and not necessarily describe the region as a whole statistically correctly.

The statistics are:

- `n` : number of surveys;
- `mean` :, *i.e.*, the regional mean (https://en.wikipedia.org/wiki/Arithmetic_mean) of the individual mean beach counts within a region for each litter group;
- `median` :, *i.e.*, the regional median (https://en.wikipedia.org/wiki/Median) of the individual median beach counts within a region for each litter group;
- `slope` : the median of the Theil-Sen slopes of the individual beaches within a region for each litter group. Data from different beaches have not been mixed in the computation of the Theil-Sen slopes. This method is similar to the one in Gilbert (1987) except that in our procedure all beaches within a region contribute equally to the regional trend.
- `p-value` : the p-values for each regional trend (`slope`) are computed by means of the expressions given in Van Belle & Hughes, 1984 (https://dx.doi.org/10.1029/WR020i001p00127) (Eqs. 2 and 7) and Gilbert, 1987 (https://www.osti.gov/biblio/7037501-statistical-methods-environmental-pollution-monitoring) (Eqs. 17.1 - 17.5).

The trend statistics can only be computed if all `location_code` s of a `region_code` have at least three records (surveys). If that is not the case, the table below contains `NA` .

region_code	group_code	n	mean	median	slope	p-value
OS	TC	196	49.7	17.5	0.5031	0.4498
OS	PLAST	196	31.98	10.25	0.3671	0.1953
OS	SUP	196	14.76	3.5	0	0.6559
OS	FISH	196	2.079	0.5	0	0.2878
OS	METALL	196	4.508	0.5	0	0.2222
OS	TRA	196	2.872	0.5	0	0.0016
OS	TYG	196	1.462	0.5	0	0.4201
OS	GLAS.KERAMIK	196	0.7525	0	0	0.1236
OS	GUMMI	196	0.8667	0	0	0.9999
OS	OLIKA.MATERIAL	196	0.4717	0	0	0.0171
OS	ORGANISKT	196	2.528	0	0	0.8450
OS	PAPPER.KARTONG	196	4.262	0	0	0.2009
OS	SANITET.MEDICINSKT	196	1.345	0	0	1.0000

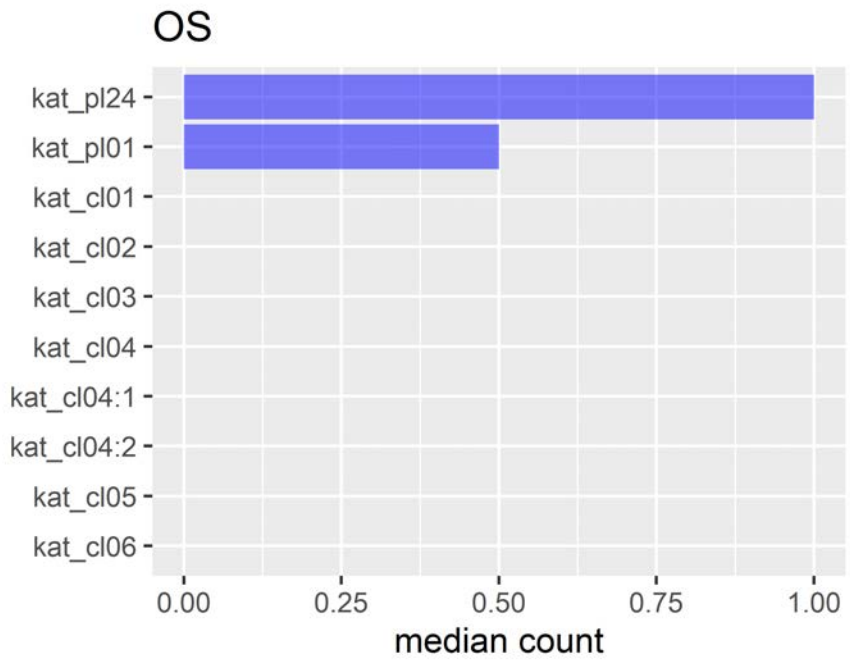
Top 10

The table below gives for each region the top 10 of litter types, *i.e.*, the 10 litter types with the highest median litter counts.

region_code	rank	type_name	median count
OS	1	kat_pl24	1.0
OS	2	kat_pl01	0.5
OS	3	kat_cl01	0.0

region_code	rank	type_name	median count
OS	4	kat_cl02	0.0
OS	5	kat_cl03	0.0
OS	6	kat_cl04	0.0
OS	7	kat_cl04:1	0.0
OS	8	kat_cl04:2	0.0
OS	9	kat_cl05	0.0
OS	10	kat_cl06	0.0

The figure(s) below show(s) for each region the top 10 of litter types.



Trend analysis

For each location code and the type names and group codes specified in the settings file, the following statistics have been estimated for the period 2013-01-01 to 2021-12-31:

- from: the first date of the time-series;
- to: the final date of the time-series;
- Theil-Sen slope (https://en.wikipedia.org/wiki/Theil%E2%80%93Sen_estimator) (slope): a robust non-parametric estimator of slope (counts / year);
- p-value (https://en.wikipedia.org/wiki/P-value): the p-value associated with the one-tailed Mann-Kendall test (https://en.wikipedia.org/wiki/Kendall_rank_correlation_coefficient) to test the null hypothesis of
  - no monotonically *increasing* trend in case the Theil-Sen slope is greater than zero;
  - no monotonically *decreasing* trend in case the Theil-Sen slope is smaller than zero;
- the number of surveys (N);

A p-value less than an *a priori* specified significance level (https://en.wikipedia.org/wiki/Statistical_significance) (*e.g.*, often α = 0.05), indicates a significant trend. If the p-value is greater than this significance level, we can't say that there is no trend. We can only conclude that our data do not show evidence for a significant trend (due to lack of data, noise, etc.).

The Mann-Kendall test is a non-parametric test and as such does not make distributional assumptions on the data.

```
Warning: The following specified group code(s) are not found and will be skipped:
'KEMISKA.FORORENINGAR'
```

location_code	type name / group code	from	to	N	slope	p-value
Karehamn	FISH	2015-04-20	2021-10-27	21	0	0.3822
Karehamn	GLAS.KERAMIK	2015-04-20	2021-10-27	21	0	0.5972
Karehamn	GUMMI	2015-04-20	2021-10-27	21	0	0.5000

location_code	type name / group code	from	to	N	slope	p-value
Karehamn	METALL	2015-04-20	2021-10-27	21	0	0.7360
Karehamn	OLIKA.MATERIAL	2015-04-20	2021-10-27	21	0	NA
Karehamn	ORGANISKT	2015-04-20	2021-10-27	21	0	0.4349
Karehamn	PAPPER.KARTONG	2015-04-20	2021-10-27	21	0	0.3442
Karehamn	PLAST	2015-04-20	2021-10-27	21	0	0.4517
Karehamn	SANITET.MEDICINSKT	2015-04-20	2021-10-27	21	0	NA
Karehamn	SUP	2015-04-20	2021-10-27	21	0	0.1192
Karehamn	TC	2015-04-20	2021-10-27	21	0	0.5483
Karehamn	TRA	2015-04-20	2021-10-27	21	0	0.0361
Karehamn	TYG	2015-04-20	2021-10-27	21	0	0.1172
Malarhusen	TC	2013-04-19	2021-11-07	27	1.053	0.2865
Malarhusen	PLAST	2013-04-19	2021-11-07	27	0.7342	0.2016
Malarhusen	FISH	2013-04-19	2021-11-07	27	0	0.3916
Malarhusen	GLAS.KERAMIK	2013-04-19	2021-11-07	27	0	0.1521
Malarhusen	GUMMI	2013-04-19	2021-11-07	27	0	0.9981
Malarhusen	METALL	2013-04-19	2021-11-07	27	0	0.5647
Malarhusen	OLIKA.MATERIAL	2013-04-19	2021-11-07	27	0	0.1975
Malarhusen	ORGANISKT	2013-04-19	2021-11-07	27	0	0.8172
Malarhusen	PAPPER.KARTONG	2013-04-19	2021-11-07	27	0	0.4529
Malarhusen	SANITET.MEDICINSKT	2013-04-19	2021-11-07	27	0	0.8741
Malarhusen	SUP	2013-04-19	2021-11-07	27	0	0.6629
Malarhusen	TRA	2013-04-19	2021-11-07	27	0	0.4530

location_code	type name / group code	from	to	N	slope	p-value
Malarhusen	TYG	2013-04-19	2021-11-07	27	0	0.8309
Nattaro	TC	2013-05-05	2021-10-28	27	1.006	0.0096
Nattaro	PLAST	2013-05-05	2021-10-28	27	0.9243	0.0147
Nattaro	SUP	2013-05-05	2021-10-28	27	0.6645	0.0365
Nattaro	FISH	2013-05-05	2021-10-28	27	0	0.1542
Nattaro	GLAS.KERAMIK	2013-05-05	2021-10-28	27	0	0.5230
Nattaro	GUMMI	2013-05-05	2021-10-28	27	0	0.7777
Nattaro	METALL	2013-05-05	2021-10-28	27	0	0.8486
Nattaro	OLIKA.MATERIAL	2013-05-05	2021-10-28	27	0	NA
Nattaro	ORGANISKT	2013-05-05	2021-10-28	27	0	0.7555
Nattaro	PAPPER.KARTONG	2013-05-05	2021-10-28	27	0	0.2230
Nattaro	SANITET.MEDICINSKT	2013-05-05	2021-10-28	27	0	0.8009
Nattaro	TRA	2013-05-05	2021-10-28	27	0	0.1085
Nattaro	TYG	2013-05-05	2021-10-28	27	0	0.8719
Nybrostrand	TC	2015-04-21	2021-10-23	21	-4.399	0.0007
Nybrostrand	PLAST	2015-04-21	2021-10-23	21	-2.993	0.0027
Nybrostrand	SUP	2015-04-21	2021-10-23	21	-1.343	0.0012
Nybrostrand	METALL	2015-04-21	2021-10-23	21	-0.6019	0.0022
Nybrostrand	FISH	2015-04-21	2021-10-23	21	-0.4161	0.0017
Nybrostrand	TRA	2015-04-21	2021-10-23	21	-0.3916	0.0189
Nybrostrand	GLAS.KERAMIK	2015-04-21	2021-10-23	21	-0.2057	0.0133
Nybrostrand	GUMMI	2015-04-21	2021-10-23	21	0	0.0584

location_code	type name / group code	from	to	N	slope	p-value
Nybrostrand	OLIKA.MATERIAL	2015-04-21	2021-10-23	21	0	0.2544
Nybrostrand	ORGANISKT	2015-04-21	2021-10-23	21	0	0.5794
Nybrostrand	PAPPER.KARTONG	2015-04-21	2021-10-23	21	0	0.0060
Nybrostrand	SANITET.MEDICINSKT	2015-04-21	2021-10-23	21	0	0.3399
Nybrostrand	TYG	2015-04-21	2021-10-23	21	0	0.2015
Rullsand	TC	2013-05-06	2021-10-24	26	10.15	0.0259
Rullsand	PLAST	2013-05-06	2021-10-24	26	9.731	0.0025
Rullsand	SUP	2013-05-06	2021-10-24	26	3.423	0.0248
Rullsand	FISH	2013-05-06	2021-10-24	26	1.118	0.0004
Rullsand	PAPPER.KARTONG	2013-05-06	2021-10-24	26	0.7992	0.0219
Rullsand	SANITET.MEDICINSKT	2013-05-06	2021-10-24	26	0.6964	0.0006
Rullsand	ORGANISKT	2013-05-06	2021-10-24	26	0.572	0.0145
Rullsand	GUMMI	2013-05-06	2021-10-24	26	0.3296	0.0024
Rullsand	TYG	2013-05-06	2021-10-24	26	0.2438	0.1278
Rullsand	METALL	2013-05-06	2021-10-24	26	-0.1532	0.3129
Rullsand	GLAS.KERAMIK	2013-05-06	2021-10-24	26	0	0.3255
Rullsand	OLIKA.MATERIAL	2013-05-06	2021-10-24	26	0	0.1079
Rullsand	TRA	2013-05-06	2021-10-24	26	0	0.4559
Sjauster	TC	2013-05-31	2021-10-27	26	-0.6617	0.0184
Sjauster	PLAST	2013-05-31	2021-10-27	26	-0.487	0.0214
Sjauster	FISH	2013-05-31	2021-10-27	26	0	0.0024
Sjauster	GLAS.KERAMIK	2013-05-31	2021-10-27	26	0	0.5387

location_code	type name / group code	from	to	N	slope	p-value
Sjauster	GUMMI	2013-05-31	2021-10-27	26	0	0.5000
Sjauster	METALL	2013-05-31	2021-10-27	26	0	0.3575
Sjauster	OLIKA.MATERIAL	2013-05-31	2021-10-27	26	0	0.0562
Sjauster	ORGANISKT	2013-05-31	2021-10-27	26	0	0.2740
Sjauster	PAPPER.KARTONG	2013-05-31	2021-10-27	26	0	0.7766
Sjauster	SANITET.MEDICINSKT	2013-05-31	2021-10-27	26	0	0.8416
Sjauster	SUP	2013-05-31	2021-10-27	26	0	0.1918
Sjauster	TRA	2013-05-31	2021-10-27	26	0	0.0284
Sjauster	TYG	2013-05-31	2021-10-27	26	0	0.1127
Storsand	TC	2014-10-28	2021-10-19	22	-1.284	0.1684
Storsand	PLAST	2014-10-28	2021-10-19	22	-0.9208	0.1230
Storsand	FISH	2014-10-28	2021-10-19	22	0	0.1162
Storsand	GLAS.KERAMIK	2014-10-28	2021-10-19	22	0	NA
Storsand	GUMMI	2014-10-28	2021-10-19	22	0	0.8417
Storsand	METALL	2014-10-28	2021-10-19	22	0	0.1021
Storsand	OLIKA.MATERIAL	2014-10-28	2021-10-19	22	0	0.6532
Storsand	ORGANISKT	2014-10-28	2021-10-19	22	0	0.8306
Storsand	PAPPER.KARTONG	2014-10-28	2021-10-19	22	0	0.1757
Storsand	SANITET.MEDICINSKT	2014-10-28	2021-10-19	22	0	0.9614
Storsand	SUP	2014-10-28	2021-10-19	22	0	0.4320
Storsand	TRA	2014-10-28	2021-10-19	22	0	0.0780
Storsand	TYG	2014-10-28	2021-10-19	22	0	0.7204

location_code	type name / group code	from	to	N	slope	p-value
Tofta	TC	2013-05-31	2021-10-27	26	6.193	0.3457
Tofta	PLAST	2013-05-31	2021-10-27	26	5.218	0.0929
Tofta	SUP	2013-05-31	2021-10-27	26	1.507	0.2265
Tofta	PAPPER.KARTONG	2013-05-31	2021-10-27	26	-0.6647	0.1206
Tofta	ORGANISKT	2013-05-31	2021-10-27	26	-0.6093	0.0459
Tofta	SANITET.MEDICINSKT	2013-05-31	2021-10-27	26	0.568	0.0219
Tofta	GUMMI	2013-05-31	2021-10-27	26	0.4681	0.0073
Tofta	TYG	2013-05-31	2021-10-27	26	-0.2631	0.0487
Tofta	TRA	2013-05-31	2021-10-27	26	-0.1421	0.2317
Tofta	FISH	2013-05-31	2021-10-27	26	0	0.9640
Tofta	GLAS.KERAMIK	2013-05-31	2021-10-27	26	0	0.5534
Tofta	METALL	2013-05-31	2021-10-27	26	0	0.5264
Tofta	OLIKA.MATERIAL	2013-05-31	2021-10-27	26	0	0.2489

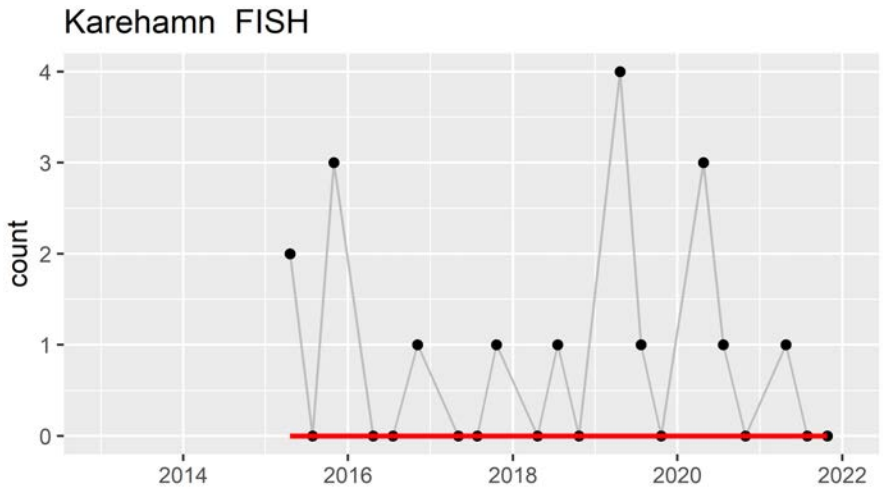
> Descriptive statisics and trend analysis results have been stored in file ‘litteR-results-20230831T182106.csv’.

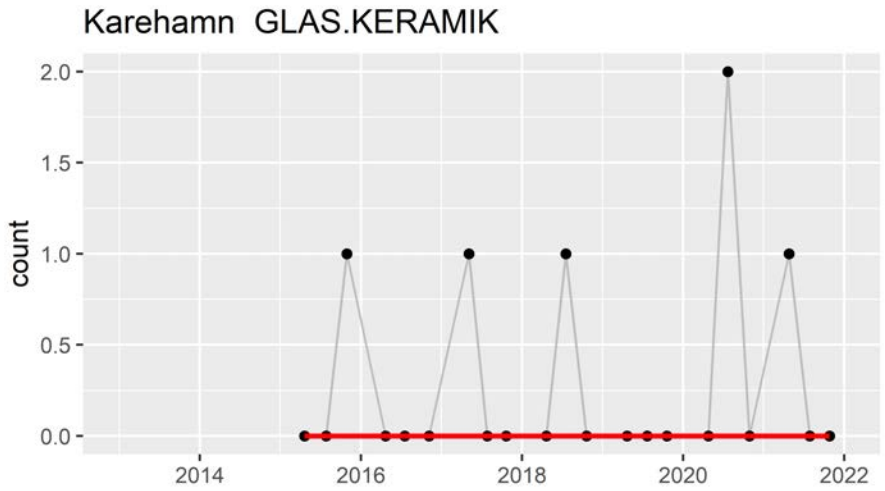
Time-series of the selected type names, group codes and and spatial codes are given in the plots below, including trend line and smoother.

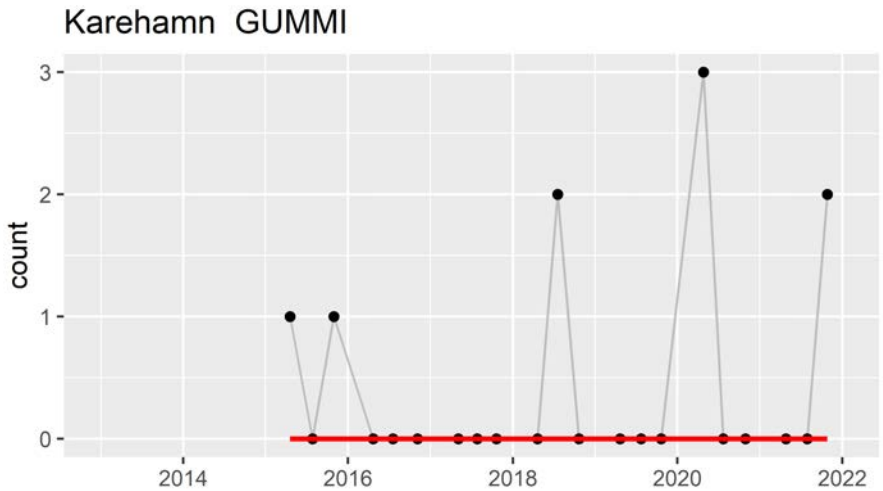
The lines and dots have the following meaning:

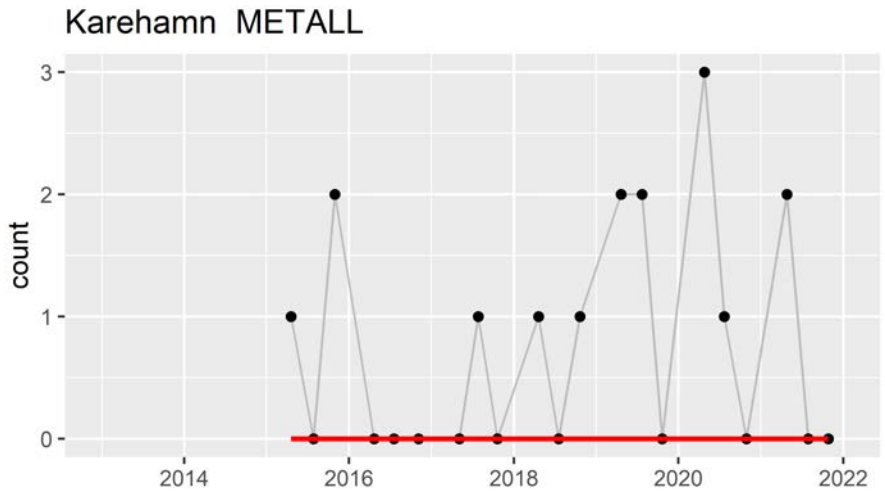
- dots: observations;
- thin gray line segments: auxiliary line segments to guide the eye (only given for 5 to 24 points);

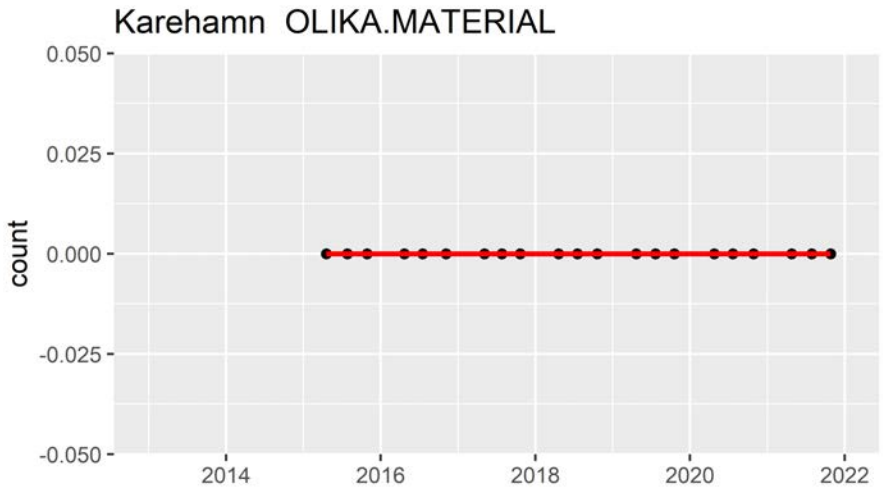
- blue line: loess-smoother (https://en.wikipedia.org/wiki/Local_regression). It is only given for 25 or more points;
- red line: Theil-Sen trend line (its slope is given in the table above). It is only given for 5 or more points. However, it is recommended to use a minimum period of 4 to 5 years to obtain useful trend results.

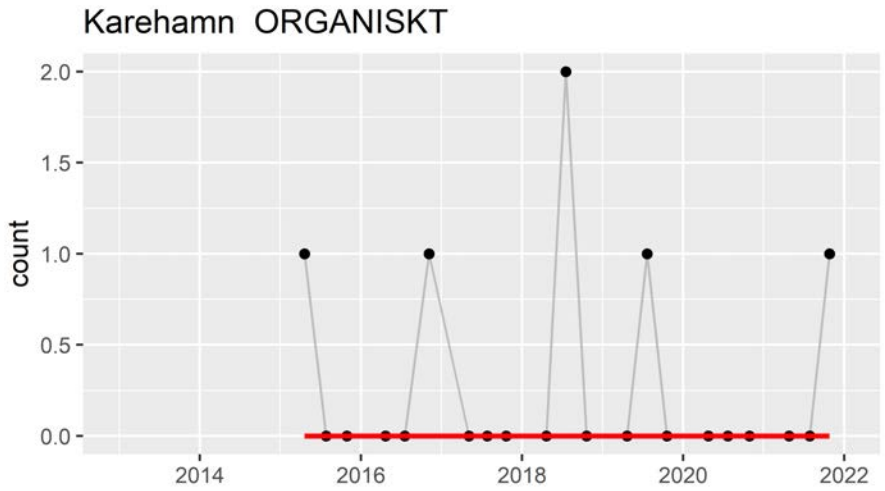

Karehamn FISH
count
0
1
2
3
4
2014
2016
2018
2020
2022

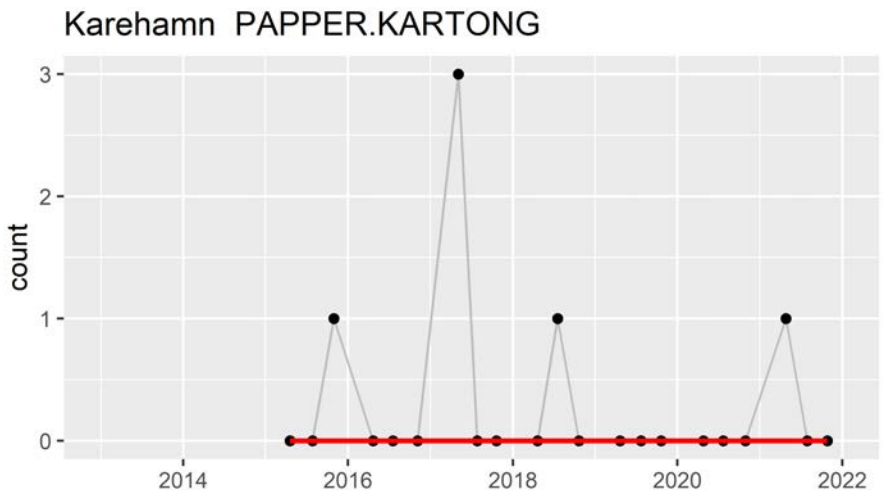

Karehamn GLAS.KERAMIK
count
0.0
0.5
1.0
1.5
2.0
2014
2016
2018
2020
2022

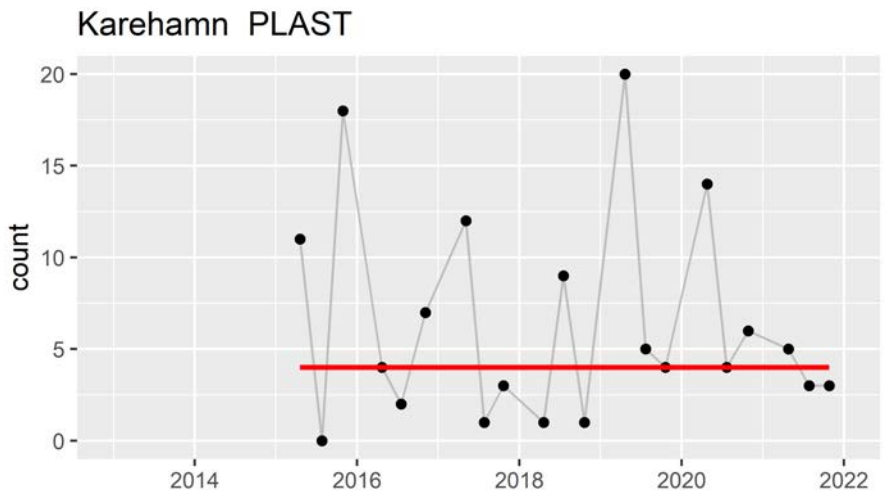

Karehamn GUMMI
count
0
1
2
3
2014
2016
2018
2020
2022

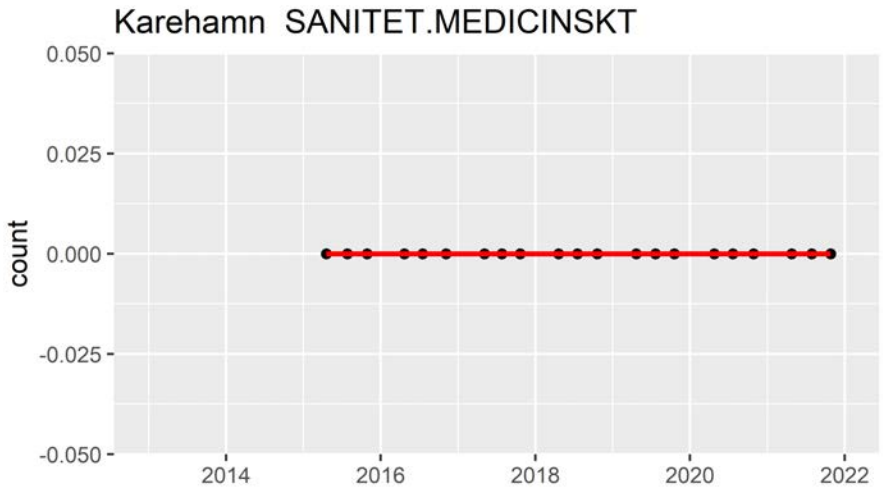

Karehamn METALL
count
0
1
2
3
2014
2016
2018
2020
2022

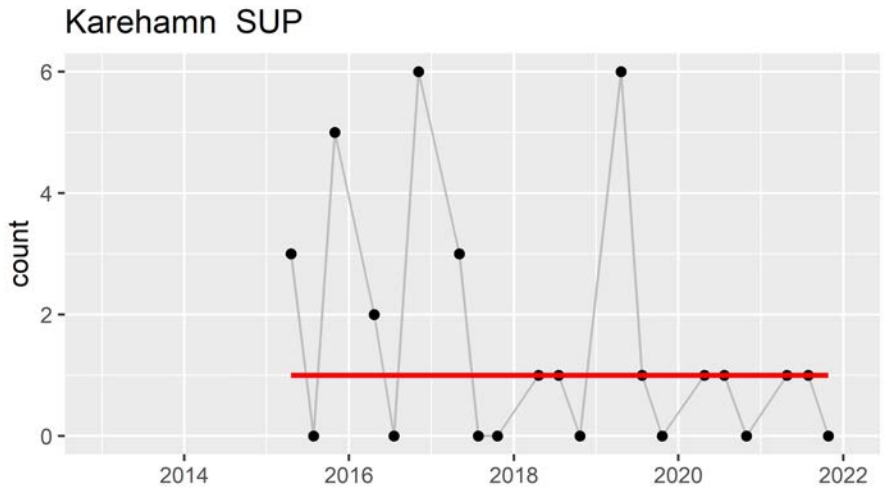

Karehamn OLIKA.MATERIAL
count
0.050
0.025
0.000
-0.025
-0.050
2014
2016
2018
2020
2022

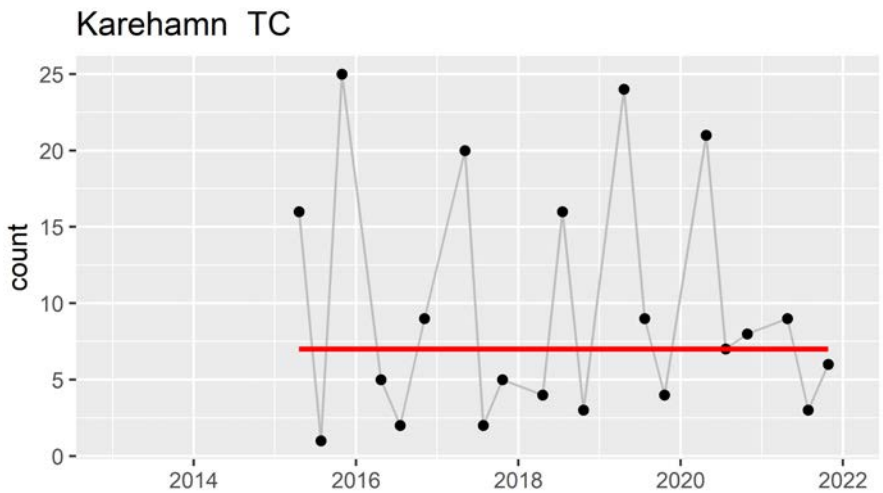

Karehamn ORGANISKT
count
2.0
1.5
1.0
0.5
0.0
2014
2016
2018
2020
2022

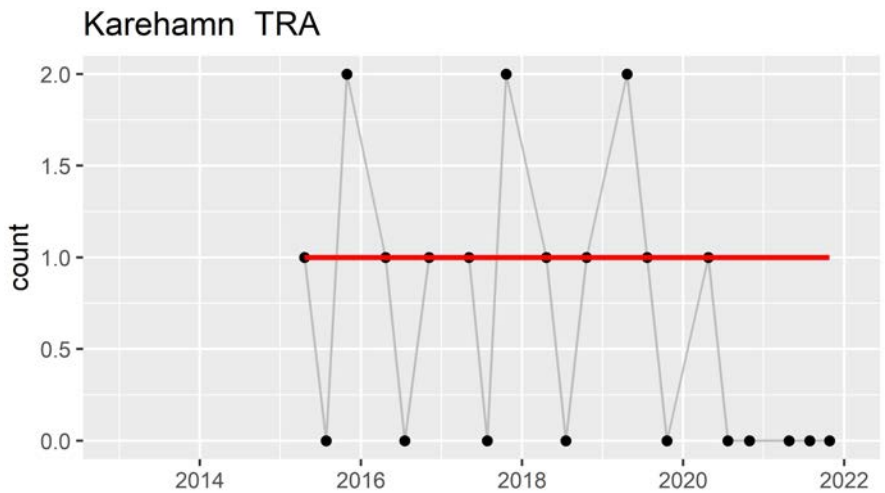

Karehamn PAPPER.KARTONG
count
3
2
1
0
2014
2016
2018
2020
2022

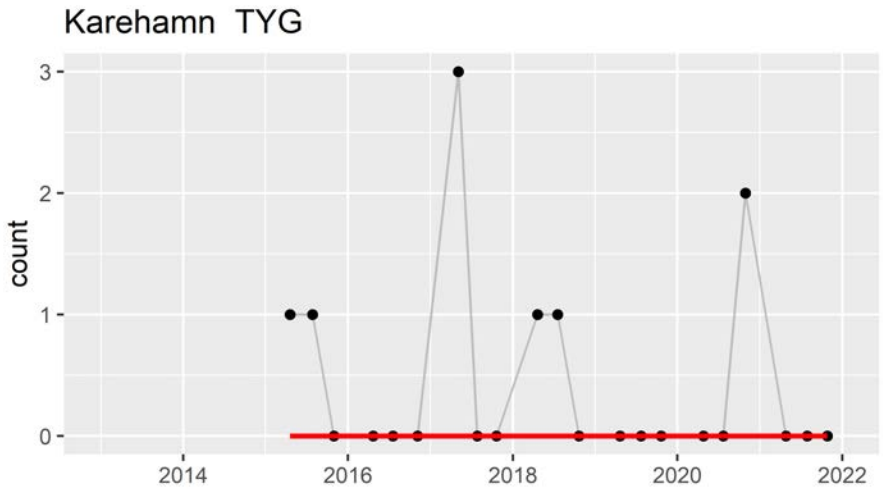

Karehamn PLAST
count
20
15
10
5
0
2014
2016
2018
2020
2022


Karehamn SANITET.MEDICINSKT
count
0.050
0.025
0.000
-0.025
-0.050
2014
2016
2018
2020
2022


Karehamn SUP
count
6
4
2
0
2014
2016
2018
2020
2022


Karehamn TC
count
25
20
15
10
5
0
2014
2016
2018
2020
2022


Karehamn TRA
count
2.0
1.5
1.0
0.5
0.0
2014
2016
2018
2020
2022


Karehamn TYG
count
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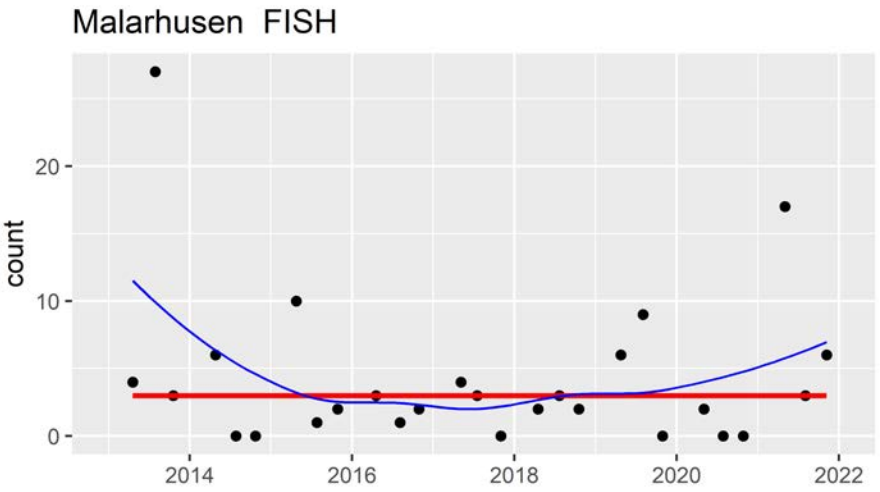
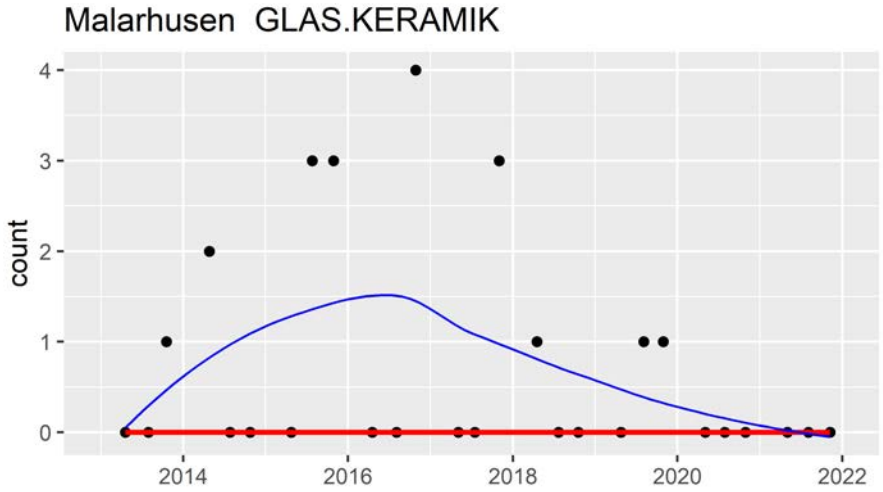
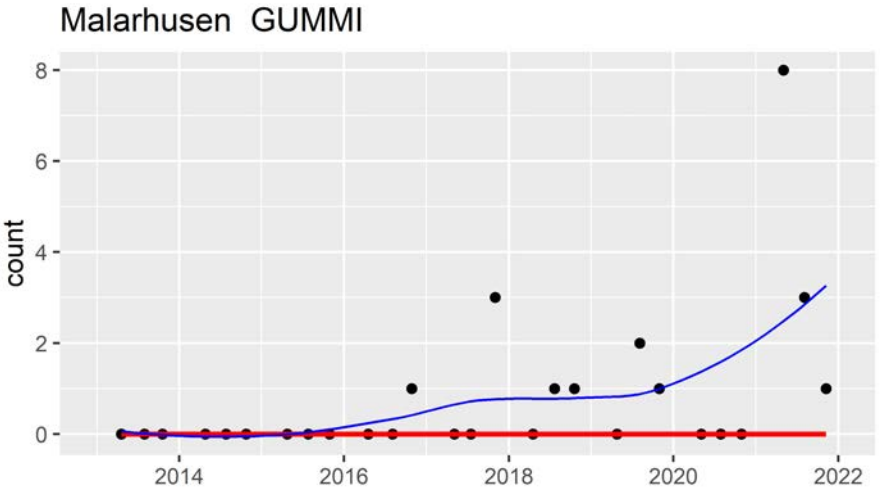
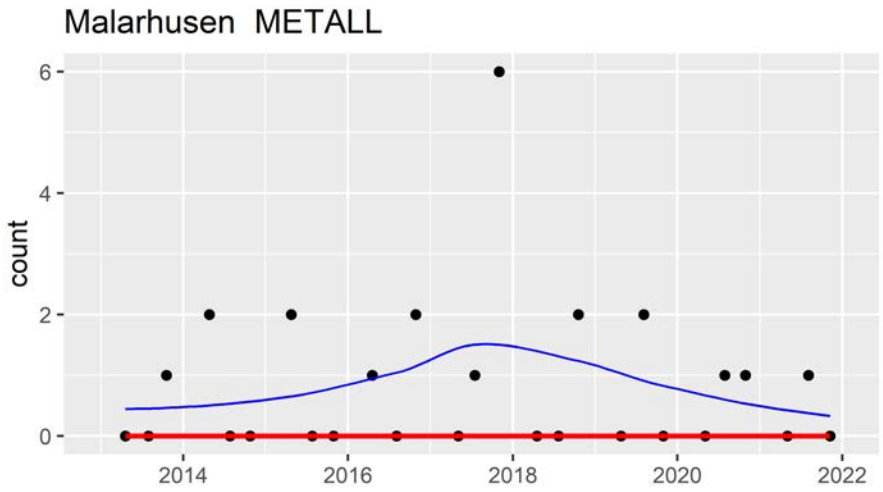
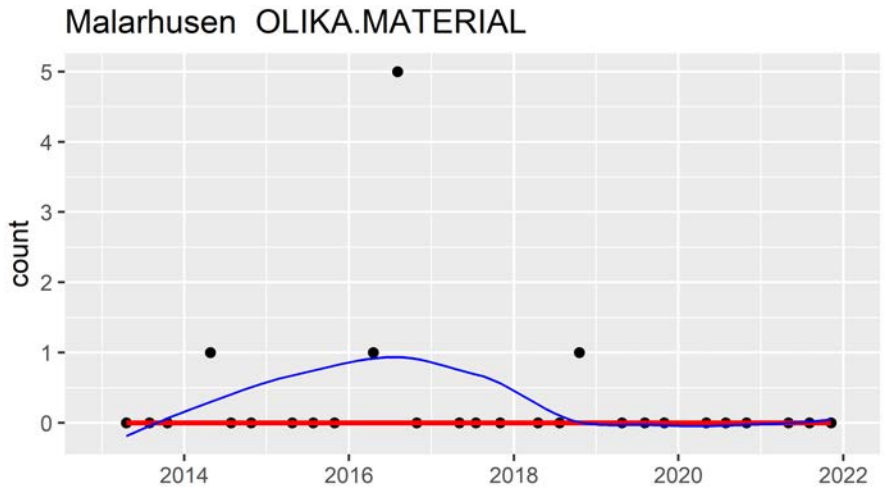
1
2
3
2014
2016
2018
2020
2022

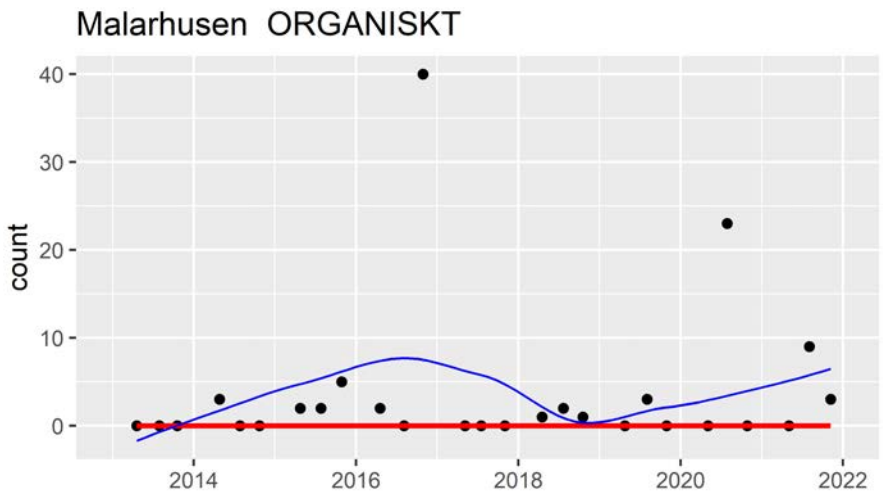

Malarhusen FISH
count
0
10
20
2014
2016
2018
2020
2022

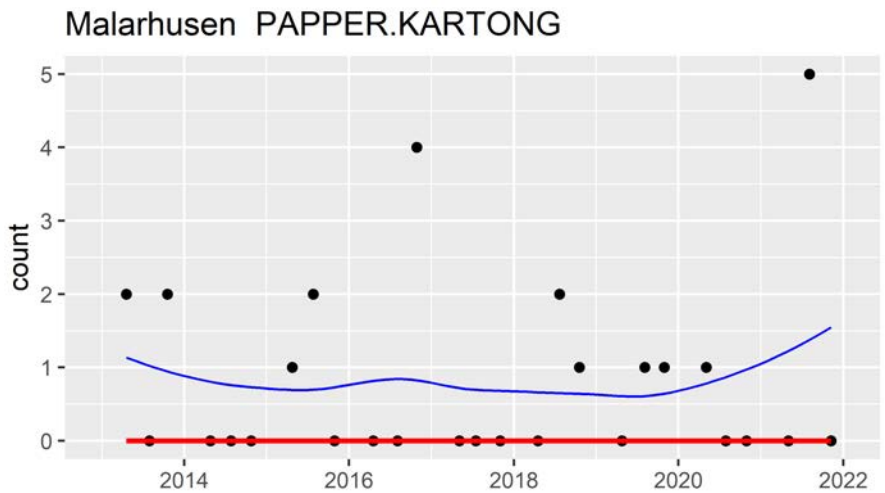

Malarhusen GLAS.KERAMIK
count
0
1
2
3
4
2014
2016
2018
2020
2022

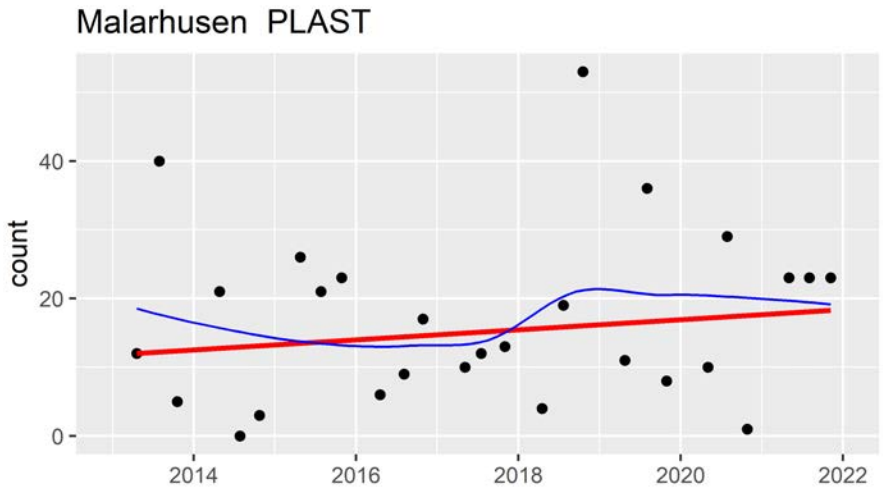

Malarhusen GUMMI
count
0
2
4
6
8
2014
2016
2018
2020
2022

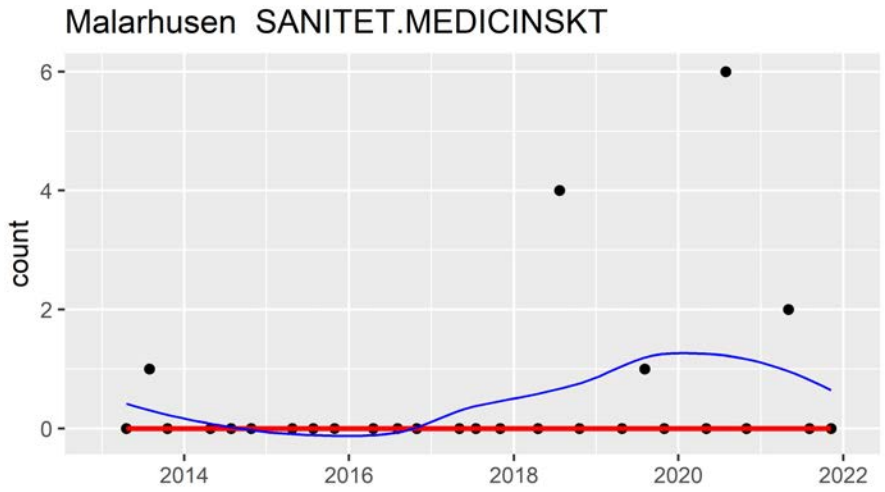

Malarhusen METALL
count
0
2
4
6
2014
2016
2018
2020
2022


Malarhusen OLIKA.MATERIAL
count
0
1
2
3
4
5
2014
2016
2018
2020
2022


Malarhusen ORGANISKT
count
0
10
20
30
40
2014
2016
2018
2020
2022


Malarhusen PAPPER.KARTONG
count
0
1
2
3
4
5
2014
2016
2018
2020
2022


Malarhusen PLAST
count
0
20
40
2014
2016
2018
2020
2022


Malarhusen SANITET.MEDICINSKT
count
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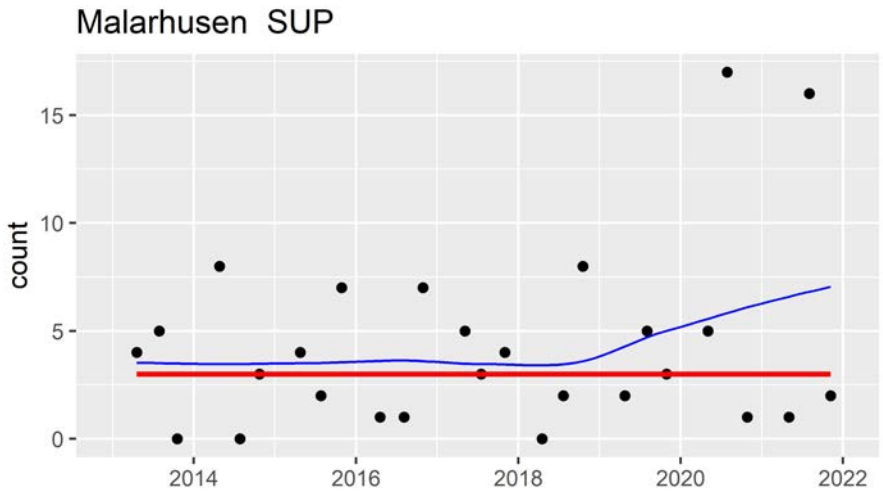
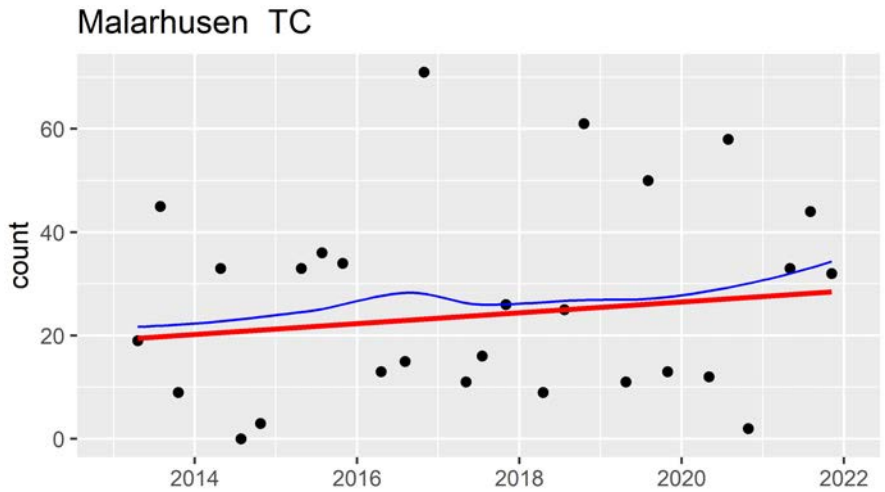
2
4
6
2014
2016
2018
2020
2022


Malarhusen SUP
count
0
5
10
15
2014
2016
2018
2020
2022


Malarhusen TC
count
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20
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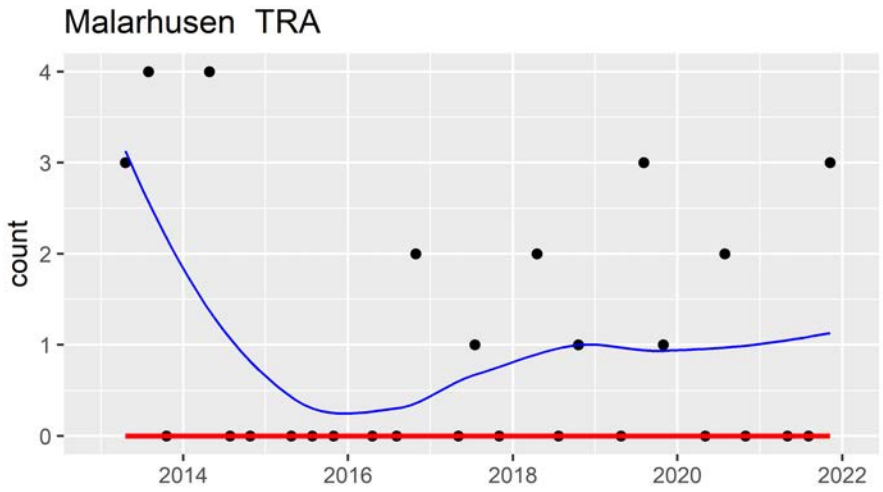
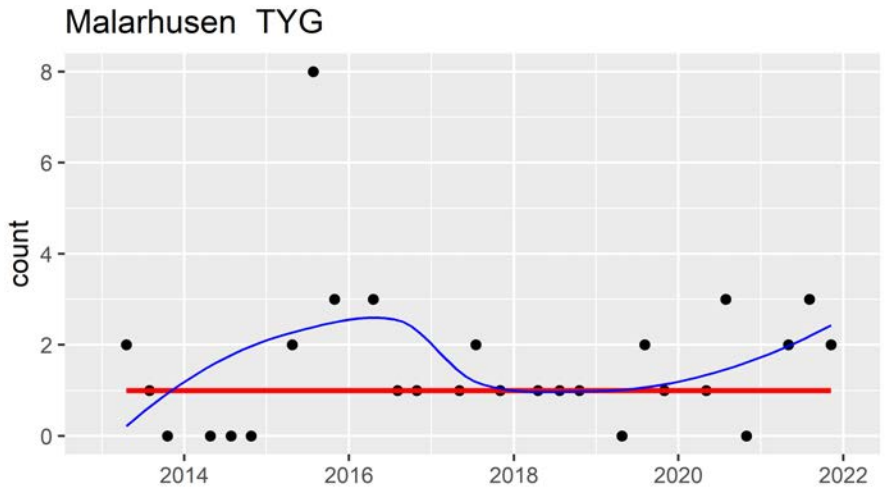
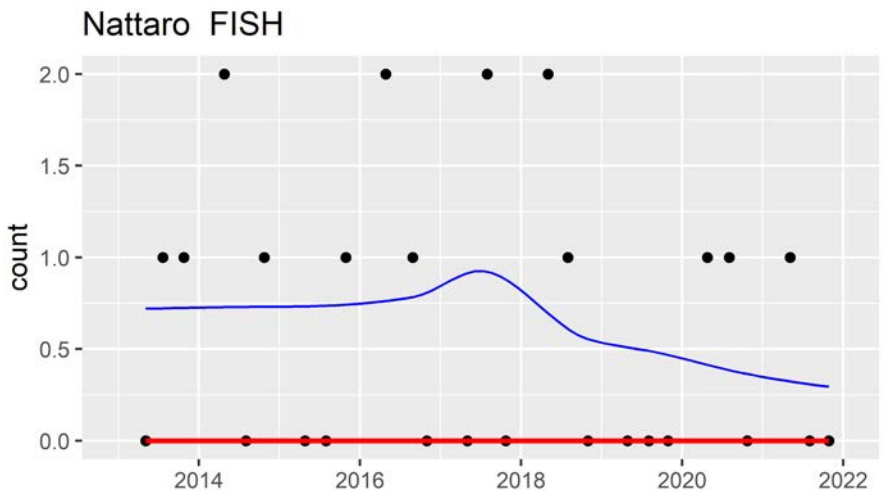
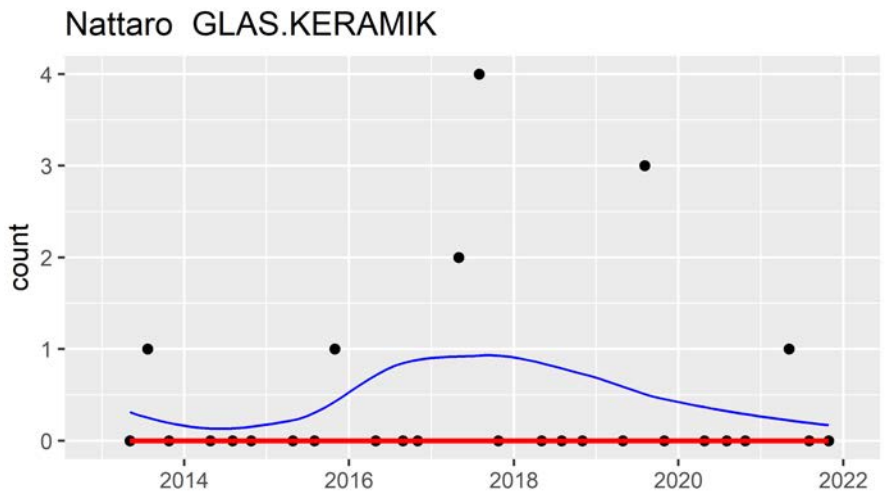
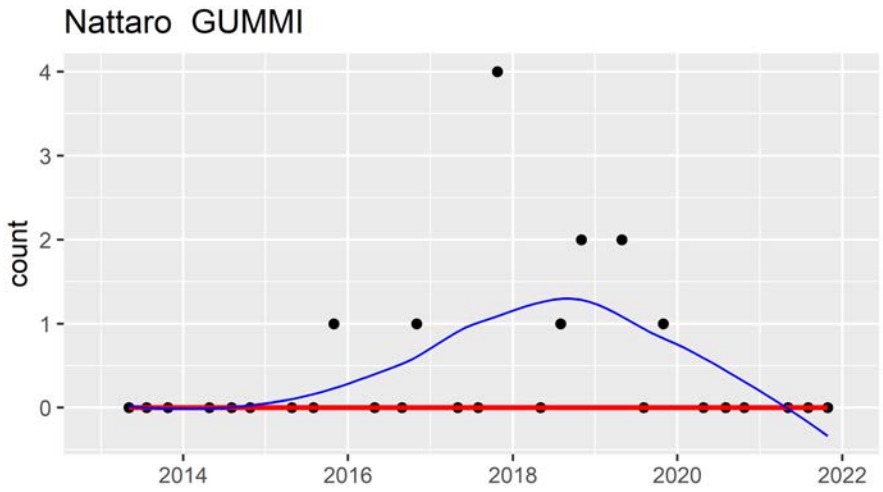
60
2014
2016
2018
2020
2022

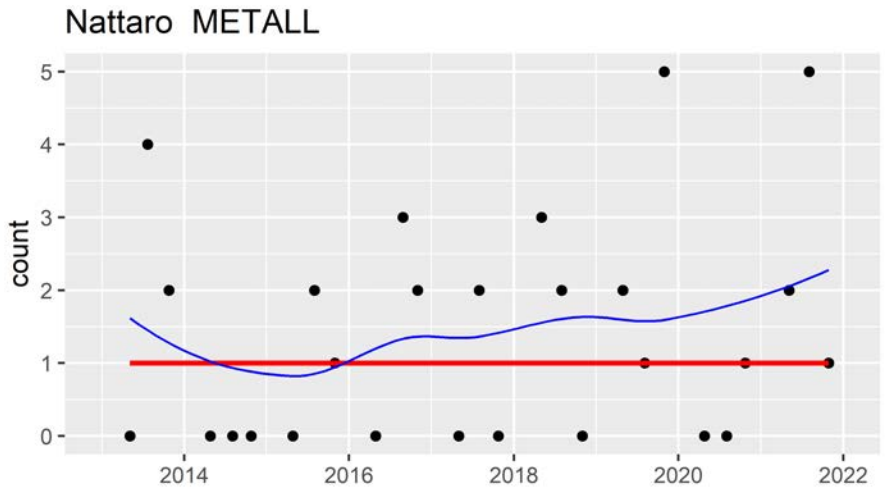

Malarhusen TRA
count
0
1
2
3
4
2014
2016
2018
2020
2022


Malarhusen TYG
count
0
2
4
6
8
2014
2016
2018
2020
2022


Nattaro FISH
count
0.0
0.5
1.0
1.5
2.0
2014
2016
2018
2020
2022


Nattaro GLAS.KERAMIK
count
0
1
2
3
4
2014
2016
2018
2020
2022


Nattaro GUMMI
count
4
3
2
1
0
2014
2016
2018
2020
2022


Nattaro METALL
count
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4
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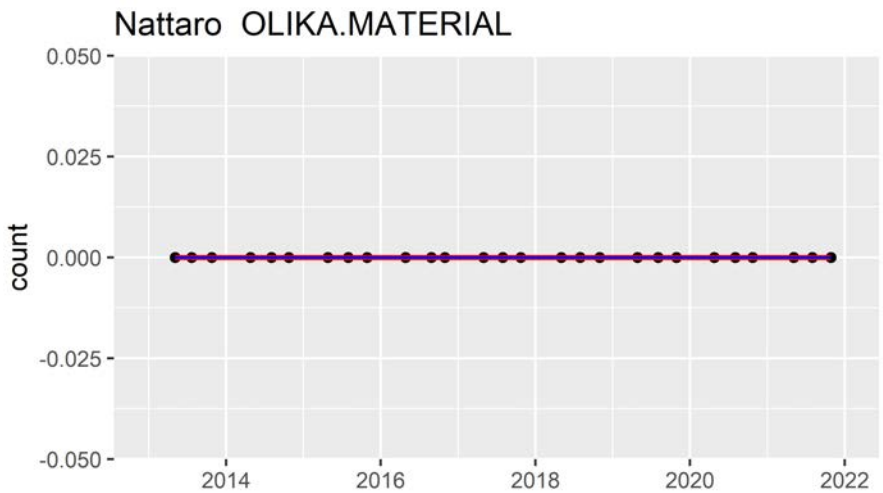
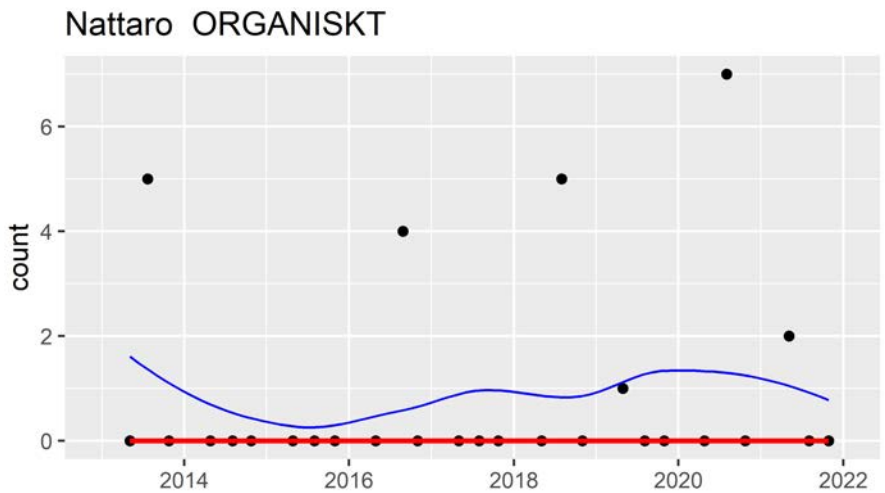
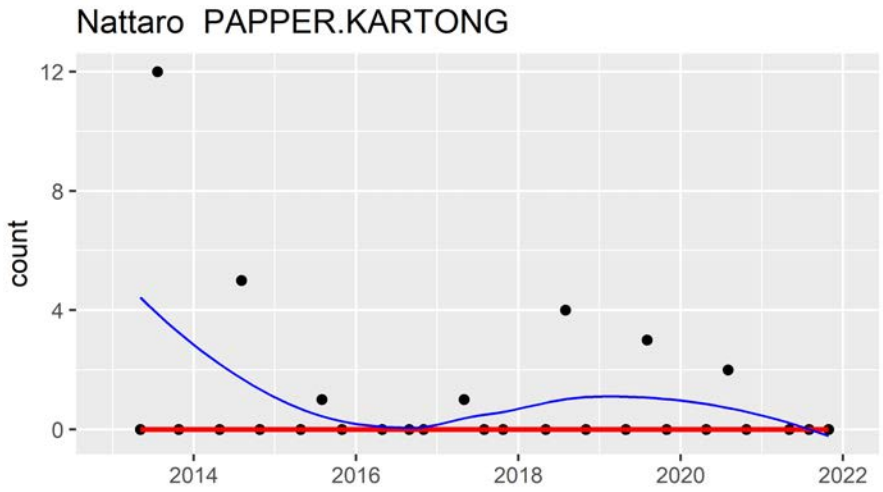
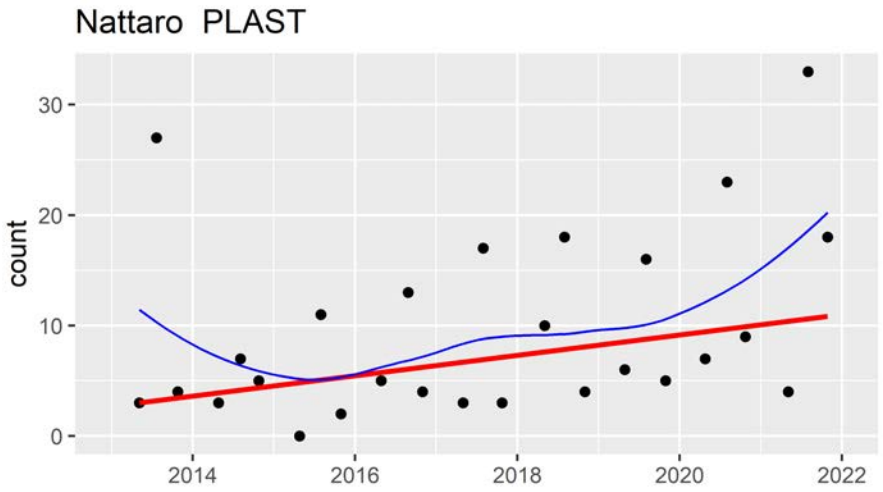
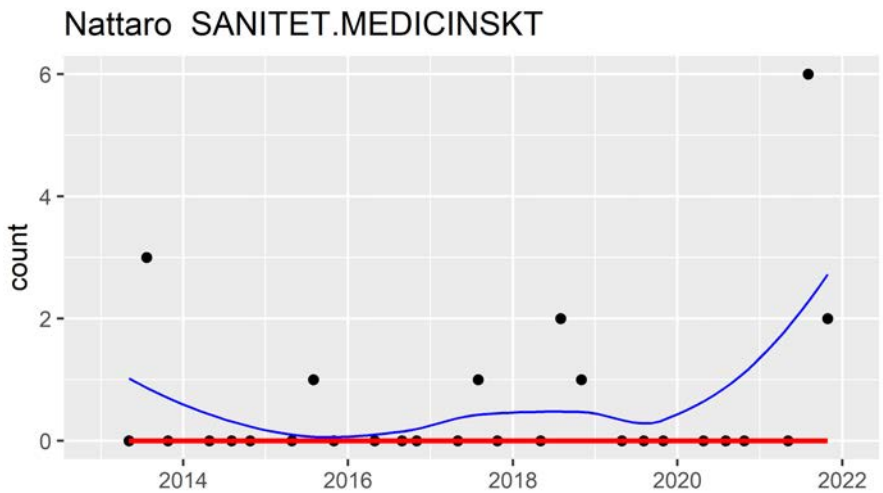
2
1
0
2014
2016
2018
2020
2022

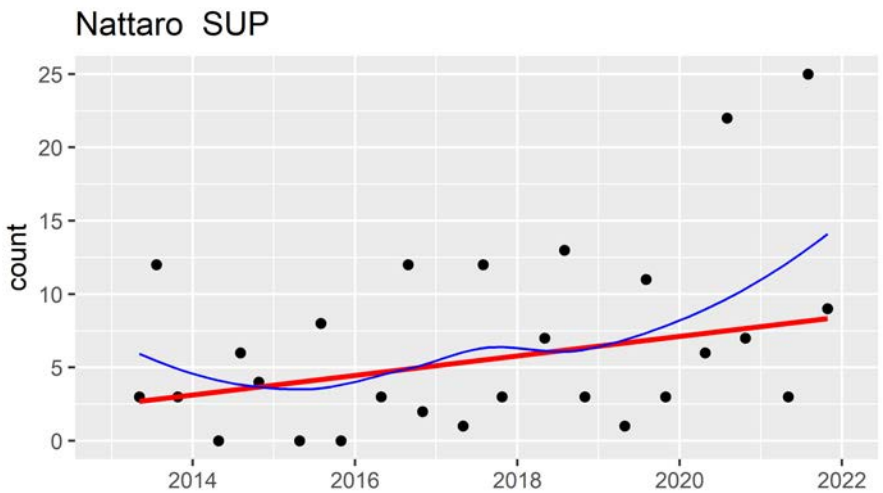

Nattaro OLIKA.MATERIAL
count
0.050
0.025
0.000
-0.025
-0.050
2014
2016
2018
2020
2022

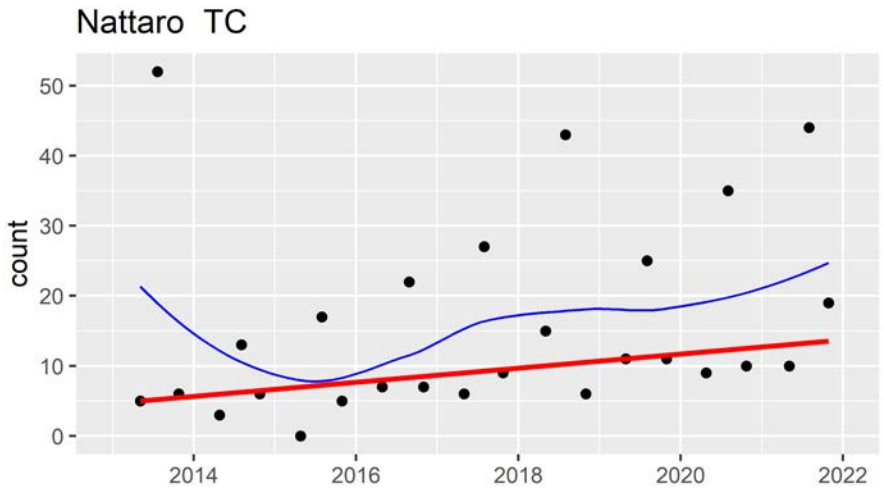

Nattaro ORGANISKT
count
6
4
2
0
2014
2016
2018
2020
2022


Nattaro PAPPER.KARTONG
count
12
8
4
0
2014
2016
2018
2020
2022


Nattaro PLAST
count
30
20
10
0
2014
2016
2018
2020
2022


Nattaro SANITET.MEDICINSKT
count
6
4
2
0
2014
2016
2018
2020
2022


Nattaro SUP
count
25
20
15
10
5
0
2014
2016
2018
2020
2022


Nattaro TC
count
50
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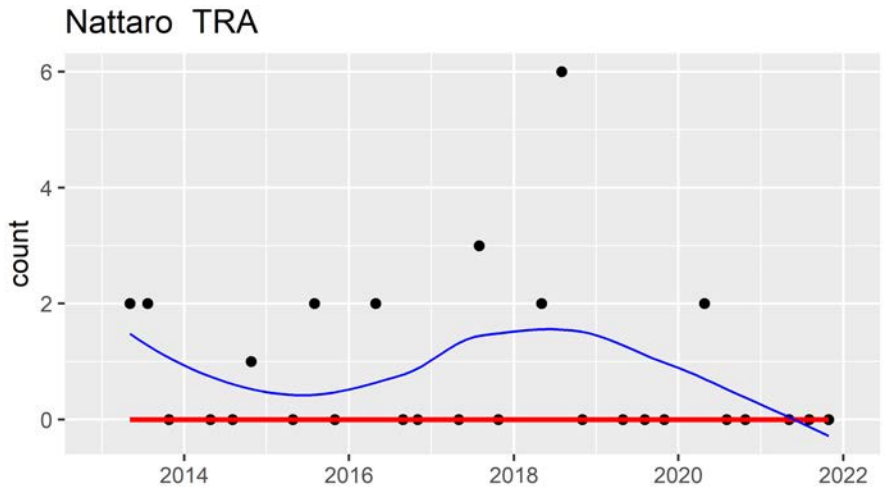
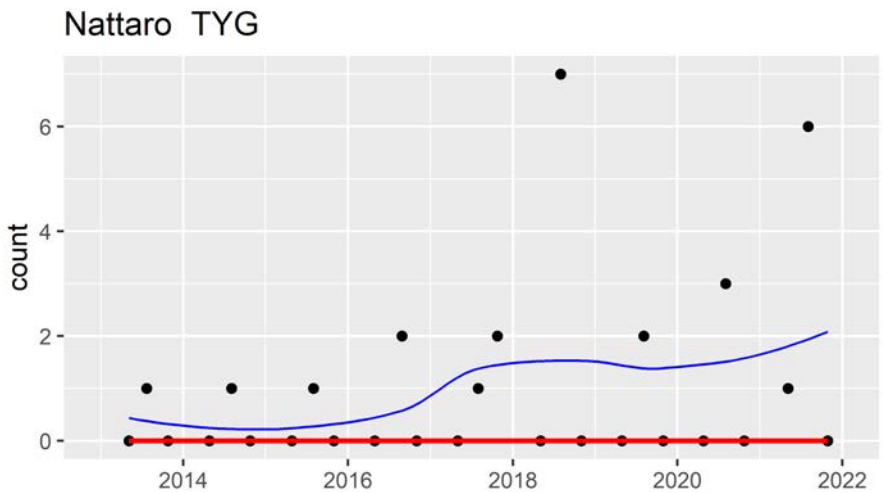
30
20
10
0
2014
2016
2018
2020
2022


Nattaro TRA
count
6
4
2
0
2014
2016
2018
2020
2022


Nattaro TYG
count
6
4
2
0
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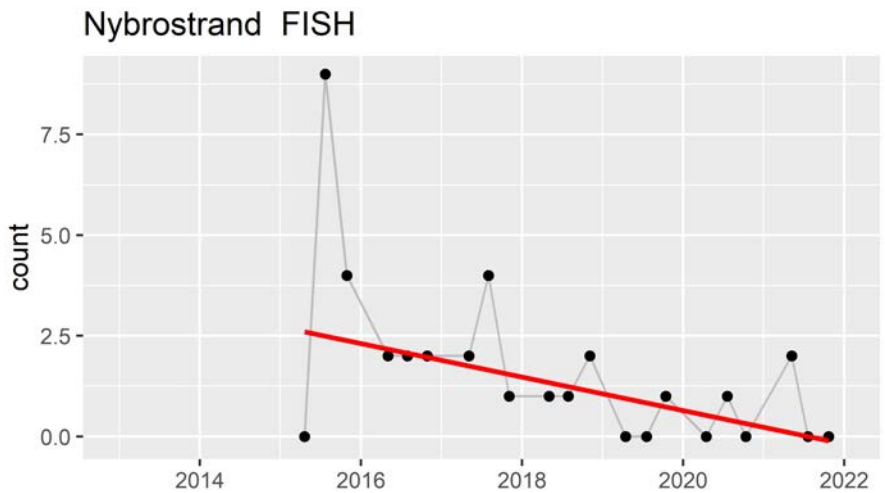
2016
2018
2020
2022


Nybrostrand FISH
count
7.5
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2.5
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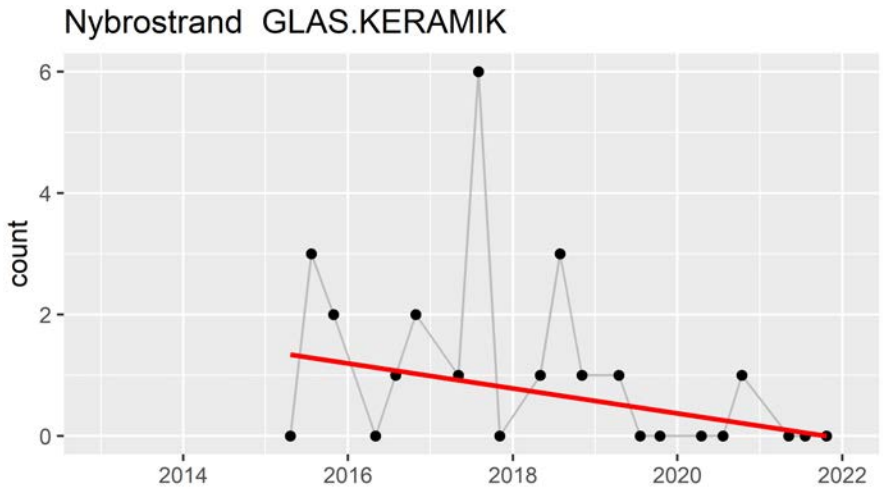
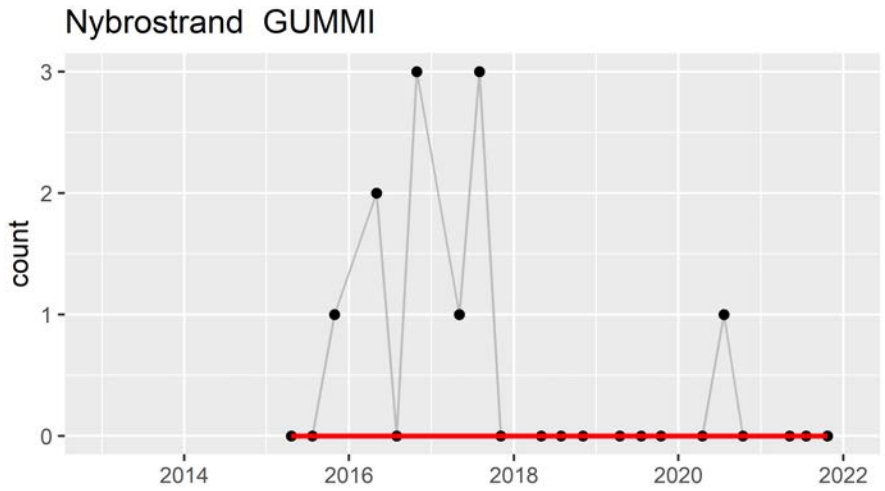
2016
2018
2020
2022


Nybrostrand GLAS.KERAMIK
count
0
2
4
6
2014
2016
2018
2020
2022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count
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2020
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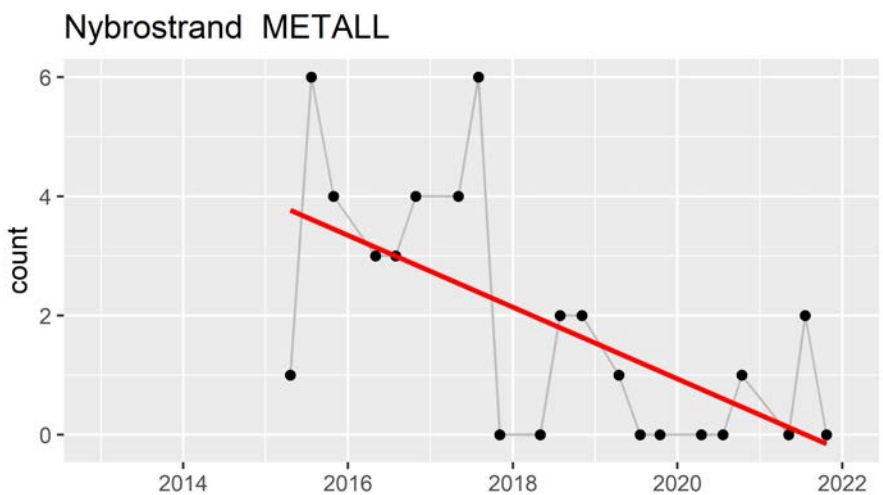
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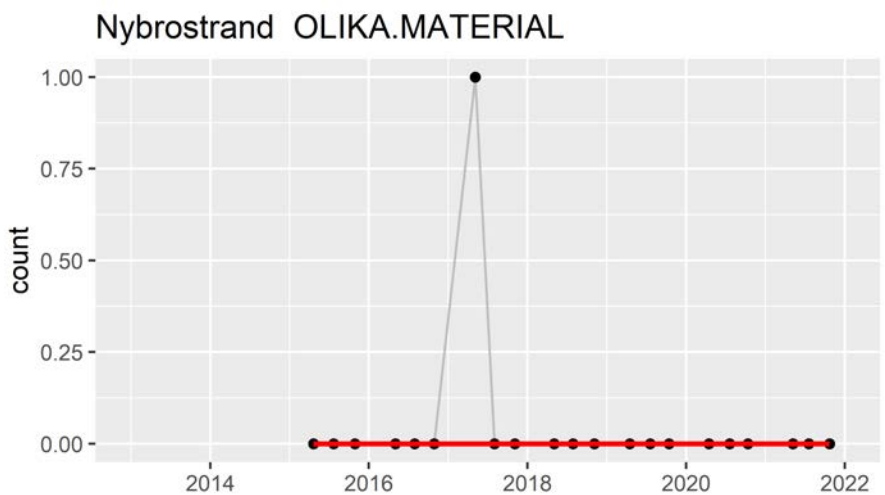
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1.00
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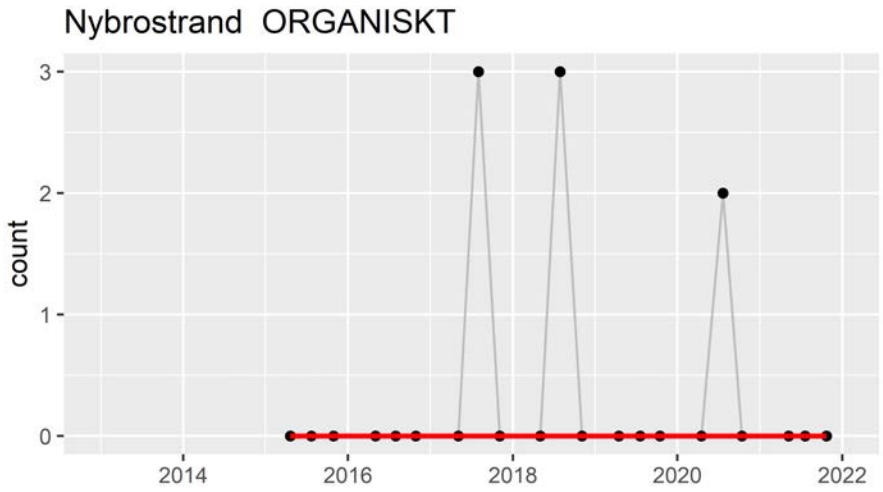
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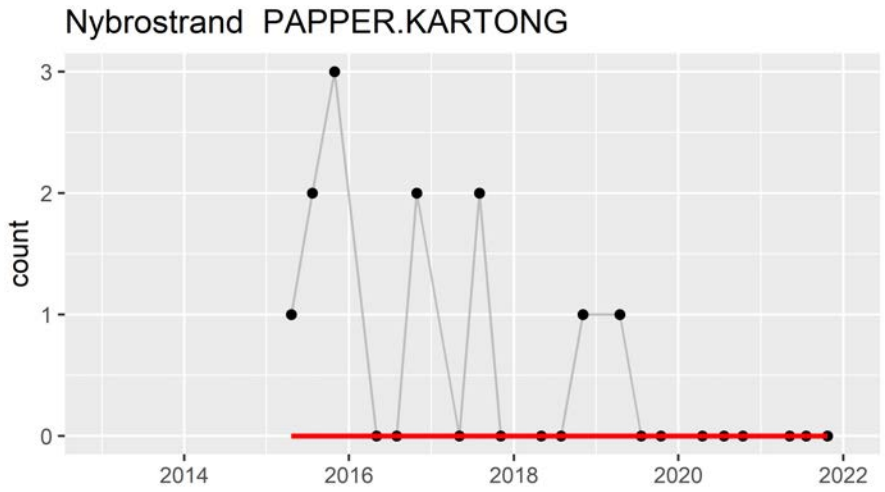
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count
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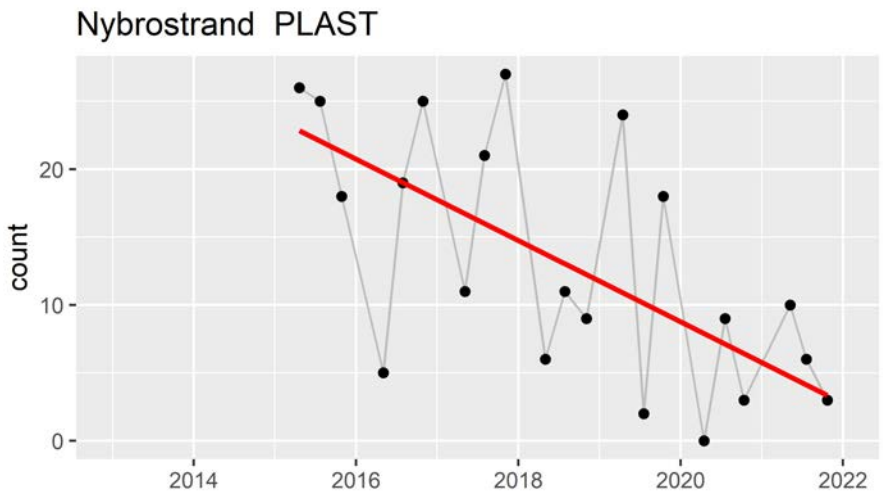
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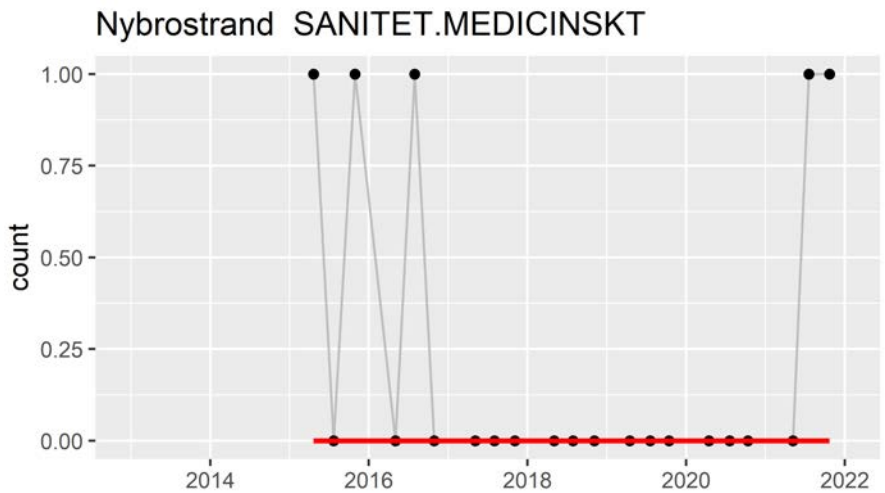
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count
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1.00
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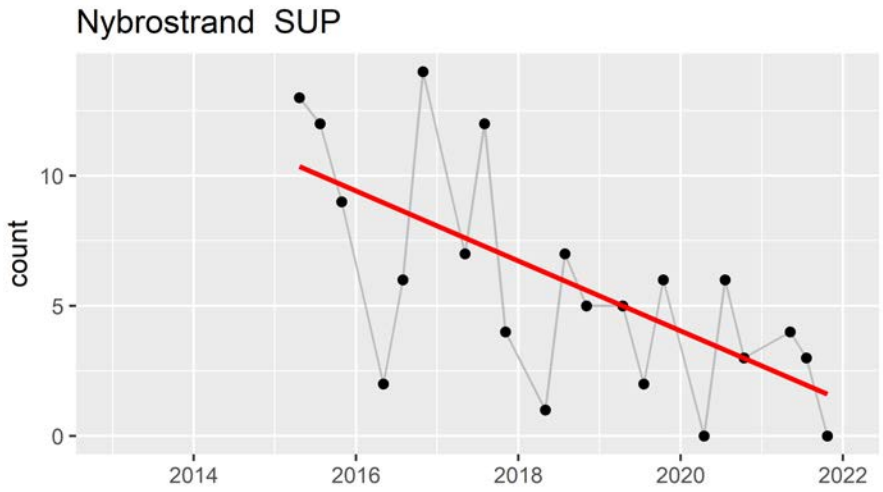
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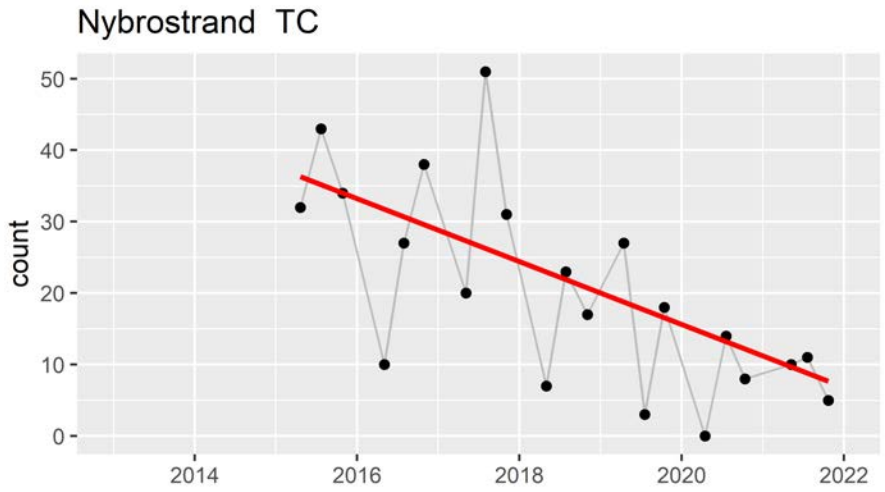
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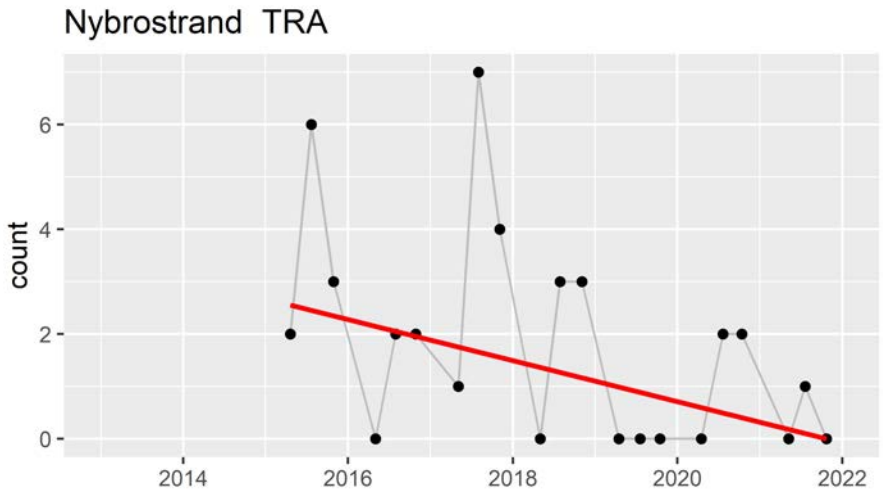
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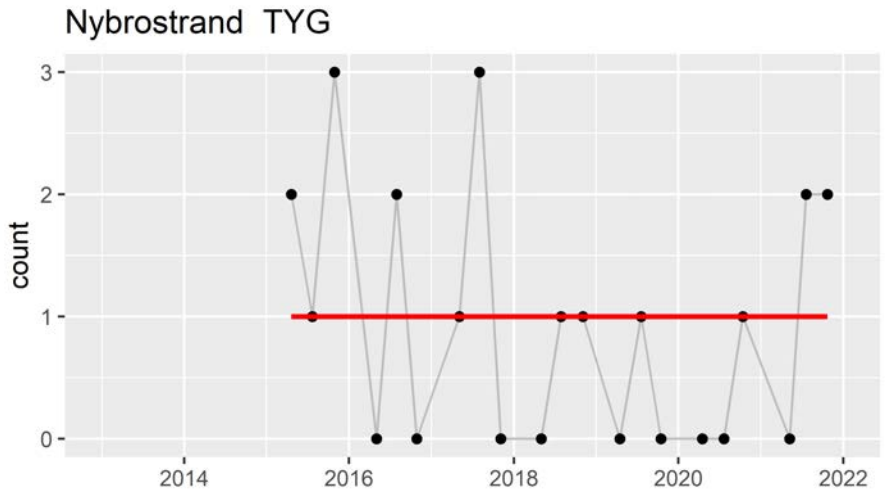
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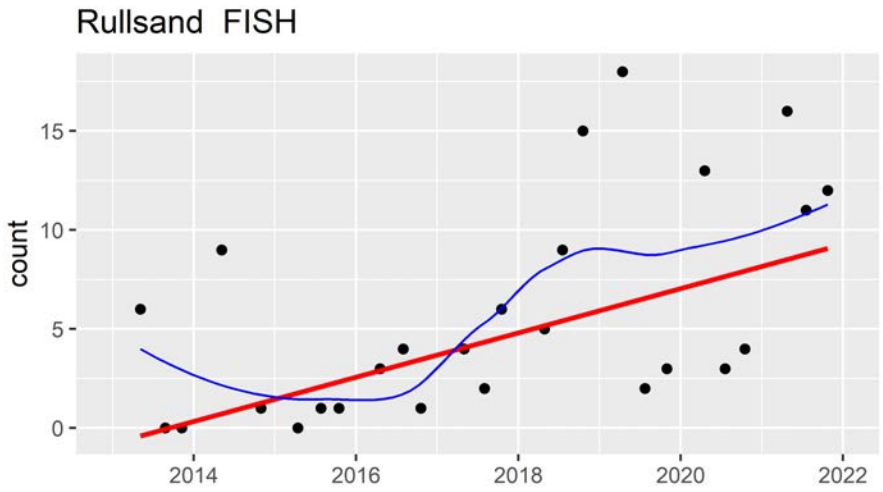
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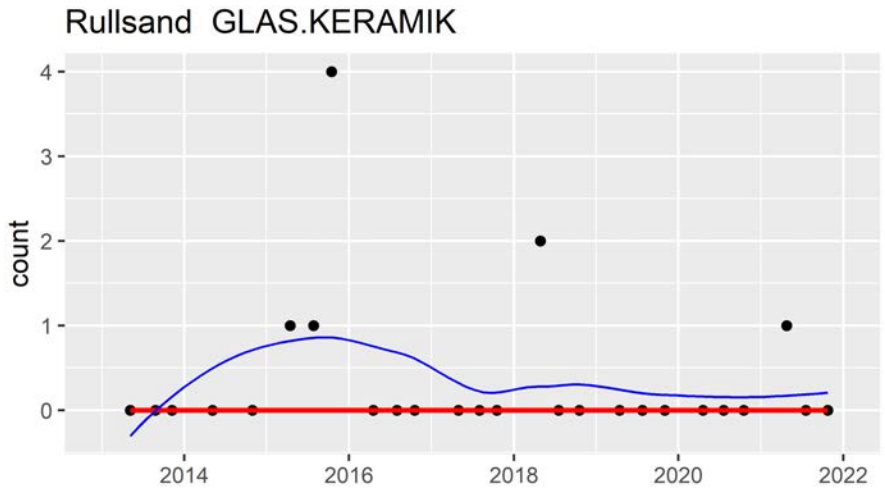
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count
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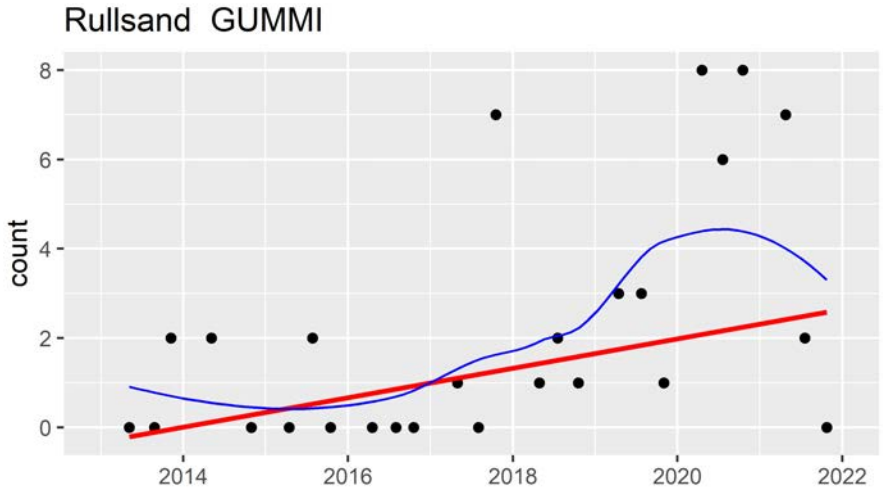
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count
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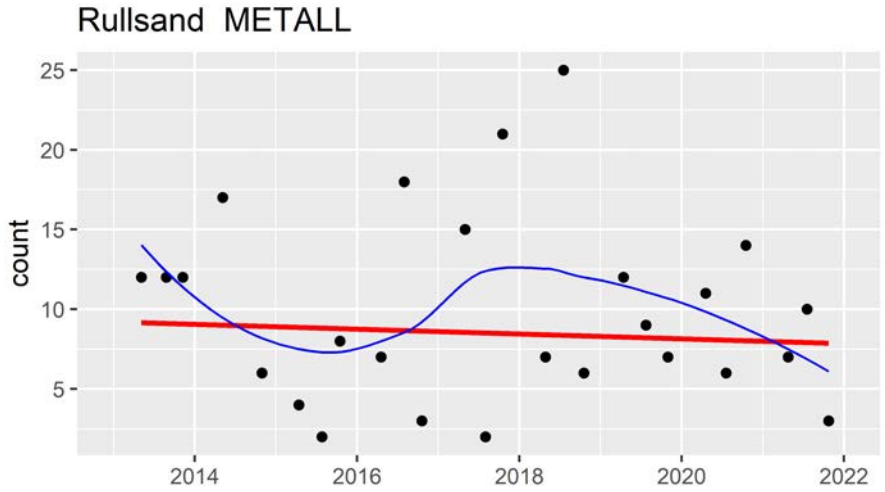
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count
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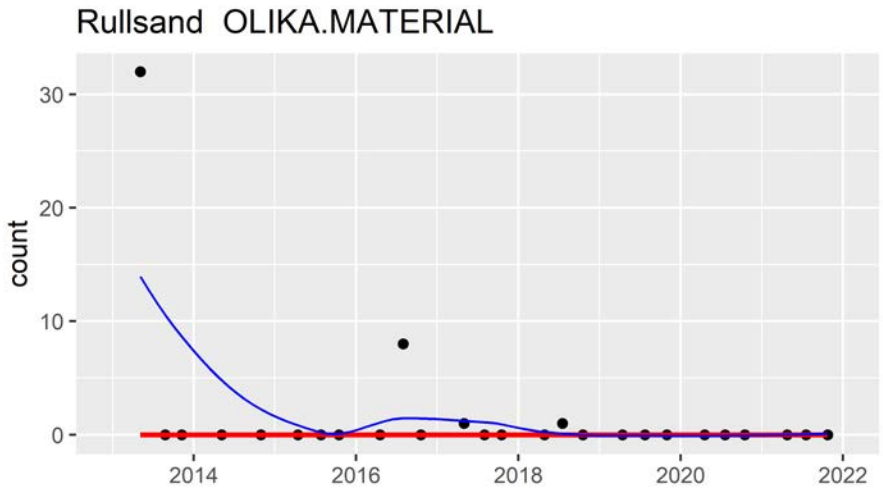
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count
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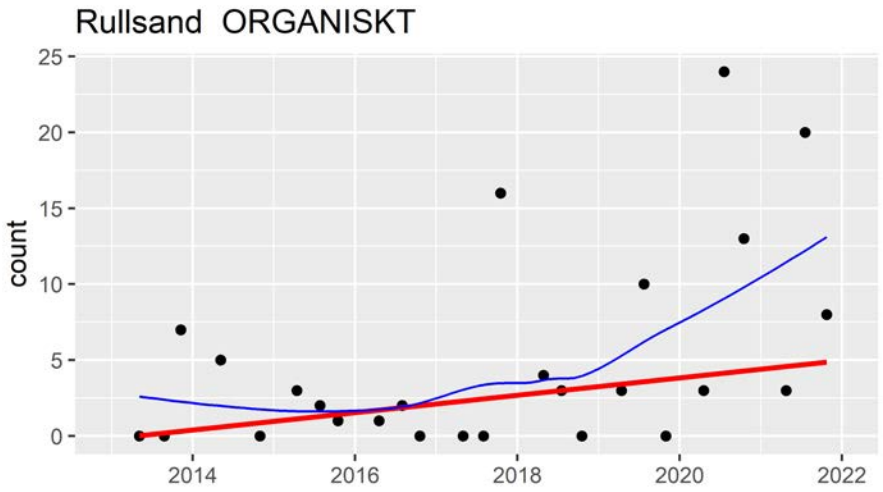
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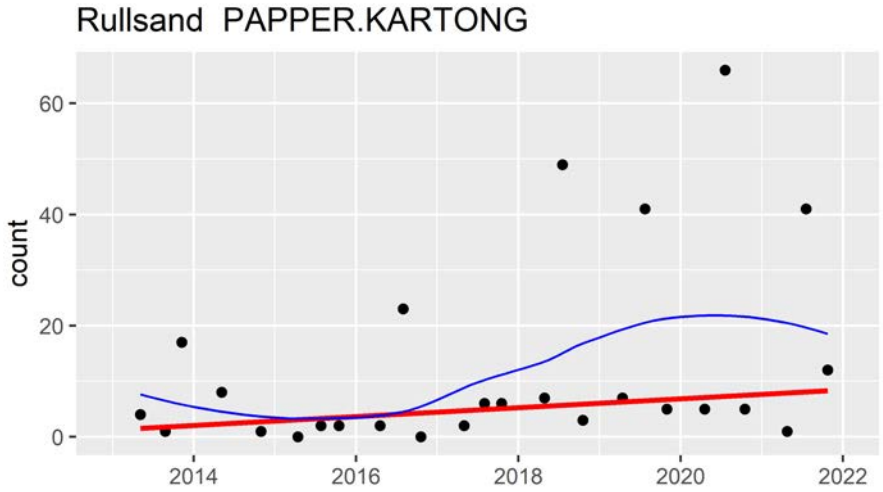
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2020
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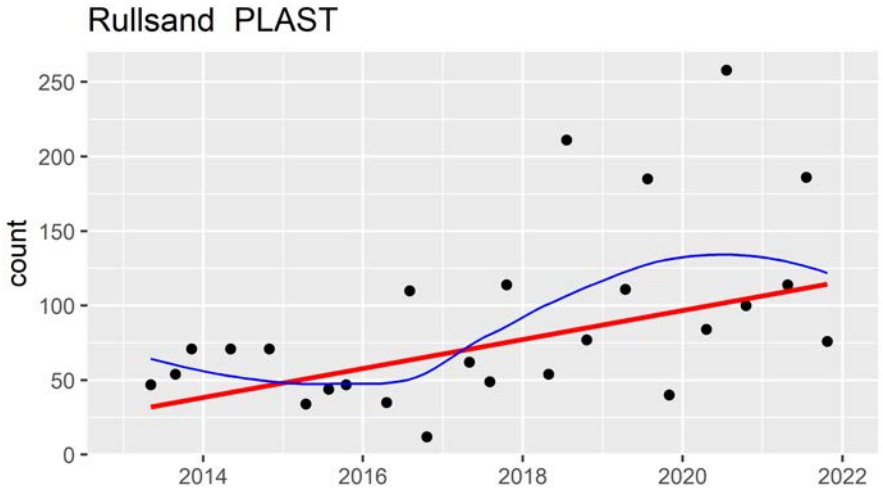
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count
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2020
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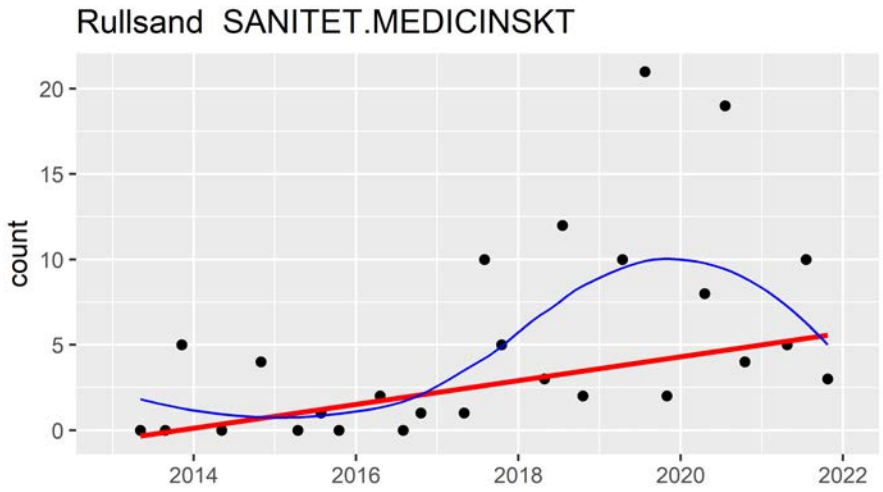
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count
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2016
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2020
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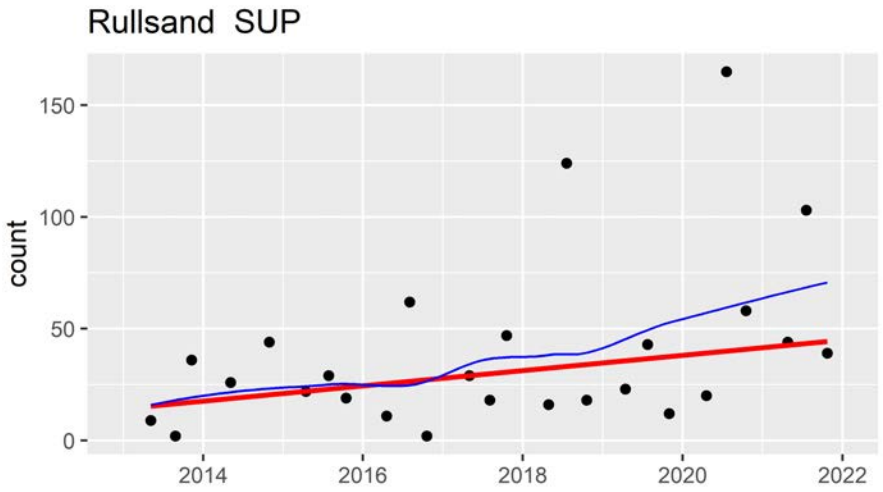
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count
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50
100
150
2014
2016
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2020
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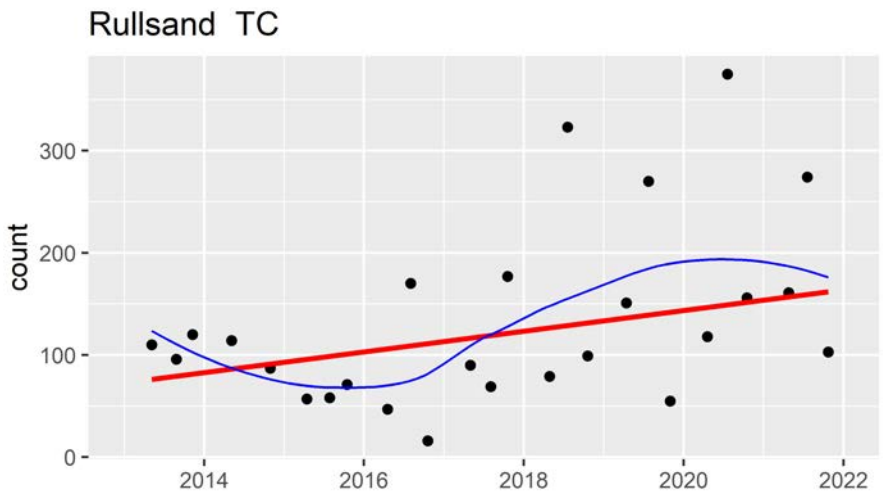
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count
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100
200
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2016
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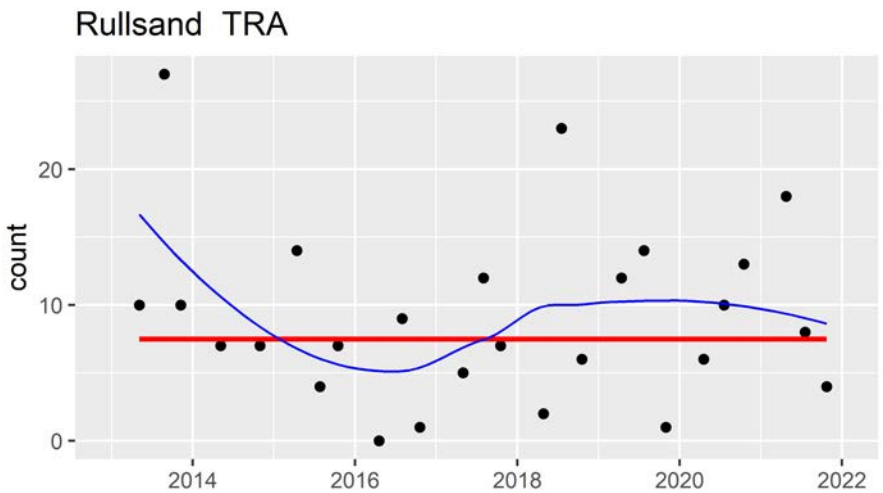
2020
2022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count
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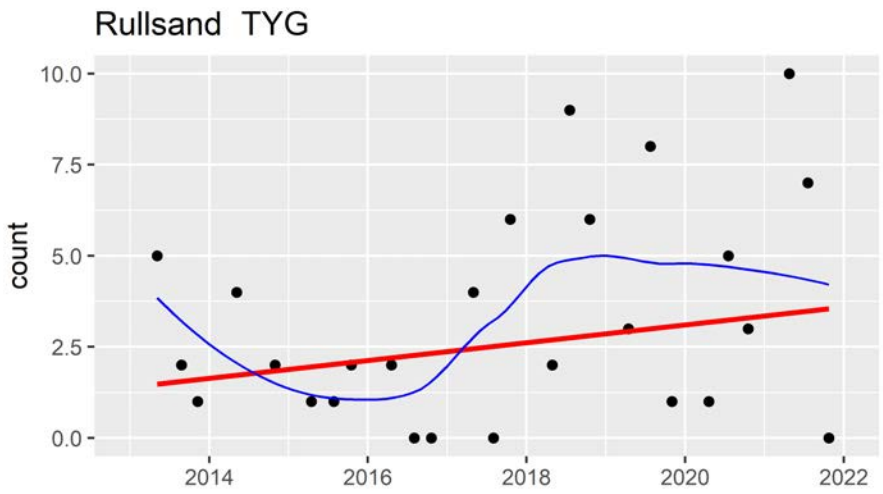
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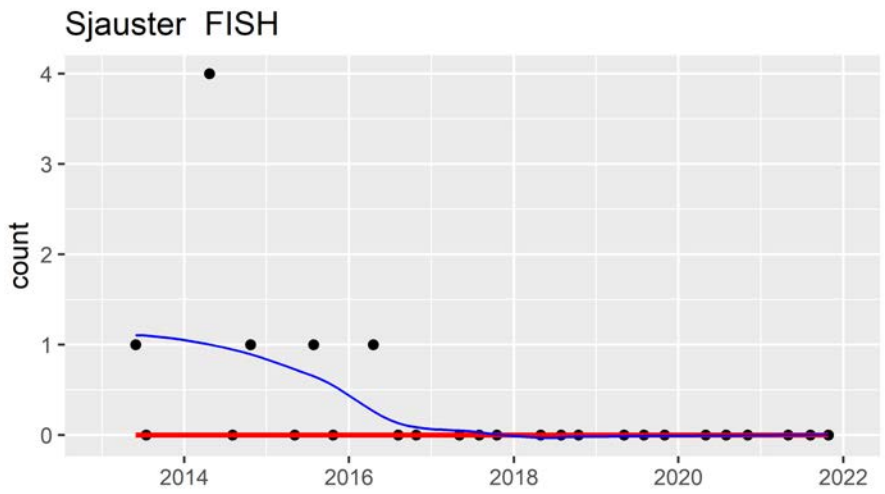
2020
2022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2018
2020
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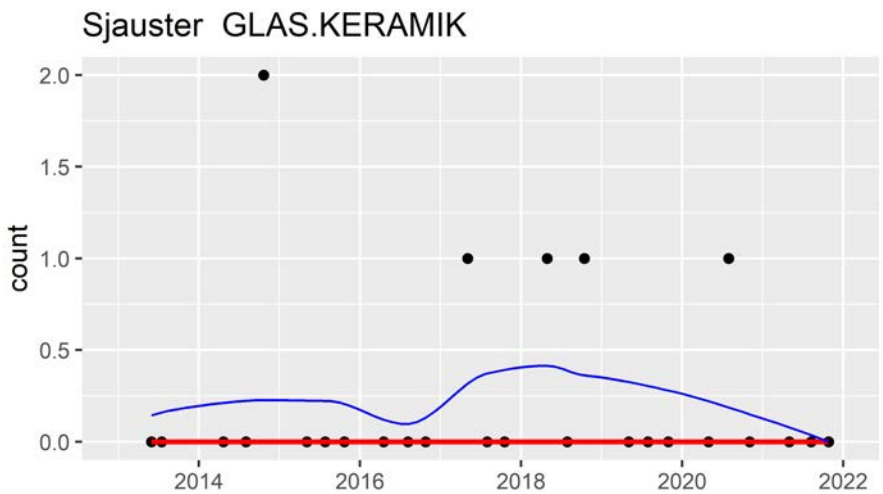
Sjauster GLAS.KERAMIK
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1.0
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0.0
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2016
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2020
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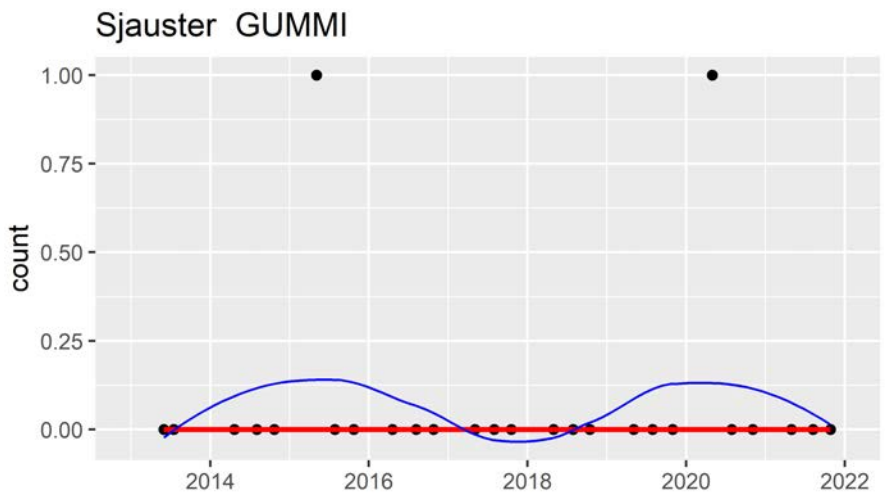
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count
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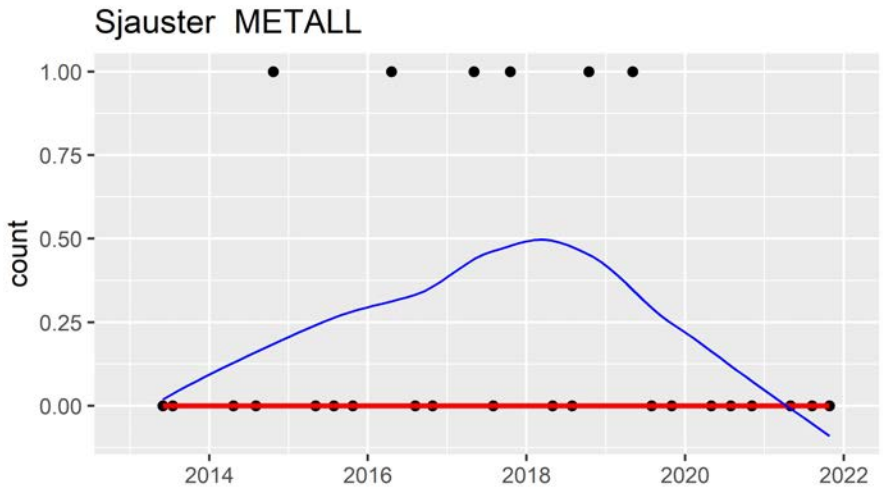
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2020
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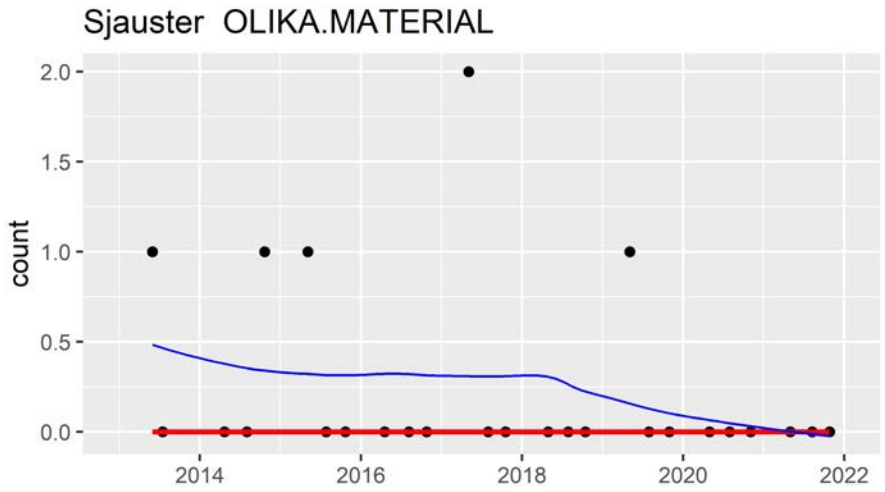
Sjauster OLIKA.MATERIAL
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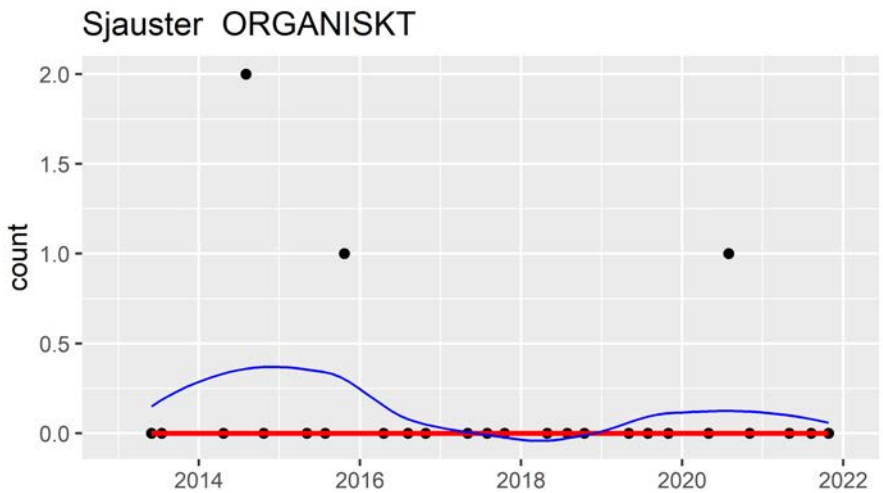
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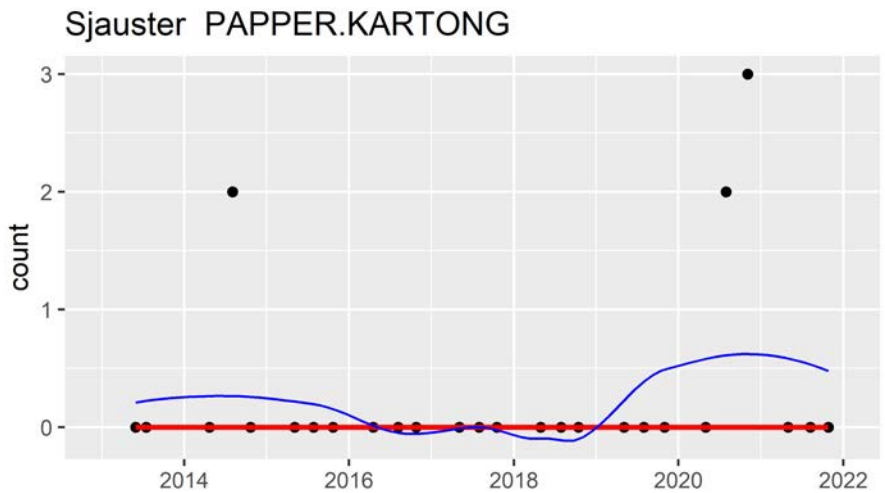
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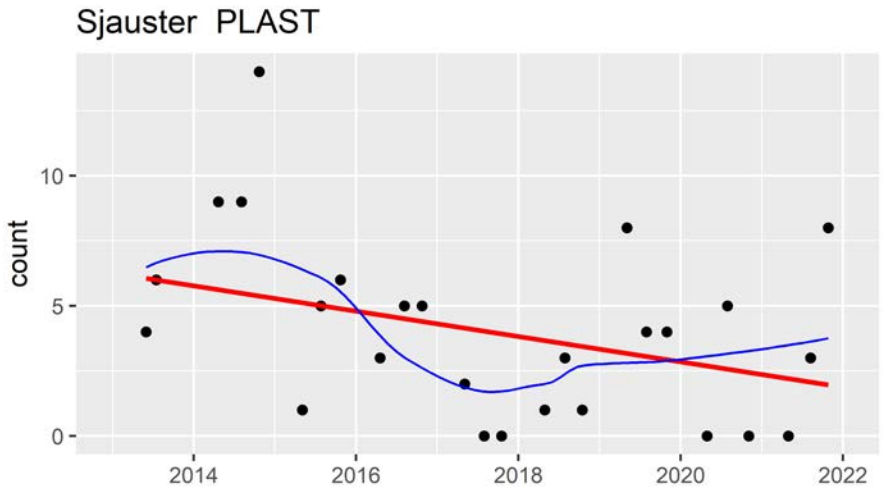
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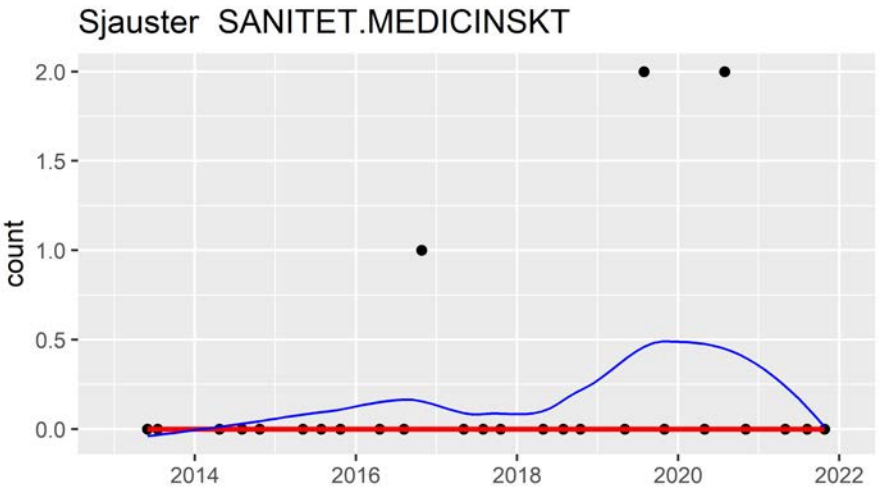
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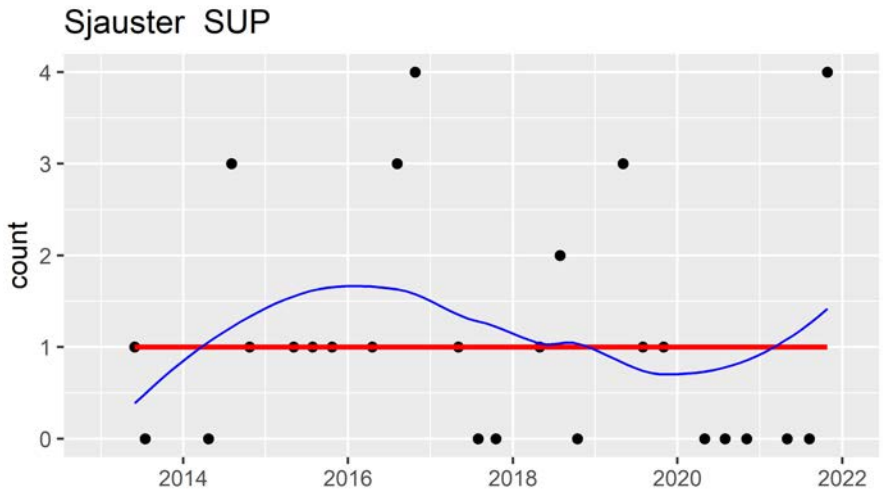
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count
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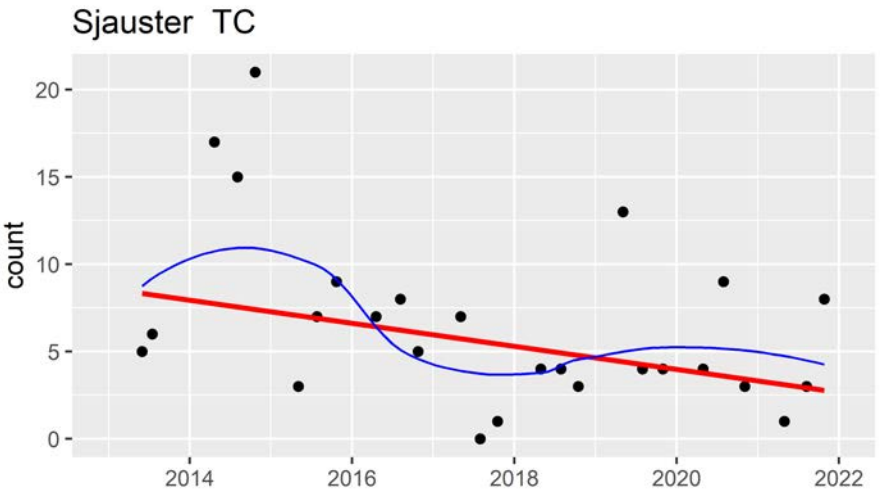
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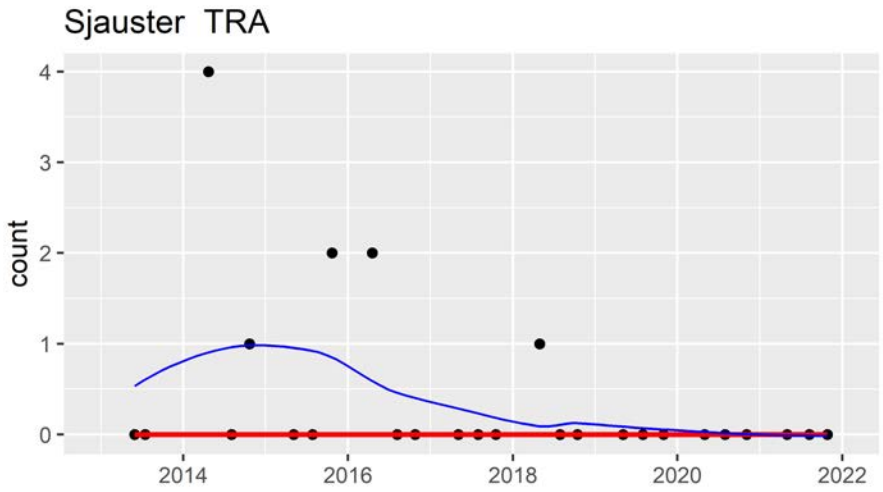
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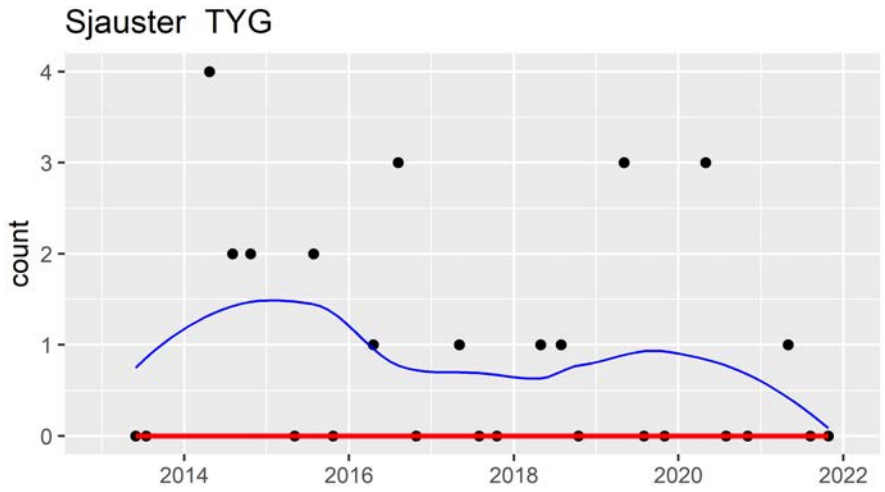
Sjauster TYG
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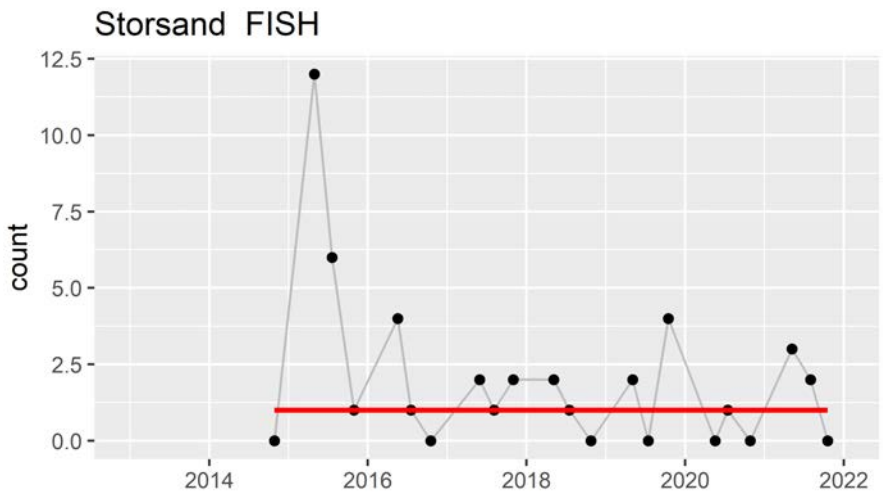
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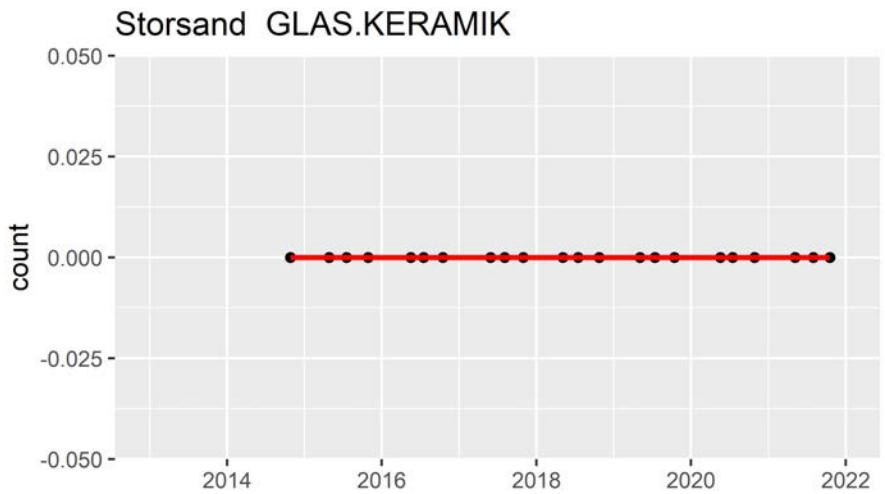
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-0.050
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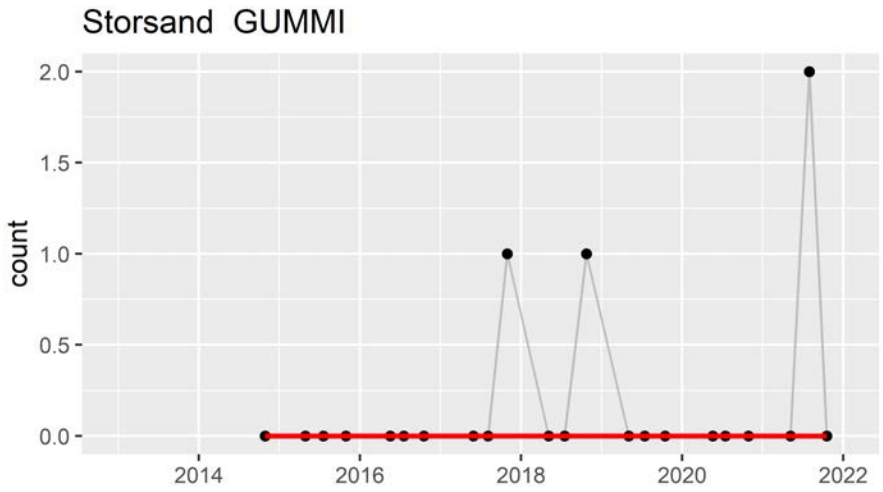
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count
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1.0
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0.0
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2016
2018
2020
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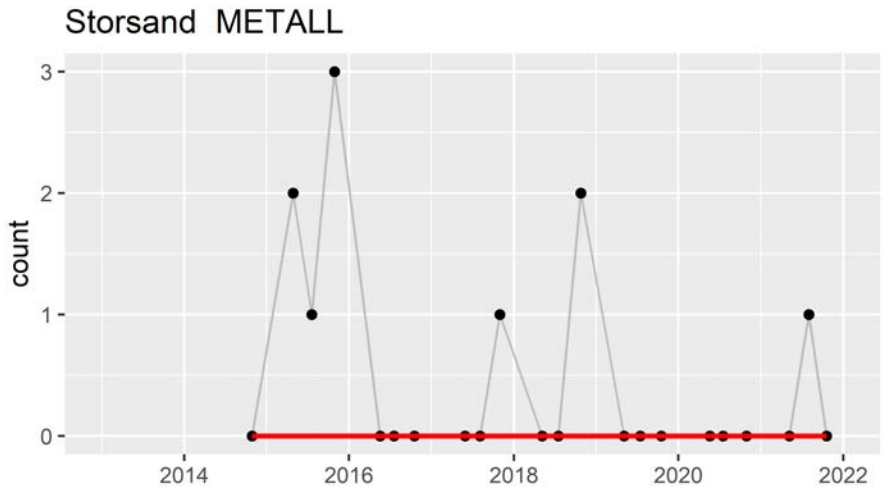
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2020
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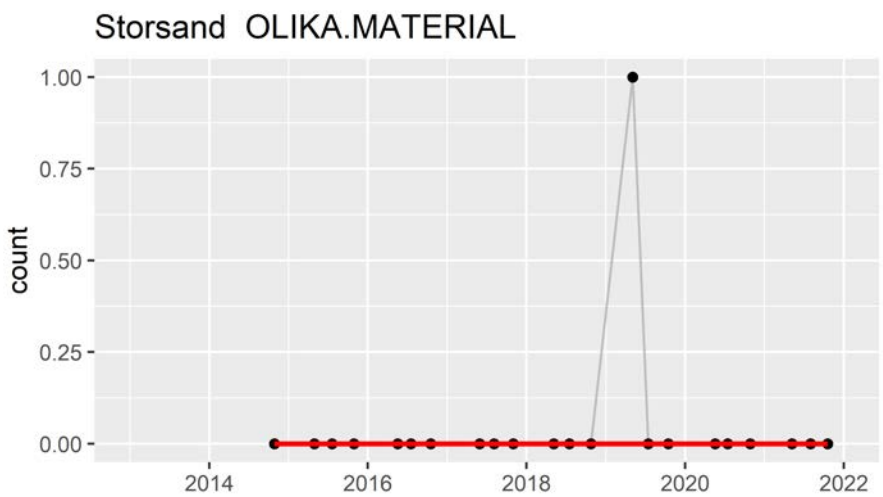
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count
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0.00
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2016
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2020
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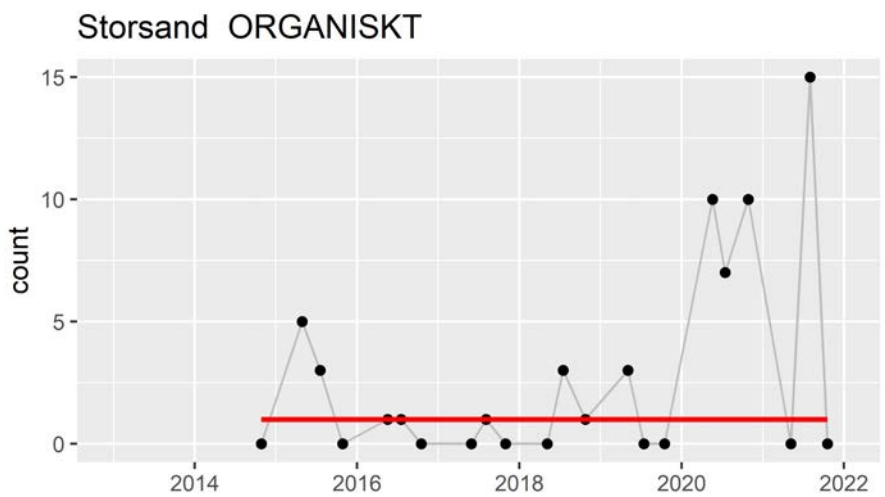
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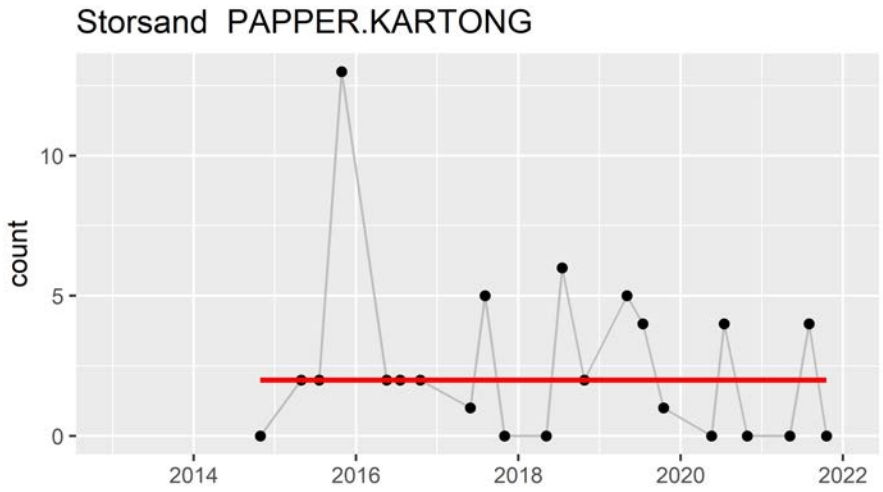
2018
2020
2022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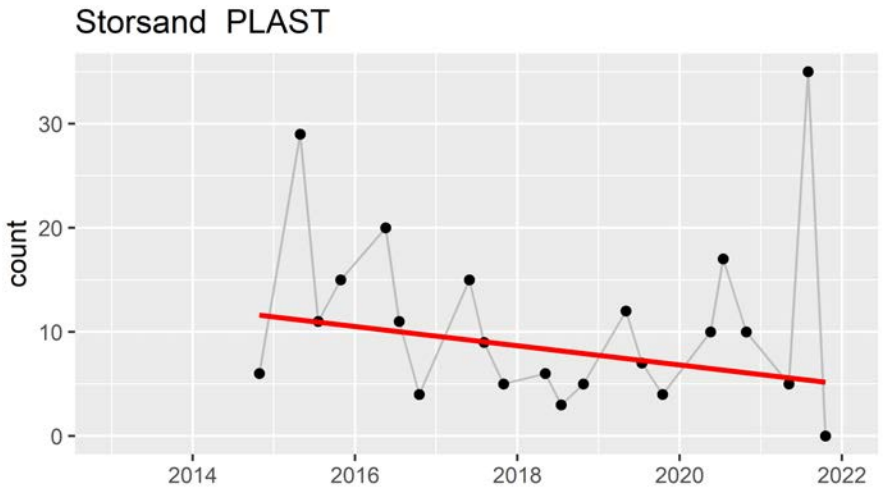
Storsand PLAST
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2016
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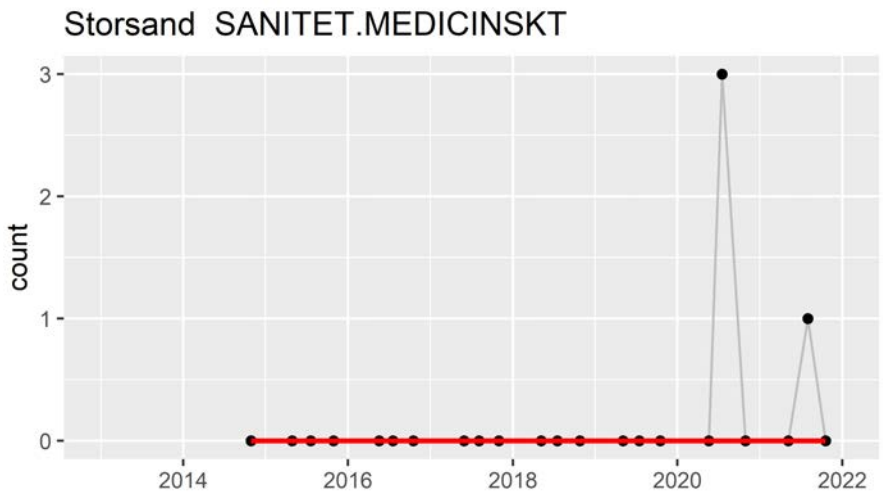
2020
2022


Storsand SANITET.MEDICINSKT
count
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2016
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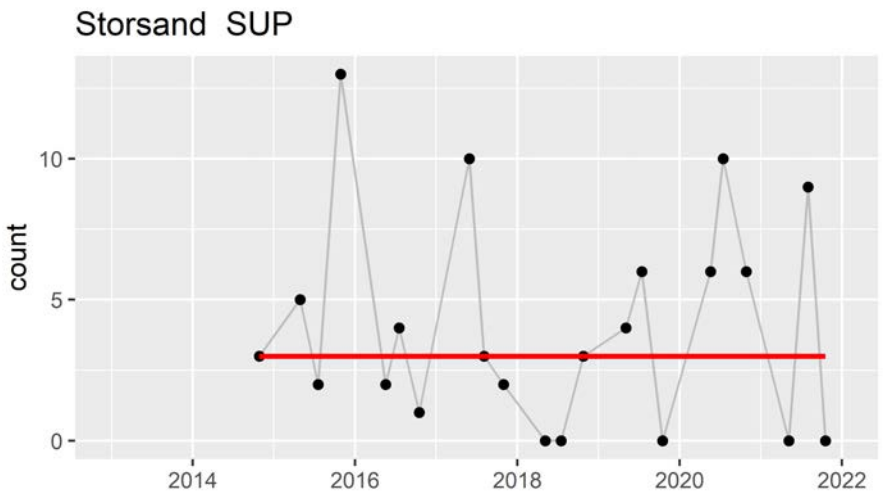
2020
2022


Storsand SUP
count
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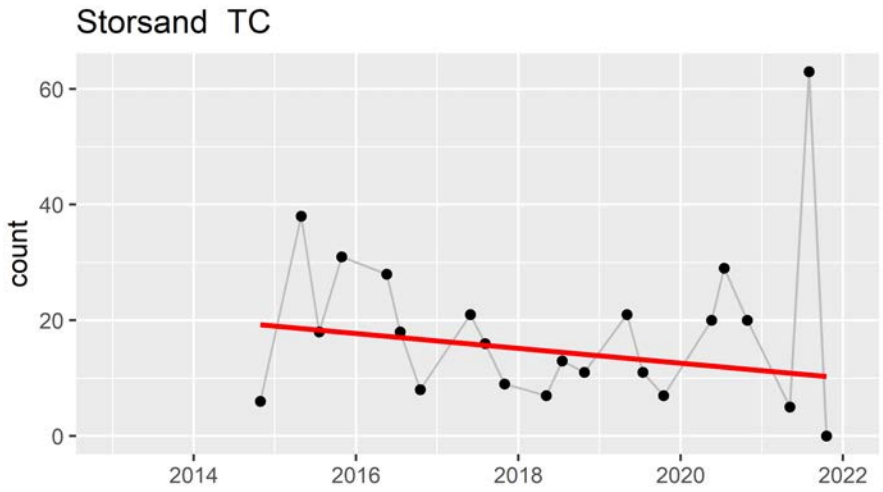
2014
2016
2018
2020
2022


Storsand TC
count
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20
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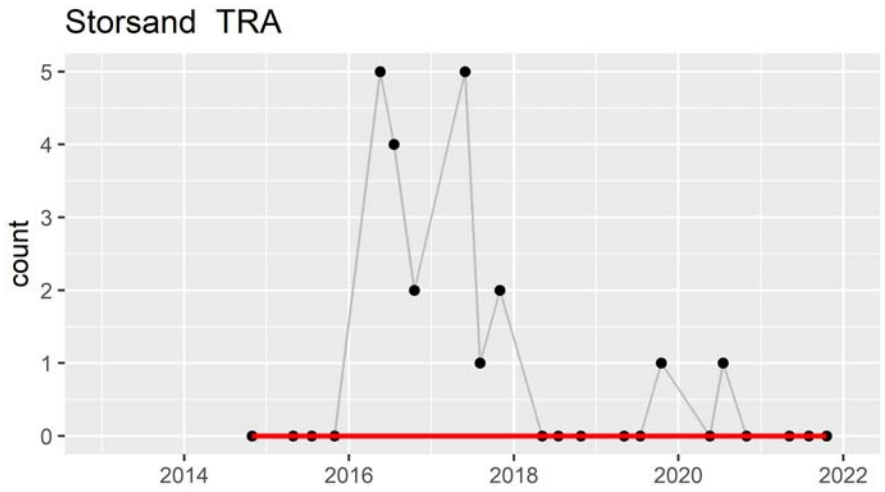
60
2014
2016
2018
2020
2022


Storsand TRA
count
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1
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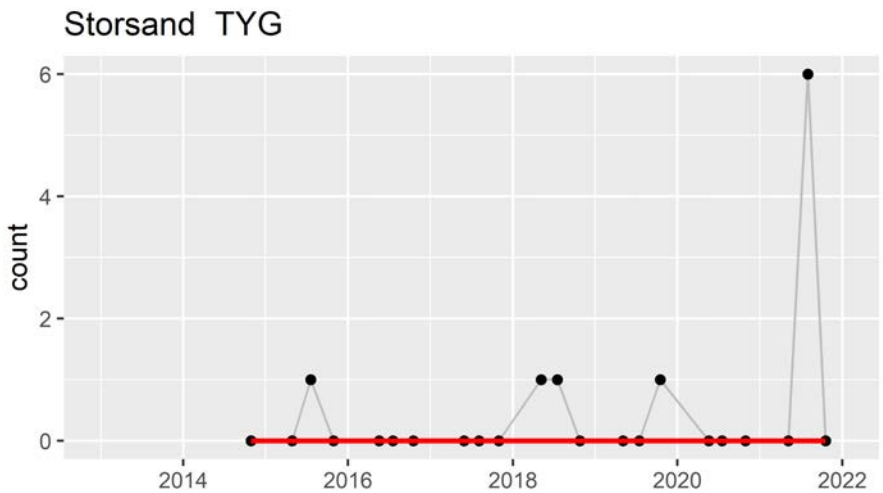
3
4
5
2014
2016
2018
2020
2022


Storsand TYG
count
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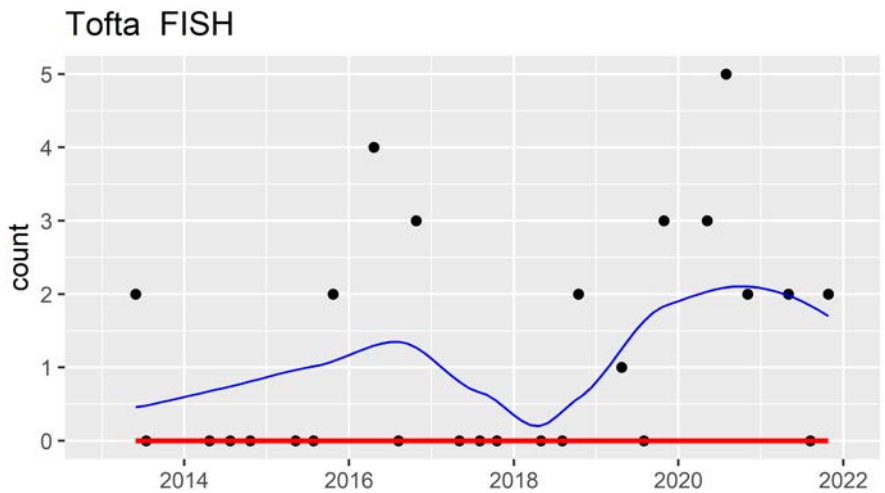
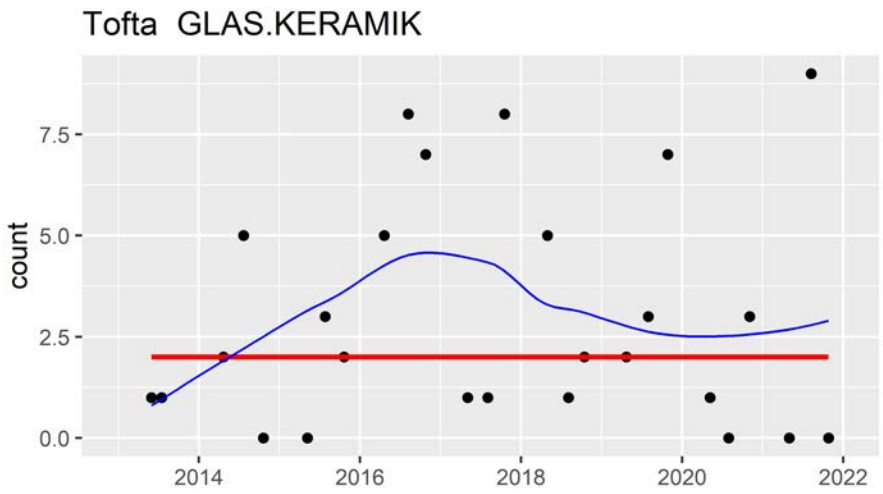
2
4
6
2014
2016
2018
2020
2022


Tofta FISH
count
0
1
2
3
4
5
2014
2016
2018
2020
2022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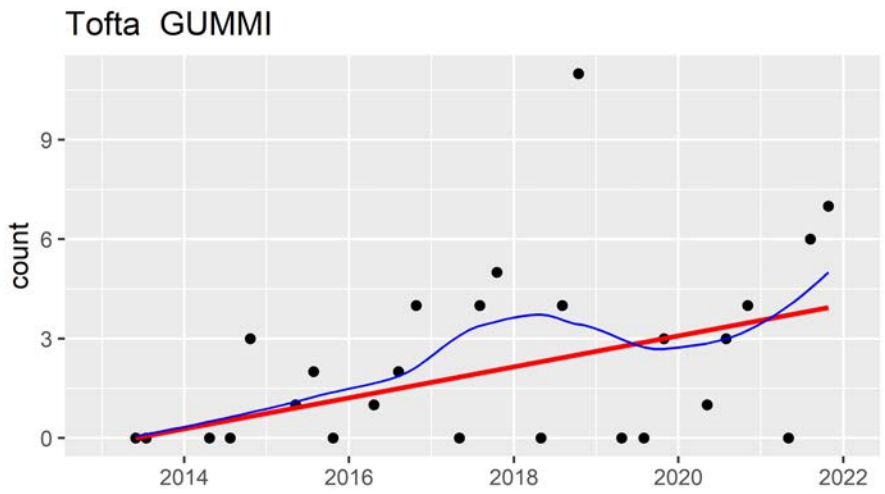
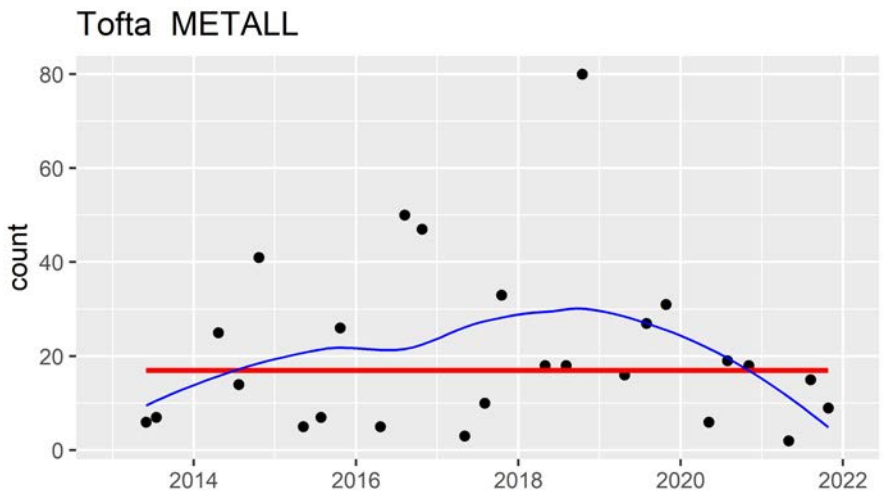
5.0
2.5
0.0
2014
2016
2018
2020
2022


Tofta GUMMI
count
9
6
3
0
2014
2016
2018
2020
2022


Tofta METALL
count
80
60
40
20
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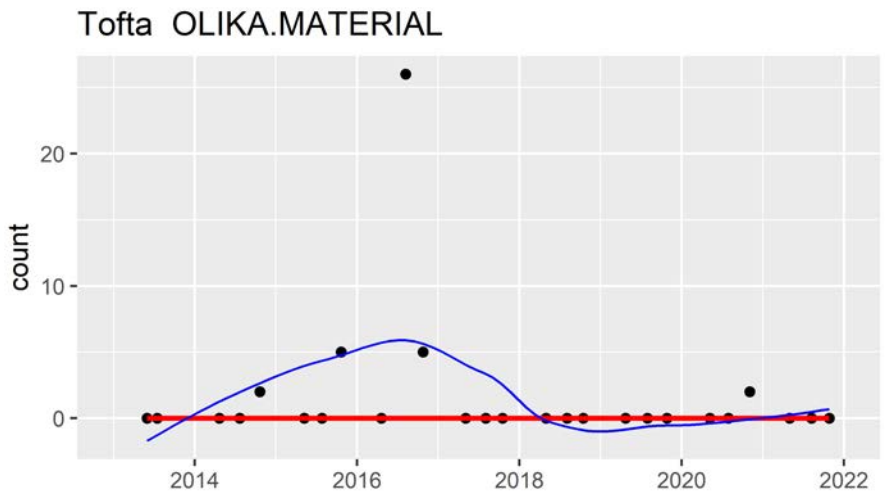
2014
2016
2018
2020
2022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count
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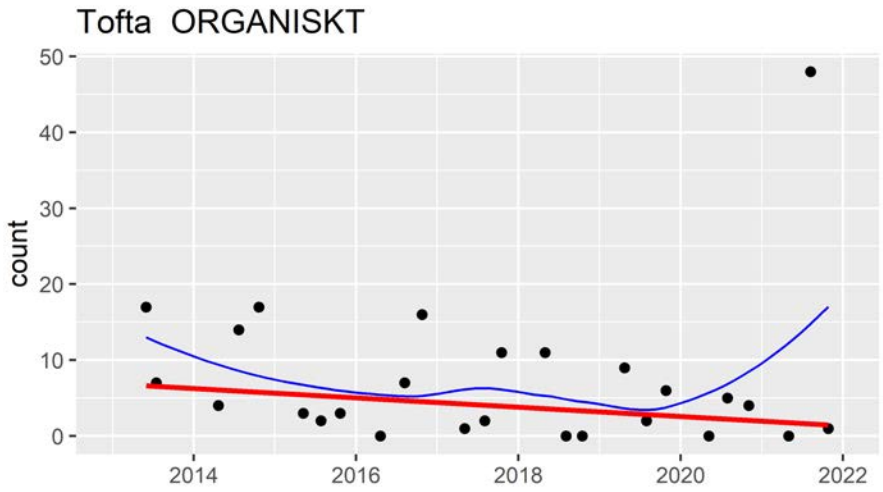
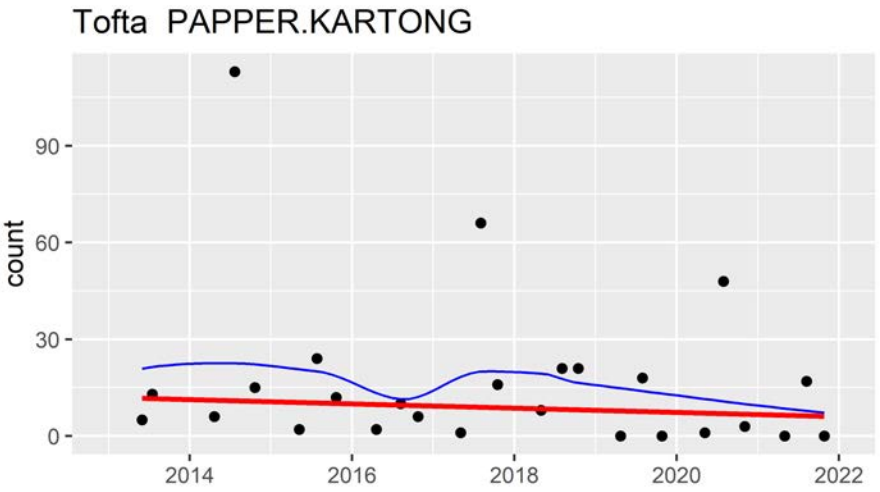
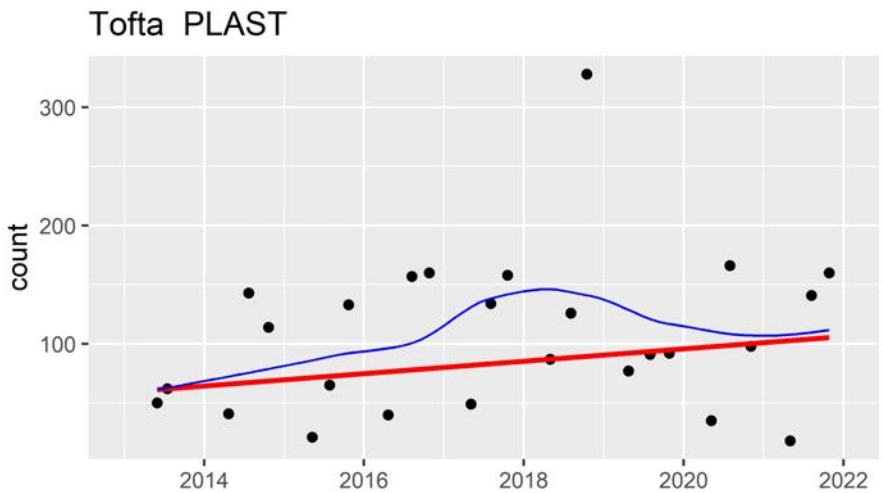
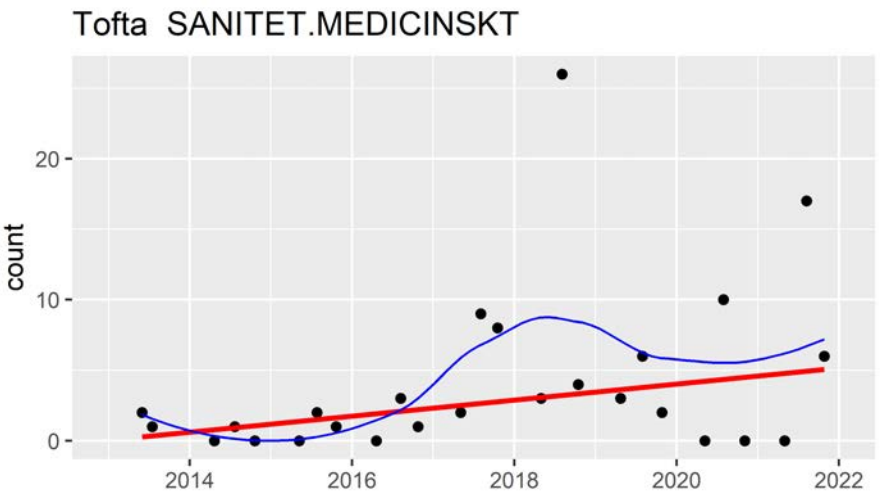
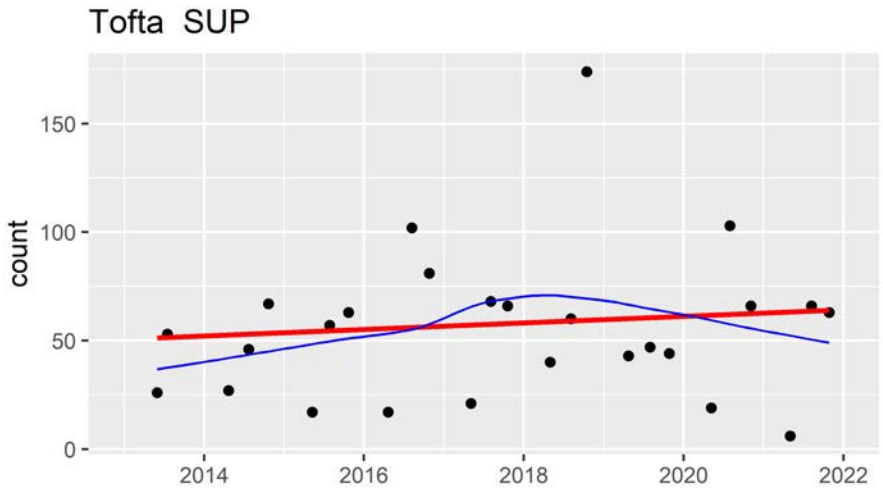
2014
2016
2018
2020
2022

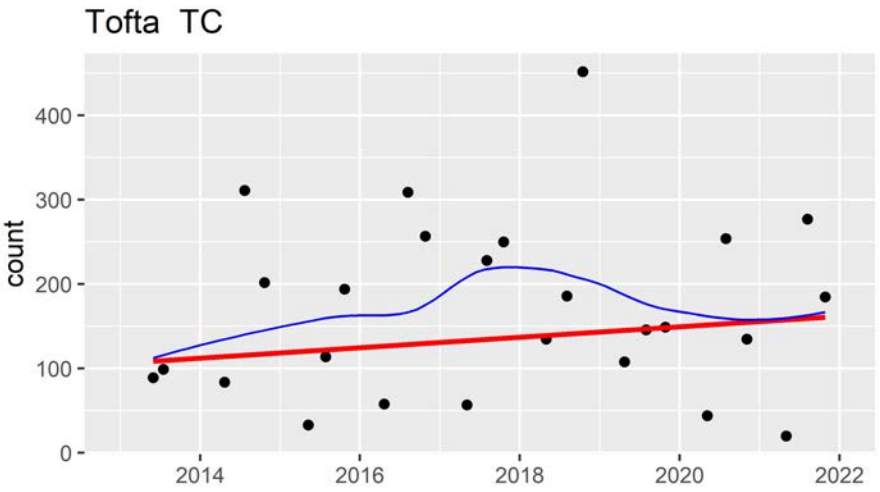

Tofta ORGANISKT
count
50
40
30
20
10
0
2014
2016
2018
2020
2022

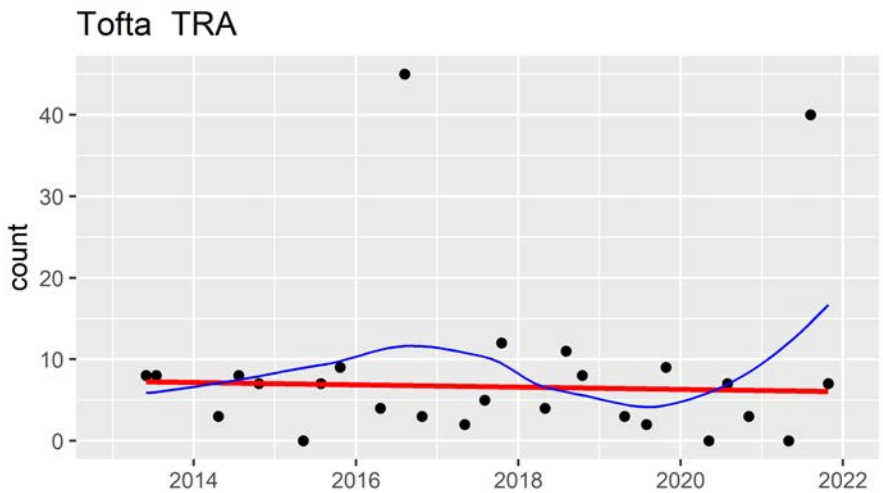

Tofta PAPPER.KARTONG
count
90
60
30
0
2014
2016
2018
2020
2022

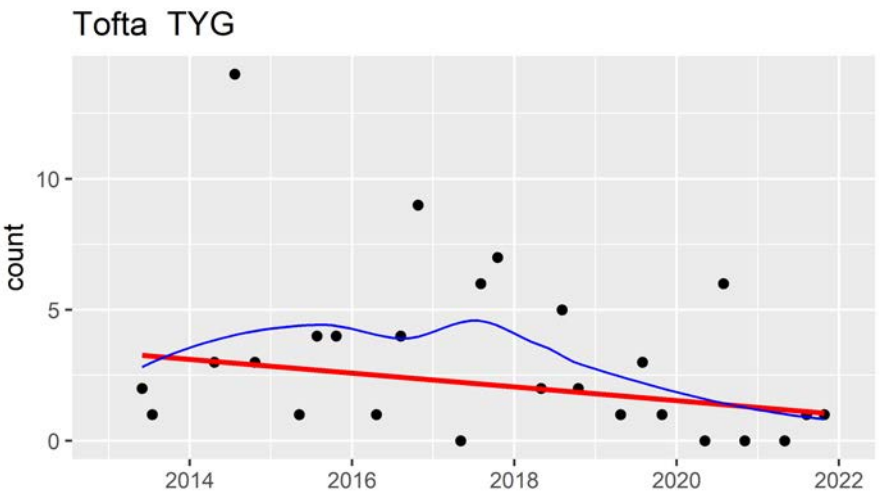

Tofta PLAST
count
300
200
100
2014
2016
2018
2020
2022


Tofta SANITET.MEDICINSKT
count
20
10
0
2014
2016
2018
2020
2022









Regional trend analysis

For each region_code and the type names and group codes specified in the settings file, the following statistics have been estimated for the period 2013-01-01 to 2021-12-31:

- the number of surveys (N);
- Theil-Sen slope: the median of all Theil-Sen slopes (https://en.wikipedia.org/wiki/Theil%E2%80%93Sen_estimator) within a region;
- p-value (https://en.wikipedia.org/wiki/P-value): the p-value associated with the one-tailed Regional Kendall test (Van Belle & Hughes, 1984 (https://dx.doi.org/10.1029/WR020i001p00127); Gilbert, 1987 (https://www.osti.gov/biblio/7037501-statistical-methods-environmental-pollution-monitoring)) to test the null hypothesis of
    - no monotonically *increasing* trend in case the regional Theil-Sen slope is greater than zero;
    - no monotonically *decreasing* trend in case the regional Theil-Sen slope is smaller than zero;

A p-value less than an *a priori* specified significance level (https://en.wikipedia.org/wiki/Statistical_significance) (*e.g.*, often α = 0.05), indicates a significant trend. If the p-value is greater than this significance level, we can't say that there is no trend. We can only conclude that our data do not show evidence for a significant trend (due to lack of data, noise, etc.).

The Regional Kendall test is a non-parametric test and as such does not make distributional assumptions on the data.

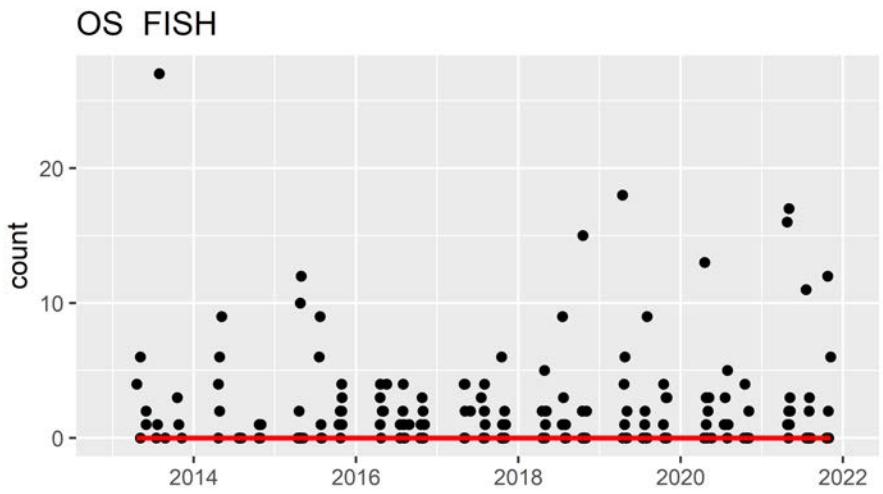
Note that the trend statistics can only be computed if all `location_code` s of a `region_code` have at least three records (surveys). If that is not the case, the table below contains `NA` .

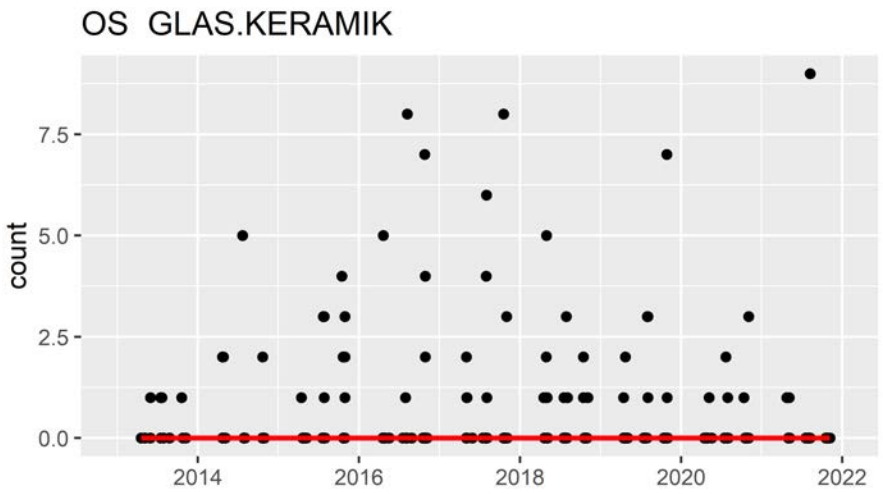
region_code	type name / group code	N	slope	p-value
OS	TC	196	0.5031	0.4498
OS	PLAST	196	0.3671	0.1953
OS	FISH	196	0	0.2878
OS	GLAS.KERAMIK	196	0	0.1236
OS	GUMMI	196	0	0.9999
OS	METALL	196	0	0.2222
OS	OLIKA.MATERIAL	196	0	0.0171
OS	ORGANISKT	196	0	0.8450
OS	PAPPER.KARTONG	196	0	0.2009
OS	SANITET.MEDICINSKT	196	0	1.0000

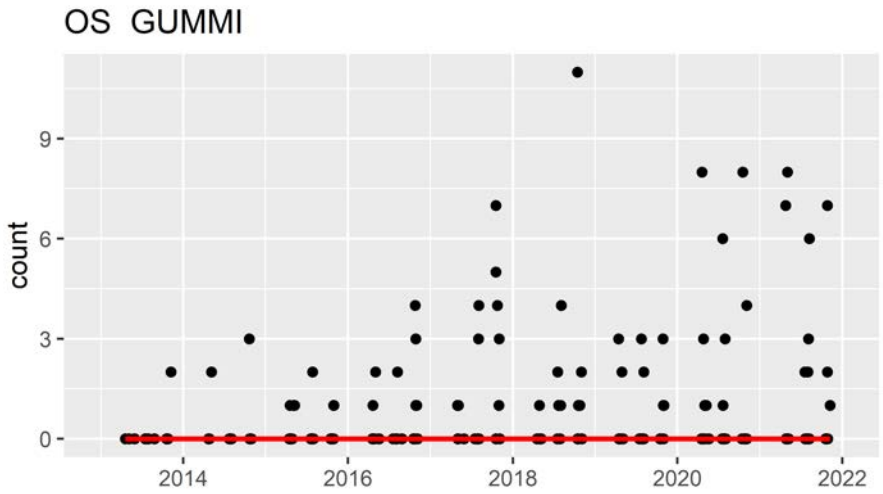
region_code	type name / group code	N	slope	p-value
OS	SUP	196	0	0.6559
OS	TRA	196	0	0.0016
OS	TYG	196	0	0.4201

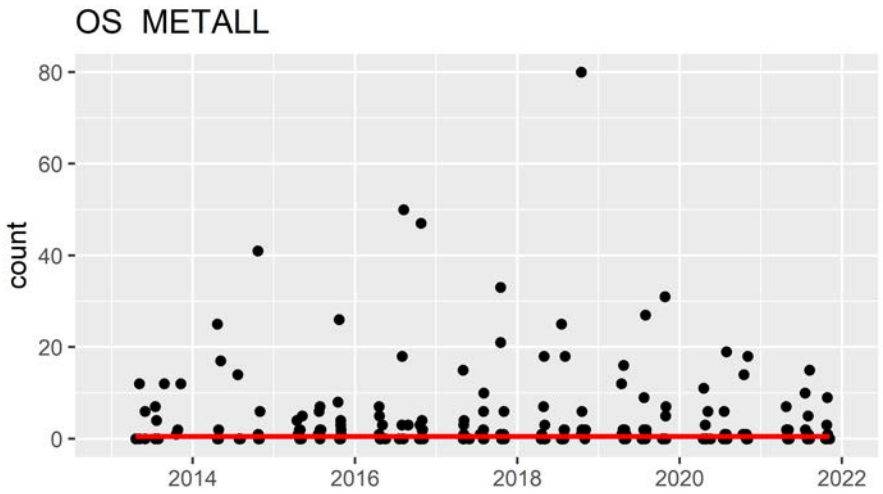
Time-series of the selected type names and group codes are given for the selected regions in the plots below (see also Settings). The lines and dots have the following meaning:

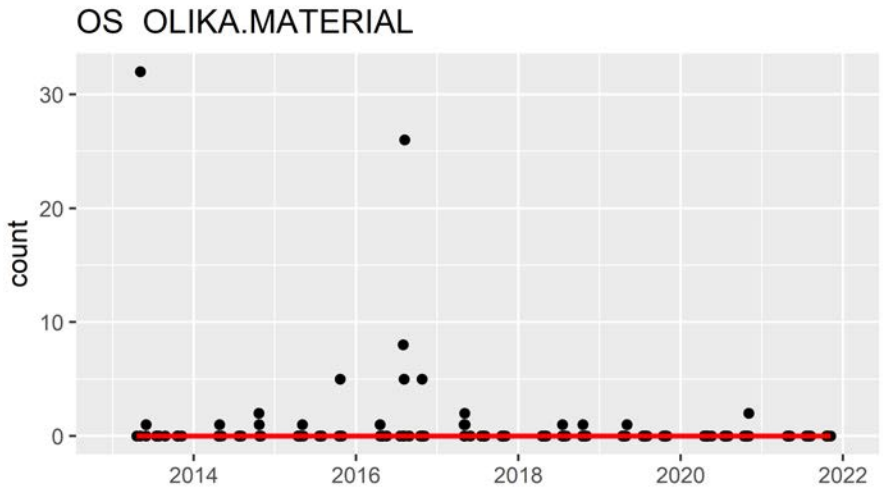
- coloured dots: observations;
- red line: Regional Theil-Sen trend line (its slope is given in the table above). Note that the trend line (red line) is only given in case there are at least three records (surveys) in each `location_code` to estimate the trend parameters.

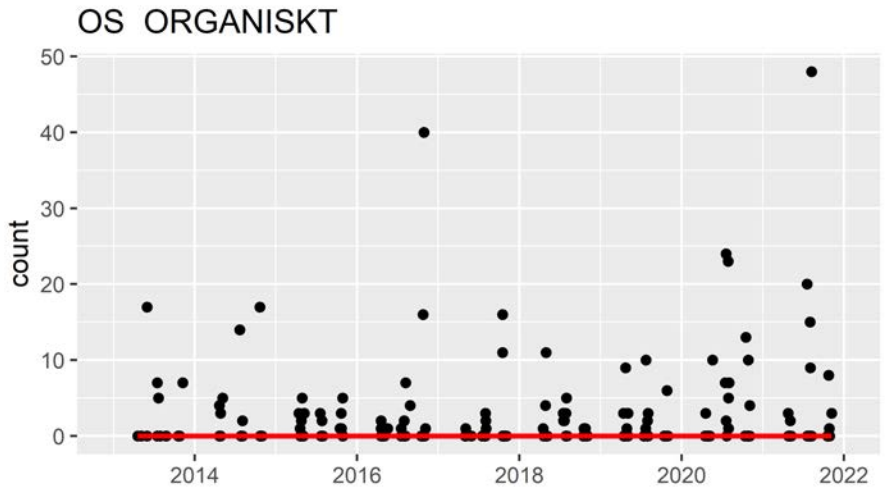

OS FISH
count
20
10
0
2014
2016
2018
2020
2022


OS GLAS.KERAMIK
count
7.5
5.0
2.5
0.0
2014
2016
2018
2020
2022


OS GUMMI
count
9
6
3
0
2014
2016
2018
2020
2022


OS METALL
count
80
60
40
20
0
2014
2016
2018
2020
2022


OS OLIKA.MATERIAL
count
0
10
20
30
2014
2016
2018
2020
2022


OS ORGANISKT
count
0
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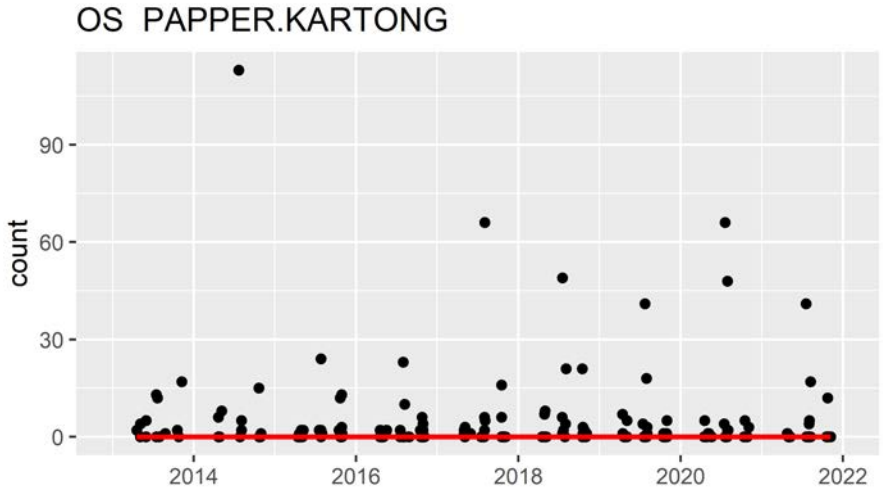
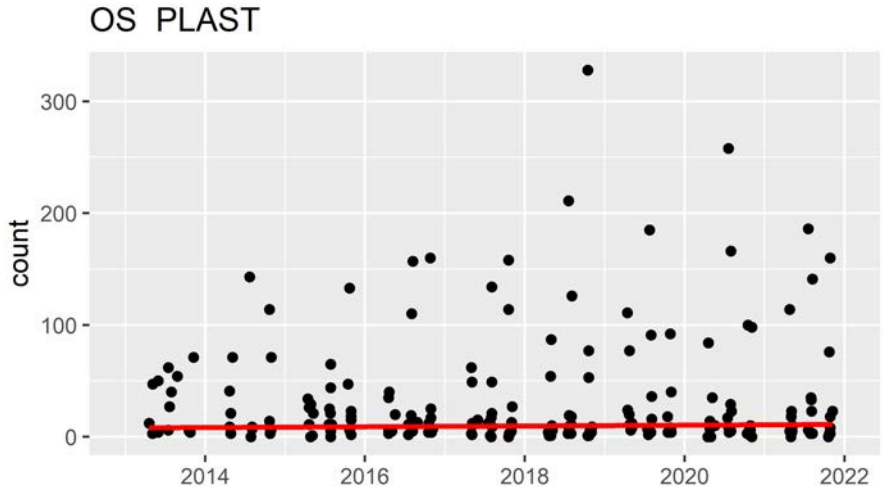
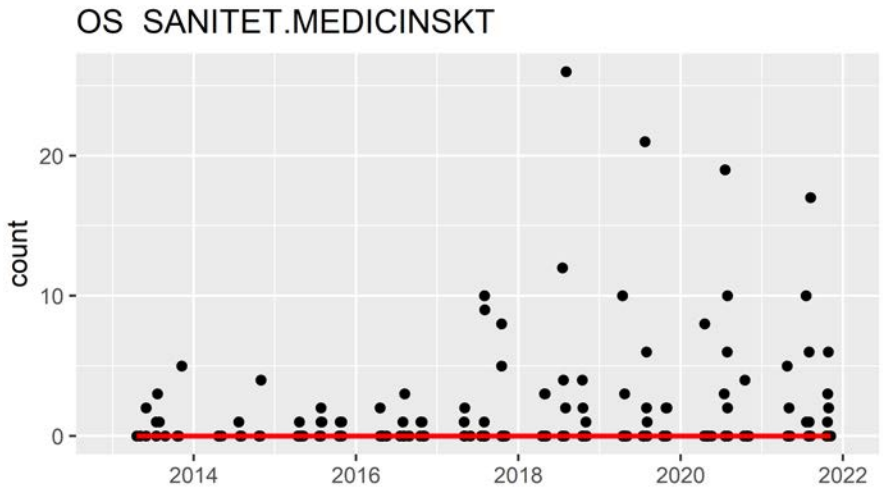
20
30
40
50
2014
2016
2018
2020
2022


OS PAPPER.KARTONG
count
0
30
60
90
2014
2016
2018
2020
2022


OS PLAST
count
0
100
200
300
2014
2016
2018
2020
2022


OS SANITET.MEDICINSKT
count
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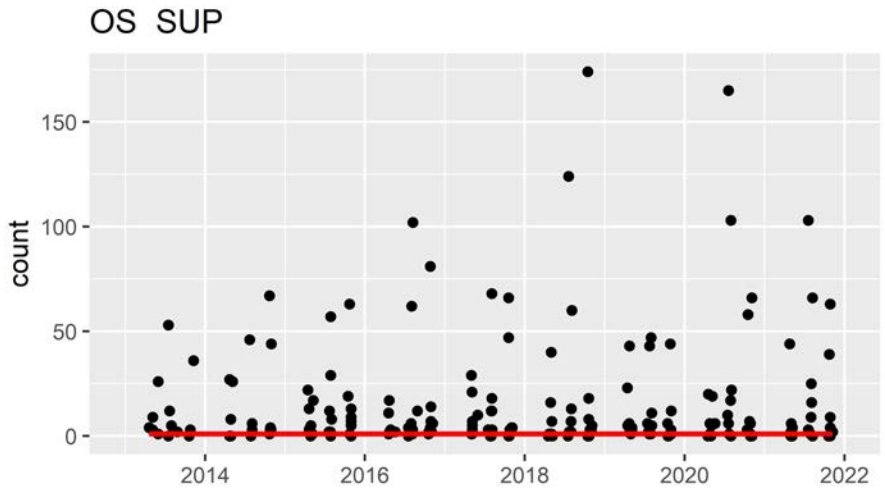
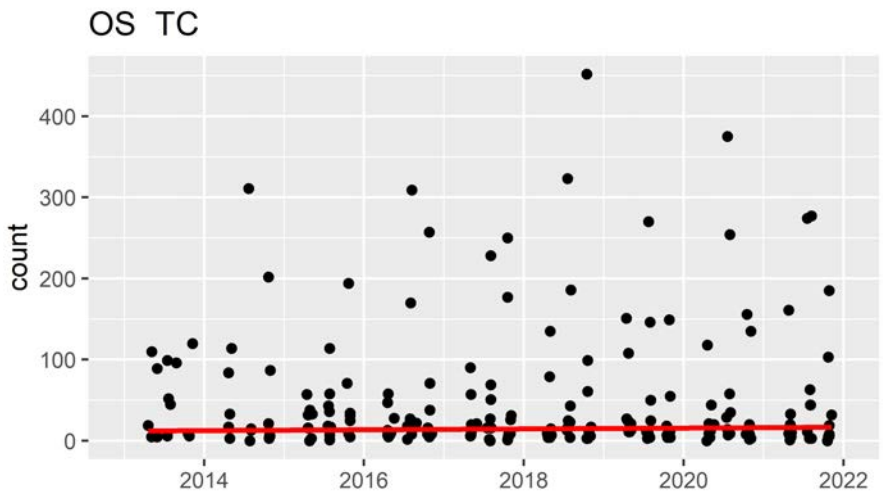
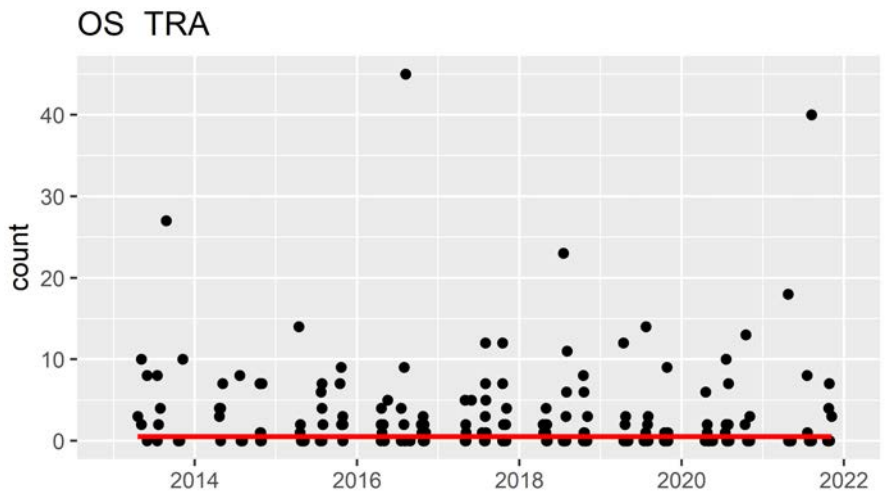
2014
2016
2018
2020
2022


OS SUP
count
0
50
100
150
2014
2016
2018
2020
2022


OS TC
count
0
100
200
300
400
2014
2016
2018
2020
2022


OS TRA
count
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20
30
40
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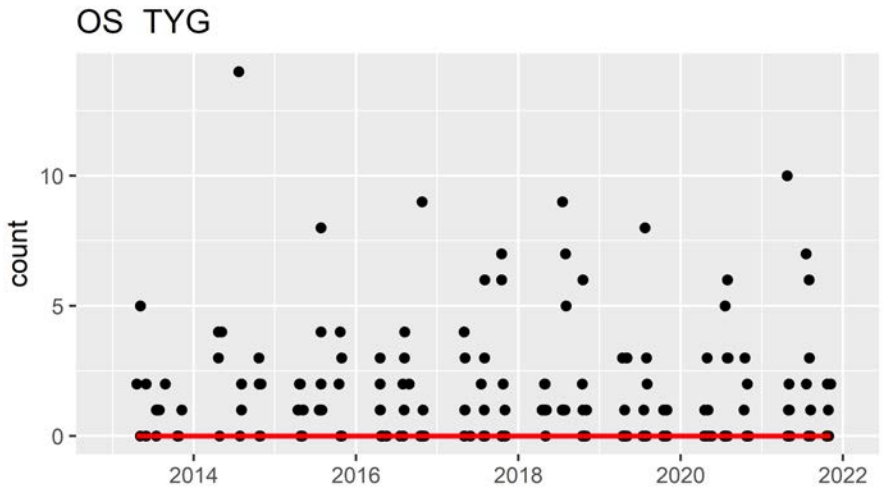
2016
2018
2020
2022


OS TYG
count
10
5
0
2014
2016
2018
2020
2022

Session Information

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R version 4.2.2 (2022-10-31 ucrt)
Platform: x86_64-w64-mingw32/x64 (64-bit)
Running under: Windows 10 x64 (build 22621)

Matrix products: default

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[3] LC_MONETARY=Swedish_Sweden.utf8 LC_NUMERIC=C
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attached base packages:
[1] stats     graphics  grDevices utils     datasets  methods   base

other attached packages:
 [1] stringr_1.4.1    readr_2.1.3      knitr_1.40       fs_1.5.2         ggplot2_3.4.0
 [6] tidyr_1.2.1      purrr_0.3.5      dplyr_1.0.10     rlang_1.0.6      litteR_1.0.0
[11] openxlsx_4.2.5.1

loaded via a namespace (and not attached):
 [1] tidyselect_1.2.0 xfun_0.34        bslib_0.4.1      lattice_0.20-45  splines_4.2.2
 [6] tcltk_4.2.2      colorspace_2.0-3 vctrs_0.5.0      generics_0.1.3   htmltools_0.5.3
[11] mgcv_1.8-41      yaml_2.3.6       utf8_1.2.2       pillar_1.8.1     jquerylib_0.1.4
[16] glue_1.6.2       withr_2.5.0      bit64_4.0.5      lifecycle_1.0.3  munsell_0.5.0
[21] gtable_0.3.1     zip_2.2.2        evaluate_0.18    labeling_0.4.2   tzdb_0.3.0
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