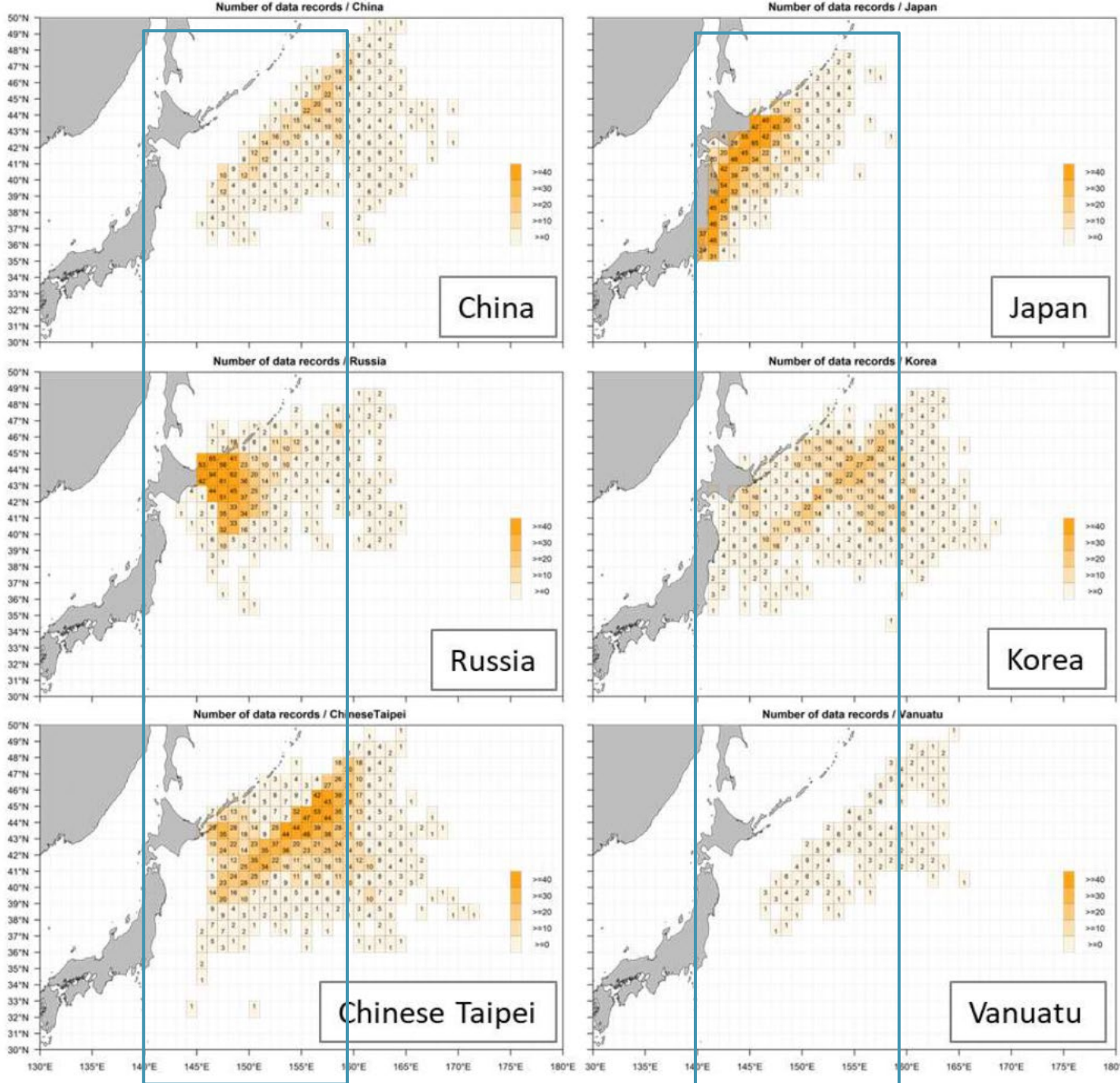


The impact of water temperature on the Pacific saury catch distribution

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The Pacific saury, *Cololabis saira*, is widely distributed in the North Pacific, and is harvested commercially in the area between 140°E and 172°E.

<https://www.npfc.int/sites/default/files/2019-08/TWG%20PSSA04%20Report.pdf>

We used environmental daily information from Meteorological Research Institute multivariate ocean variational estimation (MOVE) system for the area between 140°E and 159°E.

Figure 1. Main fishing grounds for Pacific saury by fishing members in the Western North Pacific Ocean.

NEAR-GOOS

Regional Real Time Data Base

Japan Meteorological Agency (JMA)



[Home](#) | [Documents](#) | [JMA Products](#) | [In-situ Data](#) | [Cross-Section](#)

What's New

- 2019/03/29 Replace some products in the RRTDB by the new reanalysis data (MOVE/MRI.COM)
- 2018/11/08 User registration has become unnecessary, and NEAR-GOOS RRTDB access via FTP will be terminated on 28 February 2019
- 2017/10/01 Delete some conventional version of GPVs (MGDSST)
- 2017/03/23 Release new GPVs of Daily and 10-day mean Sea Surface Temperatures in the western north Pacific (HIMSST), and the conventional version of GPVs will be deleted on 1 October and users are encouraged to use new one or Daily Sea Surface Temperatures in the global ocean (MGDSST)
- 2015/12/07 Extend reanalysis products of MGDSST and MOVE back to 1982
- 2015/12/07 Release new GPVs of Monthly mean Sea Surface Height anomalies in the Pacific
- 2014/10/27 Launch a new RRTDB web site!!

About NEAR-GOOS

The North-East Asian Regional GOOS (NEAR-GOOS) is a regional pilot project of the Global Ocean Observing System (GOOS), and it's being implemented by China, Japan, the Republic of Korea and

[Introduction](#)

[About Usage of the Data](#)

NEAR-GOOS Data Bases

[Regional Delayed Mode Data Base](#)

[China Real Time Data Base](#)

[China Delayed Mode Data Base](#)

[Republic of Korea Real Time Data Base](#)

[Republic of Korea Delayed Mode Data Base](#)

[Russian Federation Real Time Data Base](#)

[Russian Federation Delayed Mode Data Base](#)

NOWPAP Data Base

[Marine Environmental Watch System for Northwest Pacific Region](#)

About 95% of total catches provided to the North Pacific Fisheries Commission (NPFC) by its Members and almost 100% of Russian catches in 1994-2017 were distributed in the area spatially intersecting MOVE products.

sea surface temperature (SST) from Multi-scale Ultra-high Resolution spatial resolution of 0.01 degrees in longitude-latitude coordinates, roughly at 1 km intervals

The screenshot shows the NASA Podaac website. At the top left is the NASA logo and 'EARTHDATA'. To the right is 'Other DAACs'. Below the NASA logo is the Jet Propulsion Laboratory logo and 'California Institute of Technology'. In the top right corner, there are links for 'JPL HOME', 'EARTH', and 'BRING THE UNIVERSE'. The main header features the 'podaac' logo and 'Physical Oceanography Distributed Active Archive Center'. A navigation bar includes links for 'Home', 'Dataset Discovery', 'Data Access', 'Measurements', 'Missions' (which is highlighted), 'Multimedia', 'Community', 'Forum', and 'About'. Below the navigation bar is a list of satellite missions: ADEOS-II, AQUA, AQUARIUS, CYGNSS, GEOS-3, GHRSSST, GRACE, GRACE-FO, ISS-RapidScat, JASON 1, JASON 2, QuikSCAT, Sairdron, Seasat, SMAP, S-NPP, SPURS, SWOT, TERRA, and TOPEX-POSEIDON. The main content area has a breadcrumb trail 'Home » Missions' and a title 'Multi-scale Ultra-high Resolution (MUR) Sea Surface Temperature (SST) Analysis'. Underneath is a section titled 'Background' with the text: 'Sea Surface Temperature (SST) has been observed by satellite instruments since September 1981 and is one of the longest satellite-based records of any Earth climate variable. Measurements from the'. To the right of this text is a 'Figure Caption' that reads: 'Figure Caption: MUR SST analysis at various scale-dependent stages of its production.'

https://podaac.jpl.nasa.gov/Multi-scale_Ultra-high_Resolution_MUR-SST

Positions of vessels seeking or catching saury were interpolated in 1 km resolution from Russian vessel monitoring system (VMS)

<http://cfmc.ru/>



ПРЕДСТАВИТЕЛЬСТВА

Астраханский отдел

Владивостокский филиал

Калининградский отдел

Камчатский отдел

Мурманский филиал

Новороссийский отдел

Сахалинский отдел

ТАРИФЫ И ДОГОВОРЫ НА УСЛУГИ И ТОВАРЫ

Overall spatial resolution for the SDMs was upscaled to MOVE system (0.1 degrees in longitude-latitude coordinates)

ЦСМС оказывает государственные услуги и выполняет государственные работы в целях осуществления полномочий Федерального агентства по рыболовству в сфере рыболовства и сохранения водных биологических ресурсов. Учреждение создано в соответствии с распоряжением Правительства РФ, входит в структуру Федерального агентства по рыболовству.

Головной центр мониторинга располагается в Москве и на федеральном



ПОРТАЛ ОСМ

ТЕХПОДДЕРЖКА ОСМ

ЕДИНАЯ СЛУЖБА ИНФОРМАЦИОННОГО ОБСЛУЖИВАНИЯ И СОПРОВОЖДЕНИЯ СПУТНИКОВОГО ПОЗИЦИОНИРОВАНИЯ

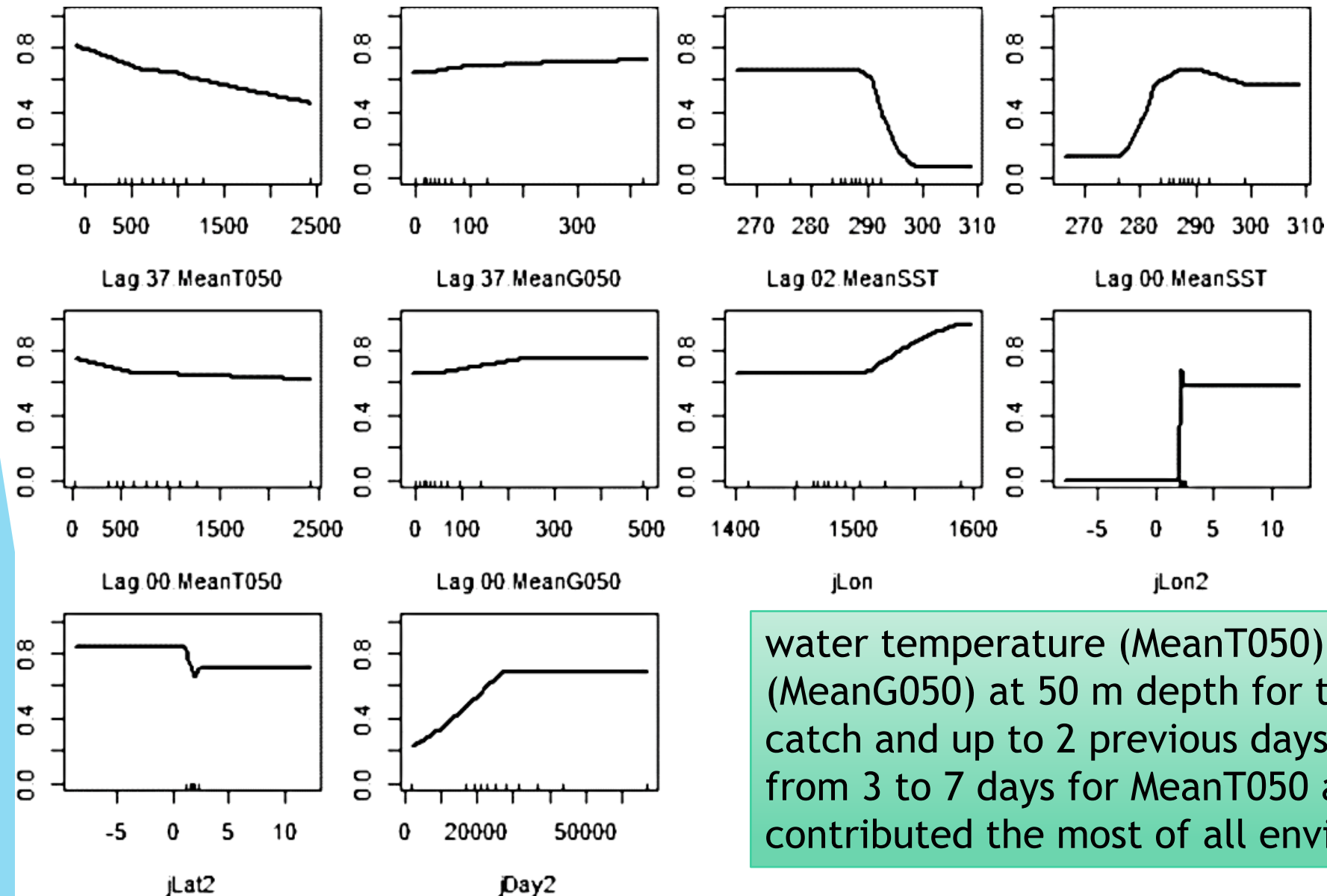
ОТРАСЛЕВАЯ СИСТЕМА МОНИТОРИНГА

AUC	0.65		0.624		0.591	
Number of points with catching operations	42224		42224		42224	
Total points	216 489		126 672		84 448	
Percent of “absences”	80.50%		66.60%		50.00%	
Label	VC %	PI %	VC %	PI %	VC %	PI %
Lag.02.MeanSST	17	11.2	16.8	12	14.6	13.7
Lag.00.MeanSST	3	4.4	2.3	4.9	1.7	6.2
Lag.04.MeanG050	1.4	0	0	0	0.9	0
Lag.03.MeanT050	1.3	0	1	0.5	1	1.3
Lag.00.MeanG050	1.1	2.1	1.4	2.5	0.5	2.2
Lag.37.MeanT050	0.7	5.3	0.7	4.4	0.5	6.1
Lag.00.MeanGRD	0.2	0.1	0.1	0.1	0	0
Lag.34.MeanGRD	0.2	0.1	0.2	0.1	0.1	0.2
Lag.37.MeanT100	0.2	0.6	0	0.3	0	0.1
Lag.00.MeanT050	0.1	2.2	0	0.9	0	0.2
Lag.07.MeanSST	0.1	0.7	0.1	0.7	0	0.2
Lag.12.MeanG050	0.1	0	0	0	0	0
Lag.15.MeanG050	0.1	0	0	0	0.1	0
Lag.37.MeanG050	0.1	1.4	0.3	1.1	0.1	1.9
Lag.37.MeanNcm	0.1	0.5	0.1	0.4	0	0
Lag.01.MeanNcm	0	0.1	0	0.1	0	0
Lag.14.MeanG100	0	0	0.5	0	0	0
Lag.37.MeanEcm	0	0.7	0.2	0.9	0.1	0.9

Decreasing the number of points with “absences” of saury decreased AUC

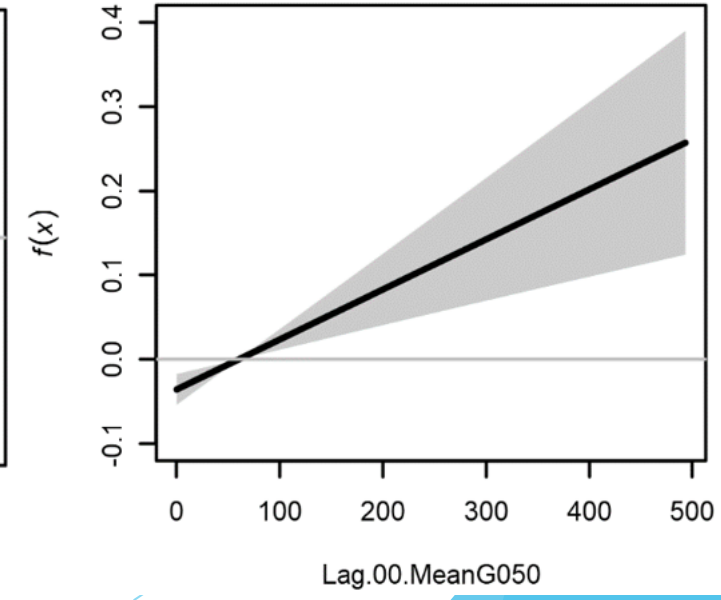
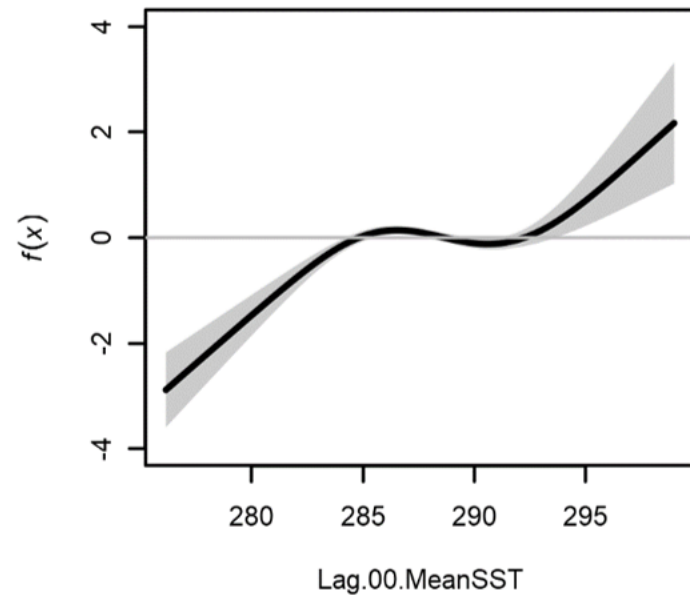
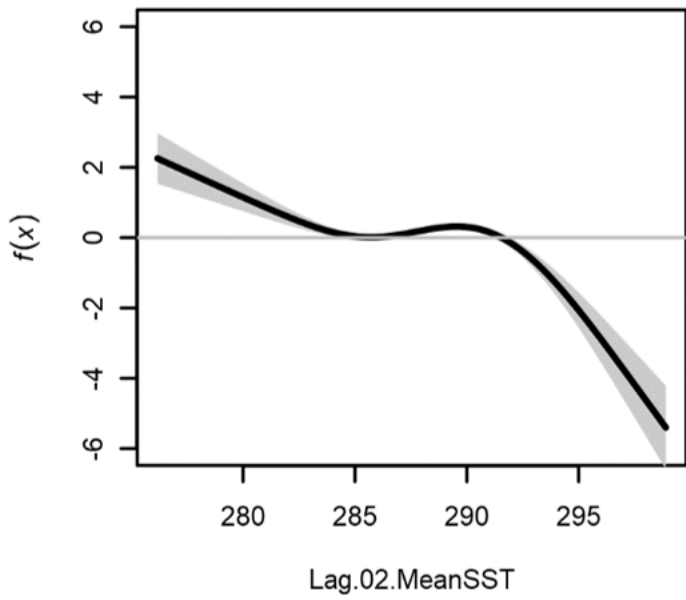
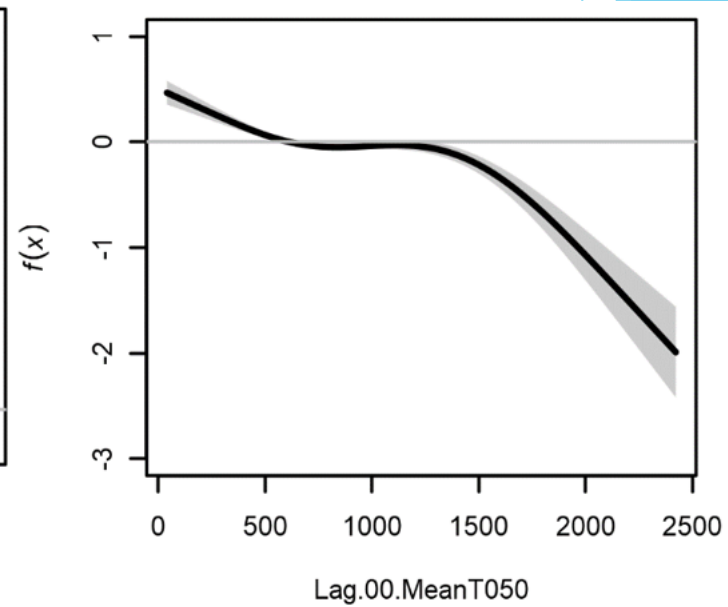
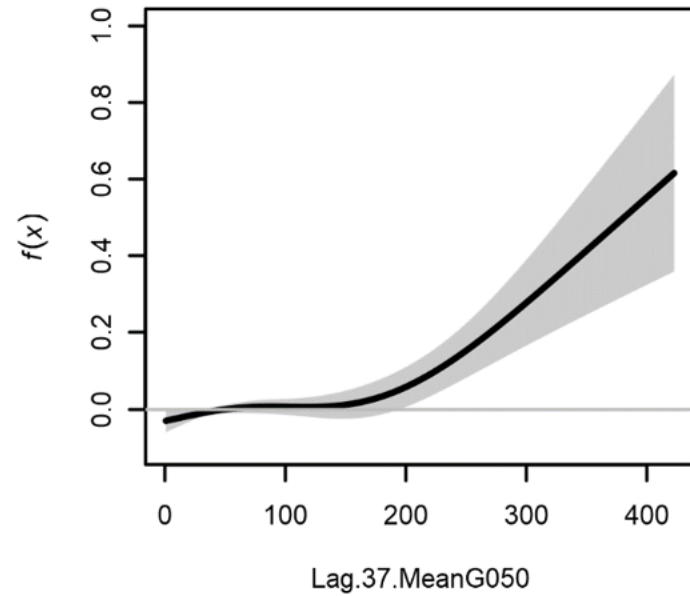
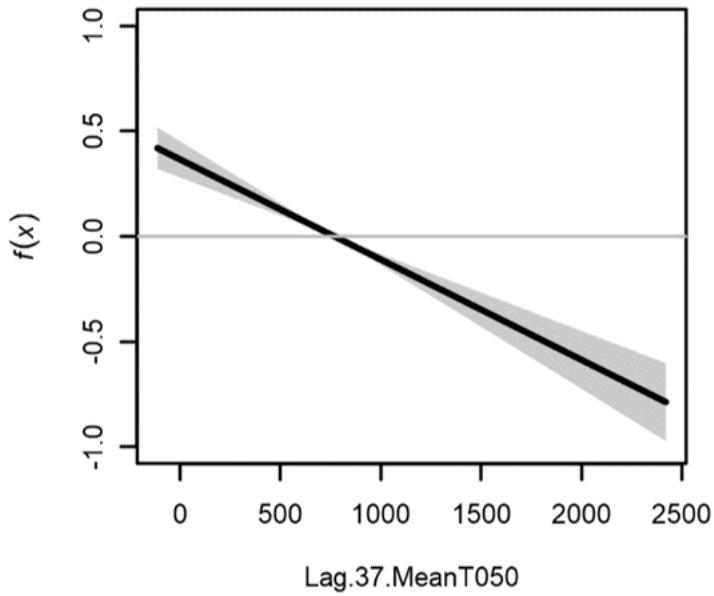
First, we estimated variable contribution and permutation importance of 184 possible combinations of SST and MOVE daily products with 0 to 7 days lags and moving average window from 0 to 7 days in MaxEnt, filtering those predictors which had VC or PI > 0.1%. Second, VC or PI > 1%.

AUC didn't change much (~0.65)

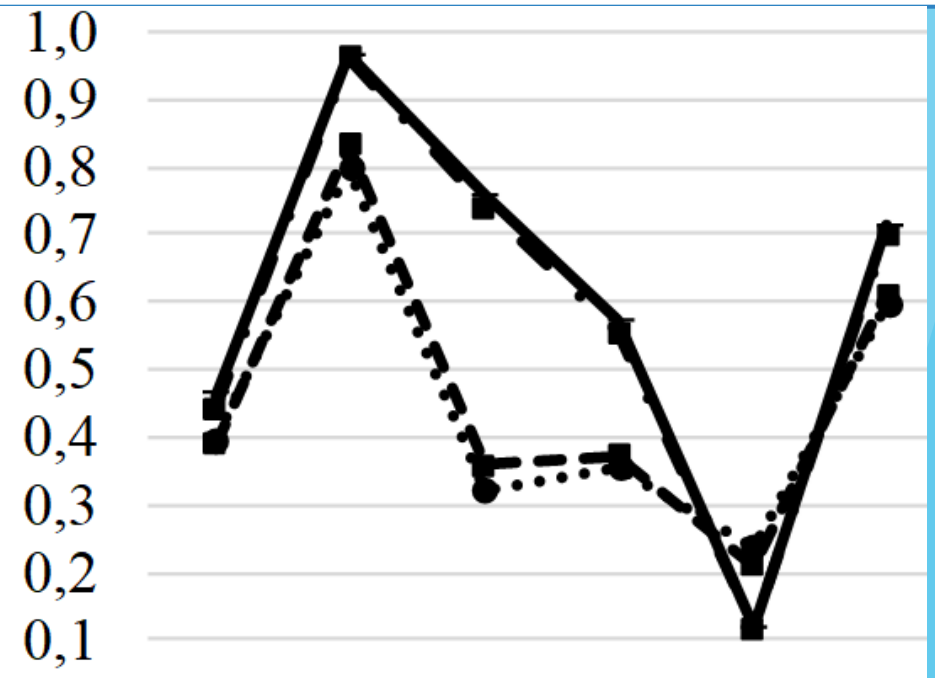
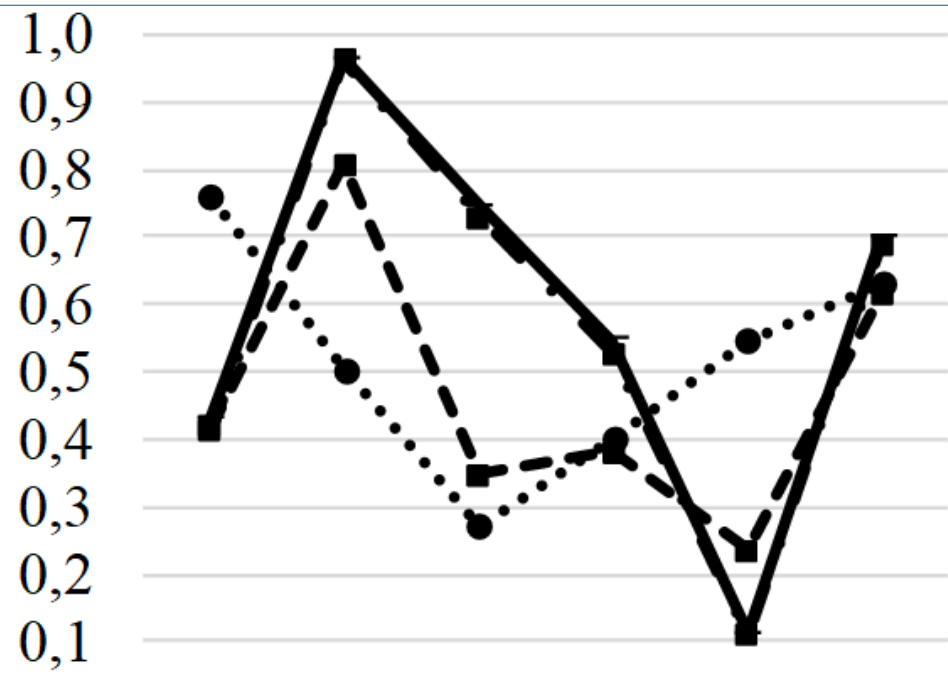


water temperature (MeanT050) and its gradient (MeanG050) at 50 m depth for the current day of catch and up to 2 previous days for MeanSST and from 3 to 7 days for MeanT050 and MeanG050 depth contributed the most of all environmental predictors

We further tried different configurations of GAMs. 3D (x,y,jday) GAM AUC = 0.71 and accuracy = 0.75 were higher than in MaxEnt in a full set, but in the test (80% training subset) AUC of 3D GAM was lower (0.60) than that of MaxEnt (AUC = 0.68)



Random Forest outperformed MaxEnt and GAMs by accuracy (0.86) and AUC (0.70) in the test and full set of data



Confusion matrix indices for the test set (left) and full set (right), where RF XY denotes RF tuned with real coordinates instead of indexed by days in a year

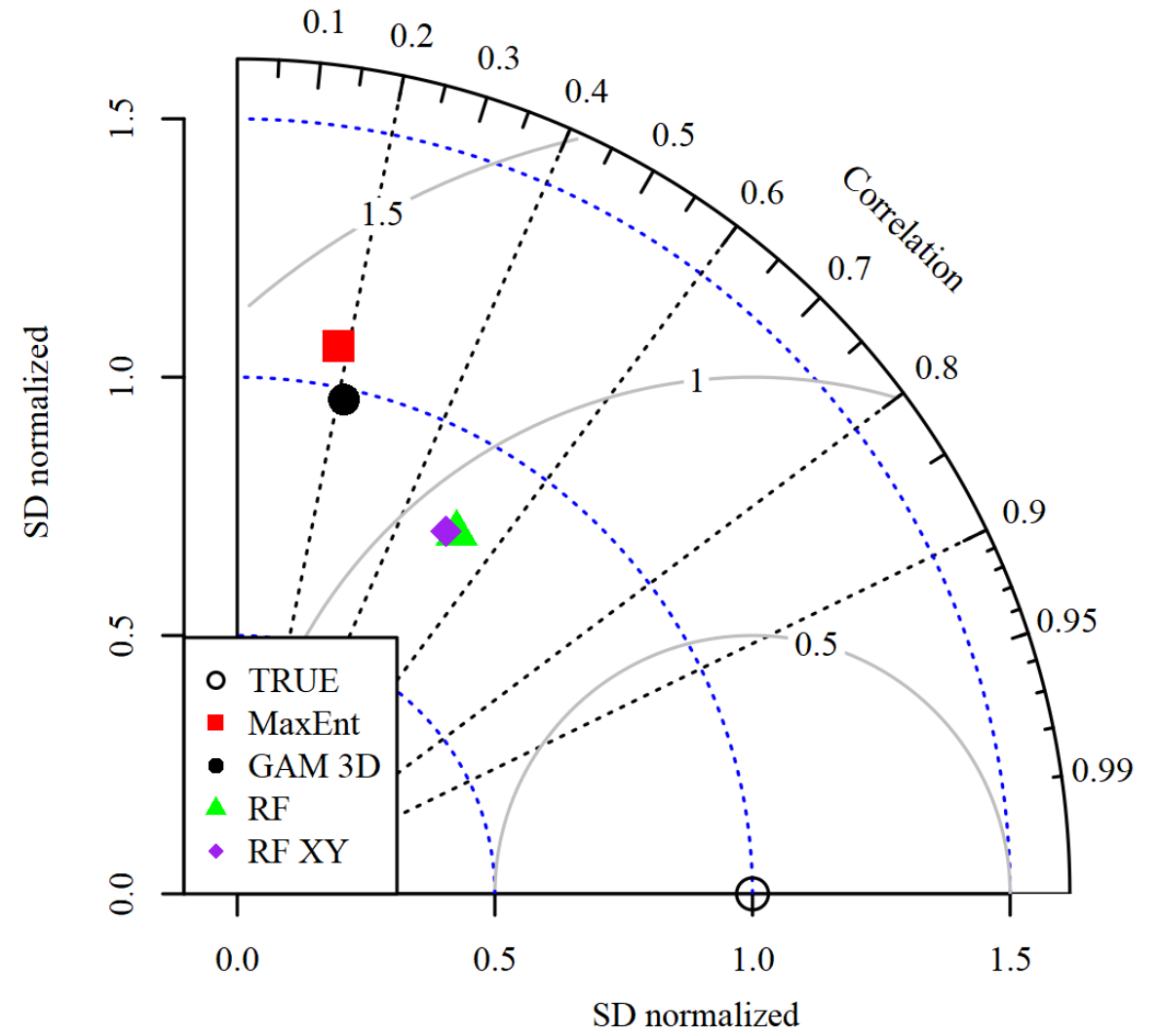
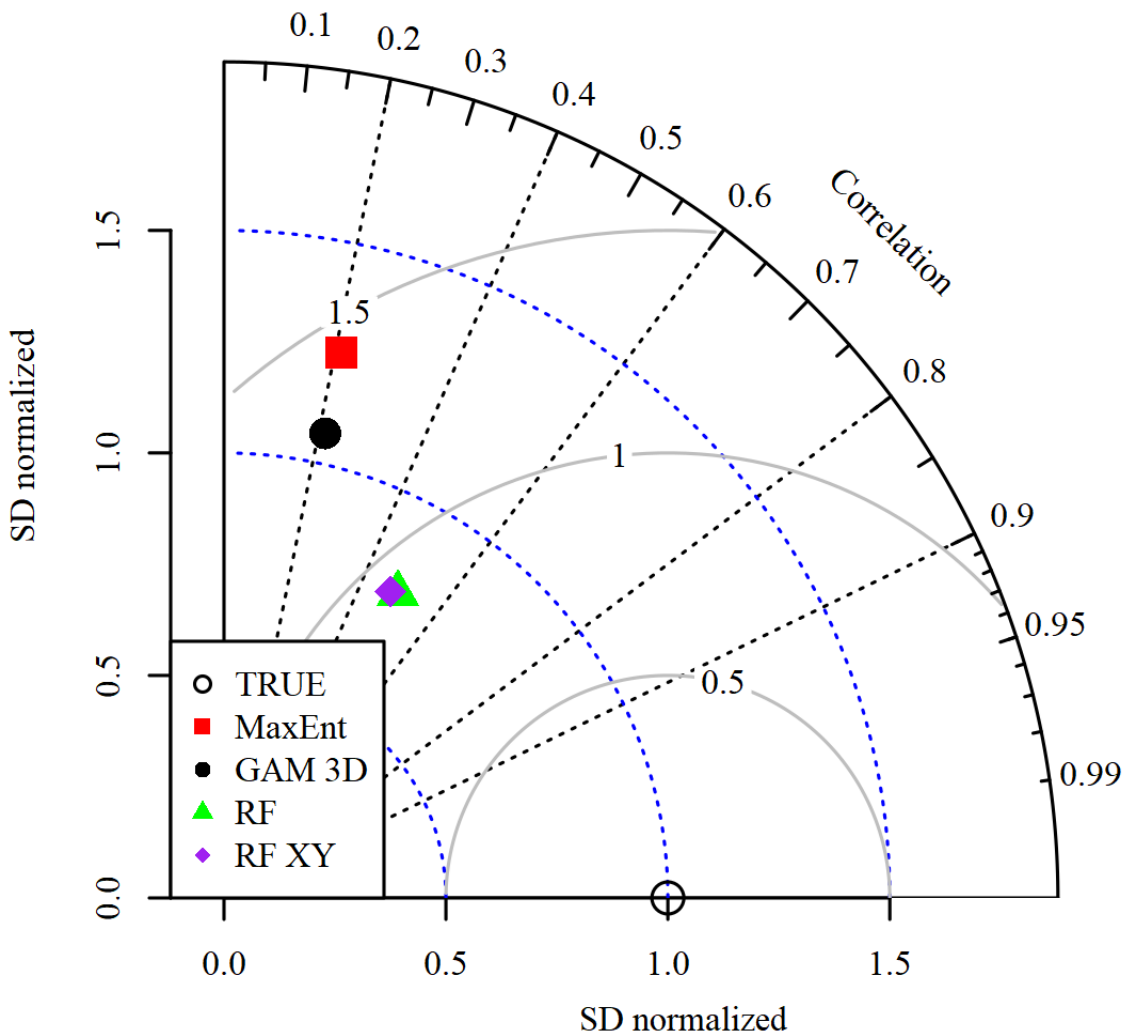
Sensitivity (recall)
 Specificity
 Precision
 F ($\beta=1$)
 Detection Prevalence
 Balanced Accuracy

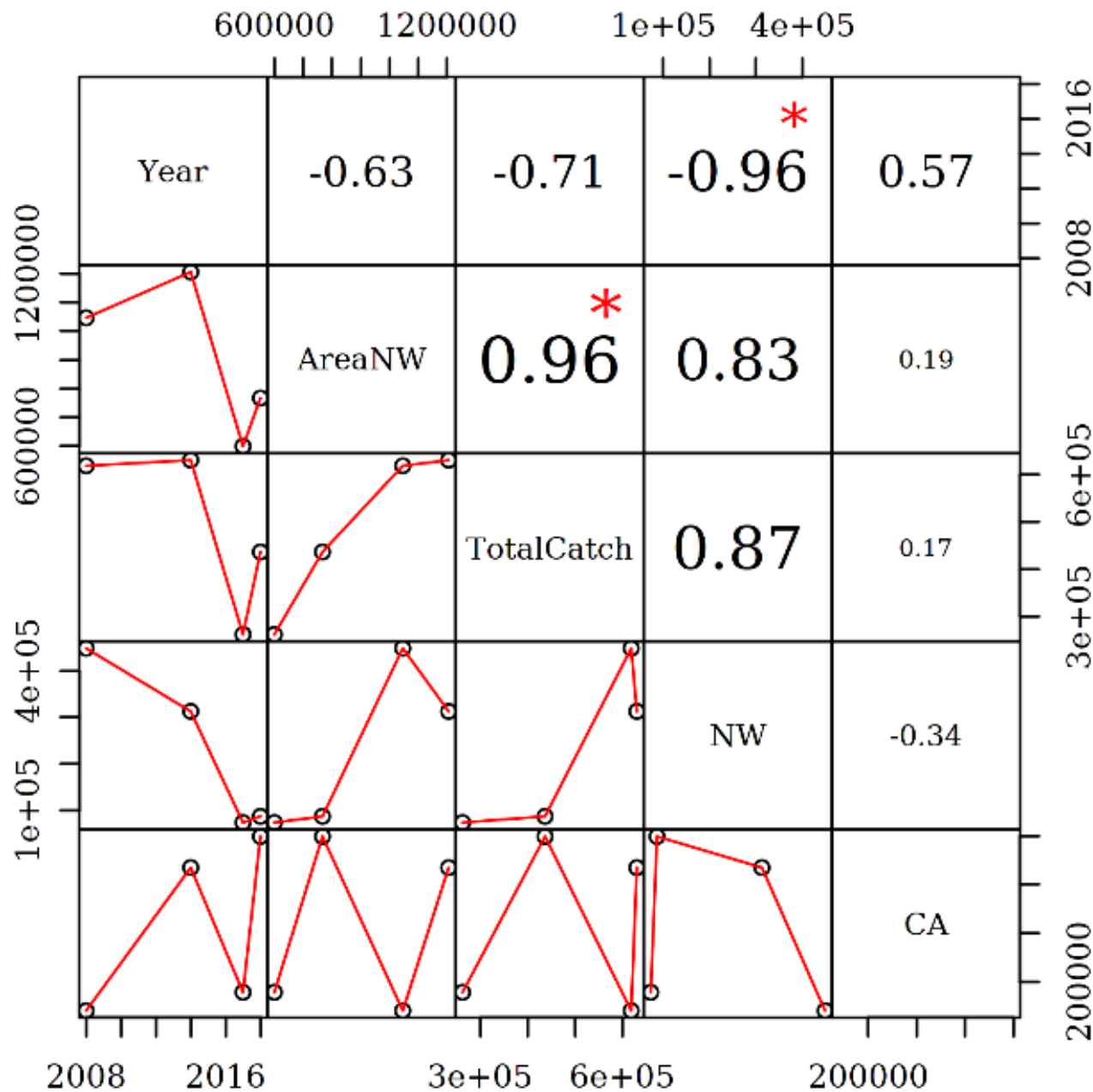
Sensitivity (recall)
 Specificity
 Precision
 F ($\beta=1$)
 Detection Prevalence
 Balanced Accuracy

---■--- 3D GAM ...●... MaxEnt
 ——— RF -■- RF XY

---■--- 3D GAM ...●... MaxEnt
 ——— RF -■- RF XY

Taylor diagram for the test sets (left) and for the full sets (right)





Pearson's product-moment correlation between Year, annual sum of the predicted areas with conditions preferred by saury in the EEZ (AreaNW), annual sum of saury catch by all Members of the NPFC (TotalCatch), catch in the EEZ (NW) and Convention Area (CA) in 2008, which had maximum catch in the NW, 2014, which had maximum total catch, 2017, which had minimum catch in the NW and 2018, which had maximum catch in the CA. Asterisk shows significant correlation ($p < 0.05$).

Though we didn't find such strong and significant correlation for the full set

Conclusions

Annual sum of the predicted areas with high HSI in the NW showed significant and strong correlation (0.96, $p < 0.05$) with total catches of saury in the last extreme years (2008 - maximum catch in the EEZ, 2014 - maximum total catch, 2017 - minimum catch in the EEZ and 2018 - maximum catch in the Convention Area of the NPFC) of pacific saury catch reported to the NPFC.

P.S. multiple nonlinear effects of SST, WT and TG can not be shown in a simple map, but during discussion further several animations are provided