

*How high and low frequency
events could be affecting big eye
tuna fishing in the Eastern Pacific*

Muñoz-Recalde, Sharon ¹⁾ and Ormaza-González, Franklin ^{1,2)}

1) Escuela Superior Politecnica del Litoral.

2) Cámara Nacional de Pesquería.

Presented at the 9th IATTC SAC

May 2018

Oceanography and fisheries

“ The management and assessment of stocks of highly migratory species pose problems for both scientists and managers alike because of migration of the fish into and out of different regions. It is essential to maximize our comprehension of how changes in the environment affect the horizontal and vertical distribution of fish and their catchability through gear performance; combined, they result in the catch rates that are used in stock assessment”

Hyder *et al.* 2014. Migration and Abundance of Bigeye Tuna (*Thunnus obesus*), and Other Pelagic Species, Inferred from Catch Rates and Their Relation to Variations in the Ocean Environment. SOEST Publication 09-02, JIMAR Contribution 09-371 60 pp.

Big eye tuna caches and oceanography

10C depth distribution in the Pacific Ocean.
Hanamoto E. (1987)

Effect of Oceanographic Environment on Bigeye Tuna Distribution

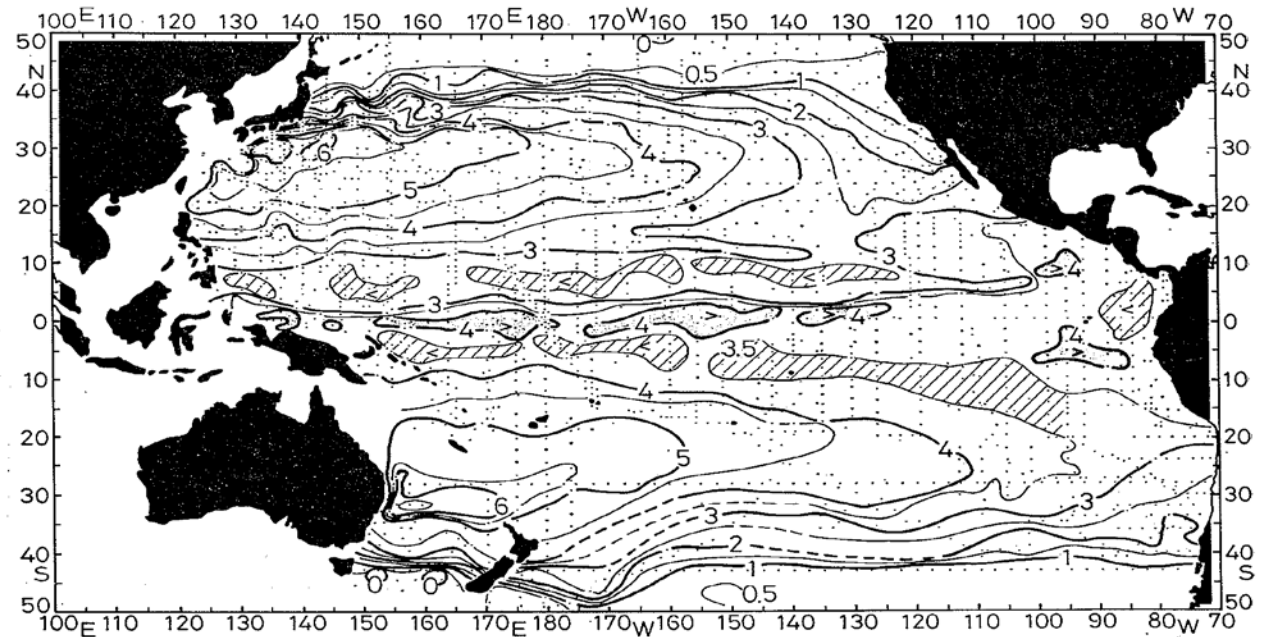
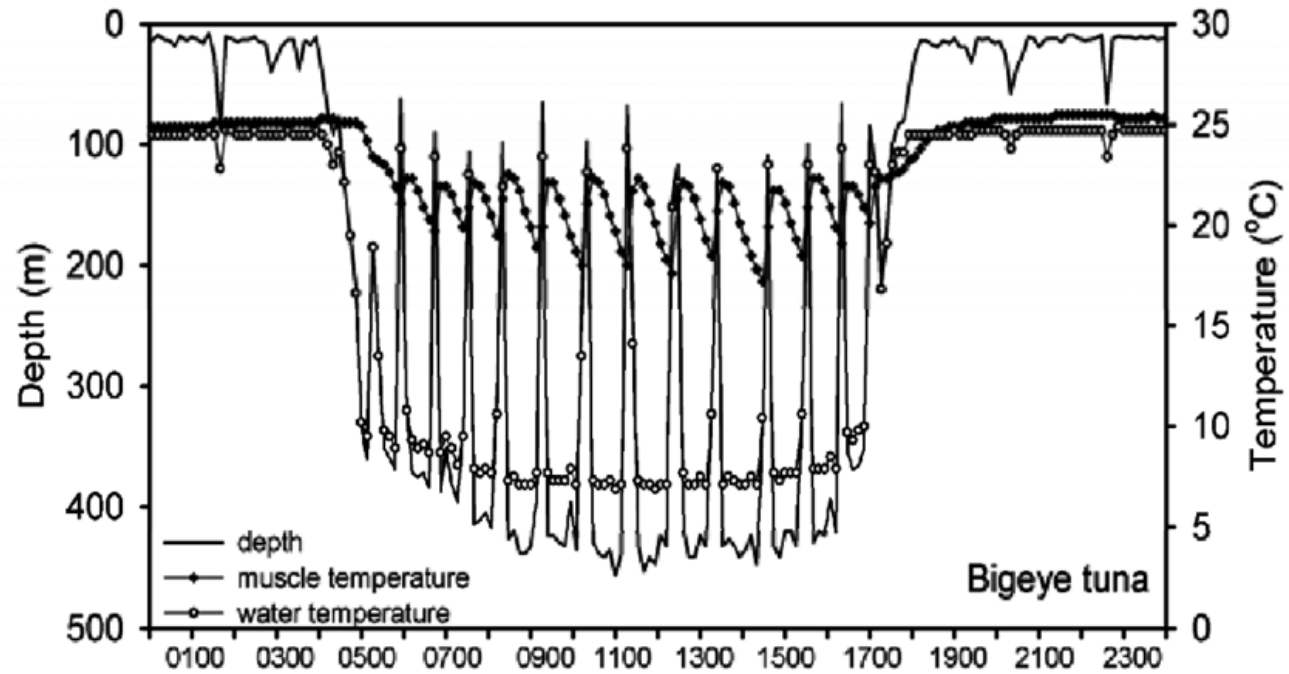


Fig. 5. The depth contour of the 10°C isotherm (depths indicated in 100-m units). The dots show positions where data were obtained. The oblique lines indicate the thermal ridge and the shaded (light black) areas indicate the thermal trough.

Big eye tuna vertical movement in the water column.

Brill, Richard AU - Bigalow, K.A. AU - Musyl, Michael AU - Fritsches, Kerstin AU - Warrant, Eric PY - 2018/05/09



Thermocline and oxycline

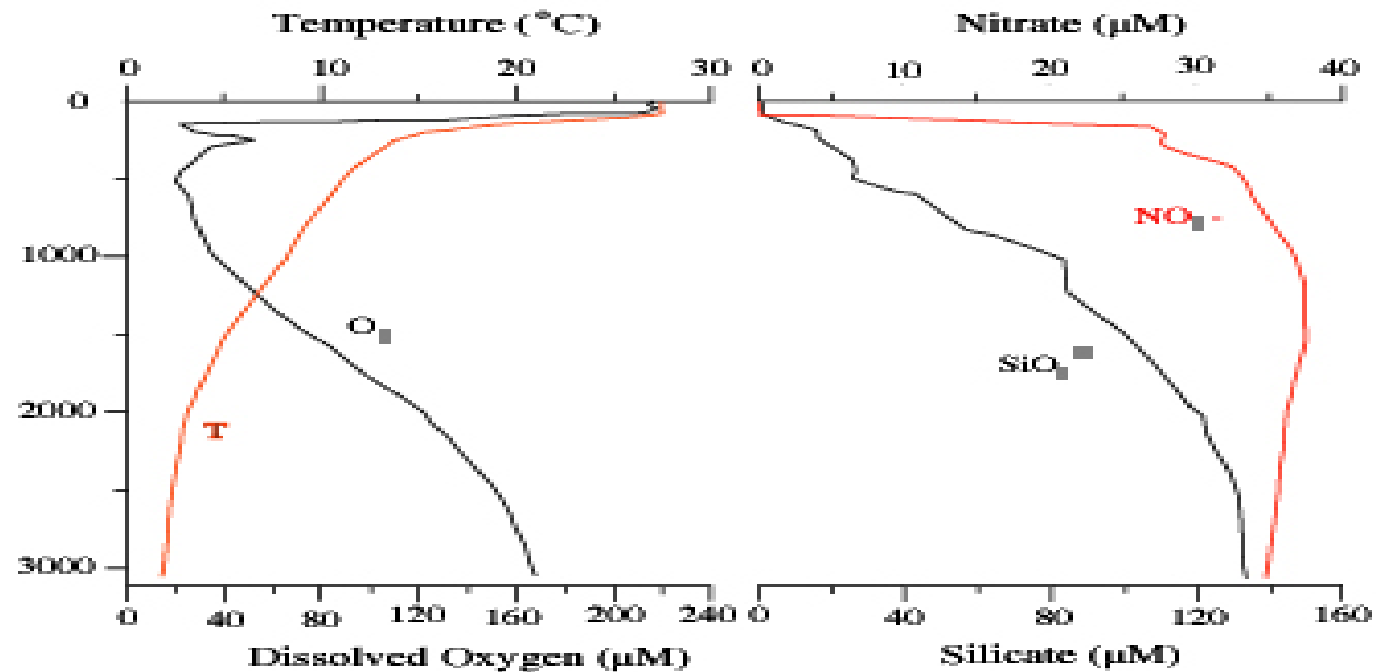
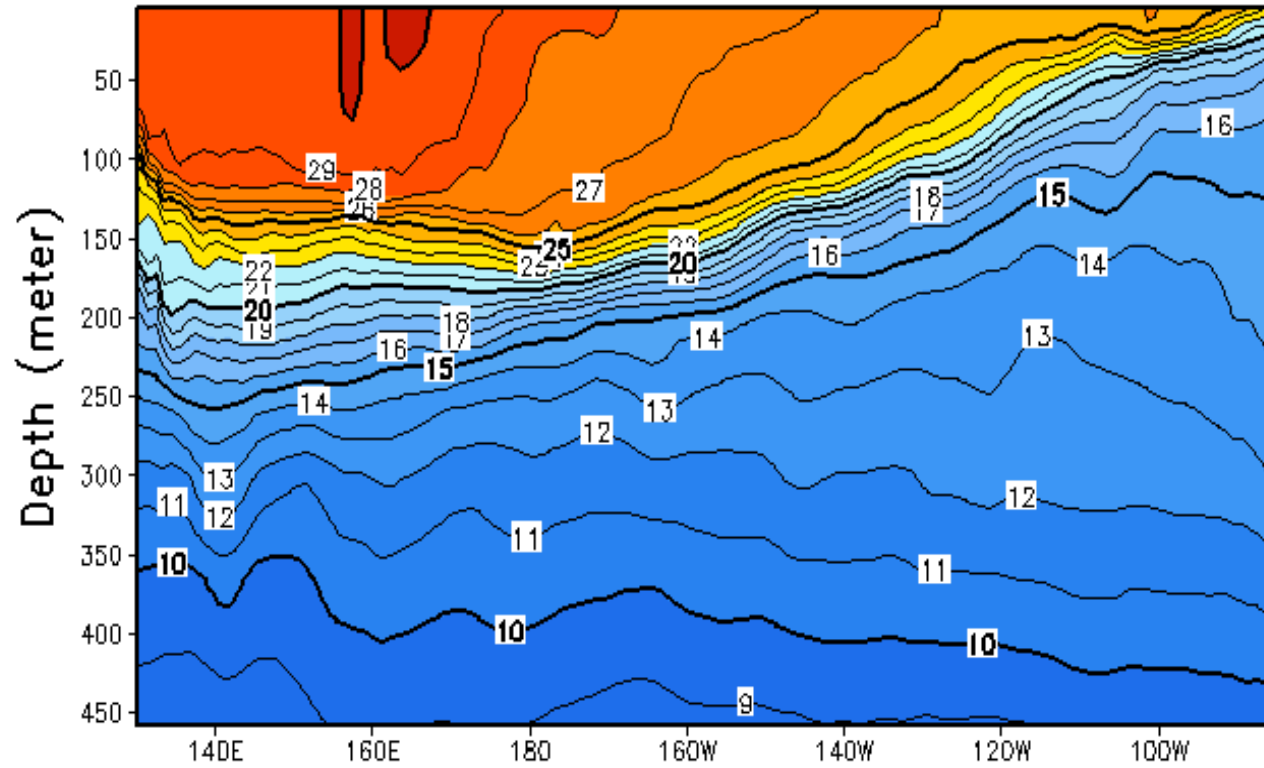
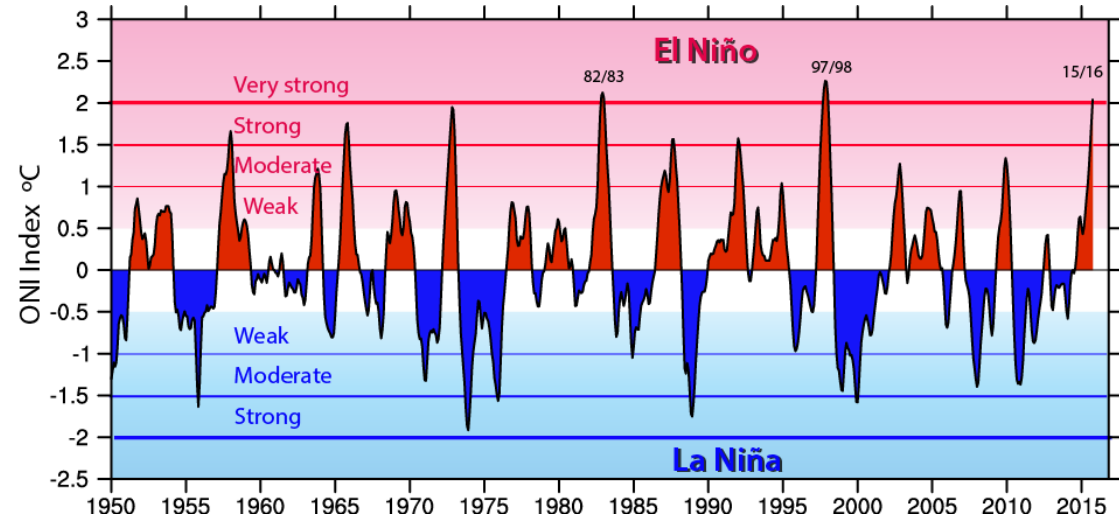


Figure 3. Typical vertical distributions (profiles) of temperature, dissolved oxygen, nitrate and silicate in the water column at 10°N and 67°E in the Arabian Sea. The thin water layer, at the top of the ocean, with near uniform levels in properties represents the surface mixed layer.

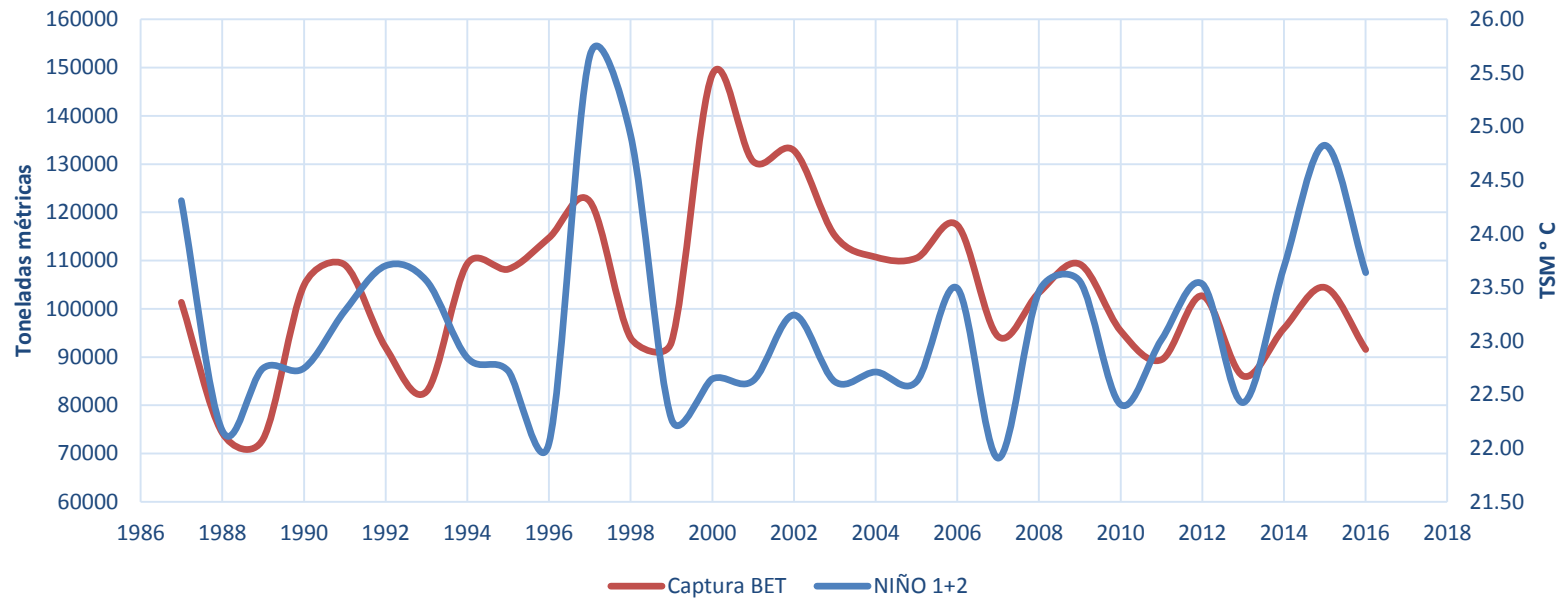
Thermocline along the Equatorial Pacific

Equatorial Temperature ($^{\circ}\text{C}$), May 08 2018



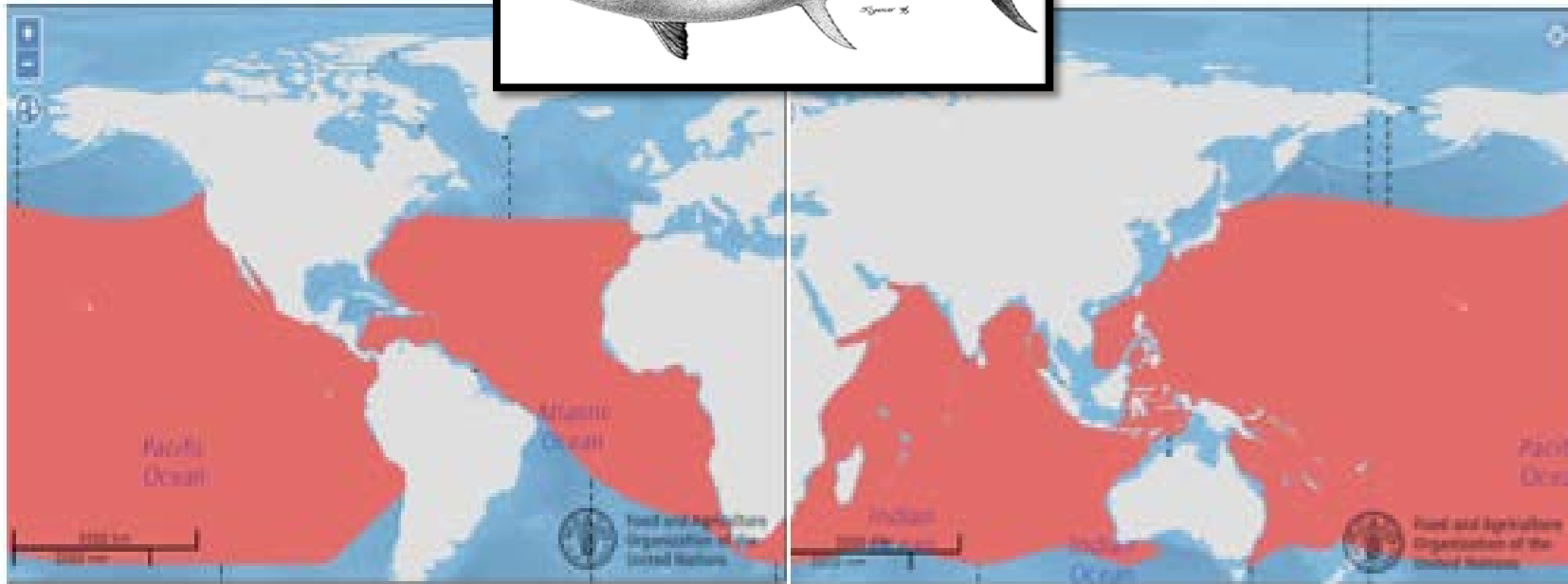
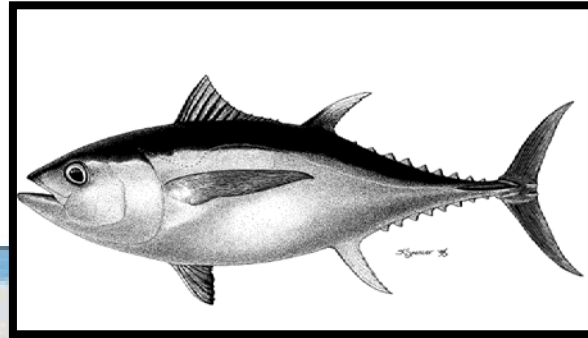


CAPTURA TOTAL BET / NIÑO 1+2

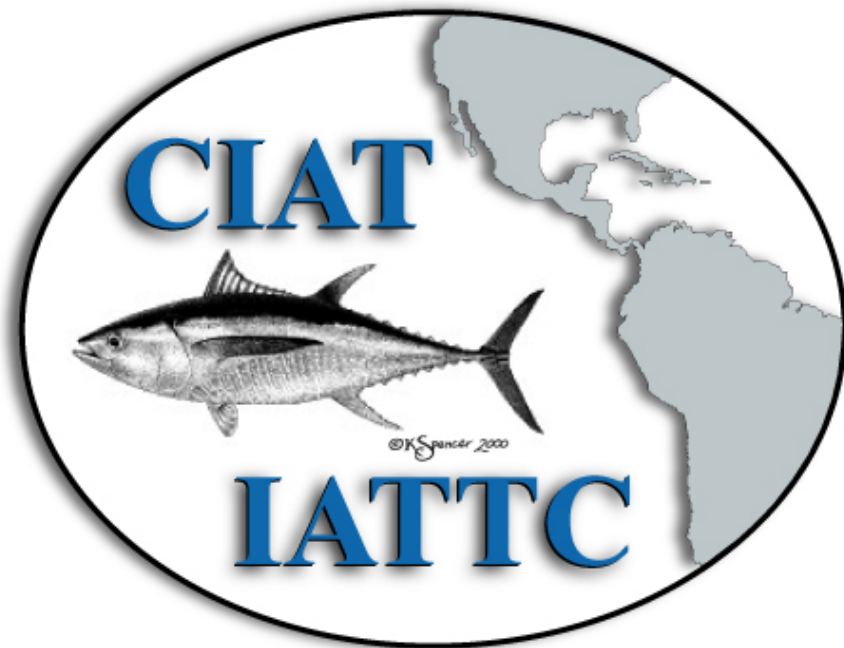


Fuente: ClimateDataGuide

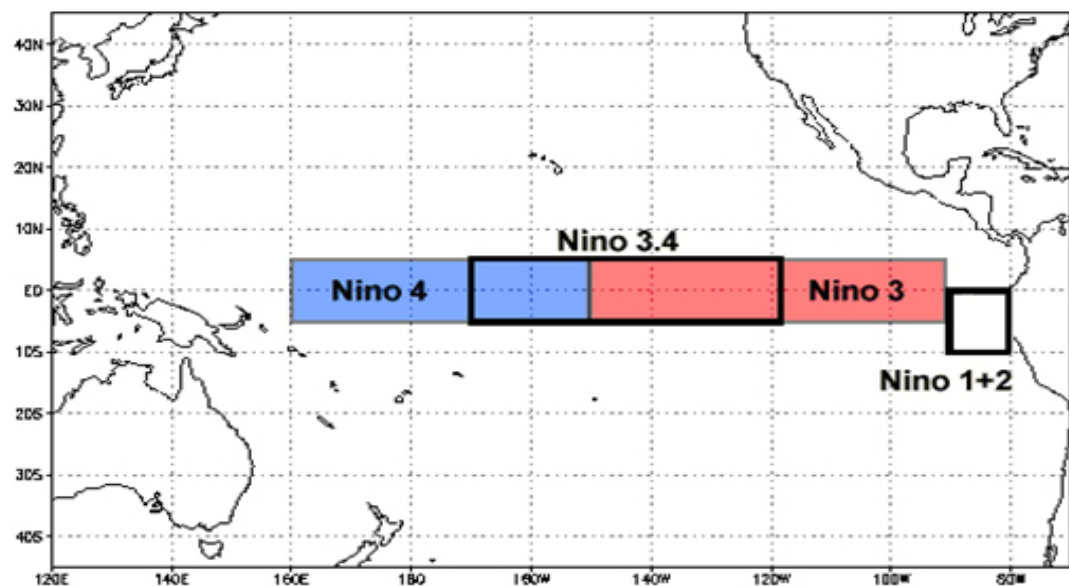
Bigeye (*Thunnus obesus*) – Patudo – Ojo grande



Distribución geográfica del Bigeye tuna
Fuente: FAO



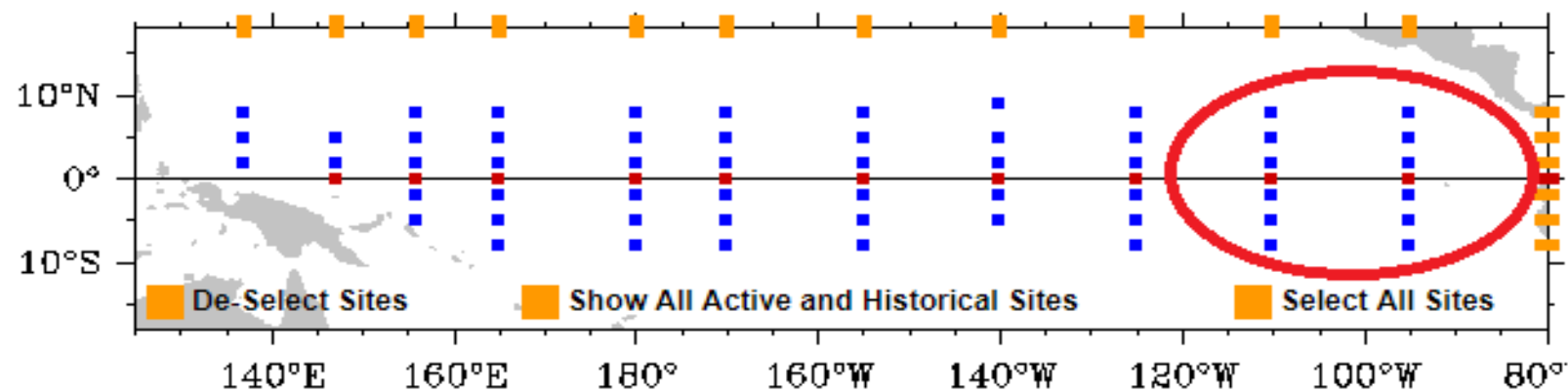
NOAA



TAO/TRITON (Pacific)

PIRATA (Atlantic)

RAMA (Indian)



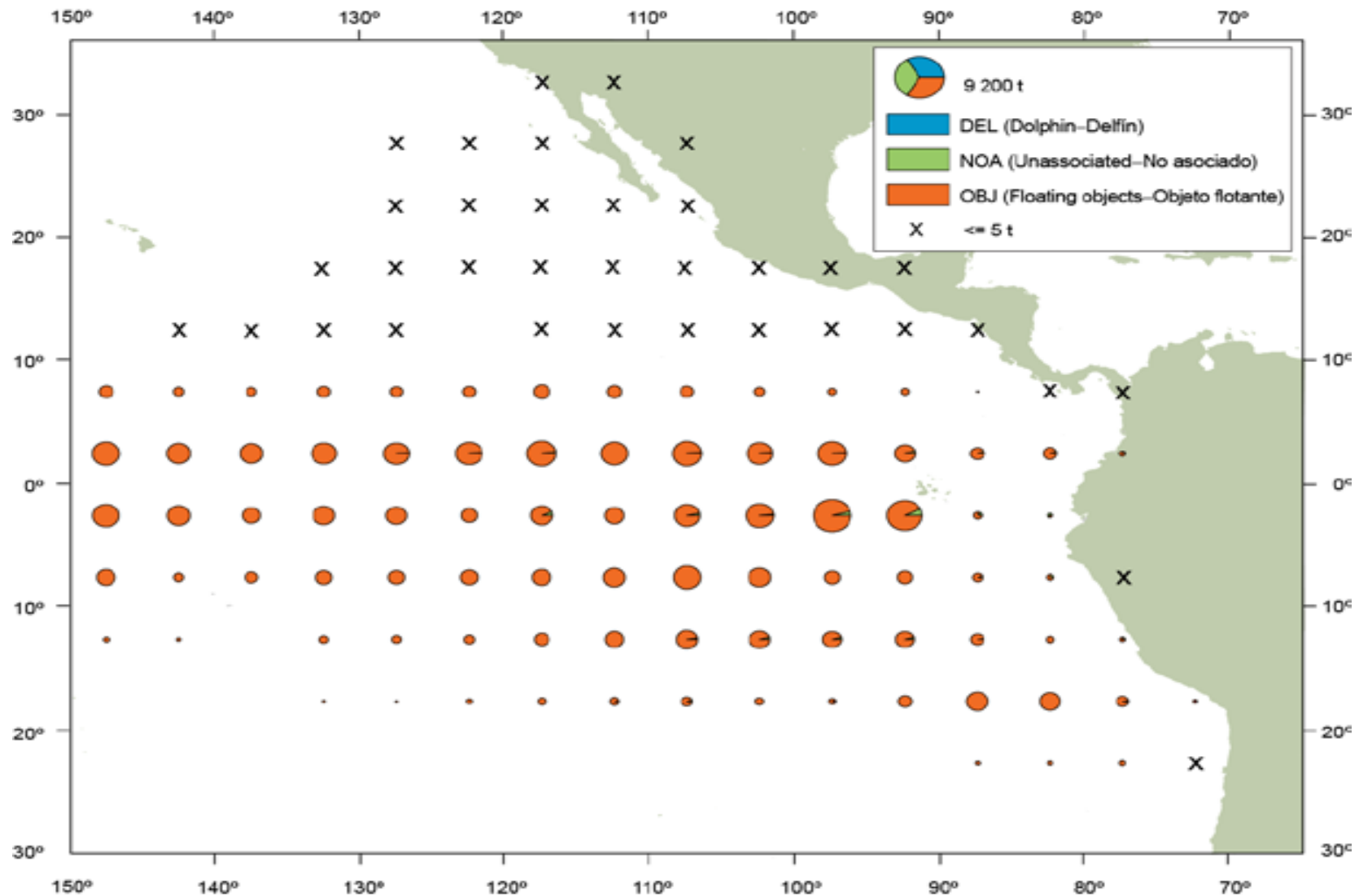
Time Series

Profiles

Time Section

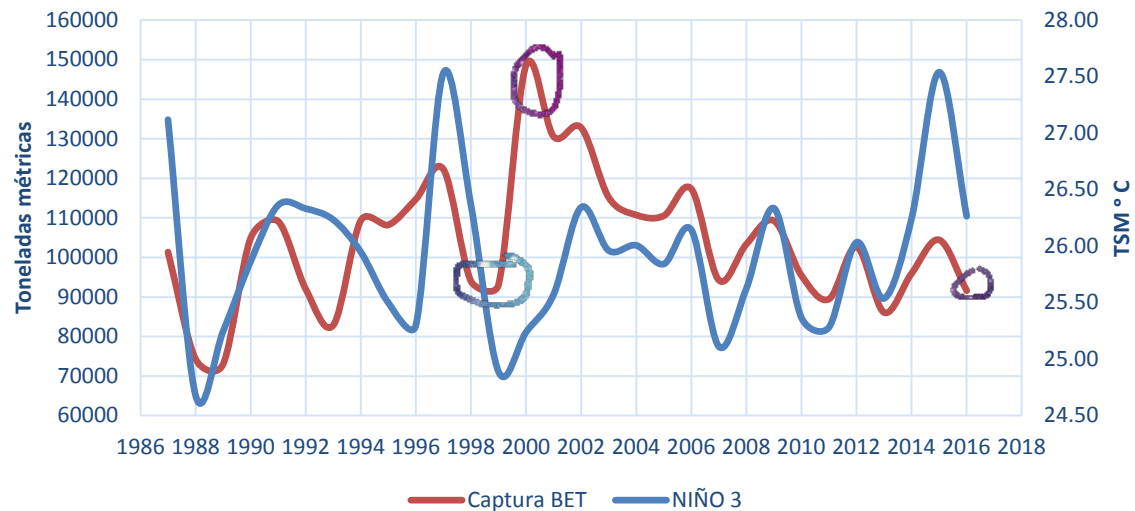
Lat Lon Map

Depth Section

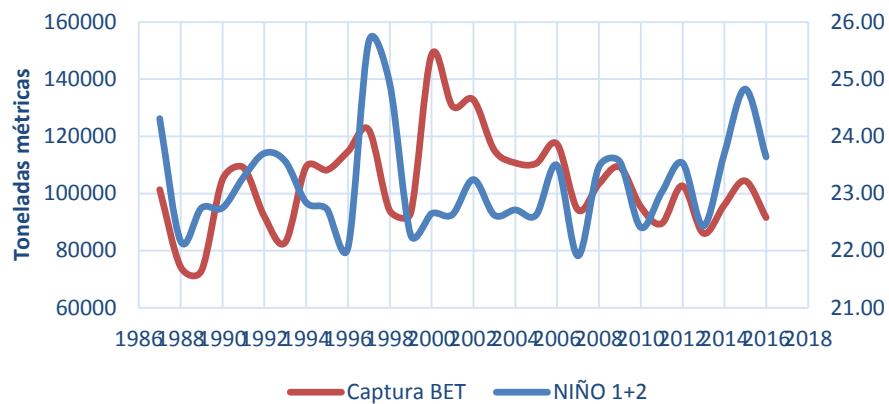


Average annual distributions of the purse-seine catches of bigeye, by set type, 2011-2015. The sizes of the circles are proportional to the amounts of bigeye caught in those 5° by 5° areas. Source: IATTC 2017

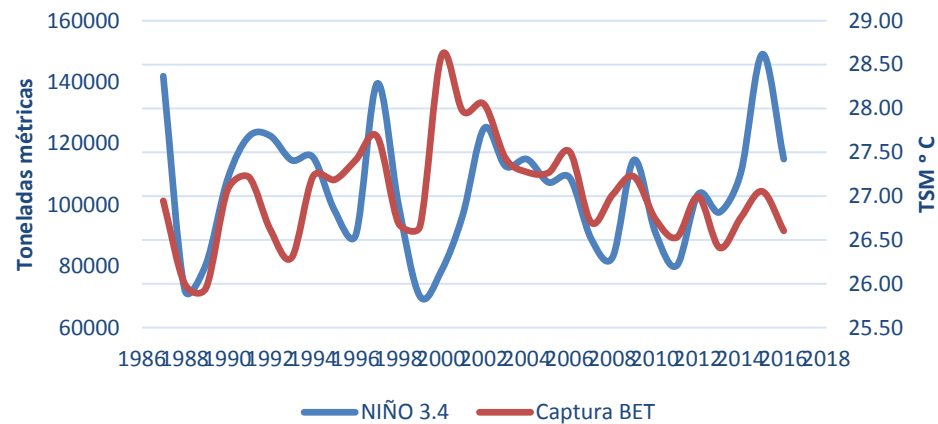
CAPTURA TOTAL BET / NIÑO 3



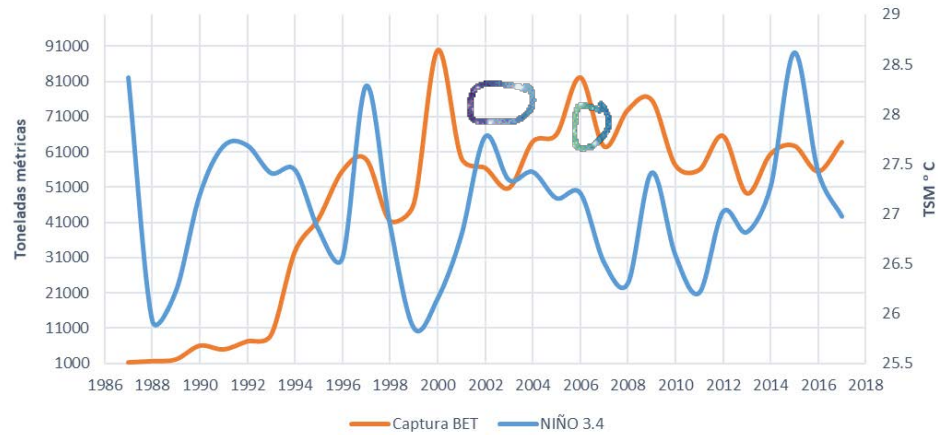
CAPTURA TOTAL BET / NIÑO 1+2



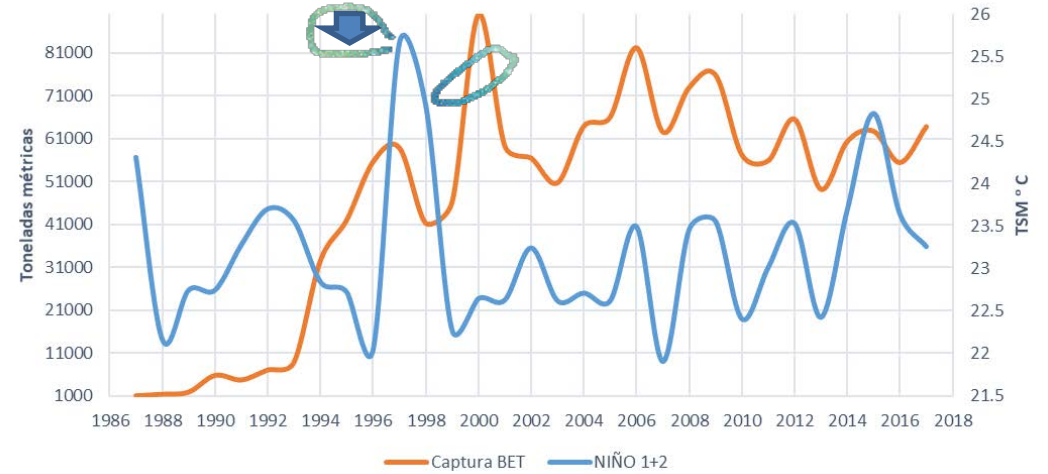
CAPTURA TOTAL BET / NIÑO 3.4



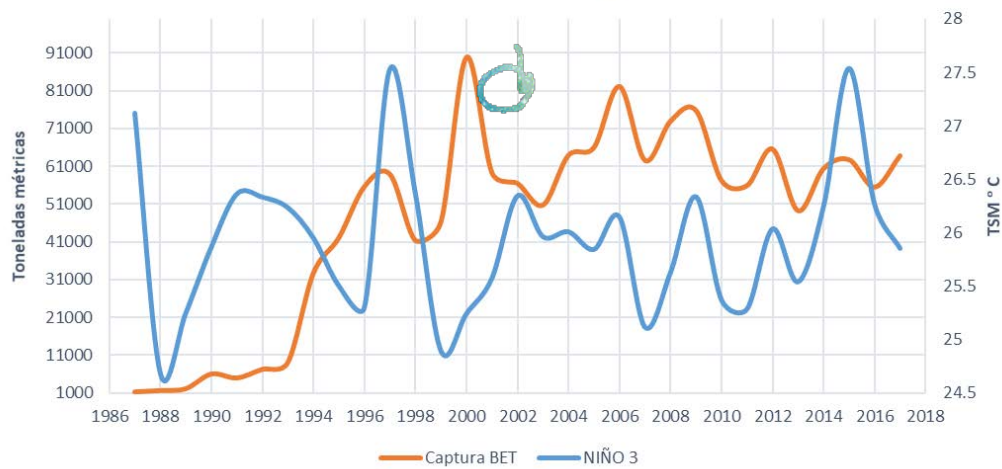
CAPTURA PS TOTAL BET / NIÑO 3.4



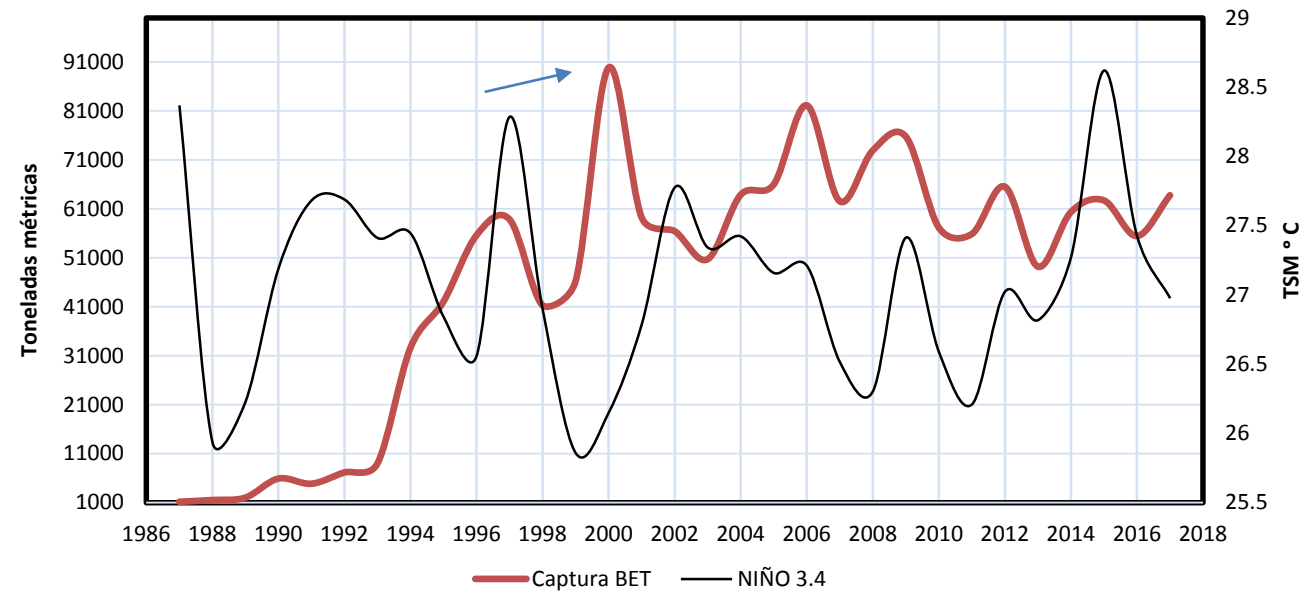
CAPTURA PS TOTAL BET / NIÑO 1+2



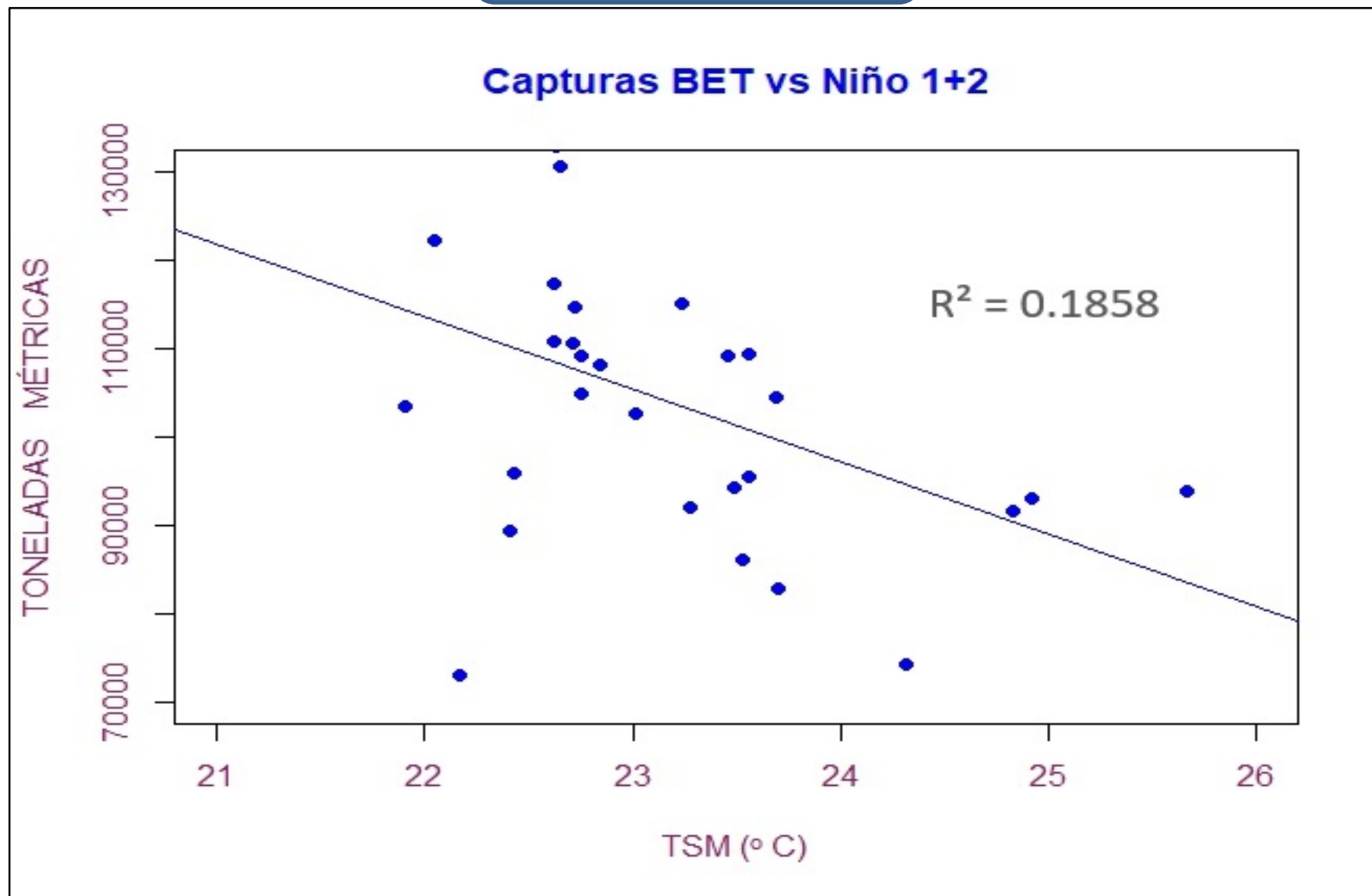
CAPTURA PS TOTAL BET / NIÑO 3



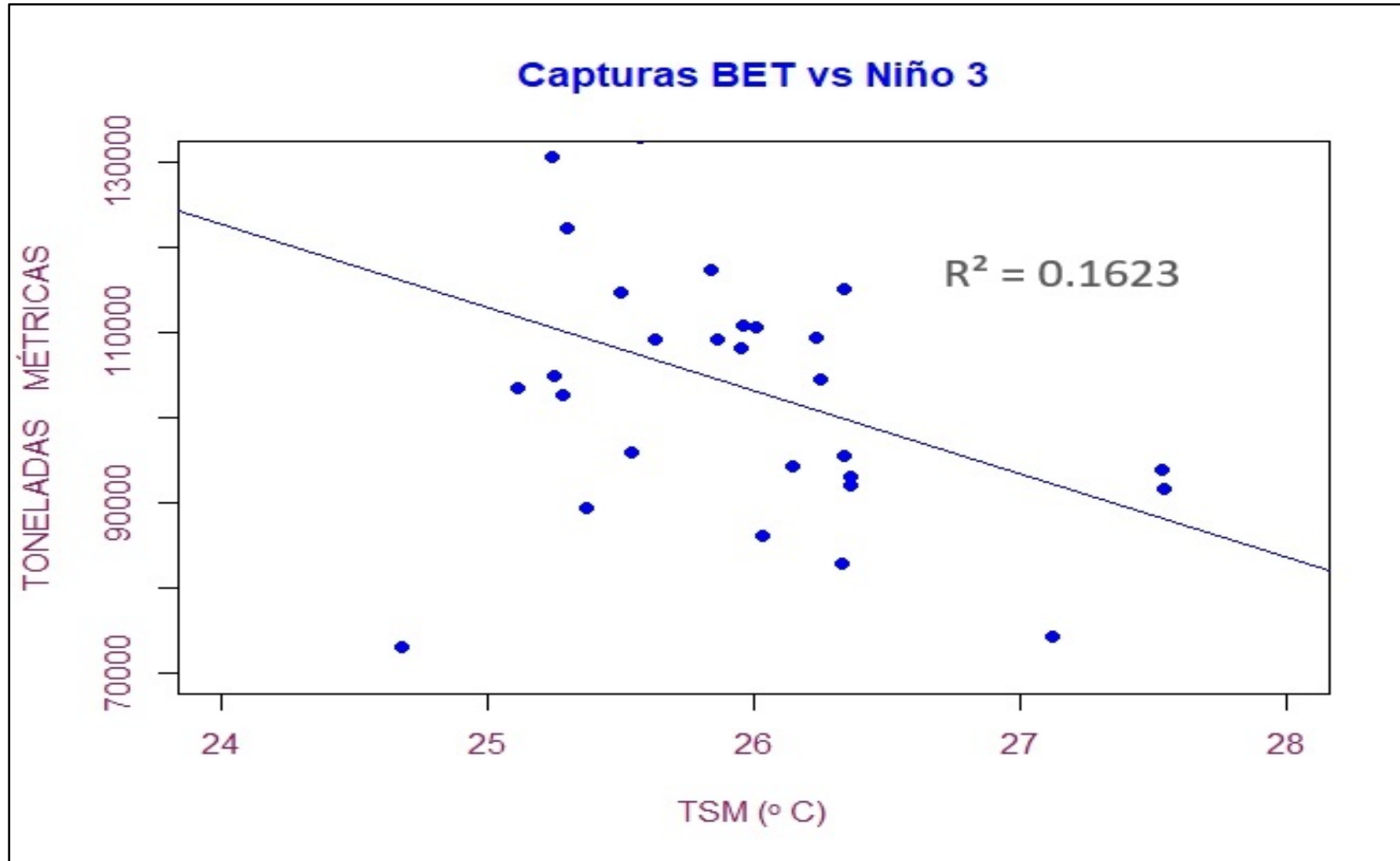
CAPTURA PS TOTAL BET / NIÑO 3.4



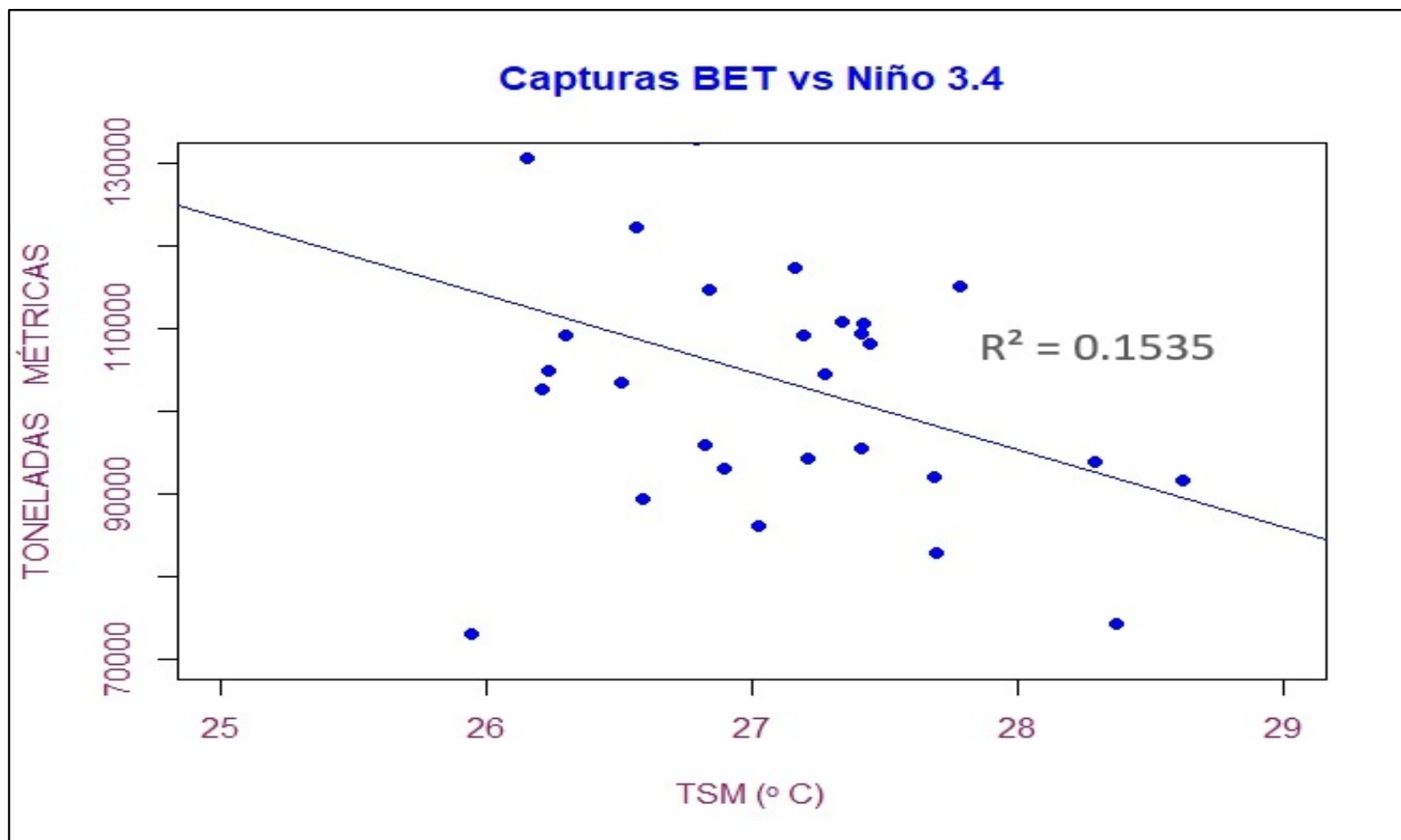
SST



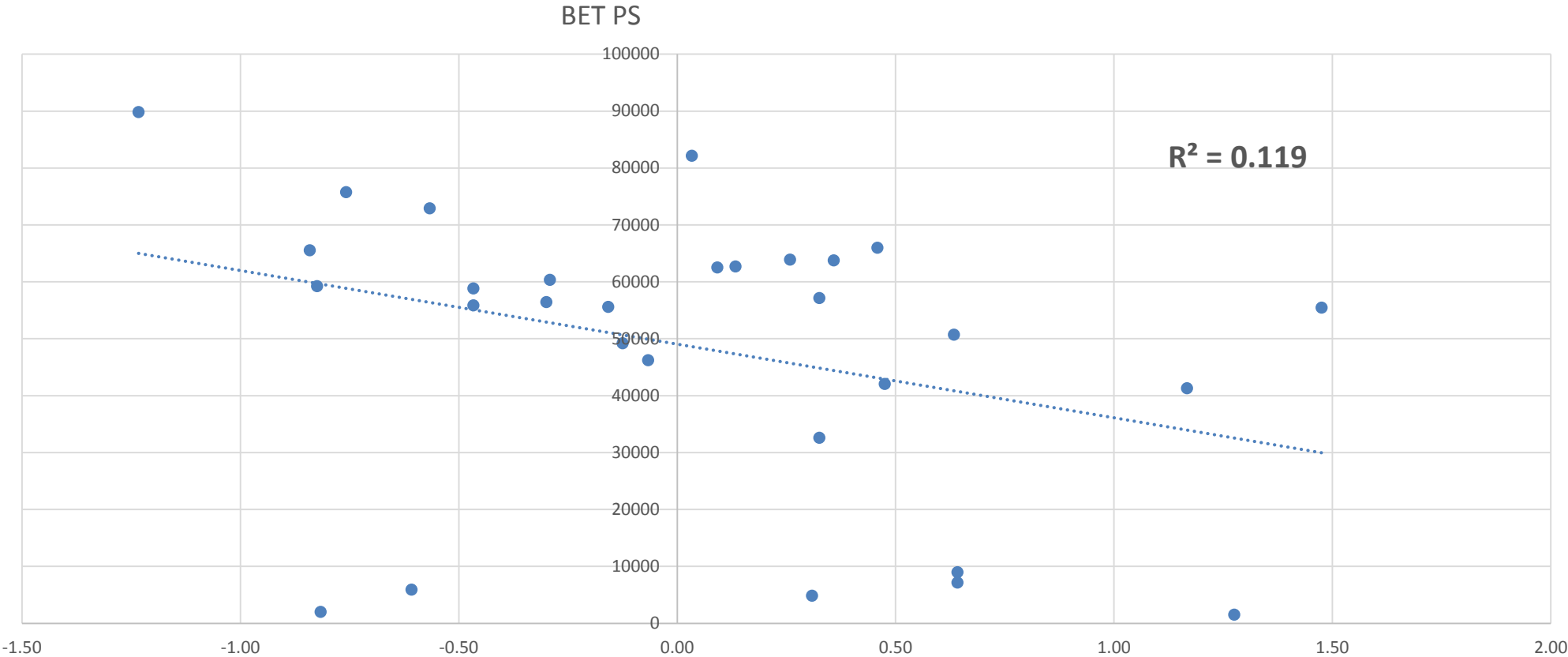
SST



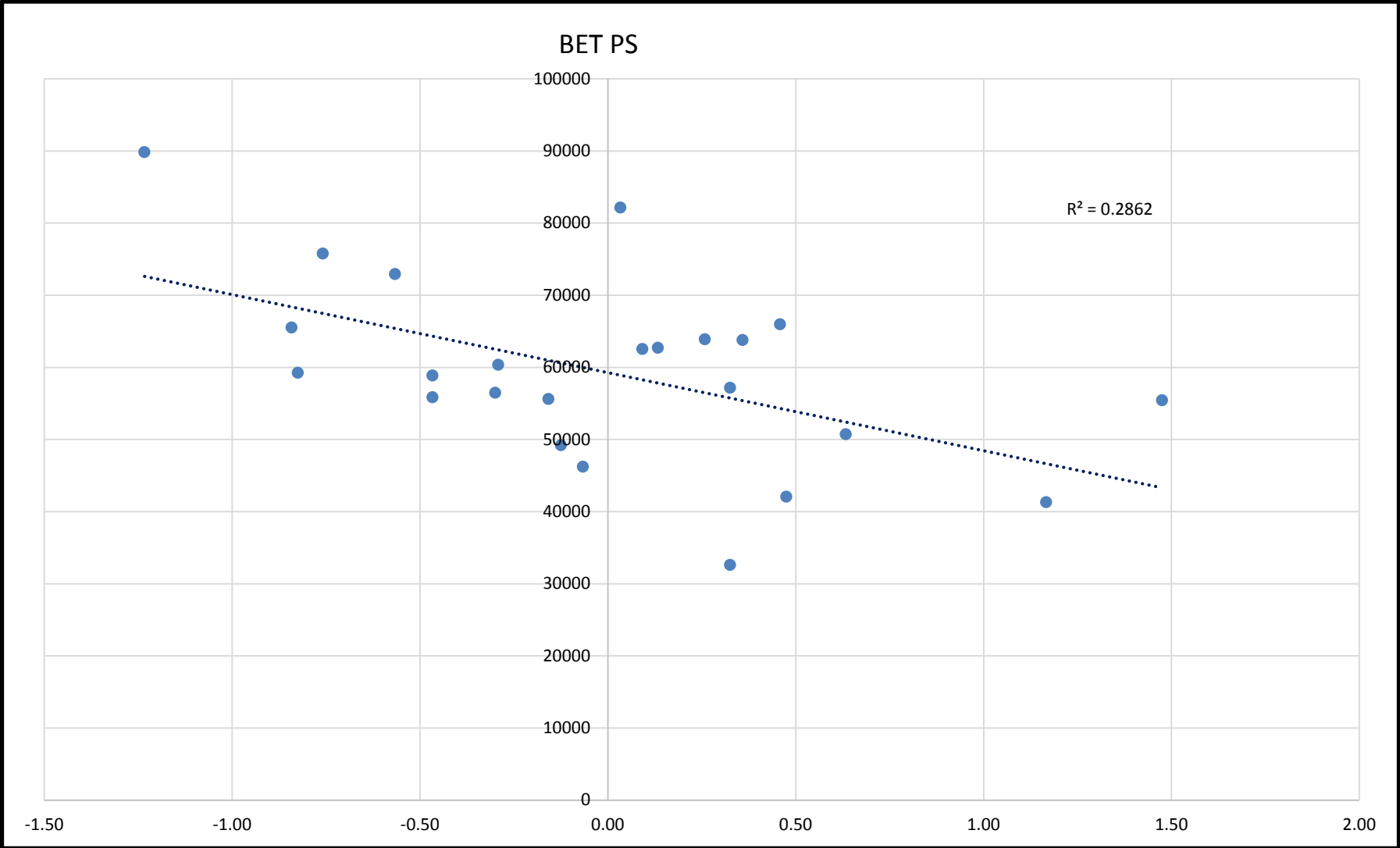
SST



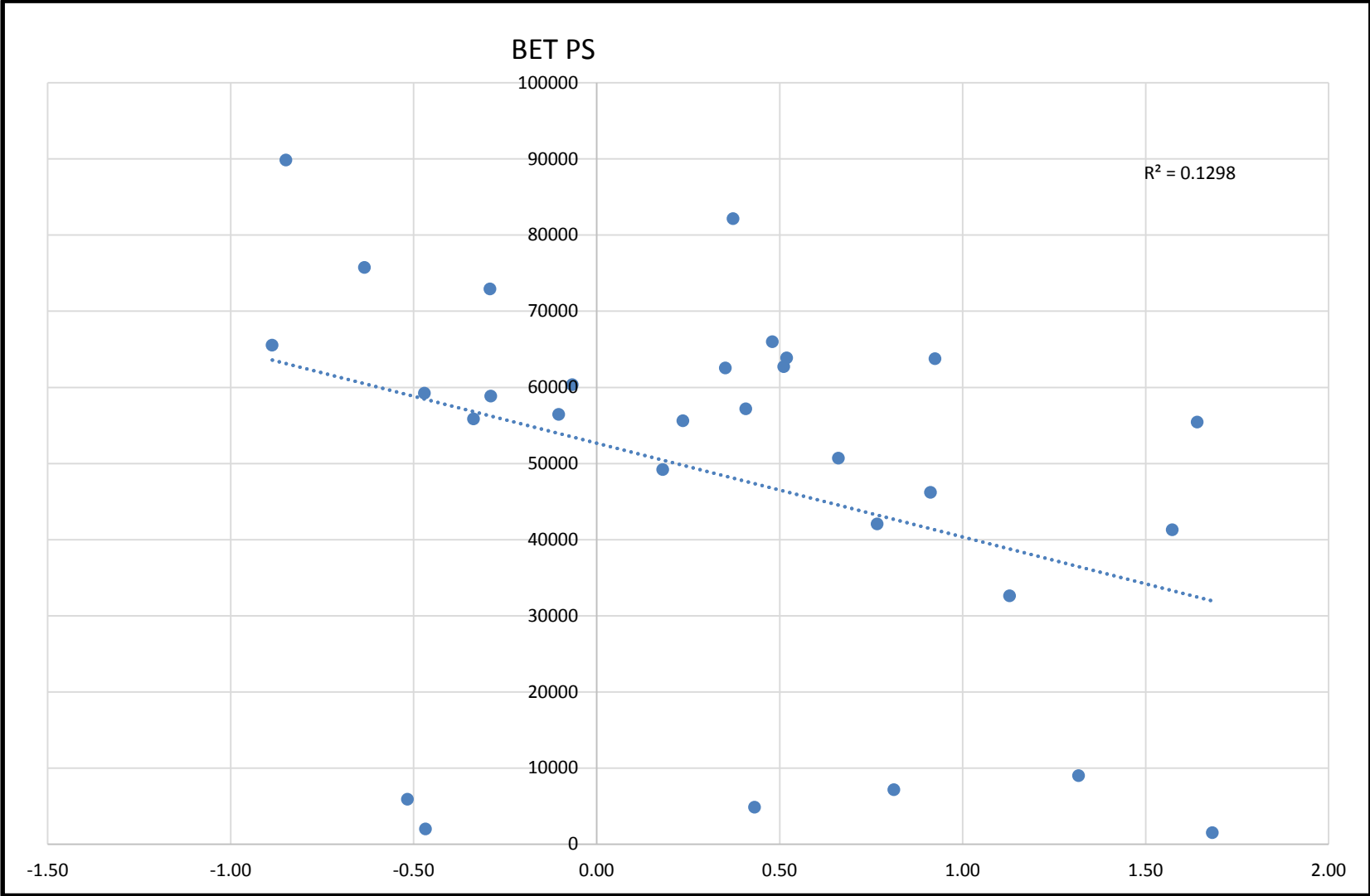
ONI



ONI



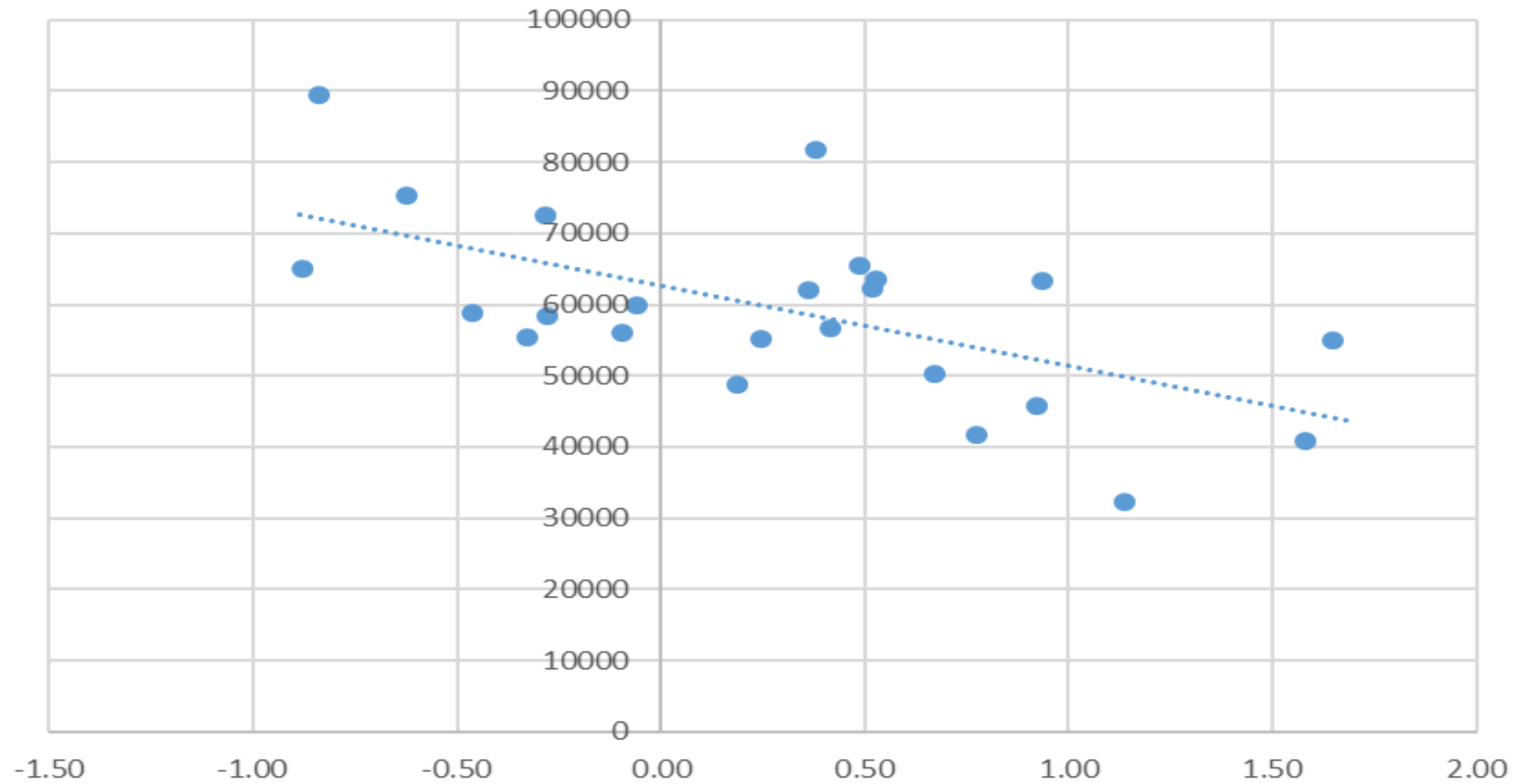
MEI



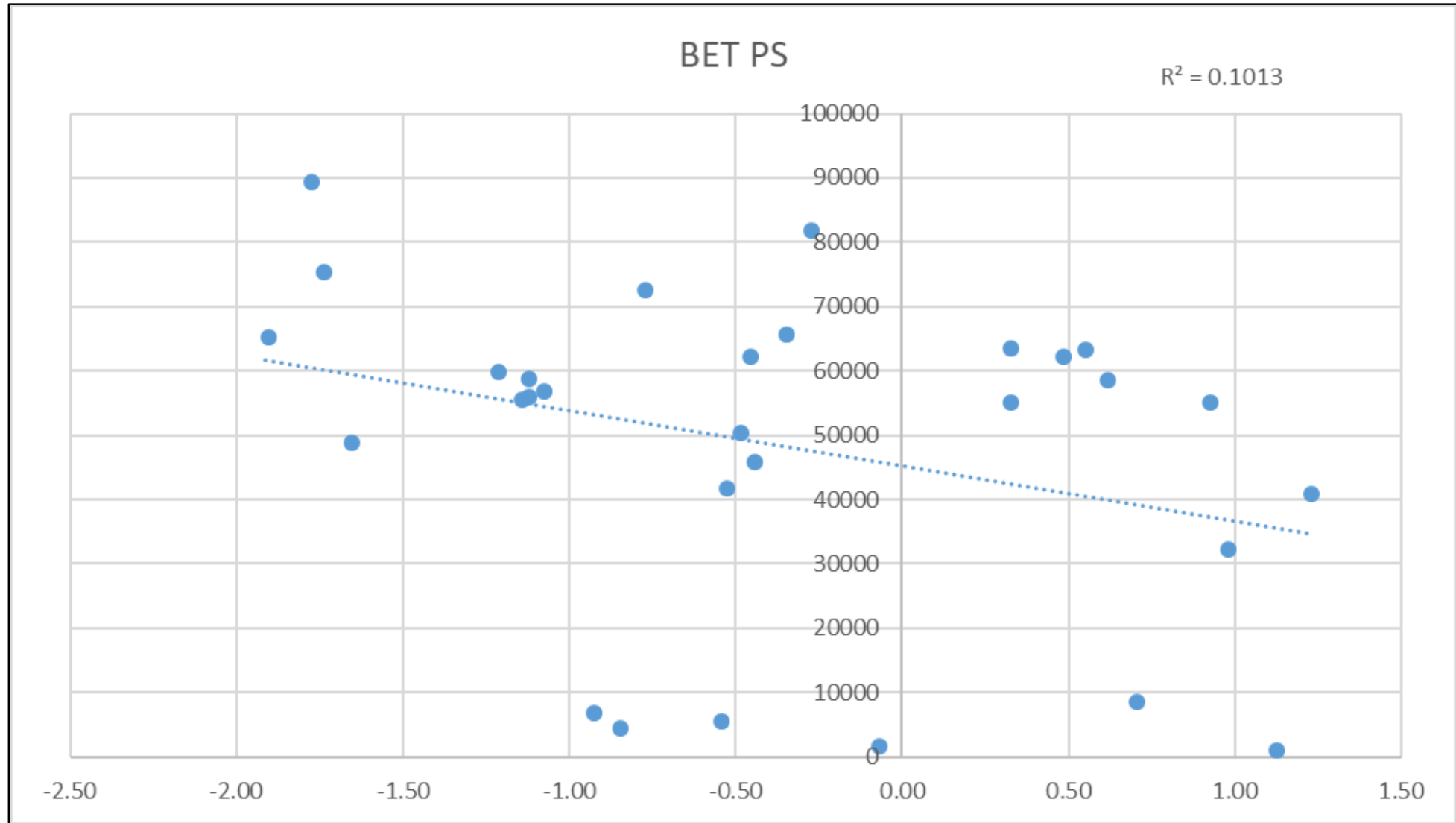
MEI

BET PS

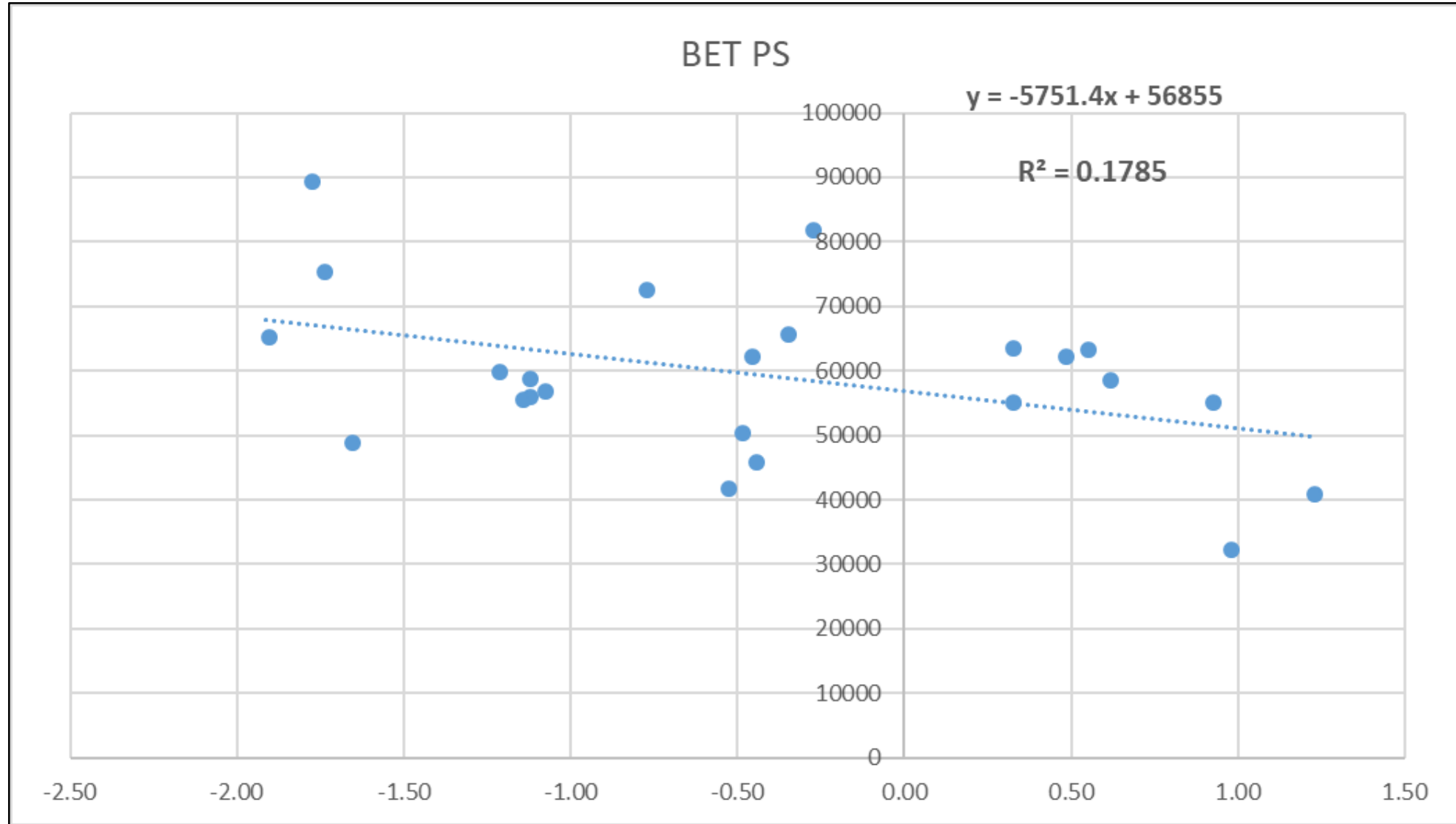
$R^2 = 0.365$



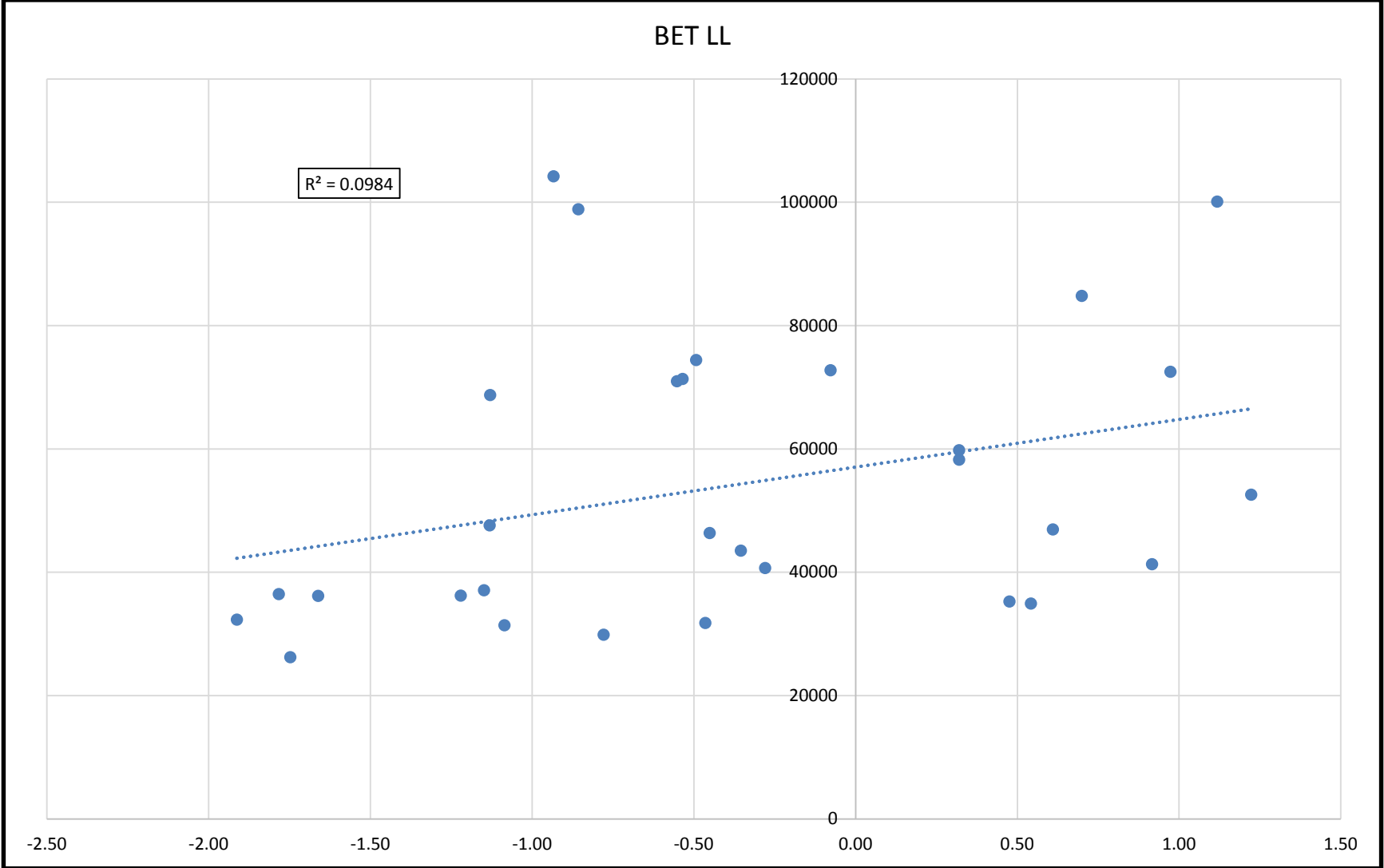
PDO



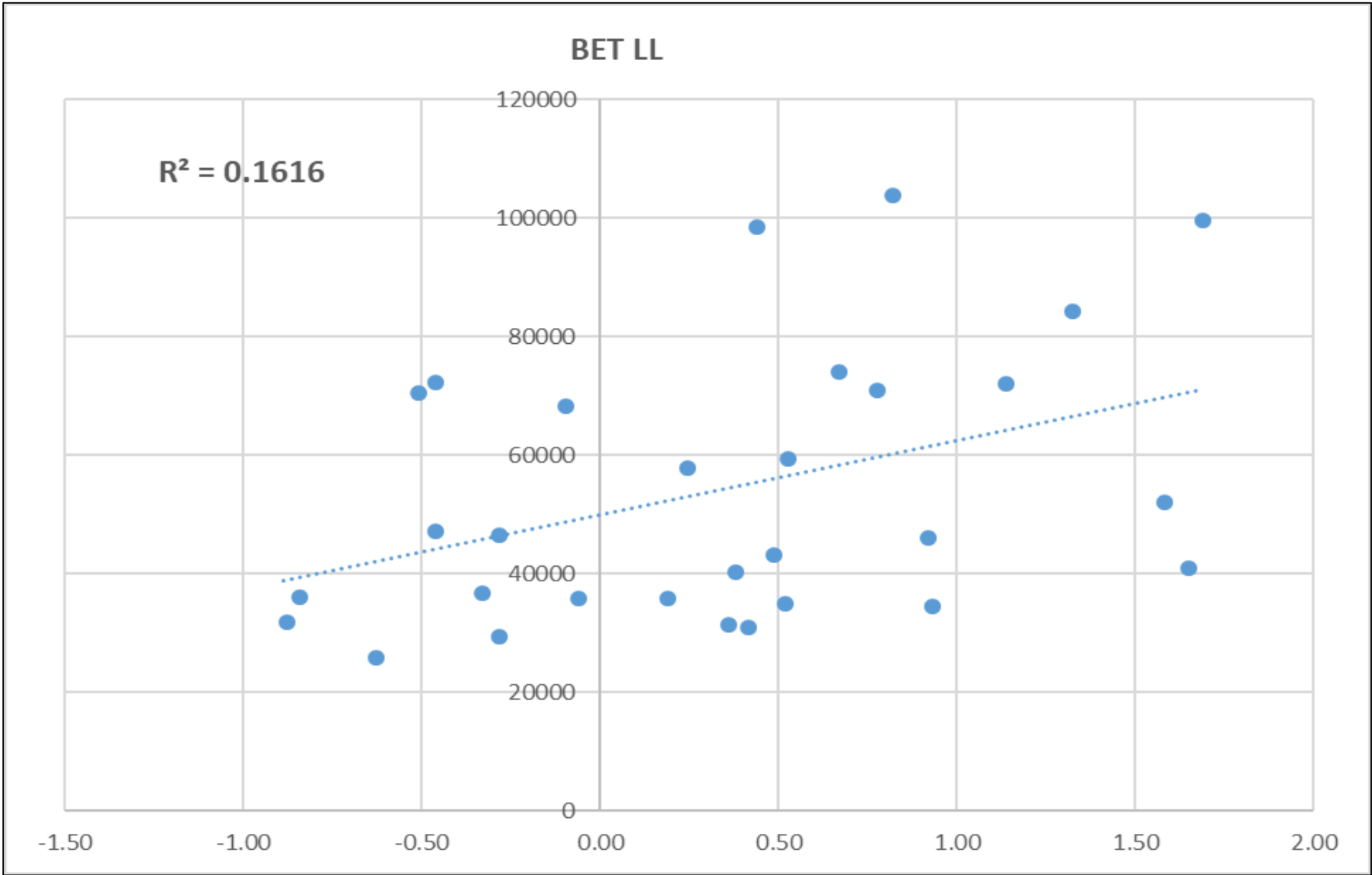
PDO



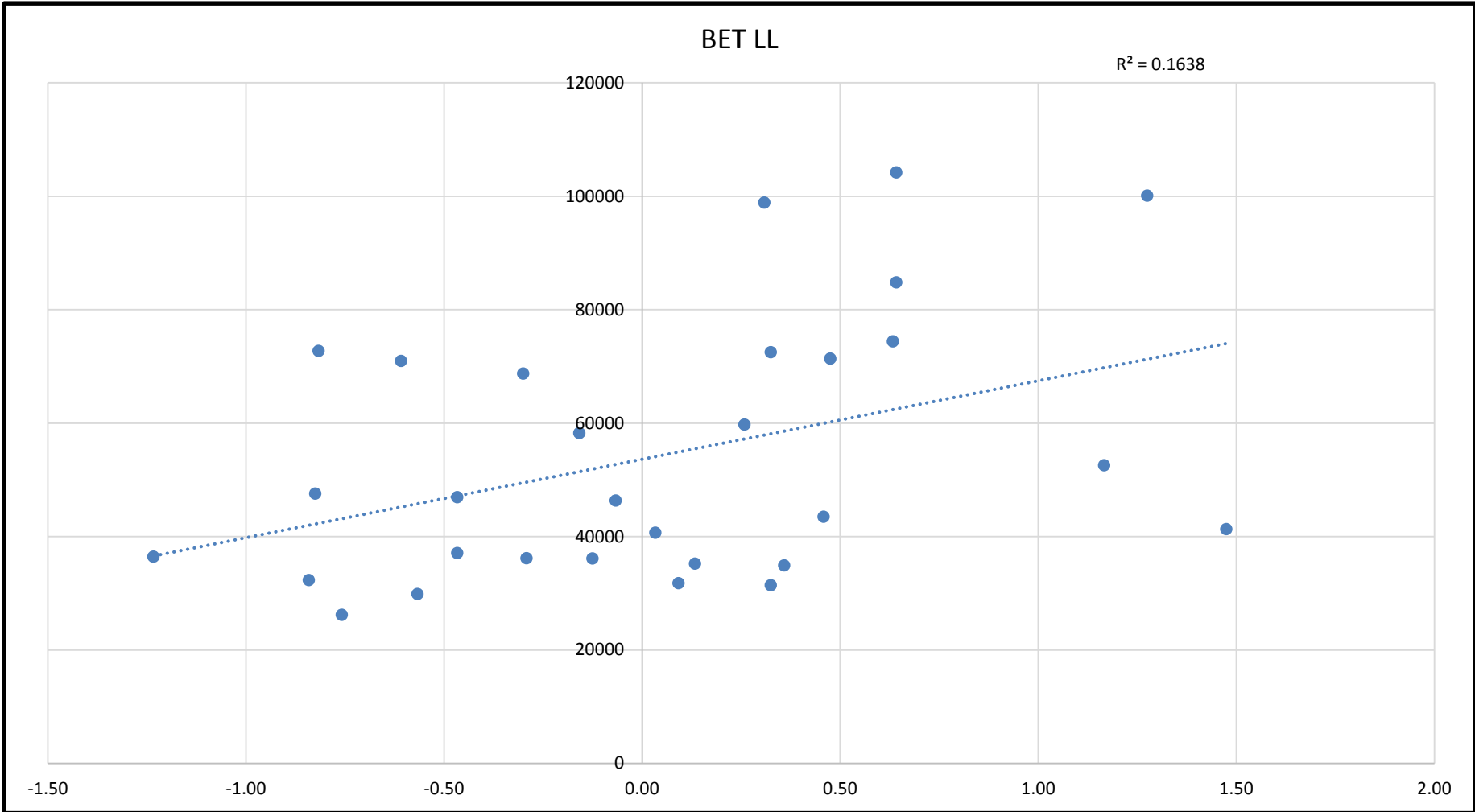
PDO - LL



MEI - LL



ONI - LL



SST-BE/Ecuador

Latitud Longitud	0	2N	2S	5N	5S	8N	8S
110 W	0.0209	0.0098	0.0186	0.0423	0.0209	0.009	0.0003
110 W (desfasado)	0.0838	0.0008	0.0045	5.00E-05	0.0004	0.0467	0.0453

Latitud Longitud	0	2N	2S	5N	5S	8N	8S
95 W	0.2213	0.0456	0.1877	0.0358	0.0853	0.0095	0.1385
95 W (desfasado)	0.0353	0.0023	0.0355	0.0198	0.0004	0.0157	0.0796

Conclusions

- Purse seiner captures of Big eye are partially affected by fluctuations of Sea Surface Temperature, but lagged 12 months
- Indexes of low (PDO) and high (ENSO) frequency affect similarly BE PS catches, lagged 12 months
- Correlations for PS catches indicated an association percentage up to 36.5%, which is considered high.
- Correlations for LL catches were around 12 %, due to the depth of catching is not affected by SST fluctuations.
- These parameters could be considered when management strategies are designed.

Gracias!!