

Worldwide Ocean Temperature EDA and Writeup

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Region name : Subcontinent West

Summary and EDA of reported data.

The Condition of the Data and Interesting Detail

Without considering the location, lowest temperature is usually between December and January, while the highest temperatures around August. According to the geography, subcontinent west is close to equator so the temperature difference through the year should not be noticeable. Since water has bigger specific heat capacity, from the equation $\Delta T = Q/mc$ (Δ =temperature change, Q =heat, m =mass, c =specific heat capacity), we can predict that the sea temperature change has a smaller range than that of air temperature, which is consistence with our plots. Also, in our plots, there's no pattern showing increase or decrease of temperature from 2001 to 2016.

The Data Acquisition and Density of Data.

For our analysis purpose, ship data is used instead of buoy data, since buoy data only contains the measurement of water depth. Ship data is dependent on the fact that ships needed to be passing through our assigned area. Data from VOS website is divided per month from 2001 to 2016. we make sure the range is in sub-continent west by limit the range of latitude from 6 to 20 and longitude from 60 to 80. In order to make data fit into preferred region while remaining consistent through years, we measure our data within a 6-hour range of noon. We dropped all the data with "NA" value in order to keep our data logically and easy for analysis. By dropping extreme measurement that out of range between (0.01,0.99), we kept the consistency of our data.

List of sources with URLs

2001 data: <https://www1.ncdc.noaa.gov/pub/data/vosclim/2001/>

2002 data: <https://www1.ncdc.noaa.gov/pub/data/vosclim/2002/>

2003 data : <https://www1.ncdc.noaa.gov/pub/data/vosclim/2003/>

2004 data: <https://www1.ncdc.noaa.gov/pub/data/vosclim/2004/>

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2011 data: <https://www1.ncdc.noaa.gov/pub/data/vosclim/2011/>

2012 data : <https://www1.ncdc.noaa.gov/pub/data/vosclim/2012/>

2013 data: <https://www1.ncdc.noaa.gov/pub/data/vosclim/2013/>

2014 data: <https://www1.ncdc.noaa.gov/pub/data/vosclim/2014/>

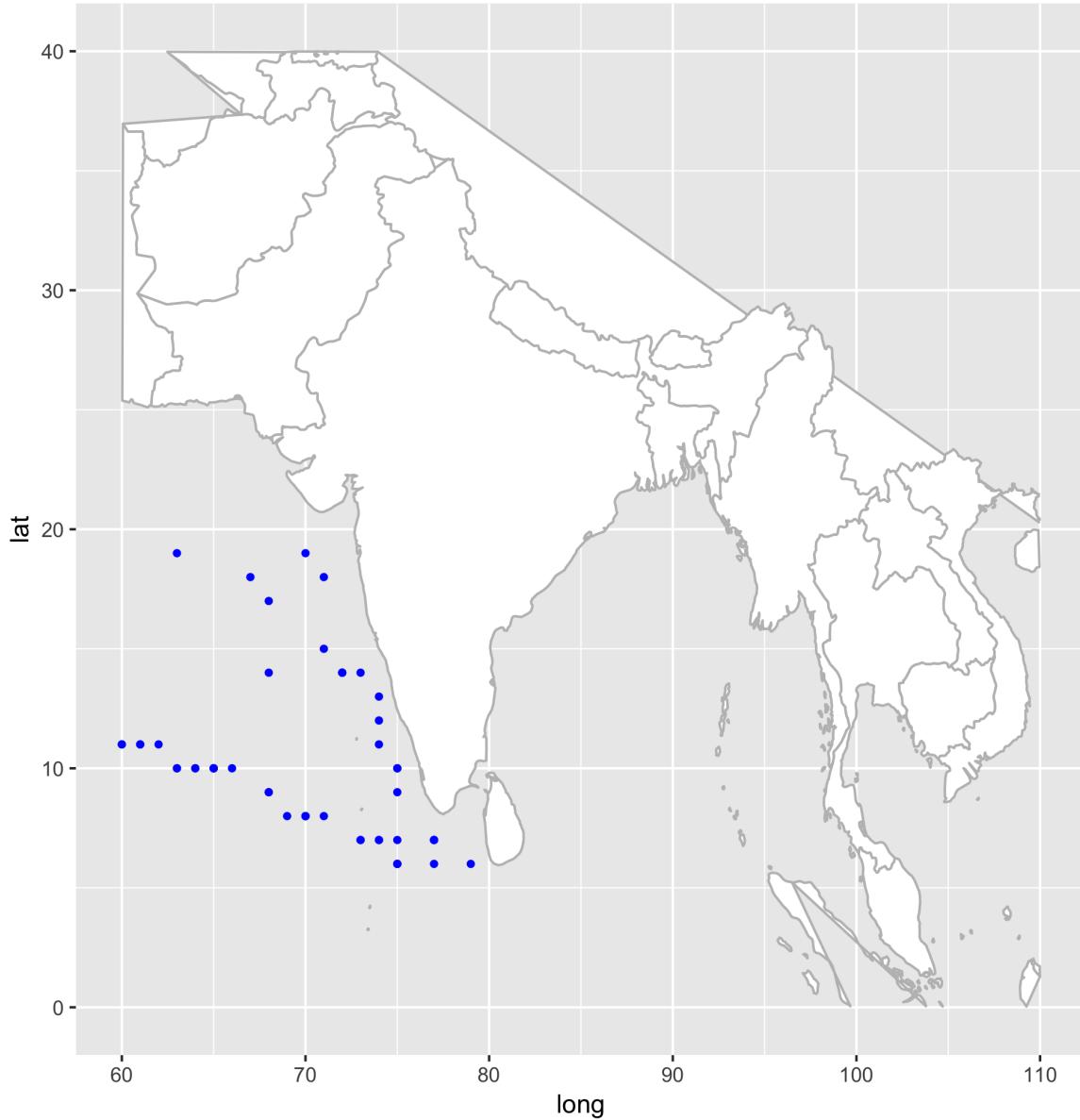
2015 data : <https://www1.ncdc.noaa.gov/pub/data/vosclim/2015/>

2016 data: <https://www1.ncdc.noaa.gov/pub/data/vosclim/2016/>

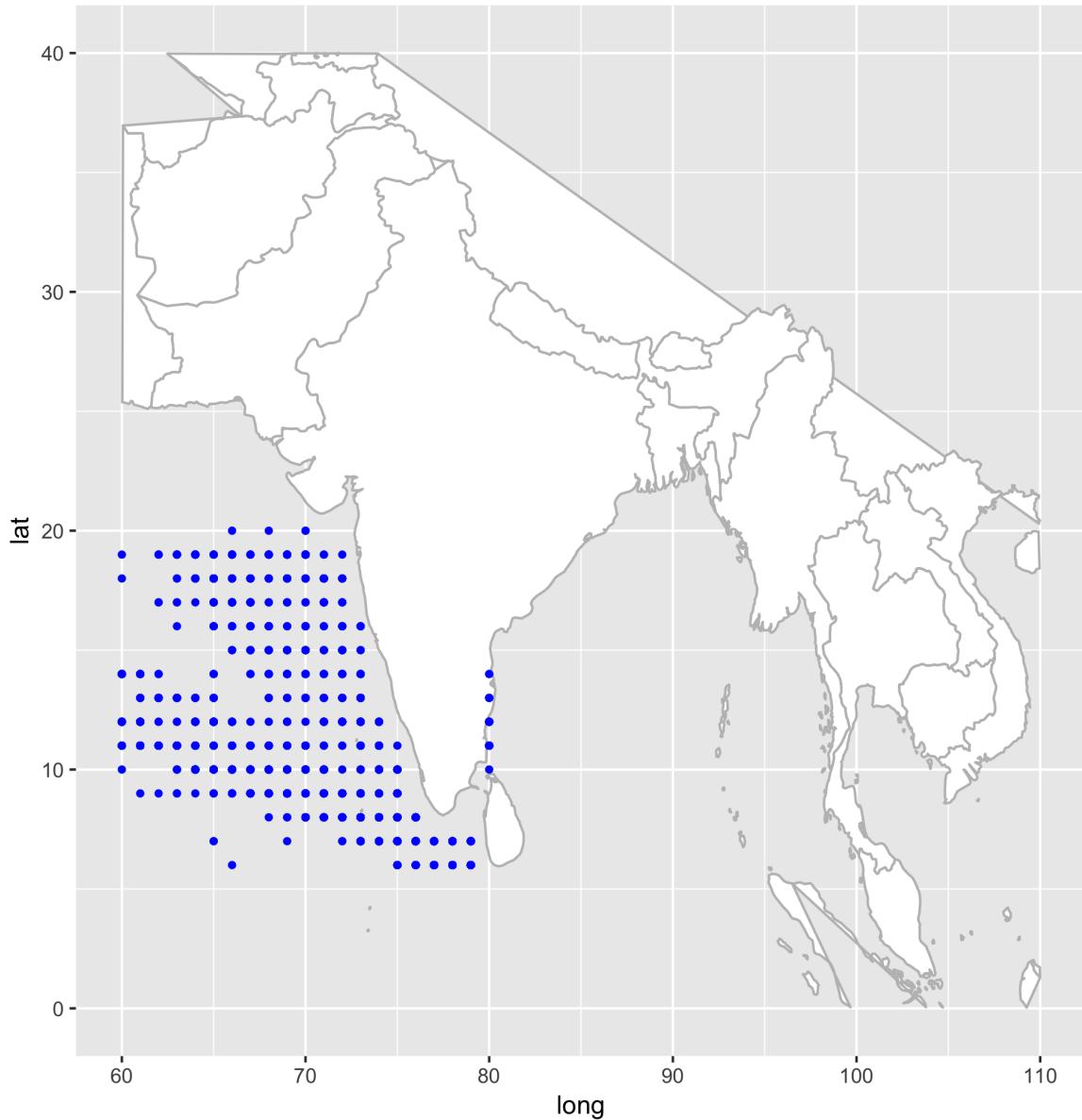
Maps

We created maps per year which show the data of Sub-Continent West region from 2001 to 2016. As we can see, when times goes on, records showing that there are more and more ship lanes are travel through this area and more data is collected in Sub-Continent West.

Subcontinent West 2001



Subcontinent West 2016



```

matrix.jan.temp = NULL
matrix.aug.temp = NULL

##### the following loop will generate the graphs
##### and it will build two matrices to track the average temprtures of two months through out the 16 y
for (k in 2001:2016) {
  YEAR = k

  load(paste0("./cleaned_data/ave_temp_",YEAR,".Rdata"))
  plot(EDA.year[,2], type = "l", main = paste("Average Sea Tempreture of", YEAR, sep = " " ) , xlab = "P
  plot(EDA.year[,3], type = "l", main = paste("Average Air Tempreture of", YEAR, sep = " " ) , xlab = "P

jan.temp = EDA.year[1,2:3]

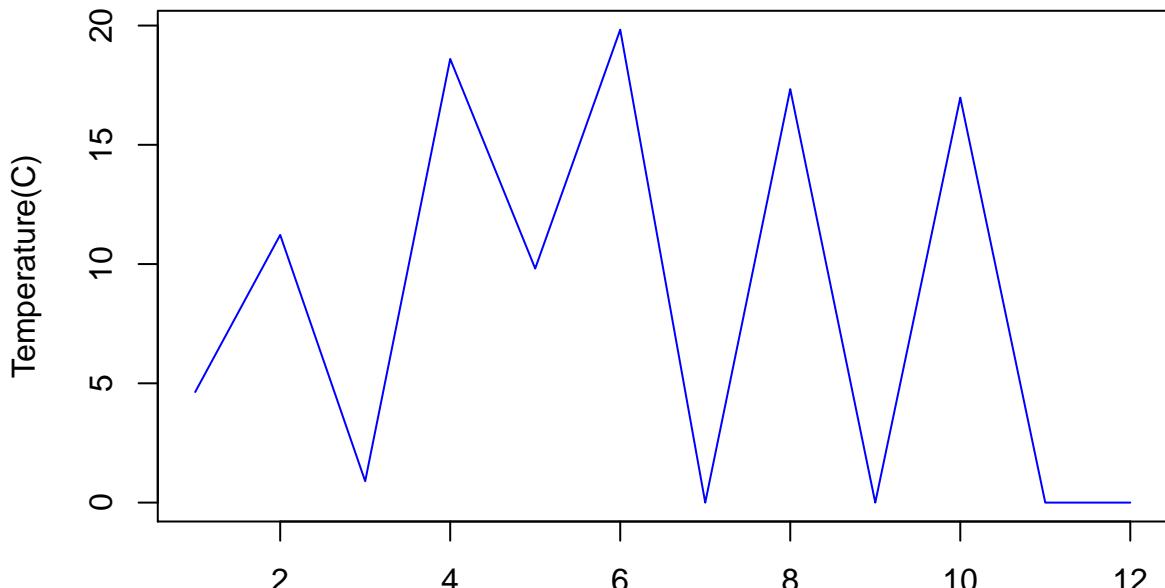
```

```

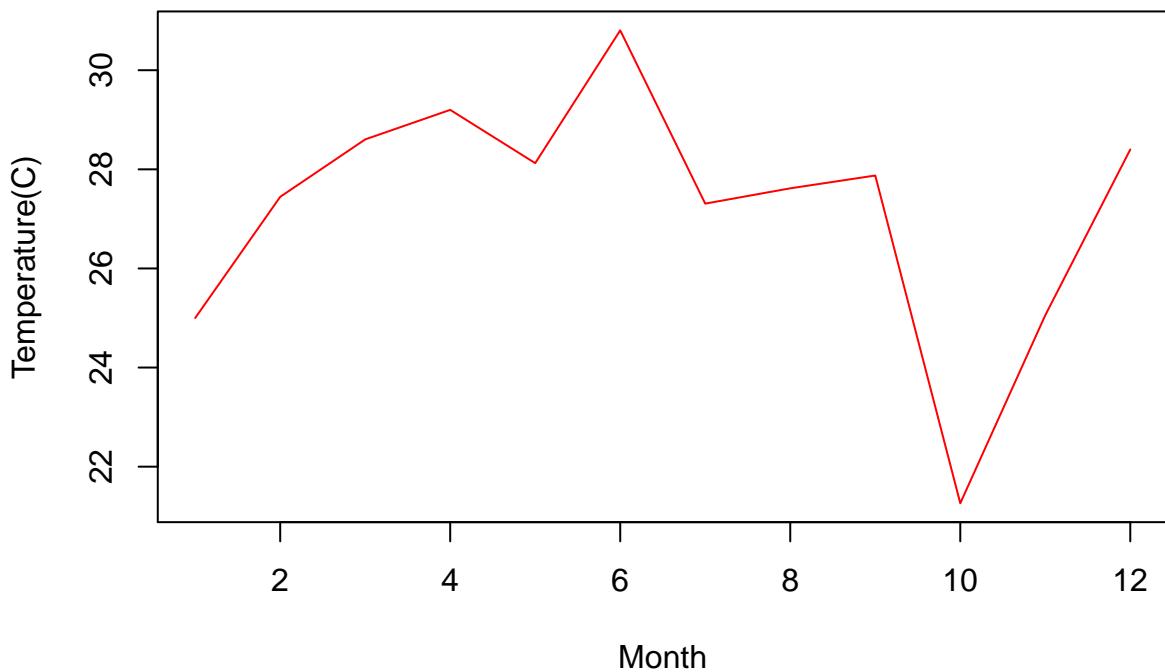
aug.temp = EDA.year[8,2:3]
#jan.temp = cbind(YEAR, jan.temp)
matrix.aug.temp = rbind(matrix.aug.temp , aug.temp)
matrix.jan.temp = rbind(matrix.jan.temp , jan.temp)
}

```

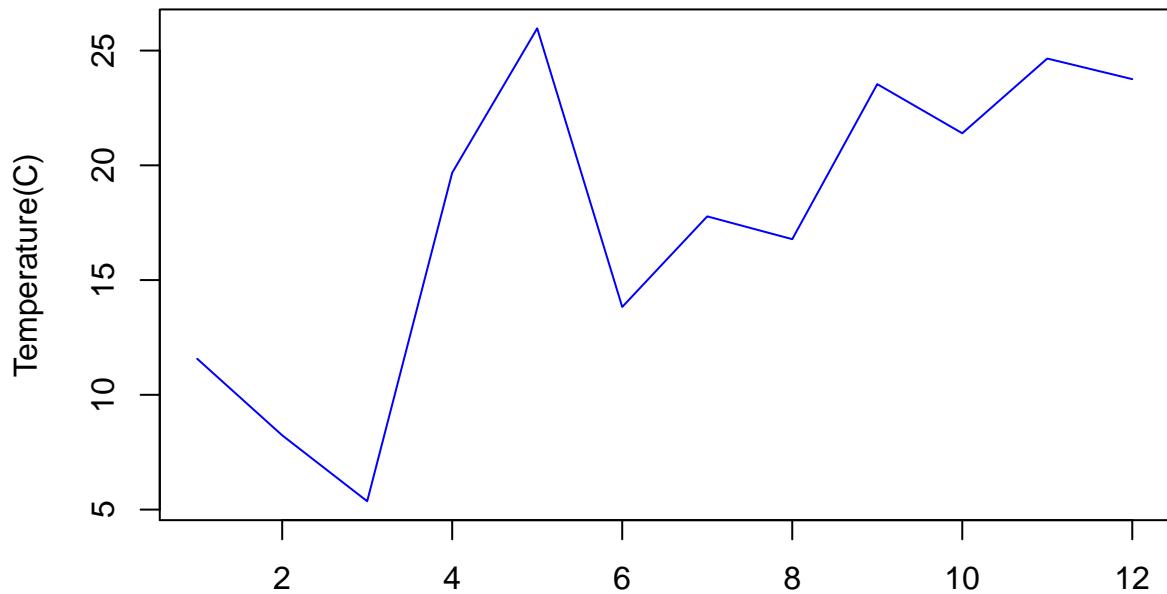
Average Sea Temperture of 2001



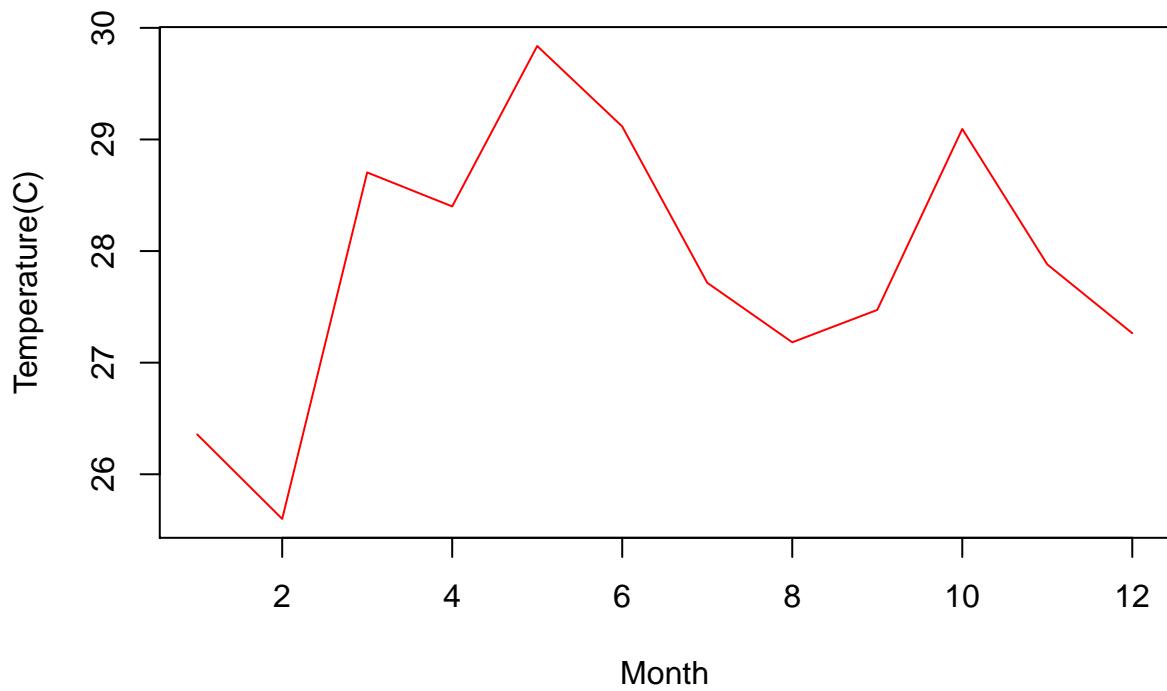
Average Air Temperture of 2001



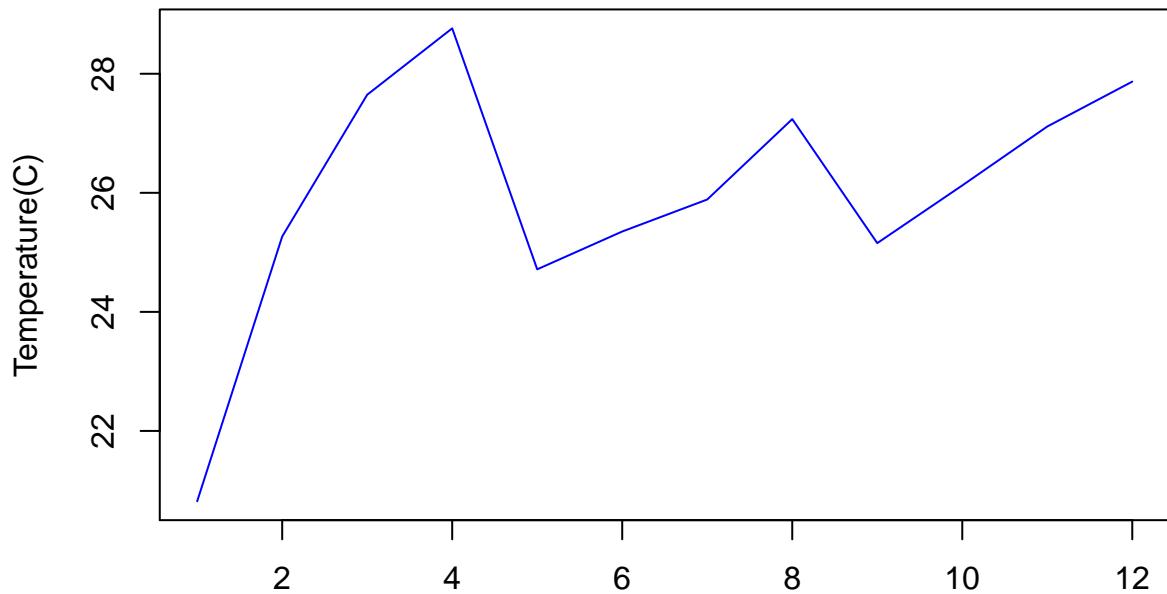
Average Sea Temperature of 2002



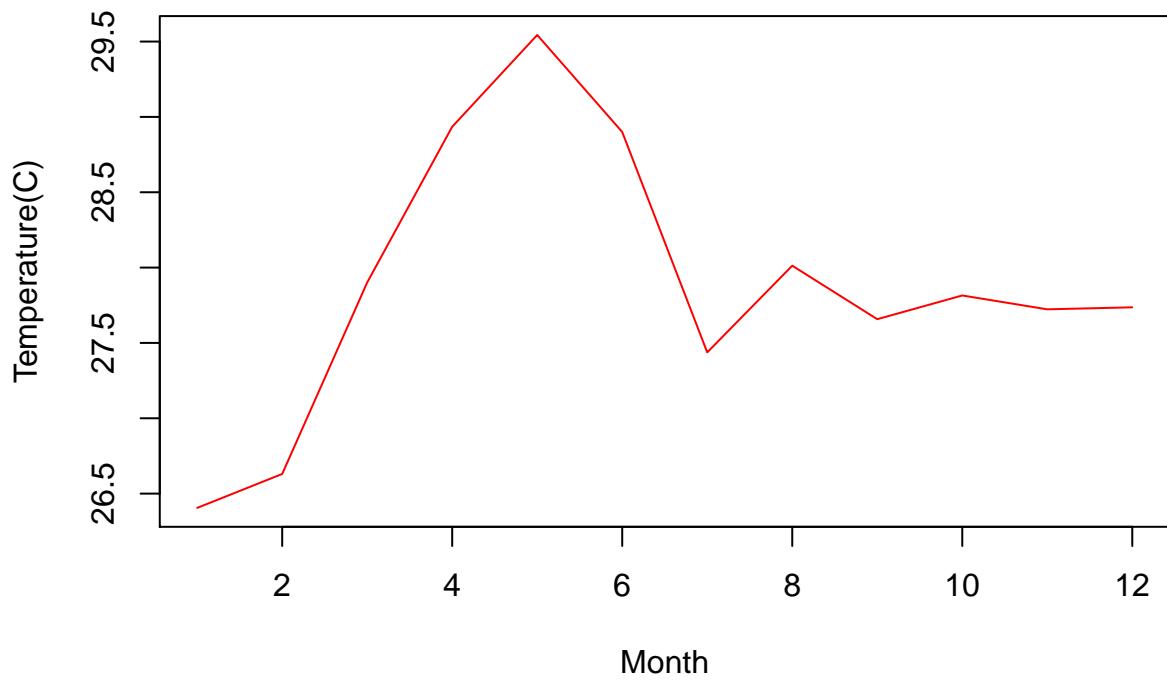
Average Air Temperature of 2002



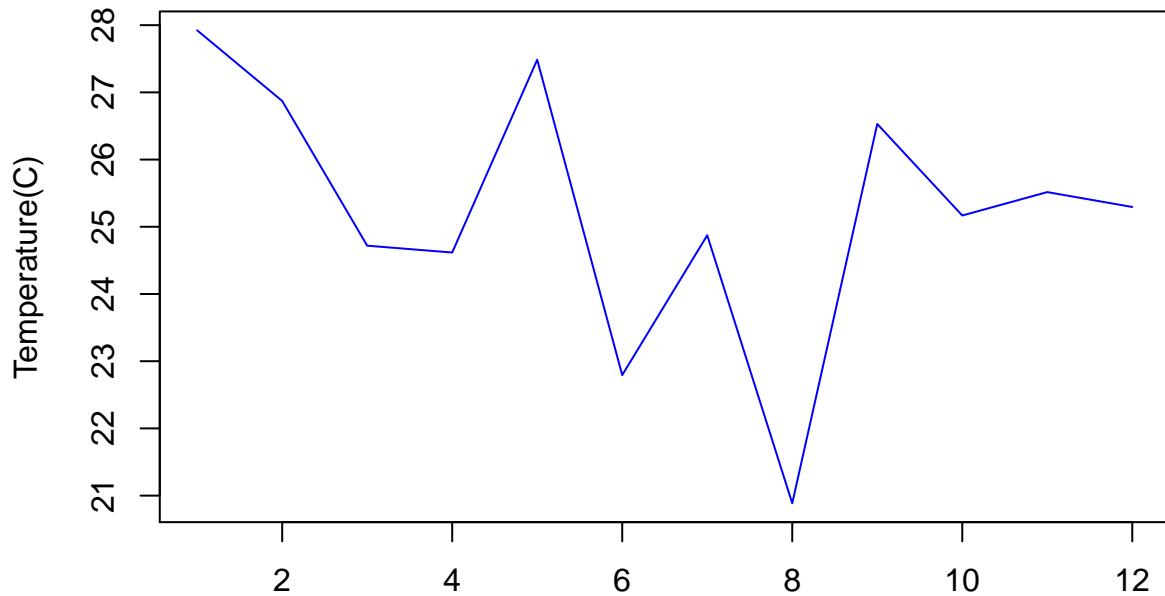
Average Sea Temperature of 2003



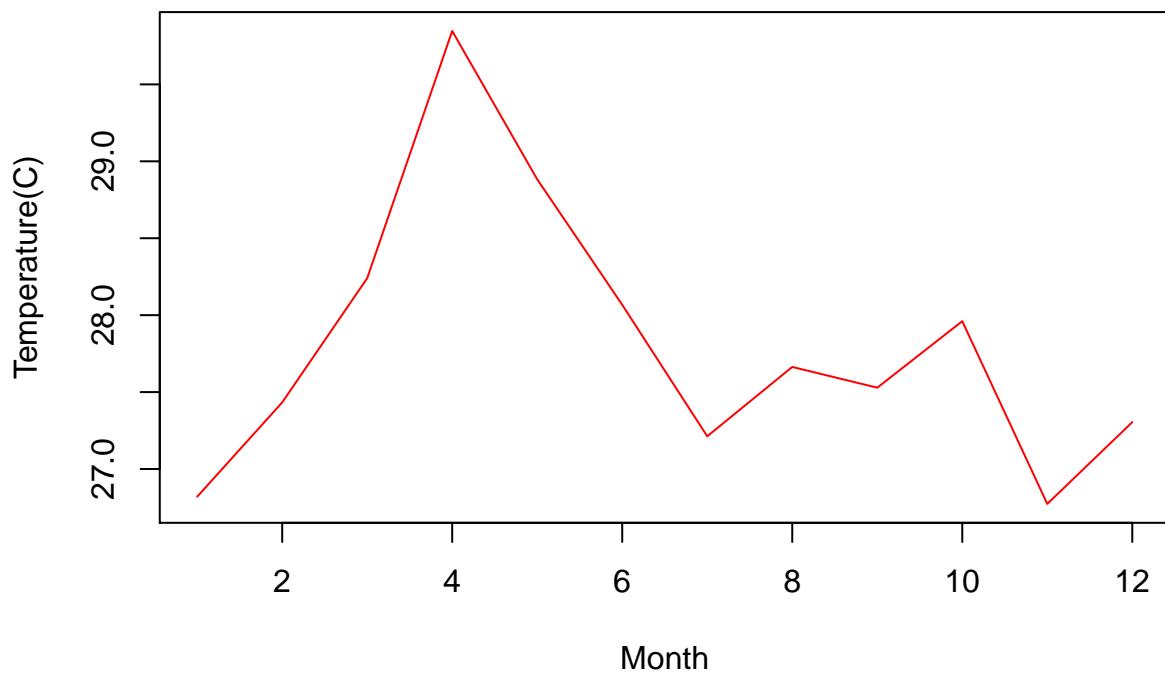
Average Air Temperature of 2003



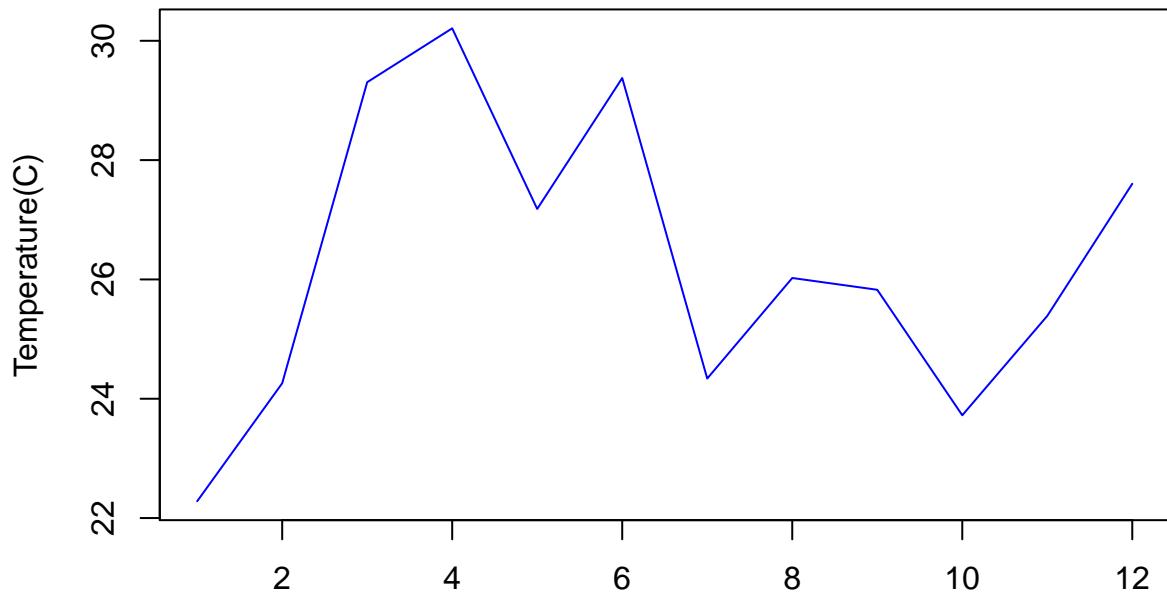
Average Sea Temperature of 2004



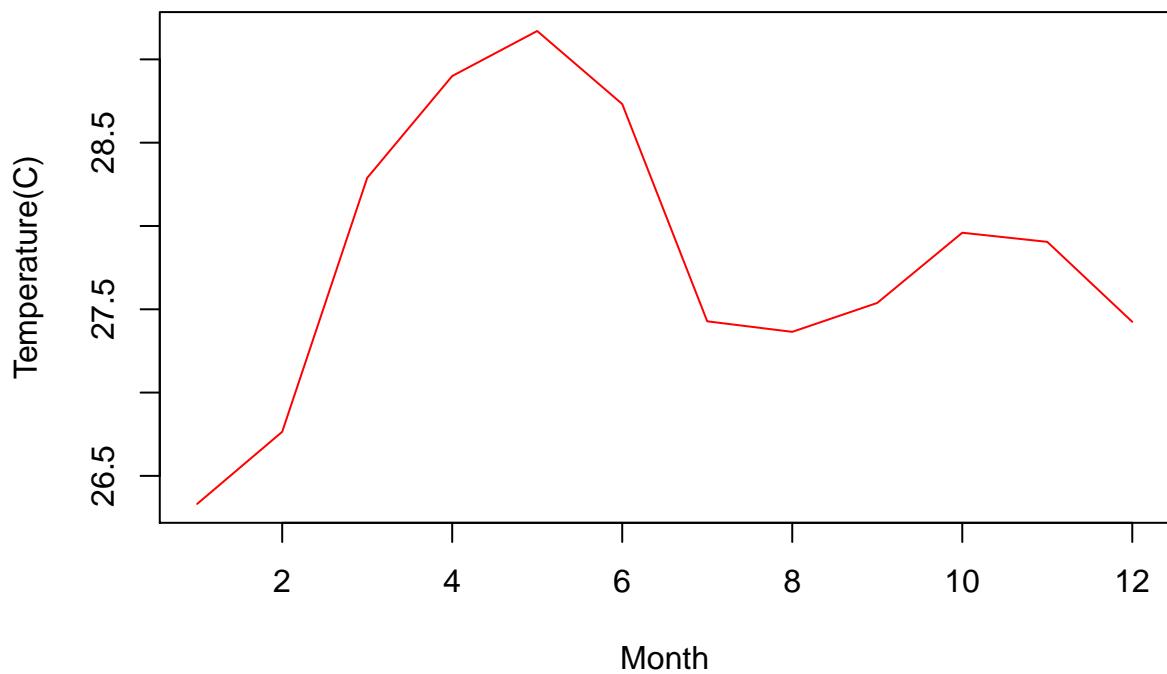
Average Air Temperature of 2004



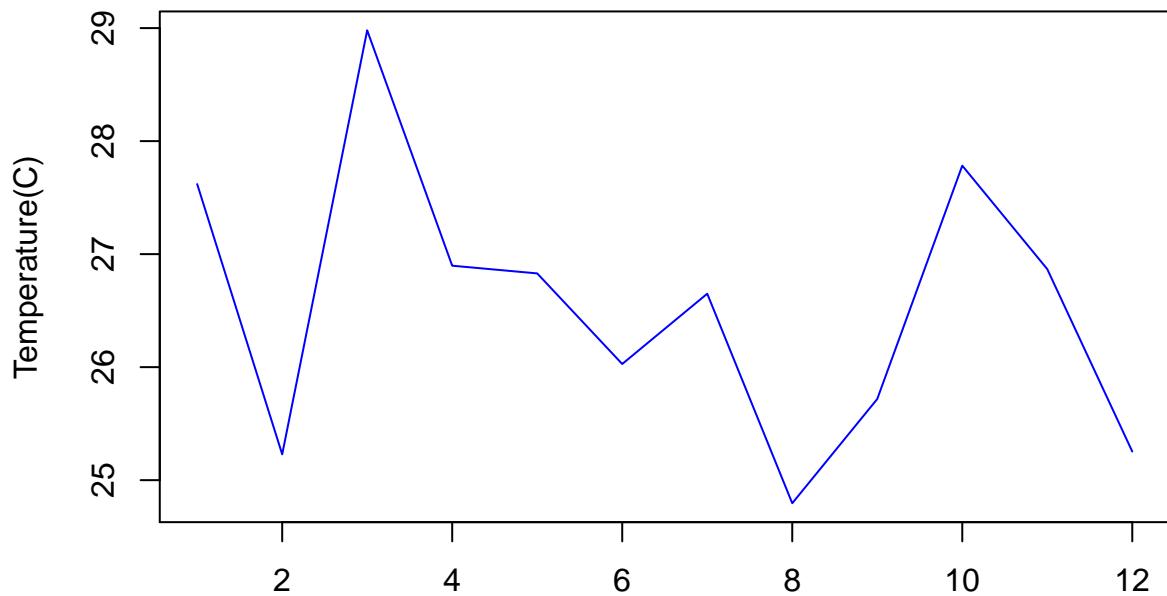
Average Sea Temperature of 2005



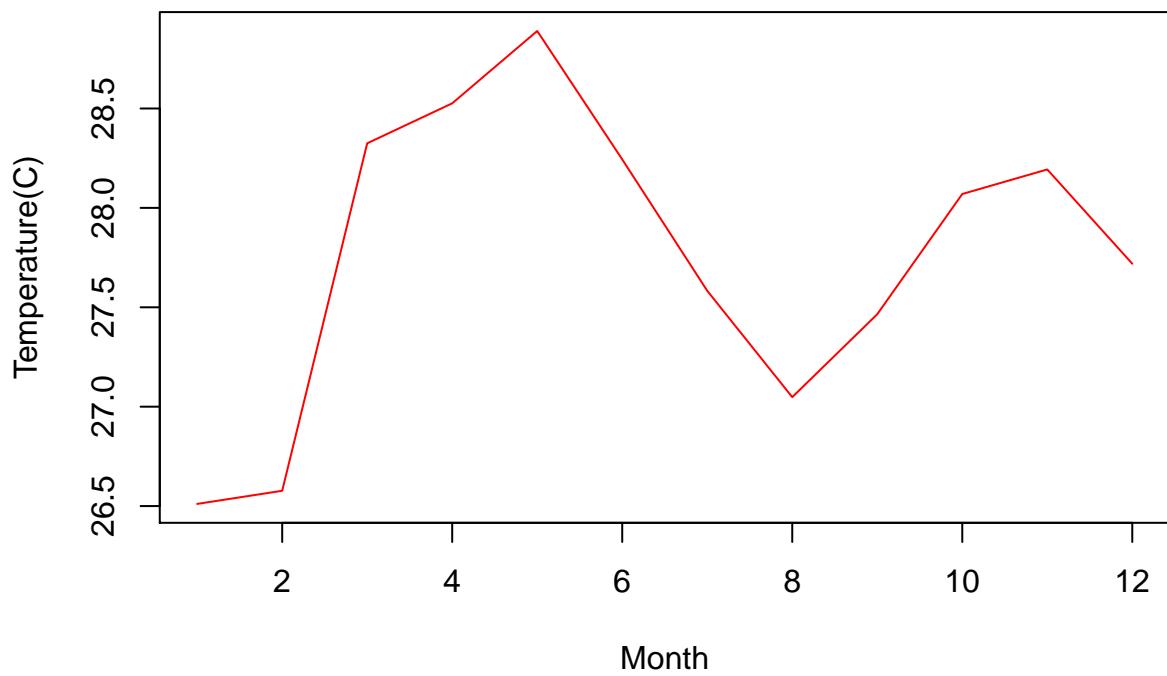
Average Air Temperature of 2005



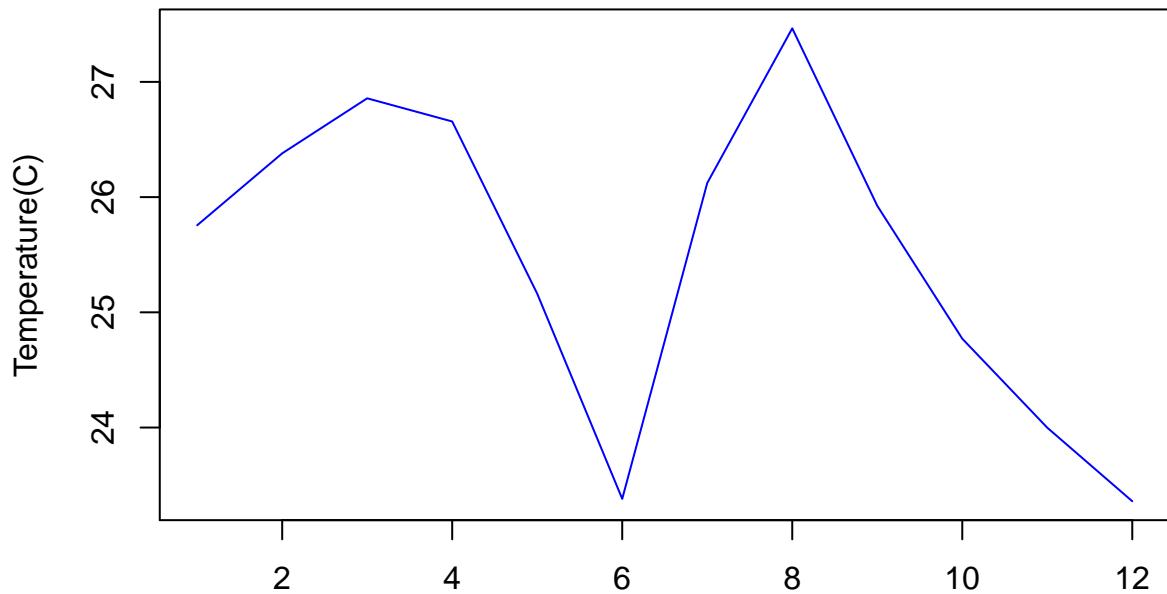
Average Sea Temperature of 2006



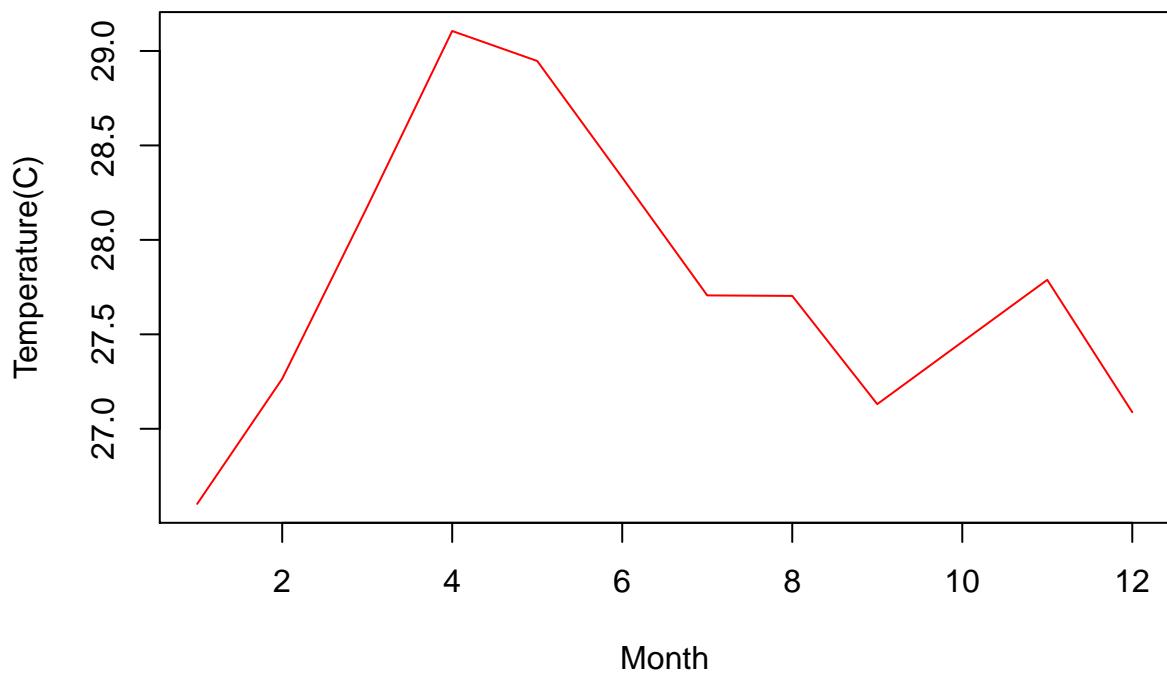
Average Air Temperature of 2006



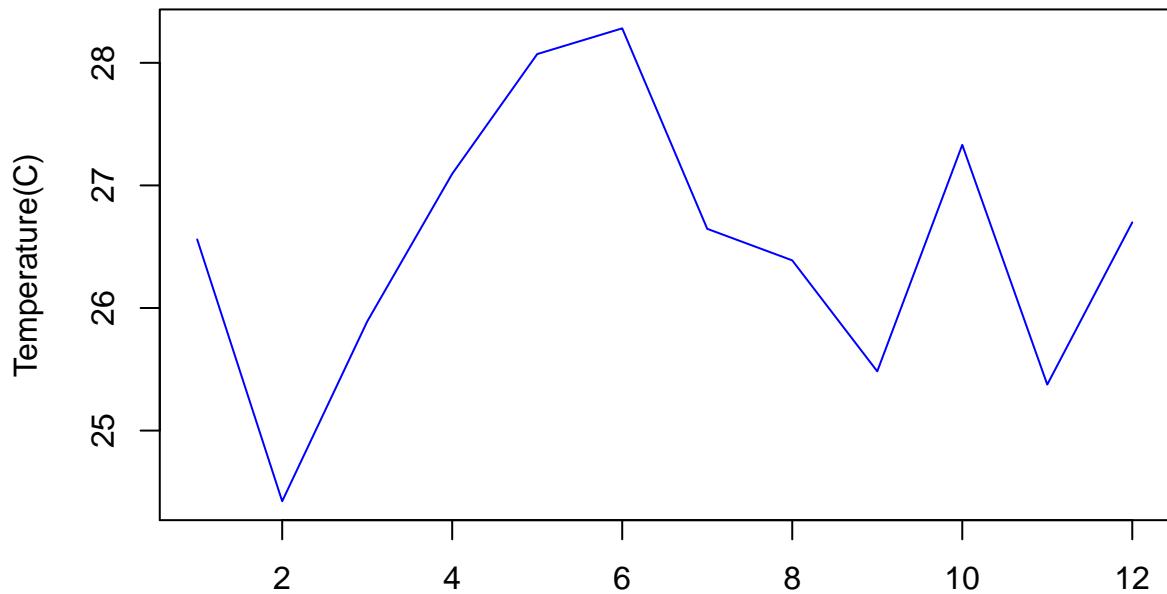
Average Sea Temperature of 2007



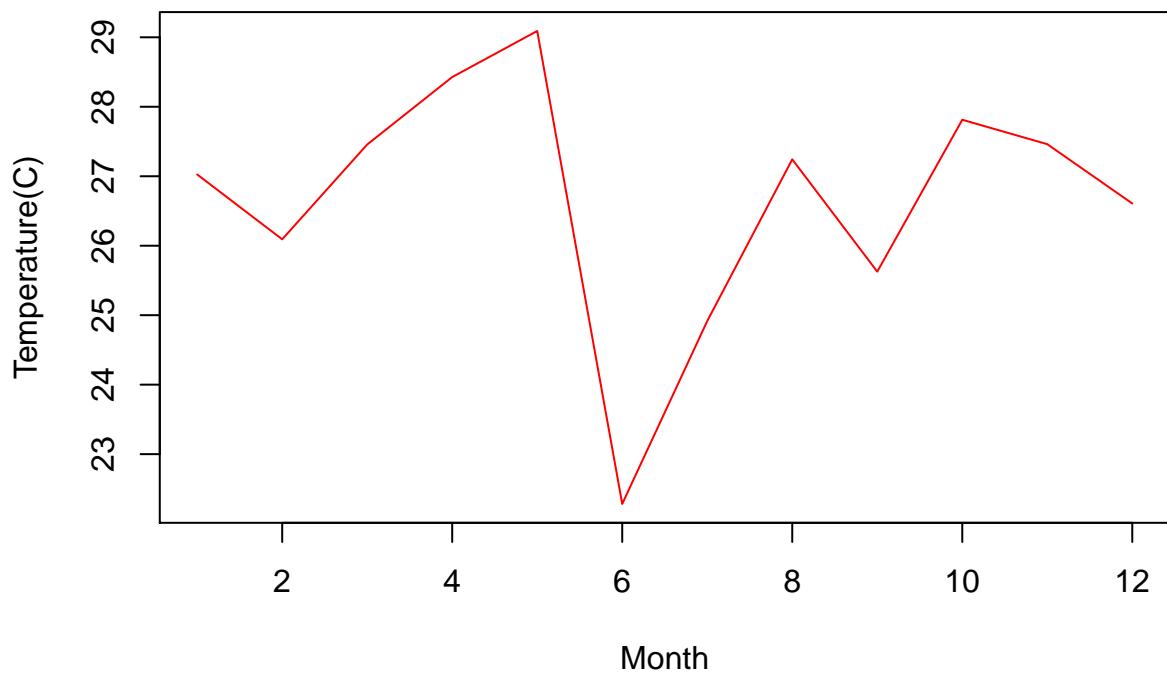
Average Air Temperature of 2007



Average Sea Temperature of 2008



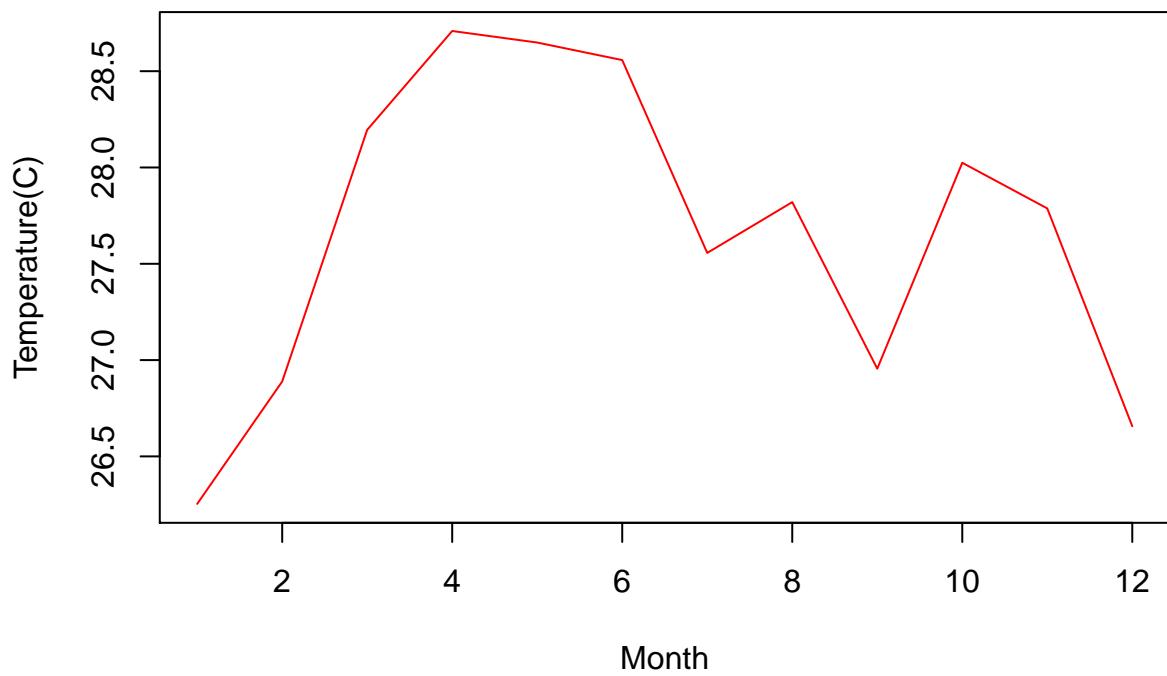
Average Air Temperature of 2008



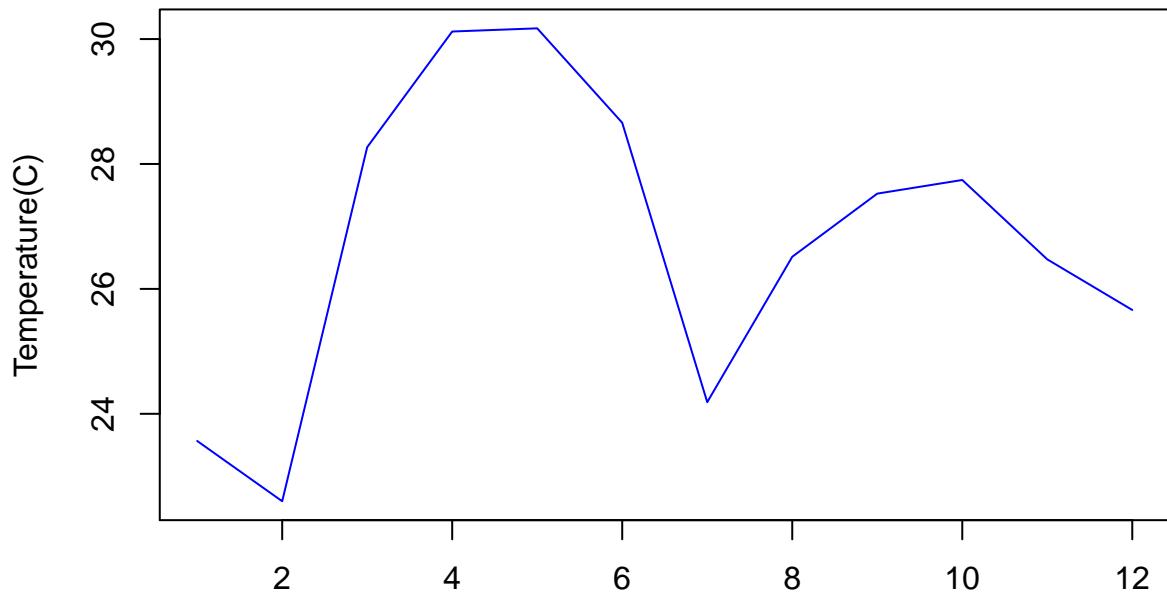
Average Sea Temperature of 2009



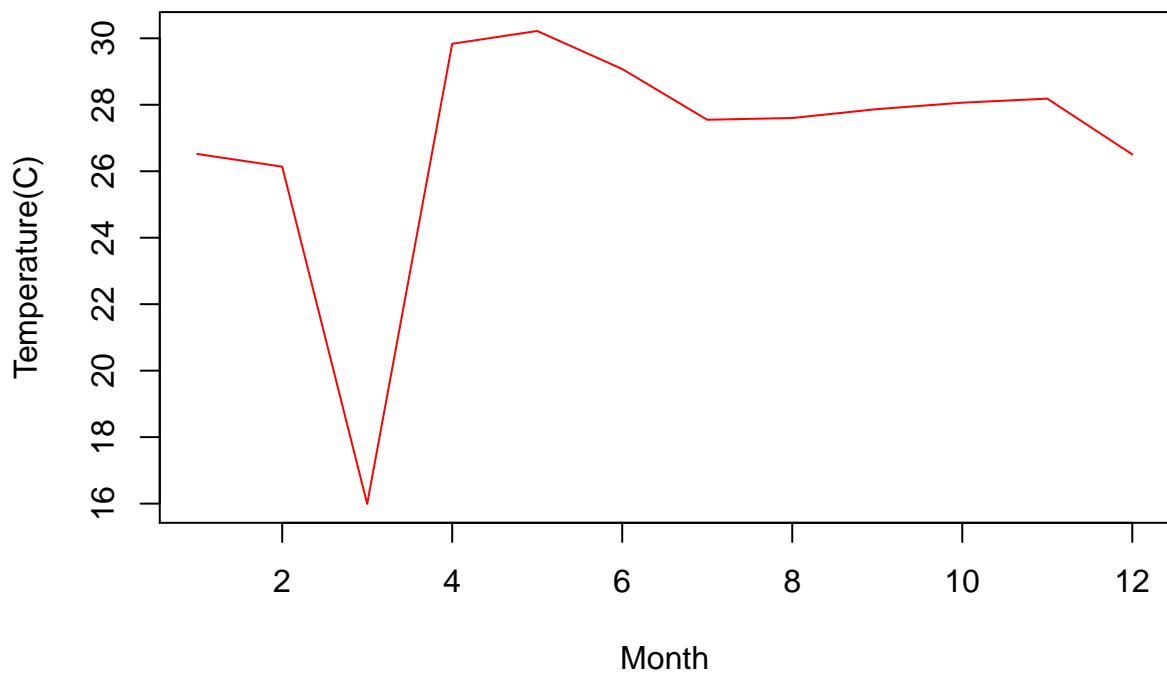
Average Air Temperature of 2009



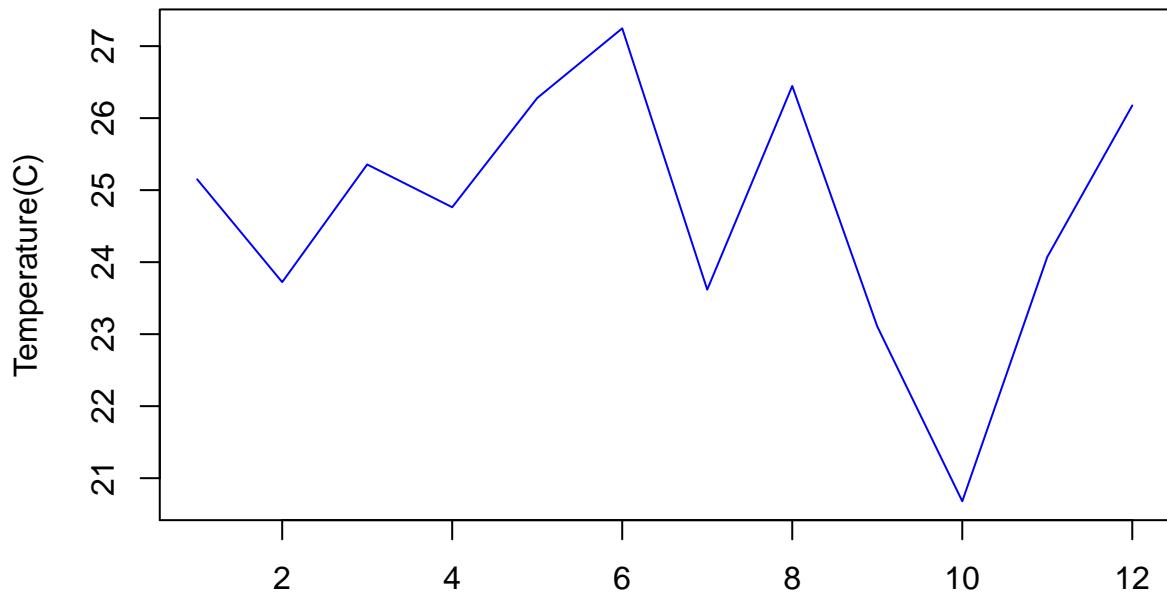
Average Sea Temperature of 2010



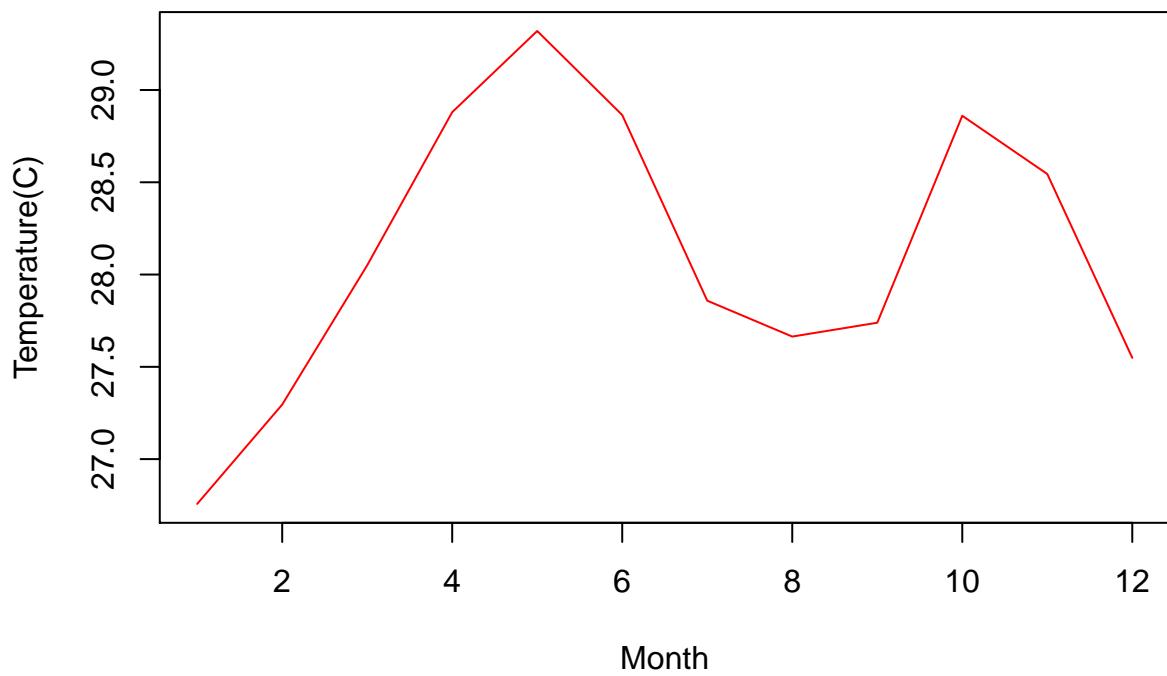
Average Air Temperature of 2010



Average Sea Temperature of 2011



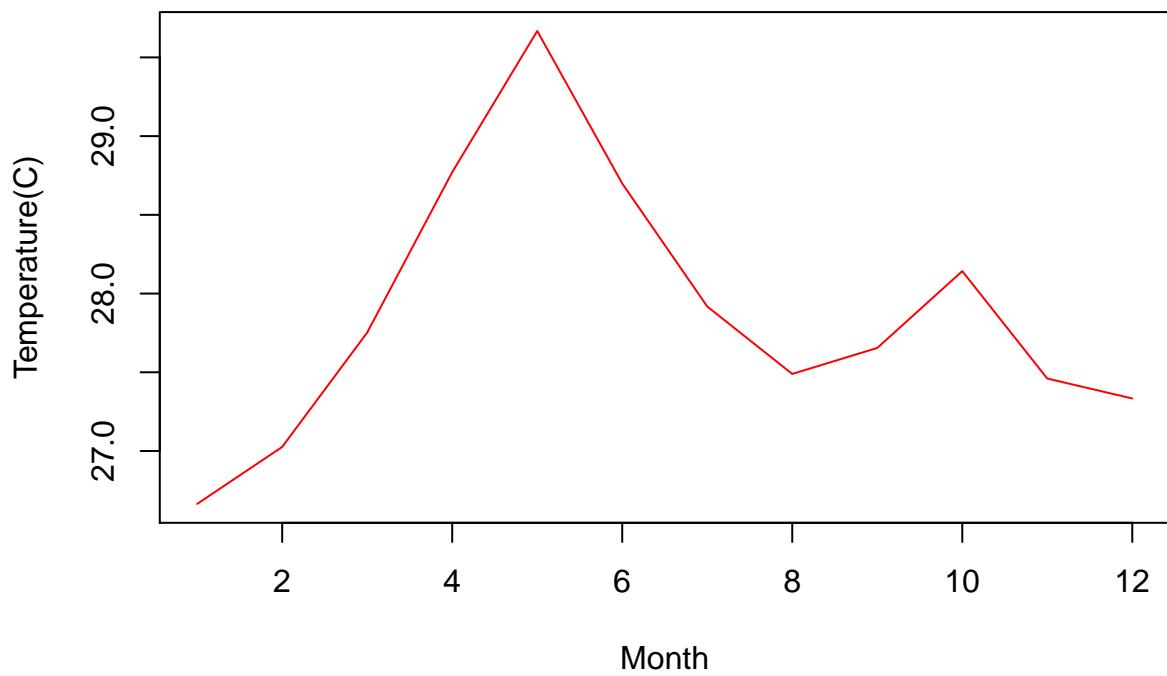
Average Air Temperature of 2011



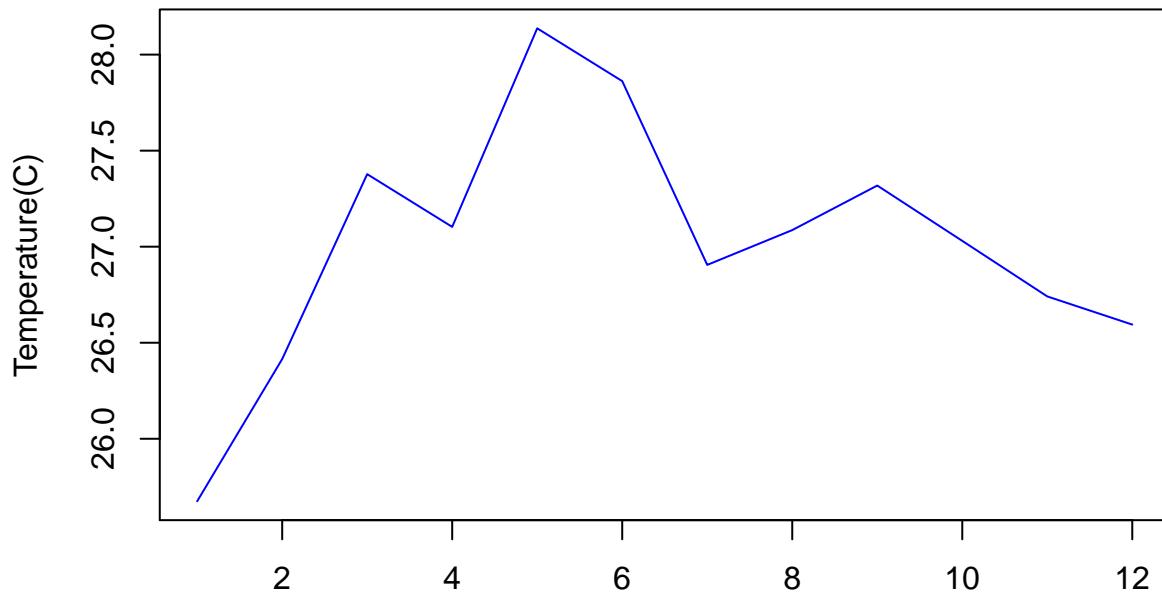
Average Sea Temperature of 2012



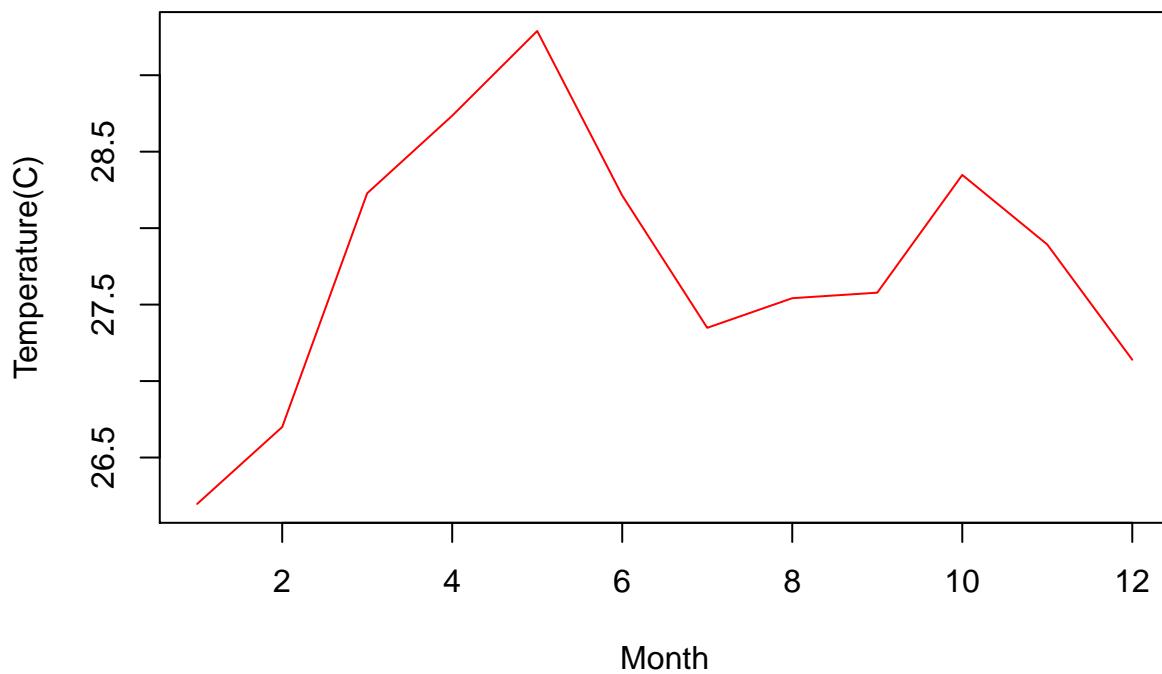
Average Air Temperature of 2012



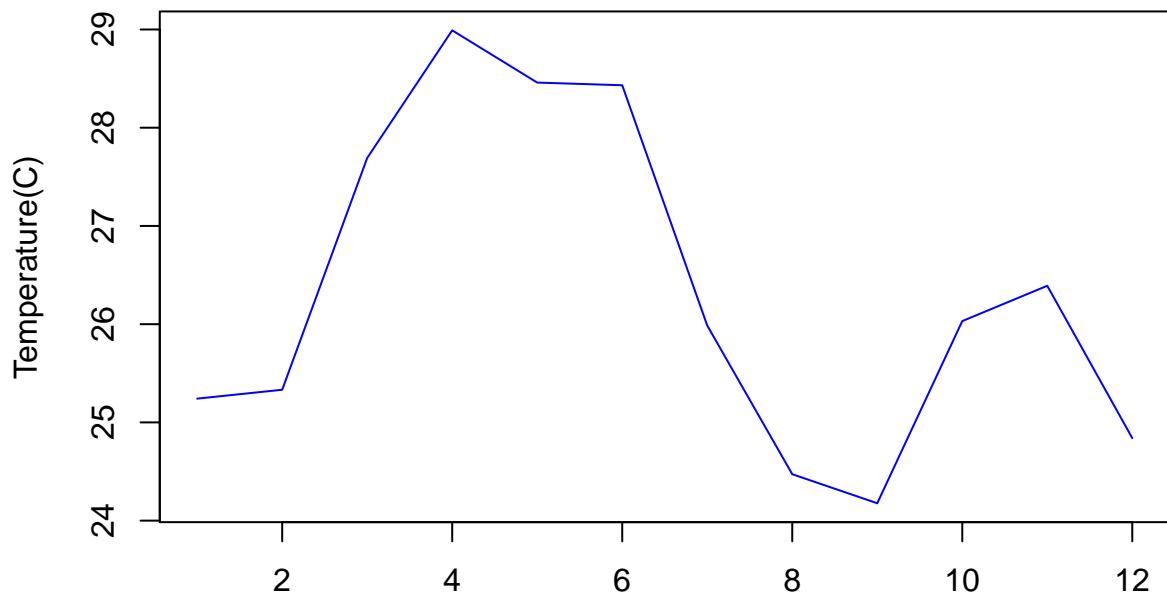
Average Sea Temperature of 2013



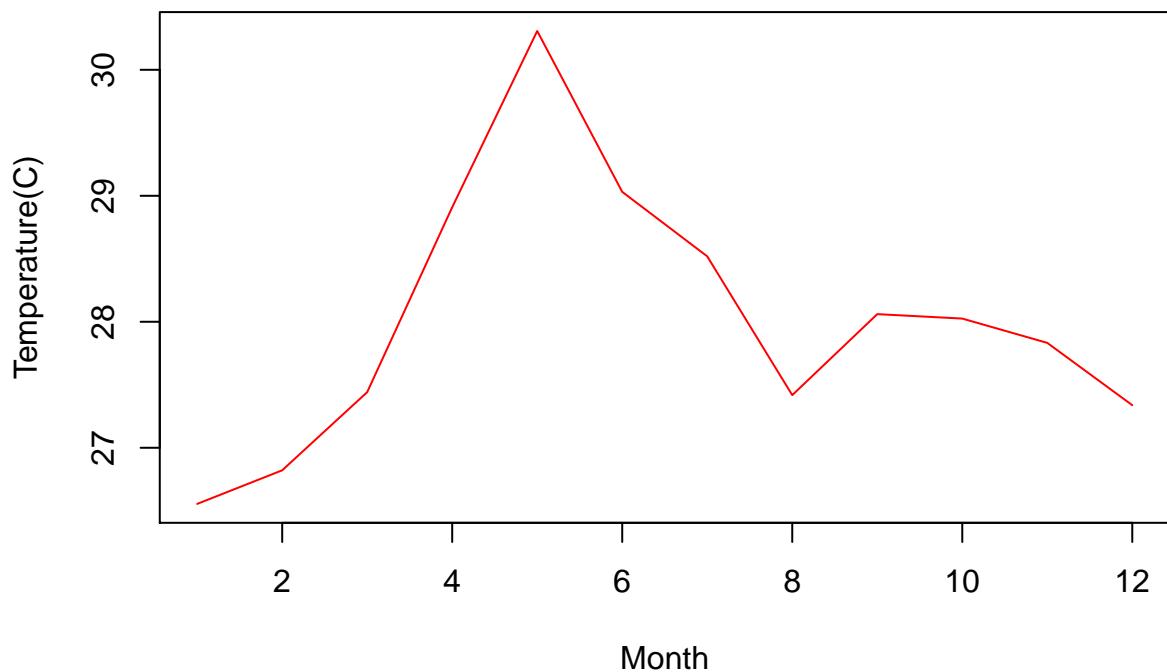
Average Air Temperature of 2013



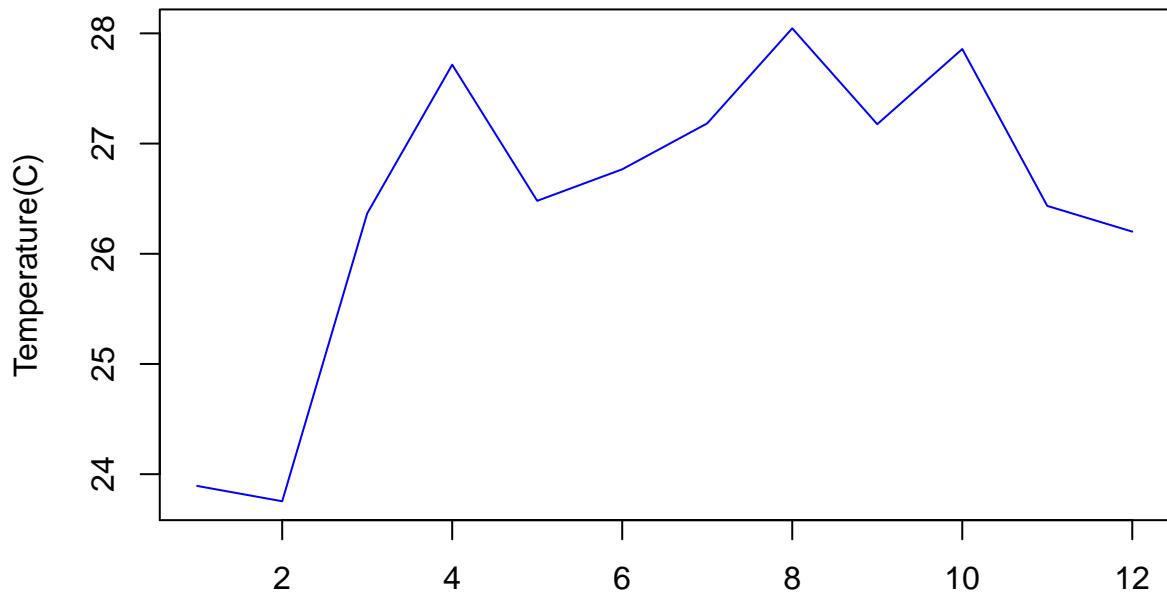
Average Sea Temperature of 2014



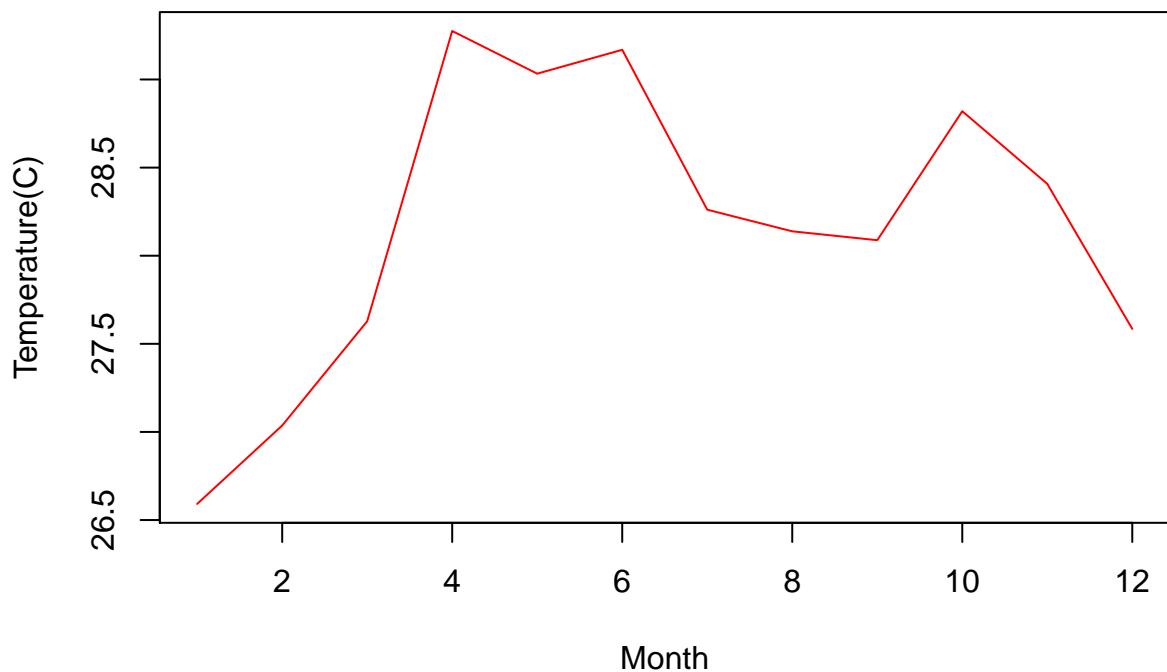
Average Air Temperature of 2014



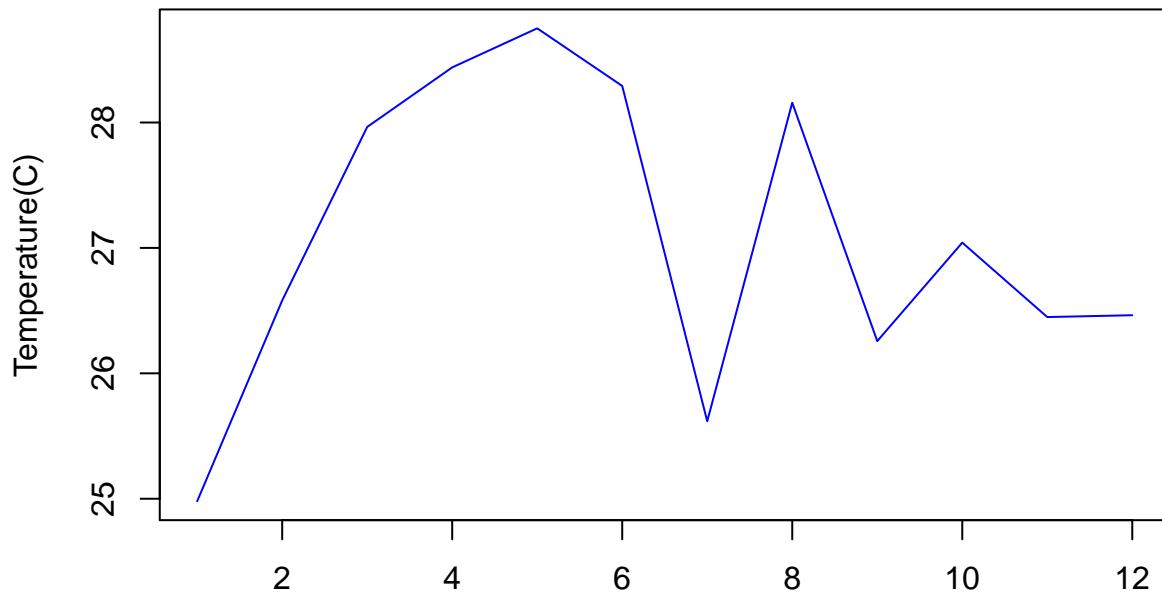
Average Sea Temperature of 2015



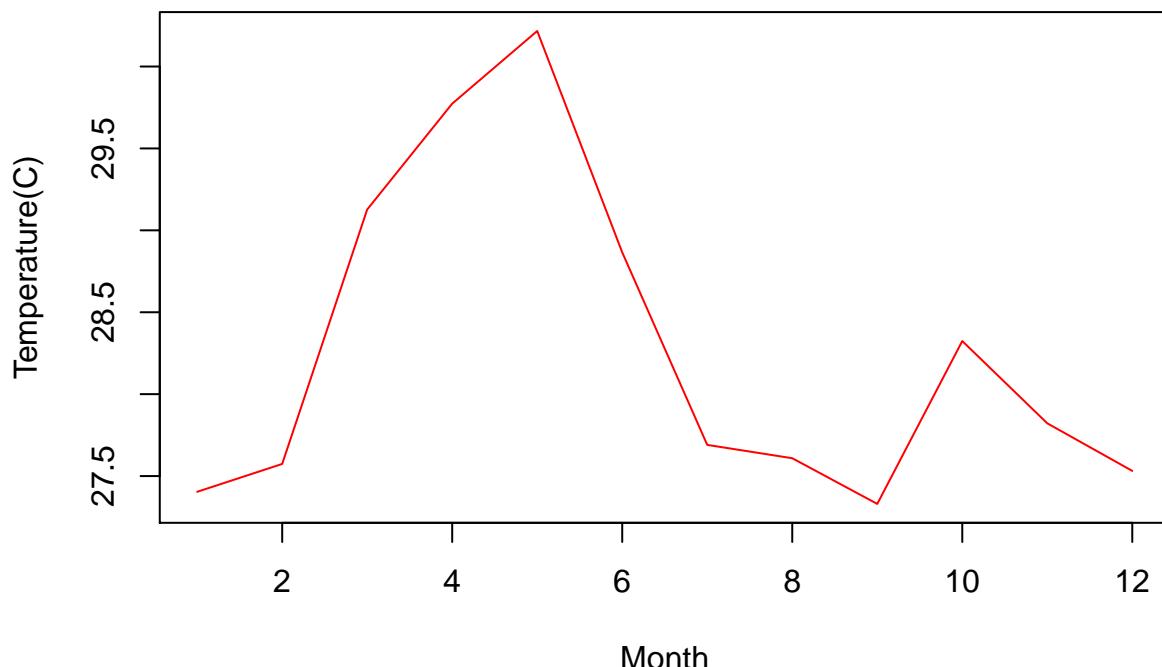
Average Air Temperature of 2015



Average Sea Temperature of 2016



Average Air Temperature of 2016



```
colnames(matrix.jan.temp) = c("Sea Temp" , "Air Temp")
rownames(matrix.jan.temp) = c("2001","2002","2003","2004","2005","2006","2007","2008","2009","2010","2011","2012","2013","2014","2015","2016")

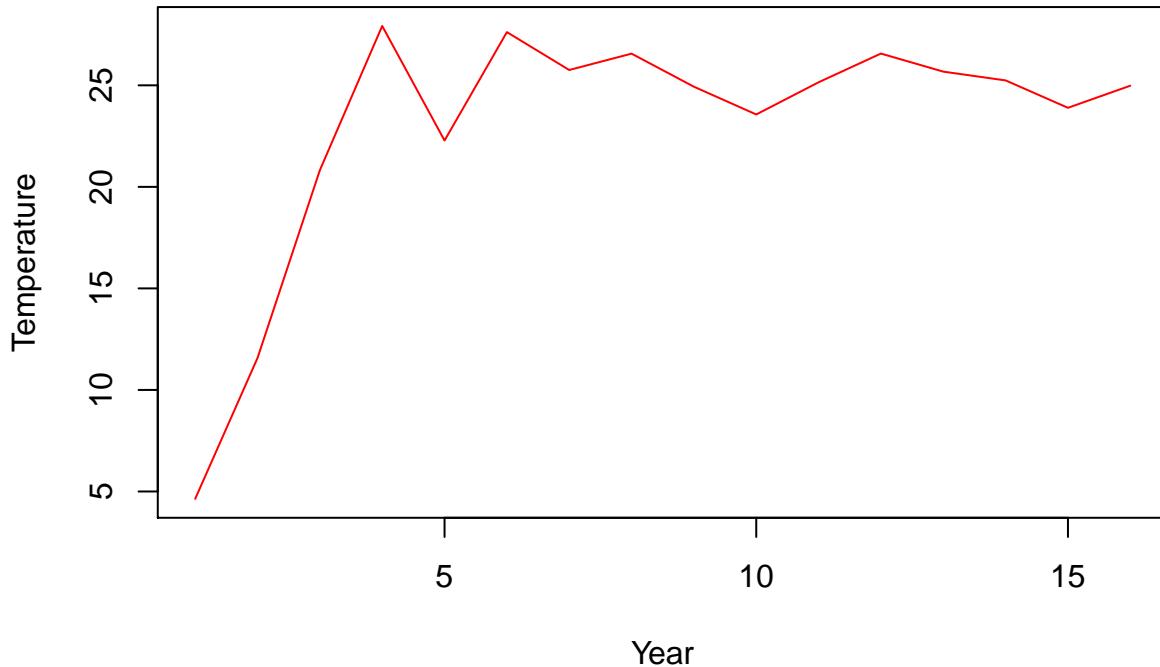
colnames(matrix.aug.temp) = c("Sea Temp" , "Air Temp")
rownames(matrix.aug.temp) = c("2001","2002","2003","2004","2005","2006","2007","2008","2009","2010","2011","2012","2013","2014","2015","2016")
```

```
##### graphing the average tempruturs of JAN AND JUL across 16 years in a gragh.
```

```
#lines(matrix.jan.temp[,1])
```

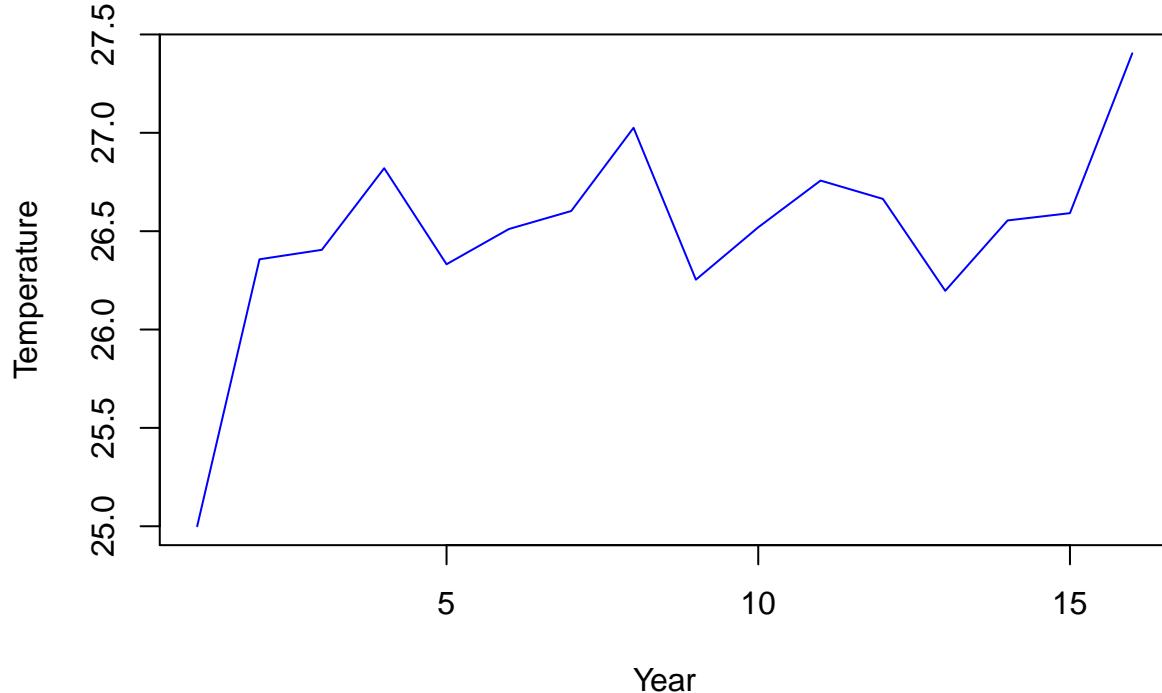
```
plot(matrix.jan.temp[,1], type = "l", main = "Average Sea Tempreture of Jaunuary" , xlab = "Year", yla
```

Average Sea Tempreture of Jaunuary



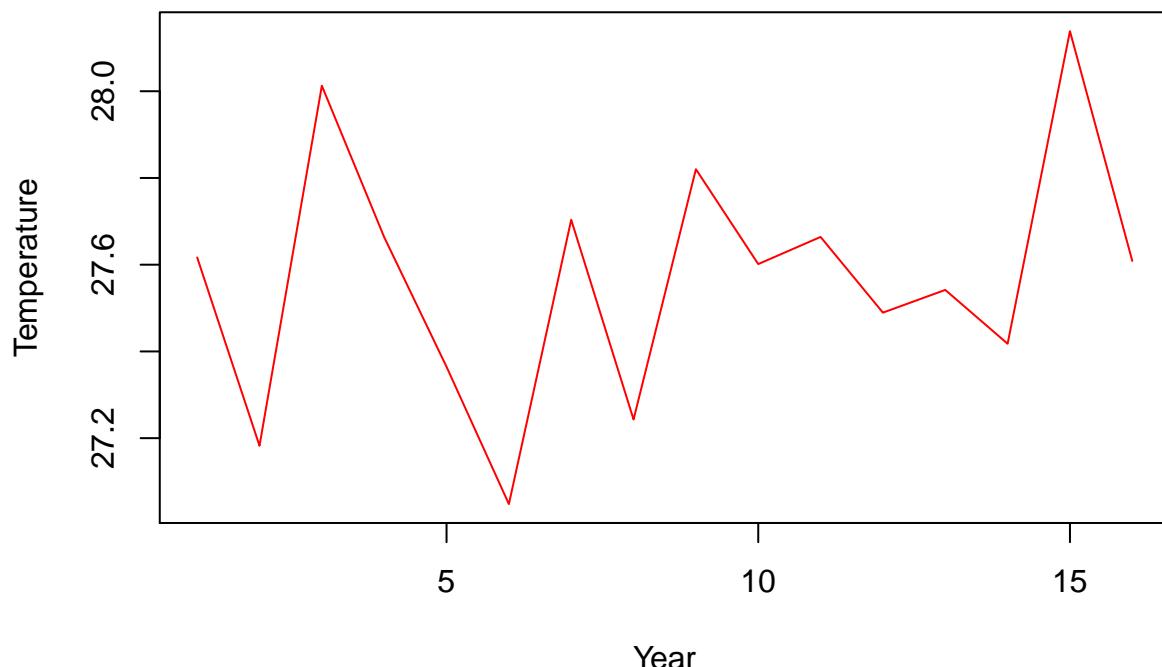
```
plot(matrix.jan.temp[,2], type = "l", main = "Average Air Tempreture of Jaunuary" , xlab = "Year", yla
```

Average Air Temperture of Jaunuary



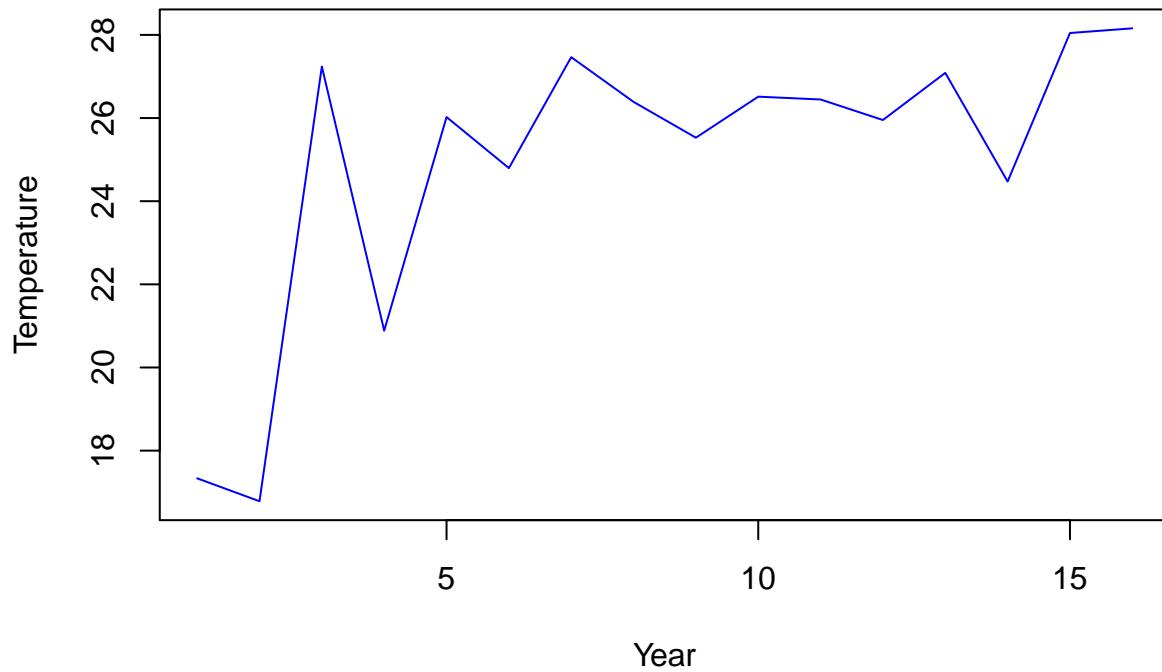
```
plot(matrix.aug.temp[,2], type = "l", main = "Average Air Temperture of August" , xlab = "Year", ylab = "Temperature")
```

Average Air Temperture of August



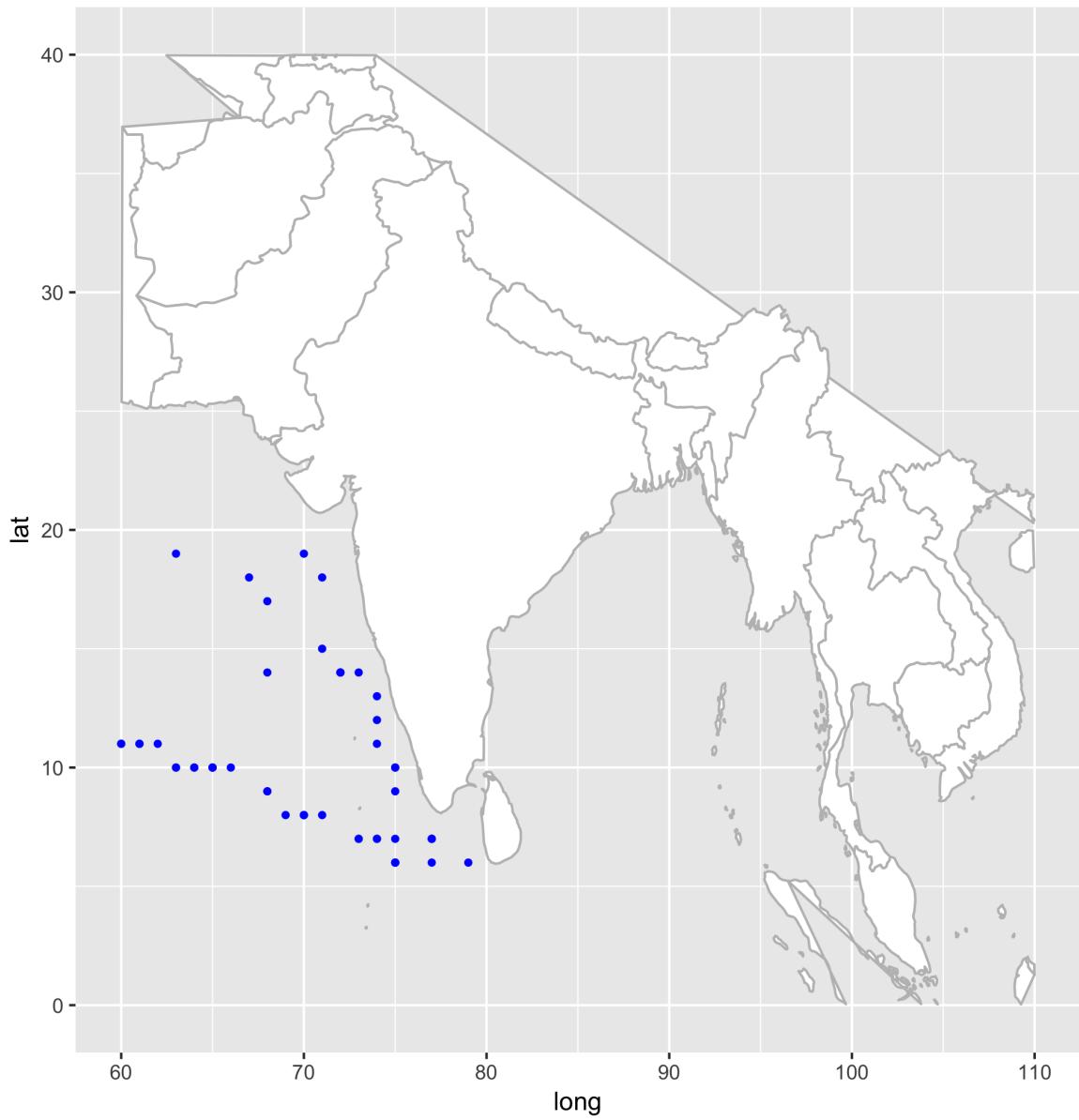
```
plot(matrix.aug.temp[,1], type = "l", main = "Average Sea Temperture of August" , xlab = "Year", ylab = "Temperature")
```

Average Sea Temperature of August

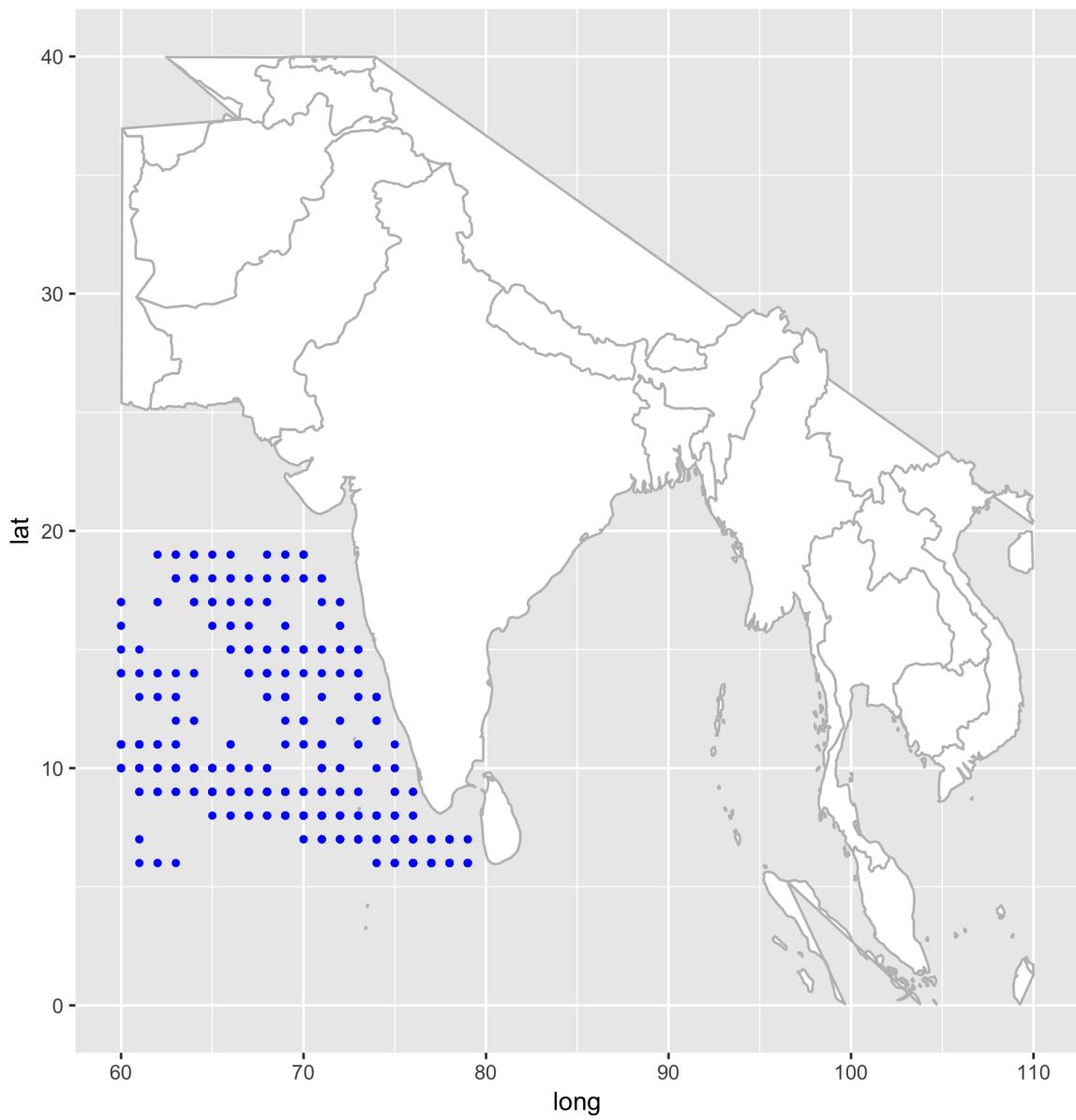


All Maps generated from 2001 to 2016

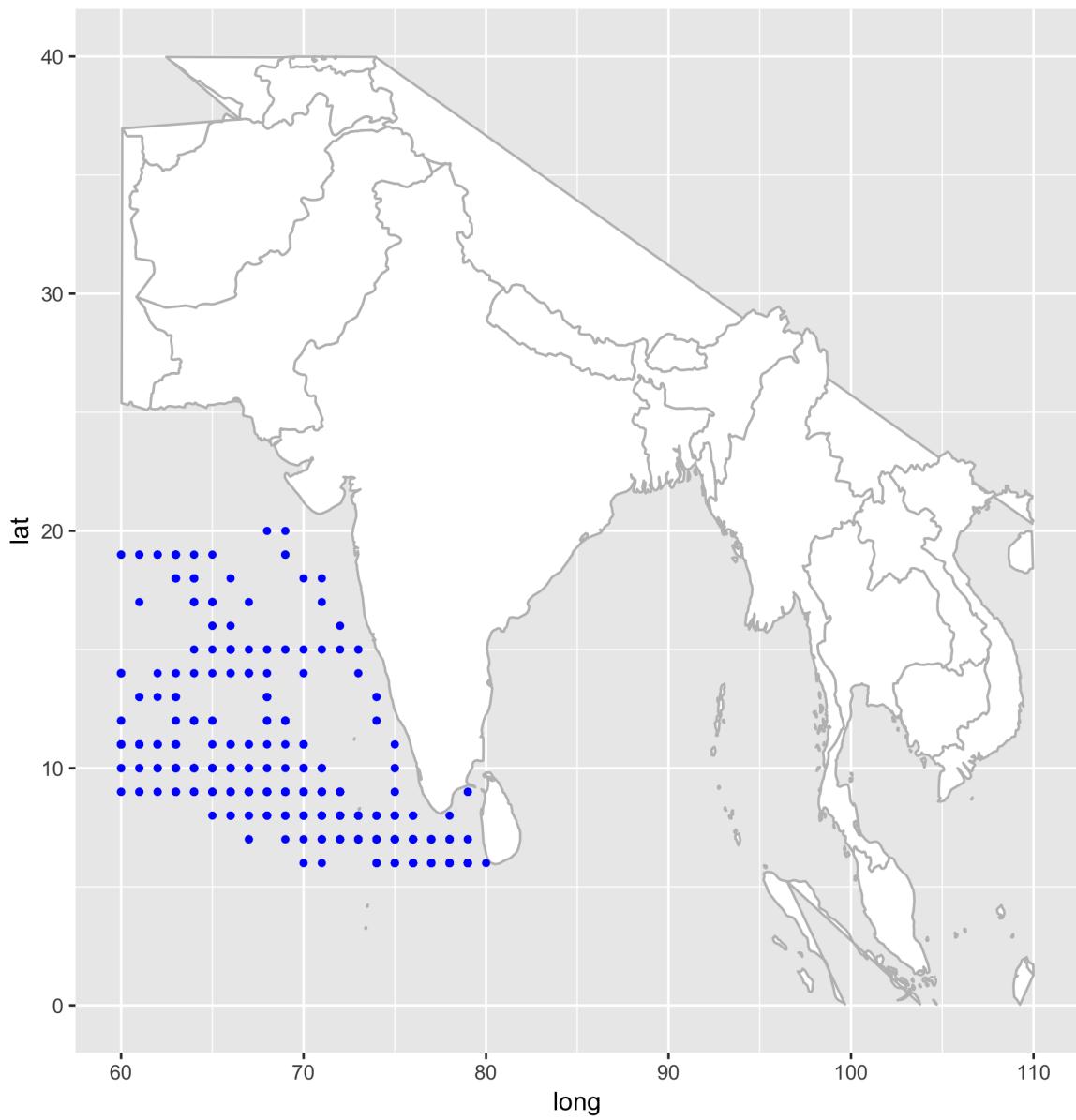
Subcontinent West 2001



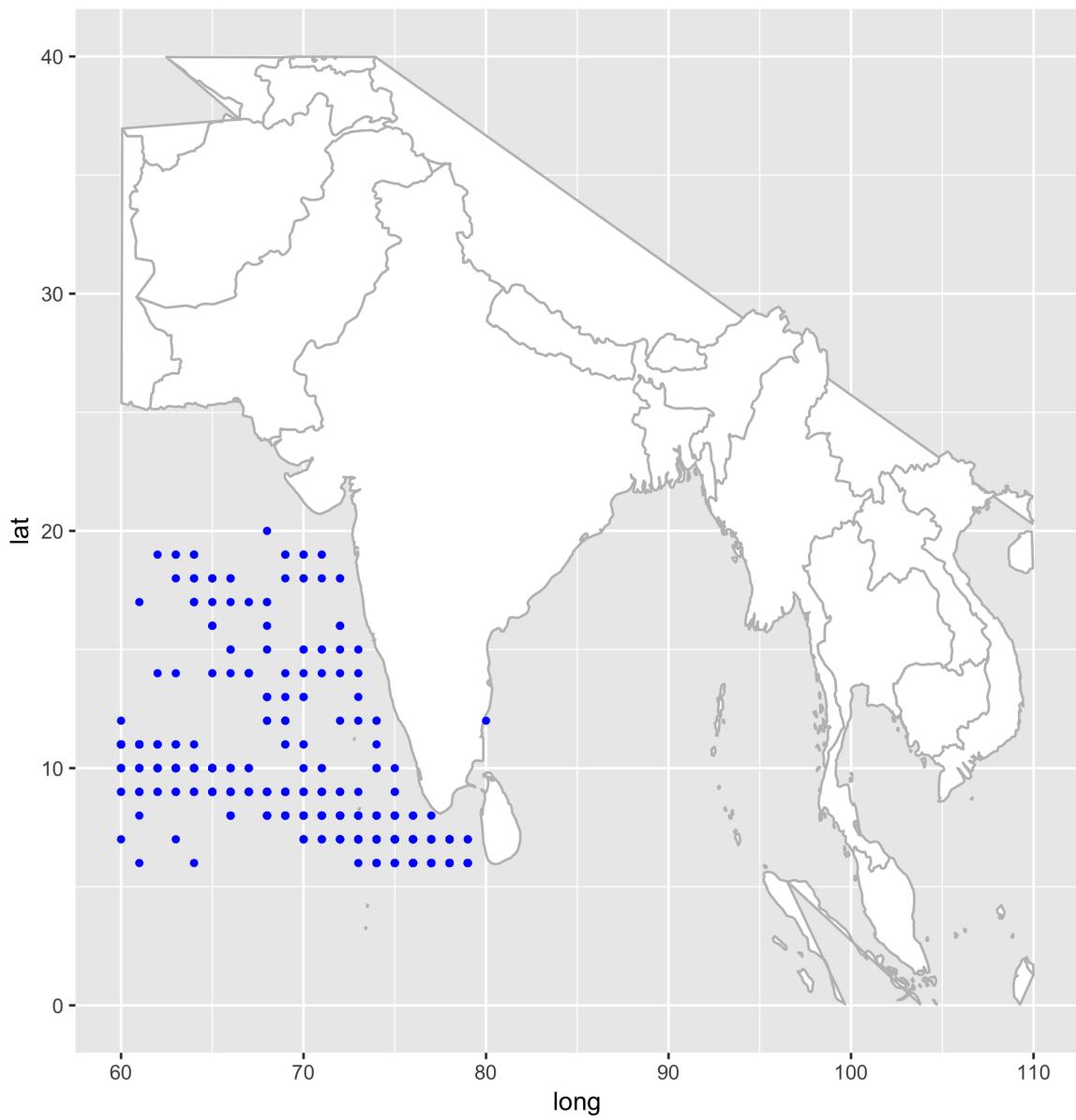
Subcontinent West 2003



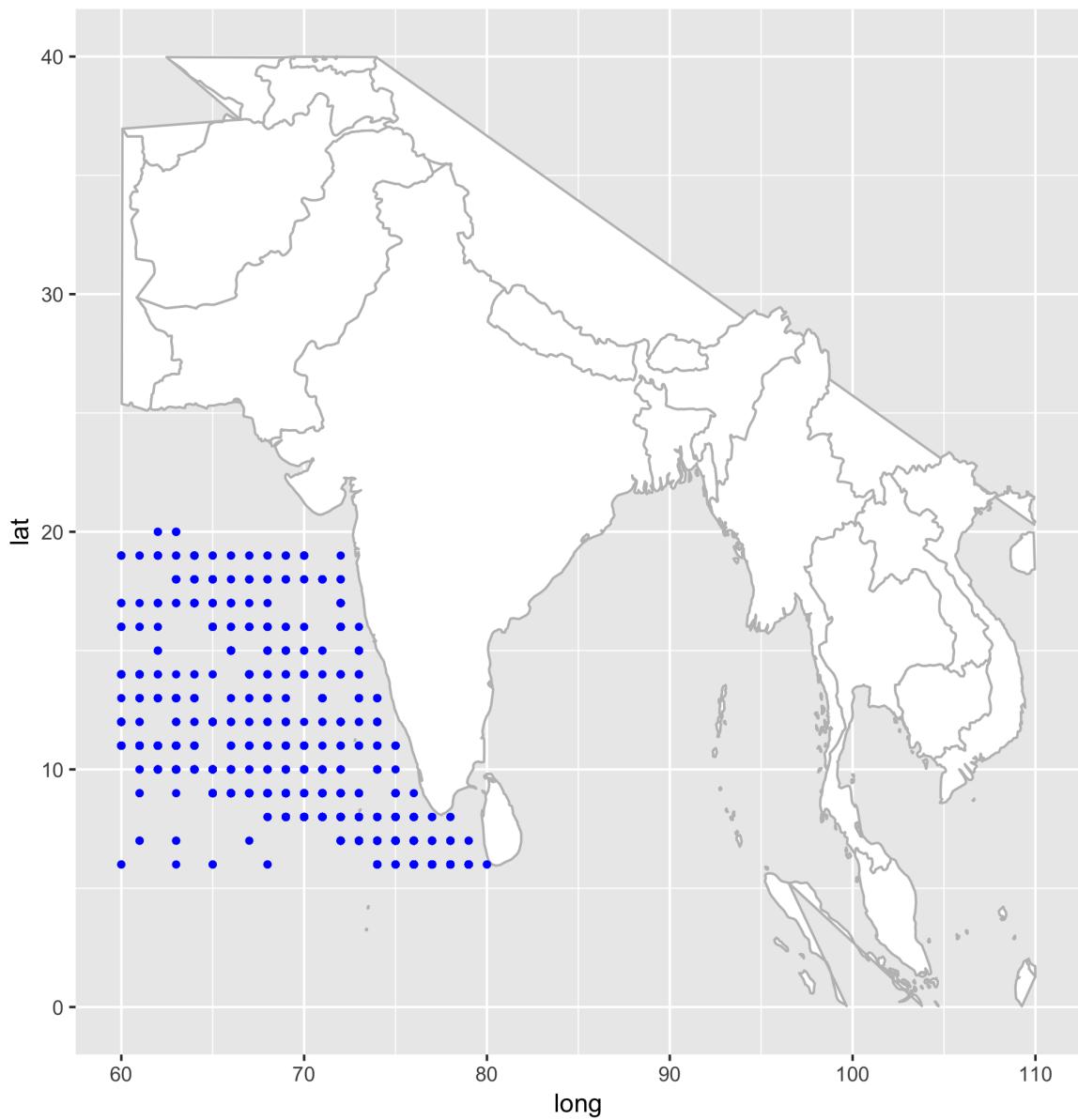
Subcontinent West 2004



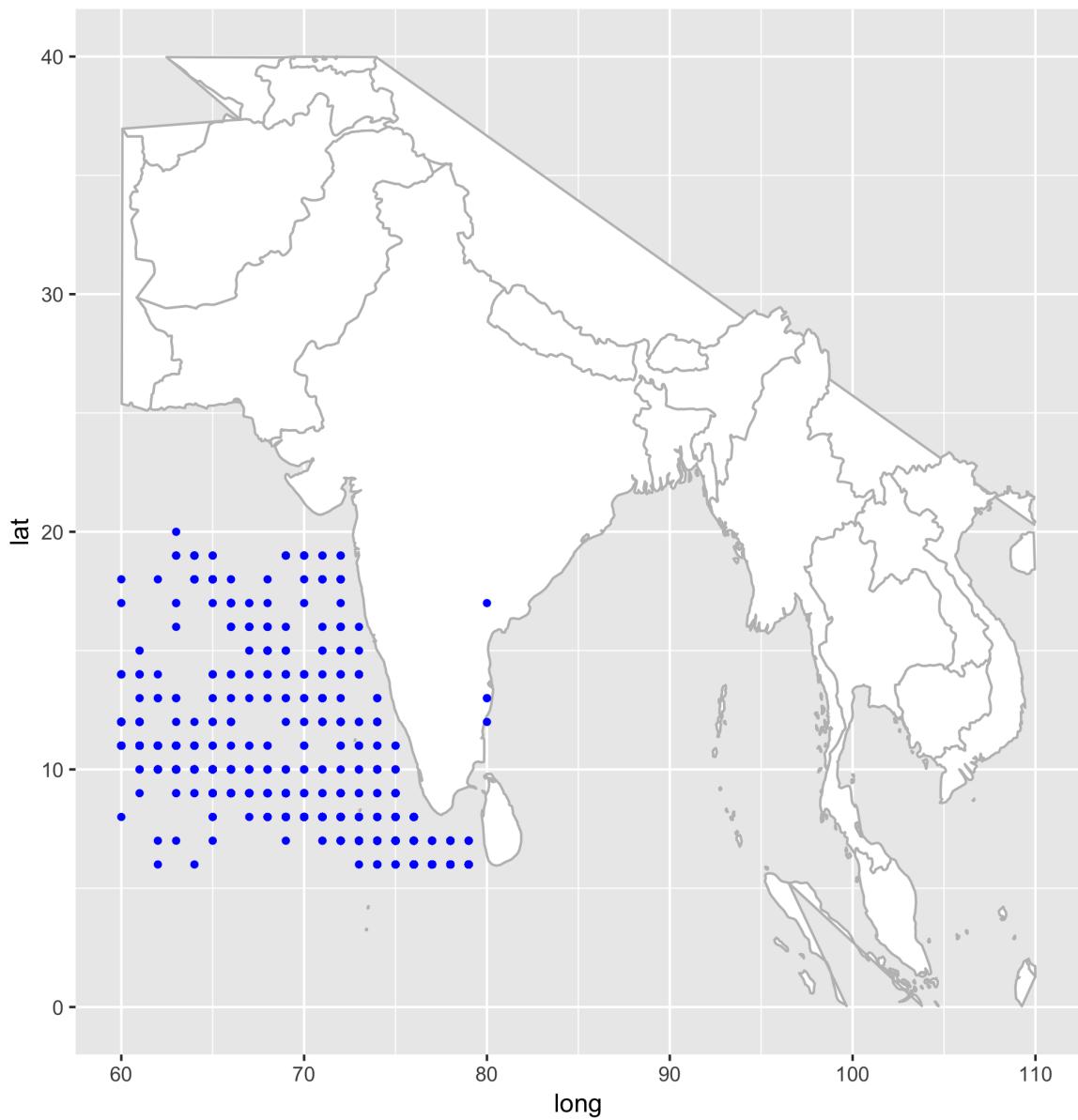
Subcontinent West 2005



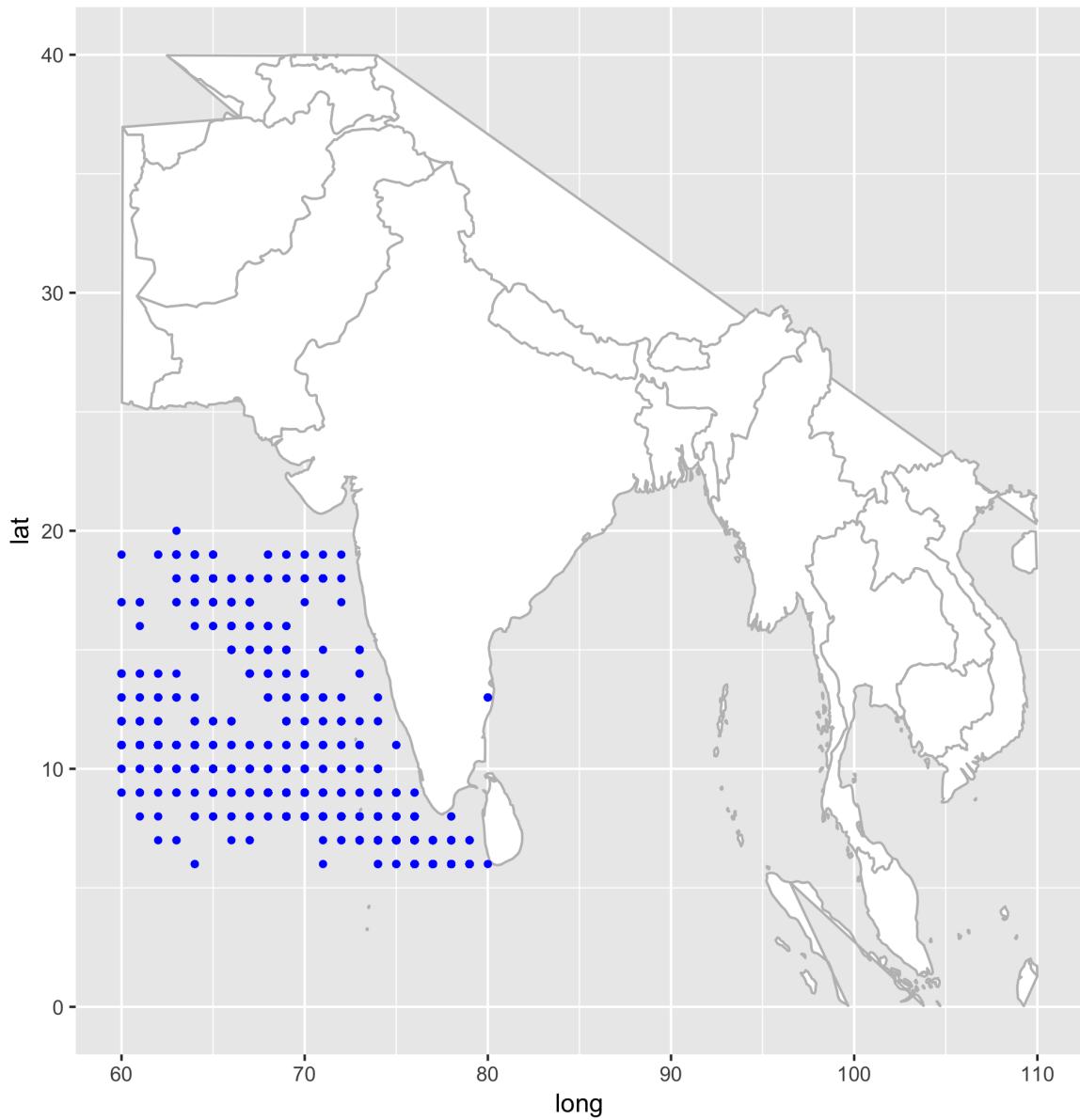
Subcontinent West 2006



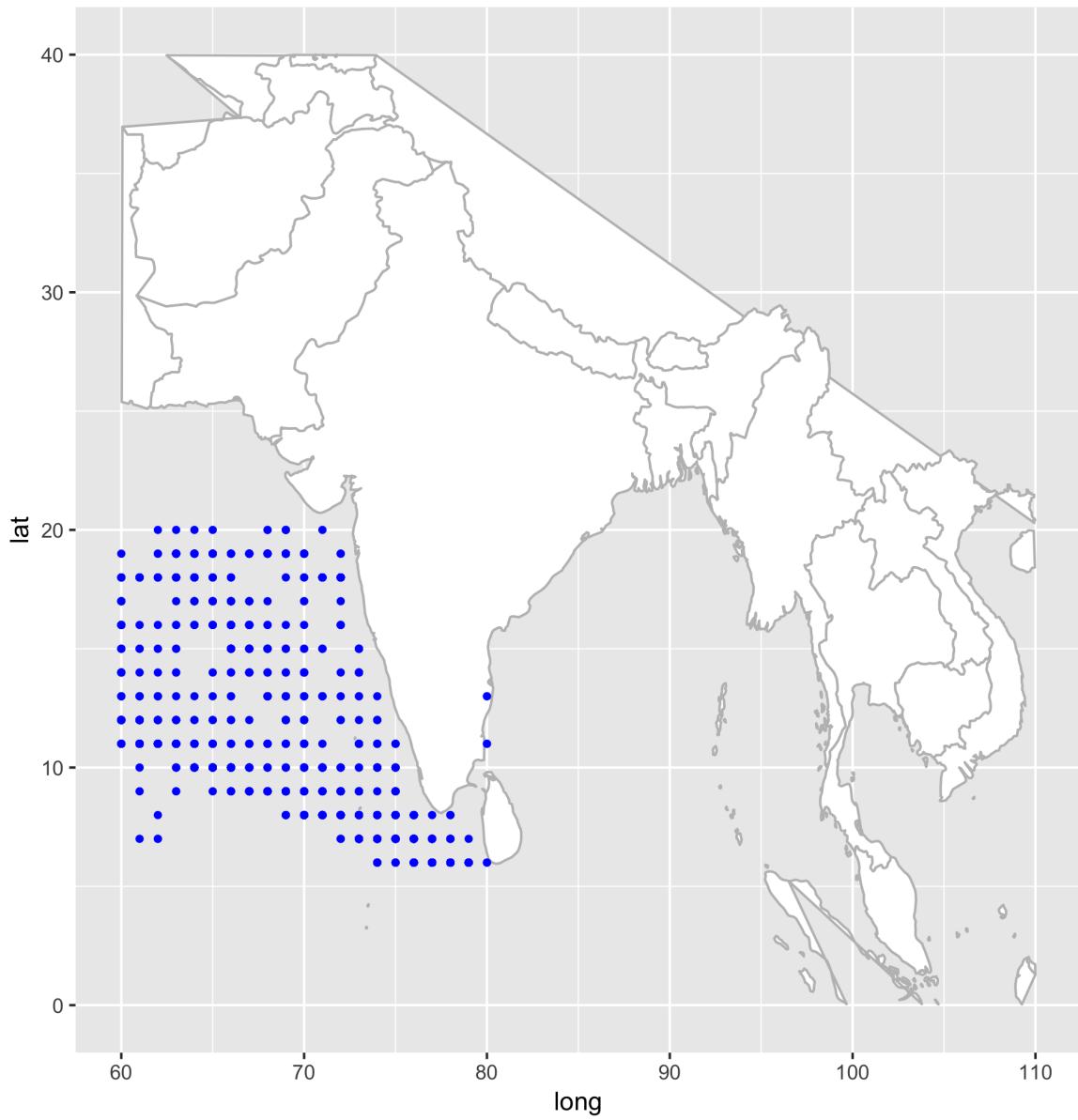
Subcontinent West 2007



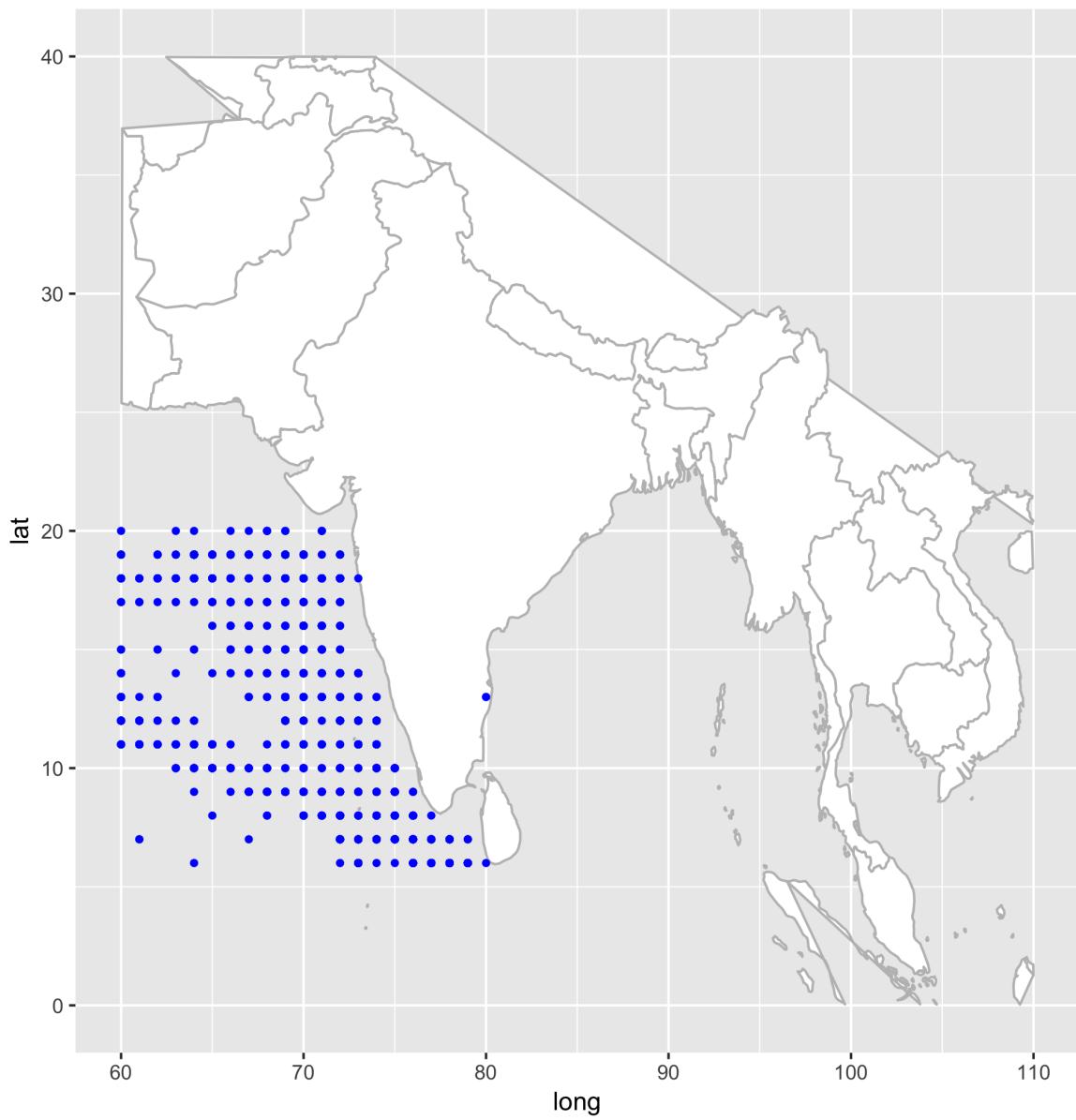
Subcontinent West 2008



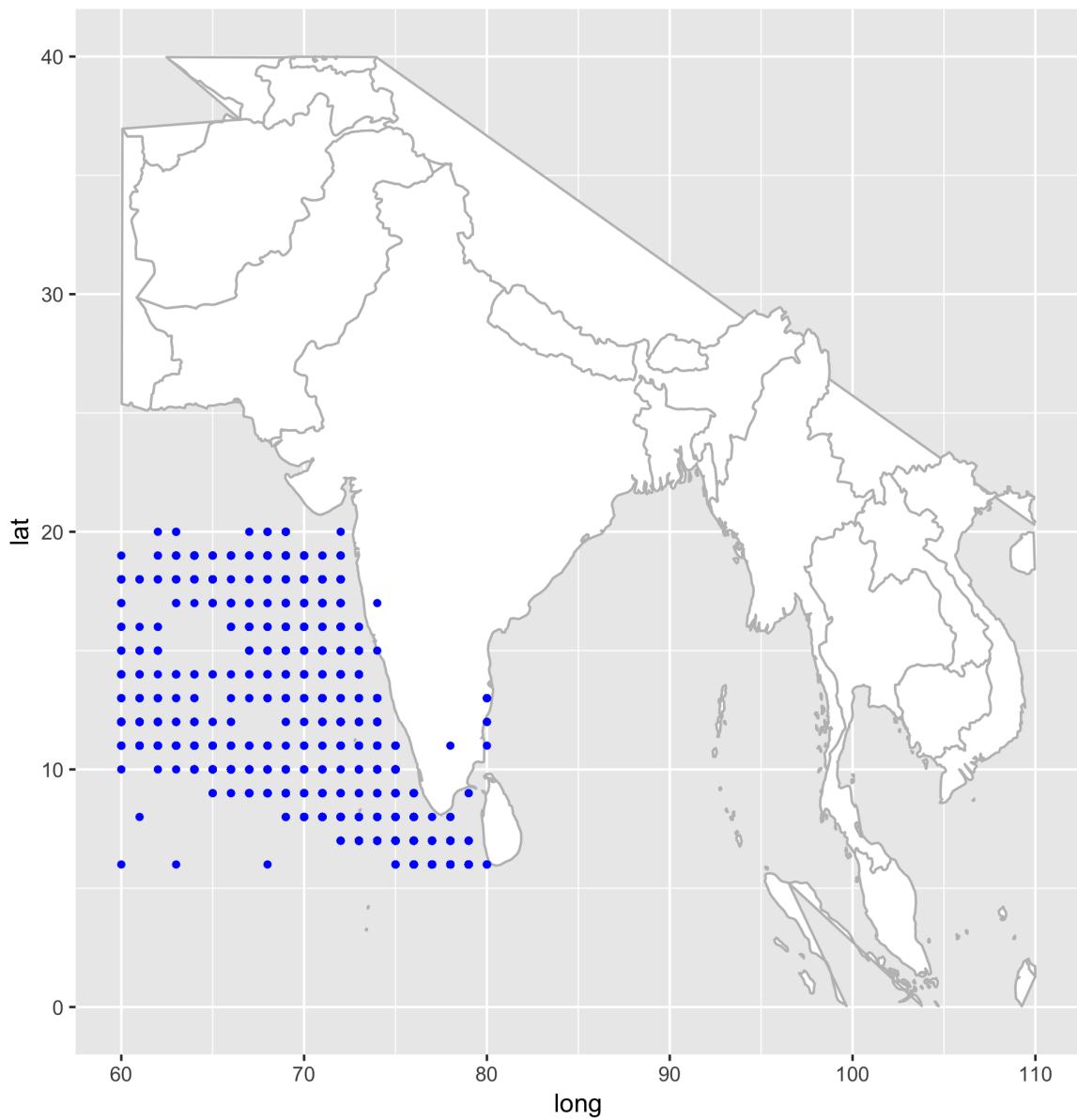
Subcontinent West 2009



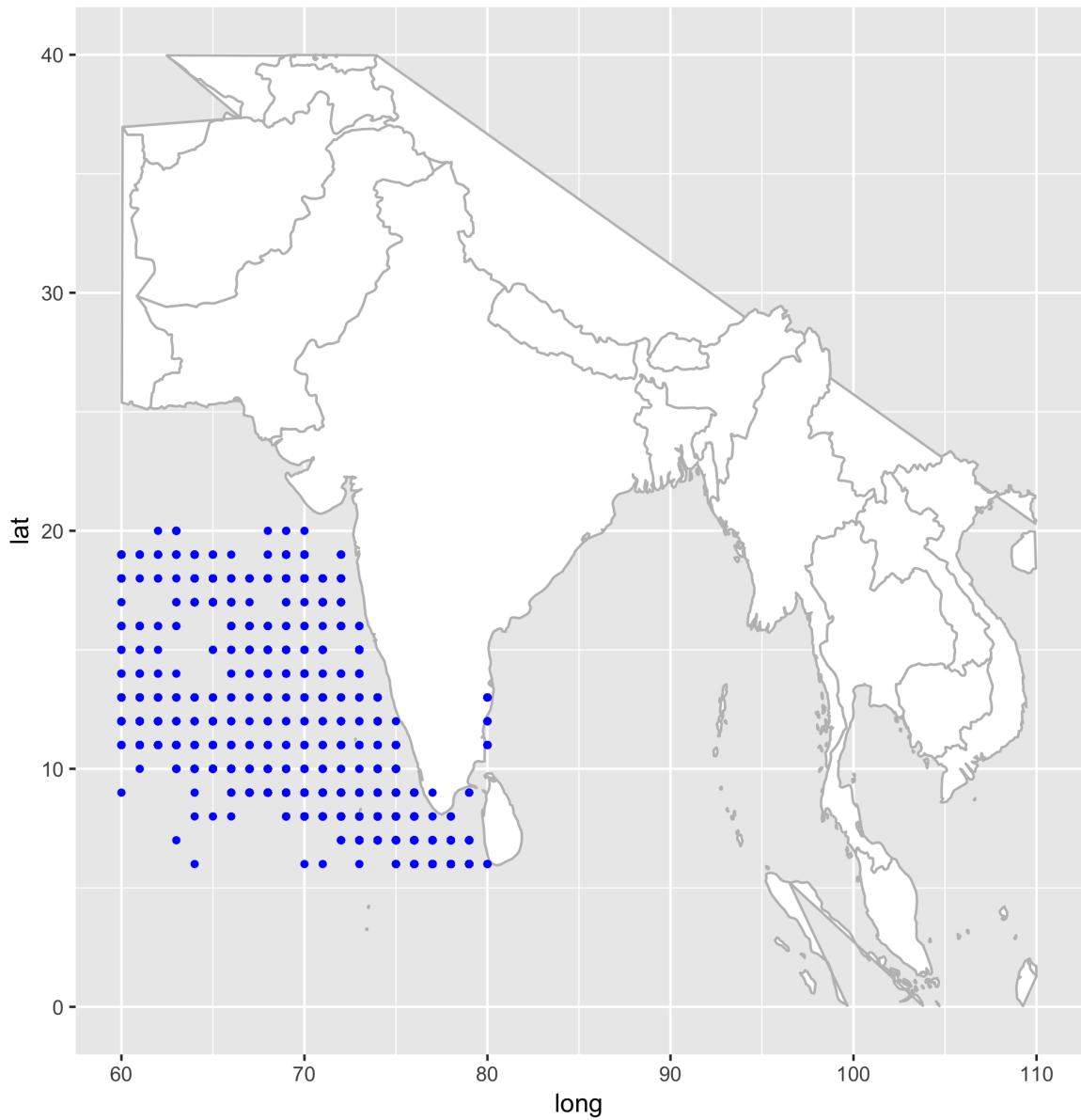
Subcontinent West 2010



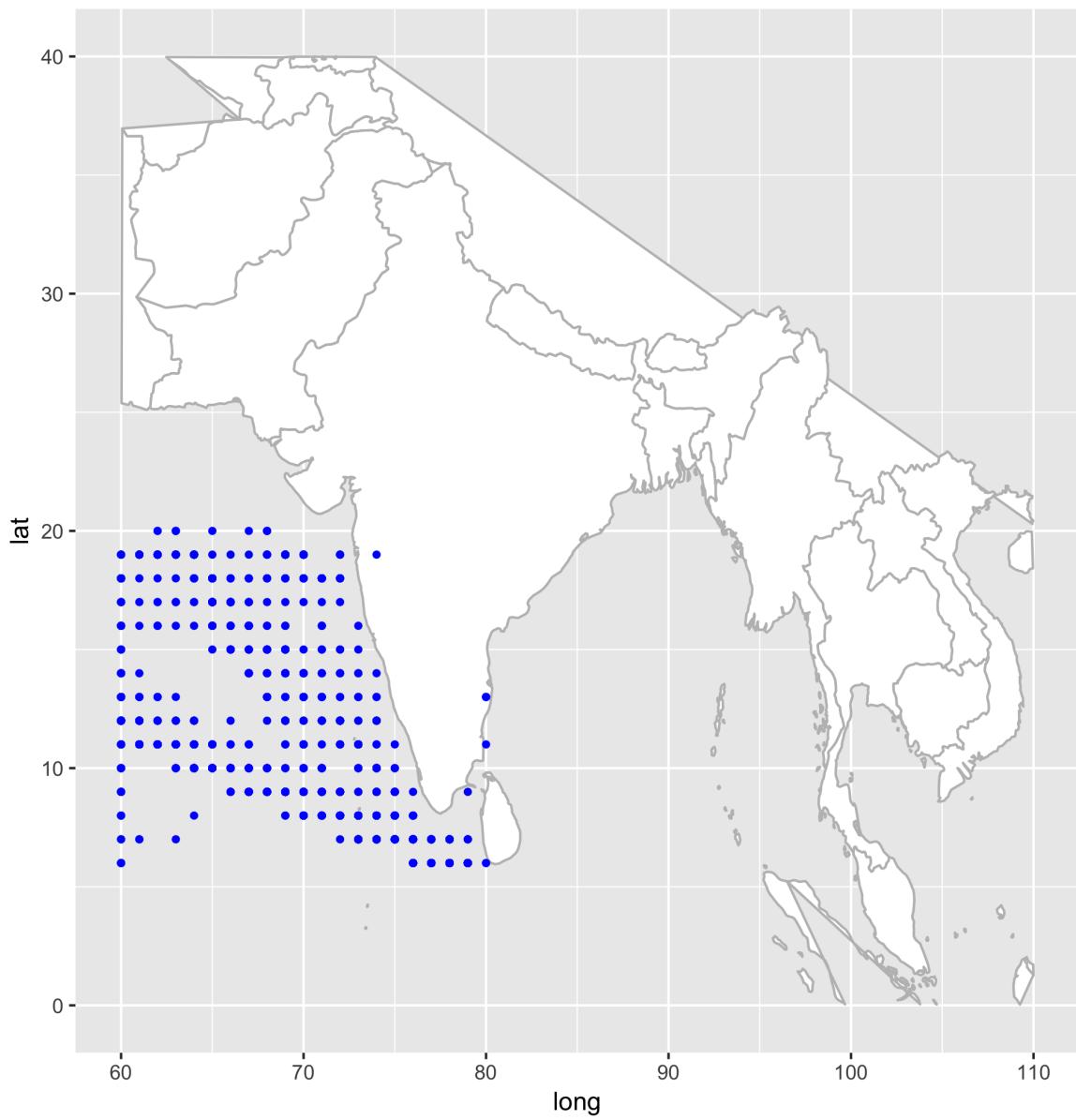
Subcontinent West 2011



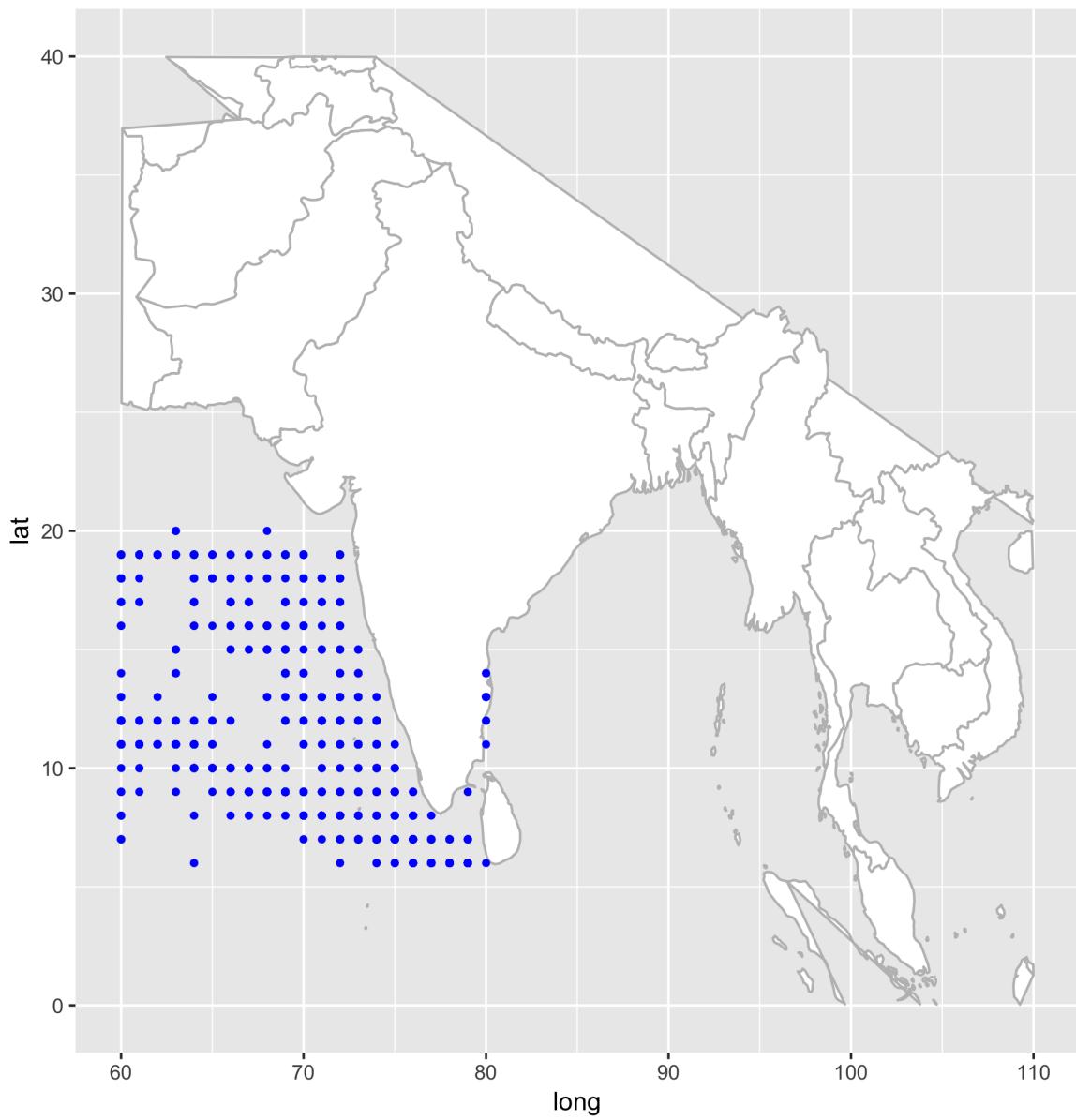
Subcontinent West 2012



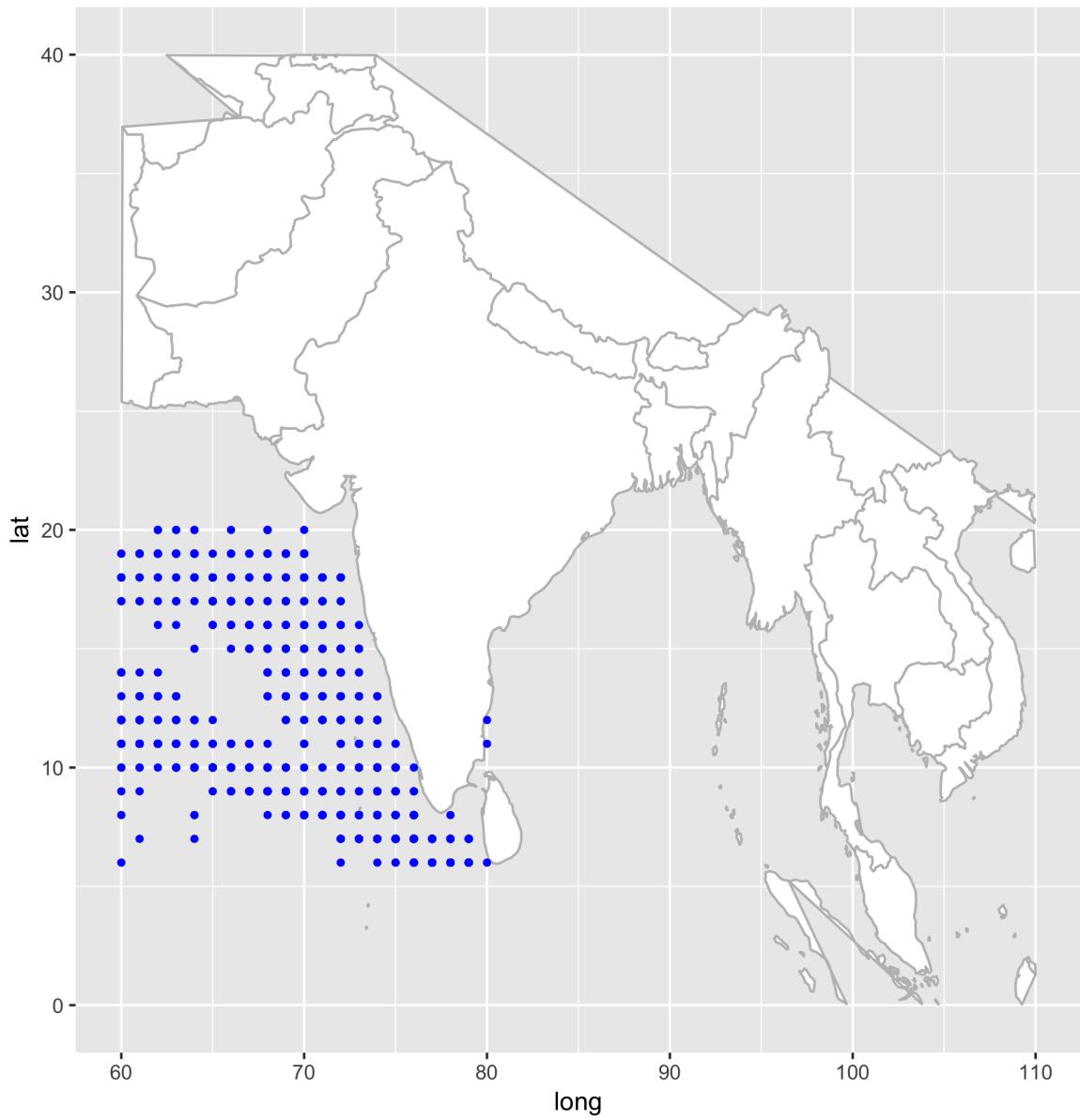
Subcontinent West 2013



Subcontinent West 2014



Subcontinent West 2015



Subcontinent West 2016

