**Purpose:** This function is the parent to a family of sub-functions used within. It is used to interpolate spatial data using some form of kriging or simple linear/spline interpolation. Optionally, this data can be plotted directly from this function.

**Version Control:** Likely many versions of this function

**Libraries**: PBSmapping, akima, gstat, fields, splancs, RColorBrewer, CircStats, spatstat

**Function Arguments Summary**

1. **contour.dat**: The data to be interpolated/kriged.
2. **interp.method**: Interpolation method. Default = 'interp' which uses interp function from

akima library

* 'gstat' uses the gstat function from gstat library
* 'krige' uses the kriging function from akima library
* 'none' = no interpolation function

1. **direct**: The directory in which grid.data is located:

default = "Y:/Offshore scallop/Assessment/Assessment\_fns/"

1. **res**: resolution for interpolation. Default = 0.01 (slightly less than 1 minute)
2. **log.data**: log transform the variable. Default =T
3. **subset.eff**: If data are subset change all values outside the subset rante to this value. Default =

NA

1. **subscale**: Adds a small buffer around the edges of the x and y values Default = res
2. **plot**: plot the results. (T/F) Default = F

***These calls are needed for the smooth function***

1. **smooth**: Smooth data data, if TRUE then smooth.bank function is called, takes average across

grid. (T/F), Default = F

1. **sres**: The resolution for the smoothing (grid), default = 1/60.1
2. **smooth.fun**: The function used to smooth data. Default = median, want a measure of central

tendency (mean or median) Note that smooth.bank function itself has this set to

the mean by default.

1. **no.data**: How to treat missing data when smoothing, Options are "NA" or "0" default is to

assume zero (not letter 'O')

1. **subset.poly**: The polygon region to include, a subset of contour.dat. Used in smooth.bank +

needed elsewhere. Default == NULL

1. **procedure**: Used only in the smooth function. Options for how to calculate the smooth. Can

be any number from 1-6 Default = 1. see smooth.bank.r for details of what each option does.

1. **expand**: Makes X and Y data a little bit bigger which helps with calculations around the

edges. default = 0.1

1. **aspr**: aspect ratio needed for calculations, missing by default which aligns with the

calculation used in PBSmapping.

1. **smooth.matrix**: Do we want to return the data as a dataframe or a list. Default = T which

returns a list

***These calls are needed for the function blank.bank***

1. **blank**: Do we want to add blanks to the data beyond where they exist. (T/F), default = F
2. **blank.dist**: The blanking distance, beyond which if no data are present zeros are assigned,

default is missing

1. **blank.eff**: Fills in the Z values for returned dataframe. Default = 0, Default = 0
2. **blank.type**: The calculation used to insert blanks. See blank.bank for details Options are 1 or 2.

Default =1

1. **blank.scale**: Makes X and Y data a little bit bigger which helps with calculations around the

edges. Default = 0.1,

***These calls are needed for the function tick.def.r***

1. **nstrata**: Number of strata. Default = 4
2. **place**:Number of decimal places to round the data to. Default = 0
3. **str.max**: maximum value for stratifying variable (all values greater will be set at maximum)
4. **str.min**: minimum value for stratifying variable (all values lesser will be set to 'subset.eff')

**This call is needed for area function**

1. **area.units**: The area calculation. Default = 'towable" which is towable units. "km2" will calculate total area.
2. **ticks**: contour lines or strata definitions to be plotted. Default = missing which leads to ticks

being calculated from nstrata if specified tick.def.r is run and replaces this value. The nstrata argument should align with ticks if both specified

**These calls are needed for image.prep**

1. **id.par**: inverse distance weighting, used when method = "gstat". Default = 0.5
2. **linear**: type of interpolation to run, used when method = "interp". (T/F) Default = T which run

linear interpolation if set to F it runs a cubic-spline interpolation

1. **max.dist**: the maximum distance for which kriging methods will use data. Default = Inf which

uses all data (see nmax)

1. **nmax**: the number of nearest observations that should be used for a kriging prediction.

Default = 7 (see maxdist)

1. **covariate.dat**: covariate data to assist with interpolation, only used for method = "krige"

Default=NULL

1. **regrid**: If using covariate data should the grid be reploted using these data. Default = F
2. **mod.type**: Model type for the variogram model (vgm). only used for method = "krige"

Options include "Exp", "Sph", "Gau", "Mat". Default = "Sph"

**Plot function arguments, if plot = F these are not used.**

1. **yl**: The y axis boundaries, default is missing so set by the data
2. **title**: title for contour plot
3. **color**: colors for contour plot
4. **title**: title for contour plot
5. **unit.lab**: Label for the units used
6. **lab**: Label for the plots
7. **units**: Unit label for the plots
8. **points**: Add datapoints to the plot. points = 1 adds EID's before smoothing/blanking. If points =

2 adds EID's from after.

1. **key**: The key for the axis labels (only used if plot=T). Default = strata. Options are:

* ‘strata’ = key diveded by ticks
* ‘cont’ = continuous scale
* ‘log.cont’ = continuous log scale

**Section 1**

In this section the contours are generated. Some pre-prossesing which calls in the functions *smooth.bank*, *tick.def*, and *blank.bank* are called in before the data are interpolated/kriged. The *nstrata* and *ticks* arguments interact to determine how many strata there are in the interpolated data, these sometimes use the *tick.def* function and other times they do not. The *smooth.bank* function is used to smooth the data, various options exist for doing this, while blank.bank is used to add 0’s (or NA’s or anything you’d like) to the data where necessary.

The interpolation is performed using the *image.prep* function which is the backbone of the contour.gen family. Interpolation can be performed via ordinary kriging, universal kriging (i.e. using a linear function with a new covariate), or interpolation (using linear or cubic spline techniques), or no interpolation which just returns an image of the raw data.

**Section 2**

In this part of the function image from Section 1 can be plotted, this is an optional section and typically the image is returned for plotting in another mapping function. After the plotting section the data is output and the area for each strata are calculated using the *areacal* function