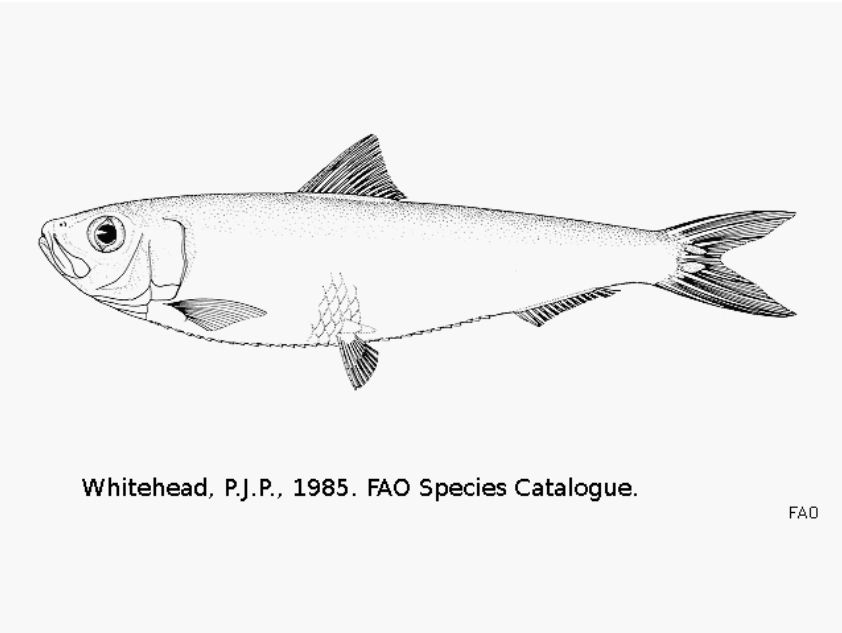
FLR in 10 slides or less



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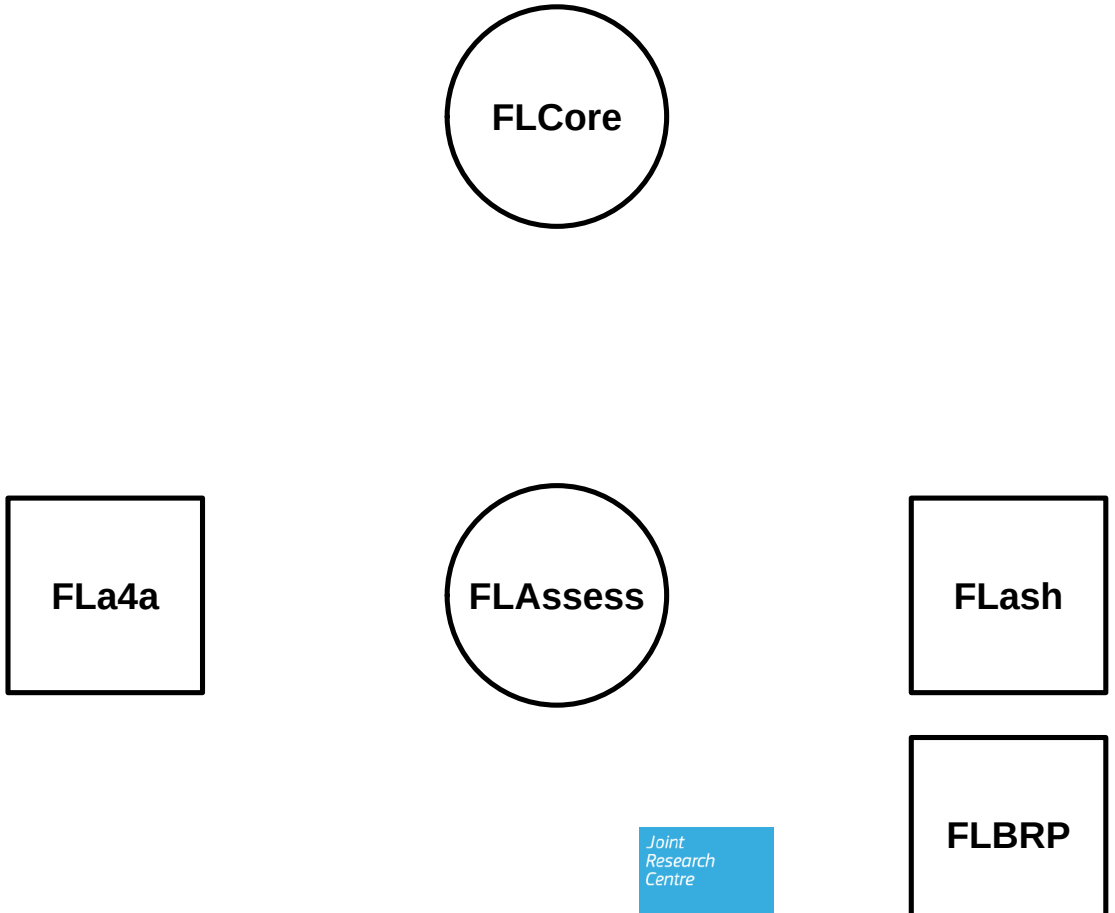
What is FLR ?

- FLR = Fisheries Libraries in R
- FLR is a set of R packages
- FLR is developed and maintained by a group of fisheries scientists

Packages

FLR packages development model



FLQuant

Stands for "FL quantity" and it's the smallest component of FLR classes.

Six dimensional array used to store data of a particular type (e.g. catch numbers), with the following dimensions:

```
[1] "quant"  "year"   "unit"   "season" "area"   "iter"
```

FLStock

Represents a fish stock and comprises a number of slots.

```
Class "FLStock" [package "FLCore"]

Slots:

Name:         catch       catch.n      catch.wt      discards    discards.n
Class:      FLQuant       FLQuant       FLQuant       FLQuant       FLQuant

Name:   discards.wt      landings   landings.n  landings.wt         stock
Class:      FLQuant       FLQuant       FLQuant       FLQuant       FLQuant

Name:       stock.n      stock.wt             m           mat       harvest
Class:      FLQuant       FLQuant       FLQuant       FLQuant       FLQuant

Name:  harvest.spwn        m.spwn          name          desc         range
Class:      FLQuant       FLQuant     character     character       numeric

Extends:
Class "FLS", directly
Class "FLComp", by class "FLS", dis                                      2
```

FLIndex

Represents a index (e.g. index of abundance from a survey)

```
Class "FLIndex" [package "FLCore"]

Slots:

Name:          type distribution         index     index.var       catch.n
Class:    character    character       FLQuant       FLQuant       FLQuant

Name:      catch.wt         effort  sel.pattern       index.q          name
Class:      FLQuant       FLQuant       FLQuant       FLQuant     character

Name:          desc          range
Class:    character       numeric

Extends: "FLComp"
```

FLSR

Represents a stock-recruitment relationship and allows the estimation of its parameters.

```
Class "FLSR" [package "FLCore"]

Slots:

Name:          rec          ssb        covar     logerror        model
Class:     FLQuant      FLQuant     FLQuants      logical      formula

Name:          logl           gr distribution      initial       params
Class:     function     function       factor     function        FLPar

Name:        logLik         vcov      hessian      details    residuals
Class:       logLik        array        array         list      FLArray

Name:        fitted         name         desc        range
Class:      FLArray    character    character      numeric

Extends:
Class "FLModel", directly
Class "FLComp", by class "FLModel", distance 2
```

FLlist

A list of other classes

```
Class "FLlst" [package "FLCore"]

Slots:

Name:       .Data     names      desc      lock
Class:       list character character   logical

Extends:
Class "list", from data part
Class "vector", by class "list", distance 2

Known Subclasses:
Class "FLQuants", directly
Class "FLCohorts", directly
Class "FLComps", directly
Class "FLPars", directly
Class "FLModelSims", directly
Class "FLStocks", by class "FLComps", distance 2
Class "FLIndices", by class "FLComp          istance 2
Class "FLBiols", by class "FLComps"          tance 2
```

Example I

```
> # load ---------------------------------
> library(FLCore)
> data(ple4.index)
> data(ple4)
> # FLStock ------------------------------
> plot(ple4)
> summary(ple4)
> # FLQuant ------------------------------
> cth <- catch(ple4)
> plot(cth)
> summary(cth)
```

Example II

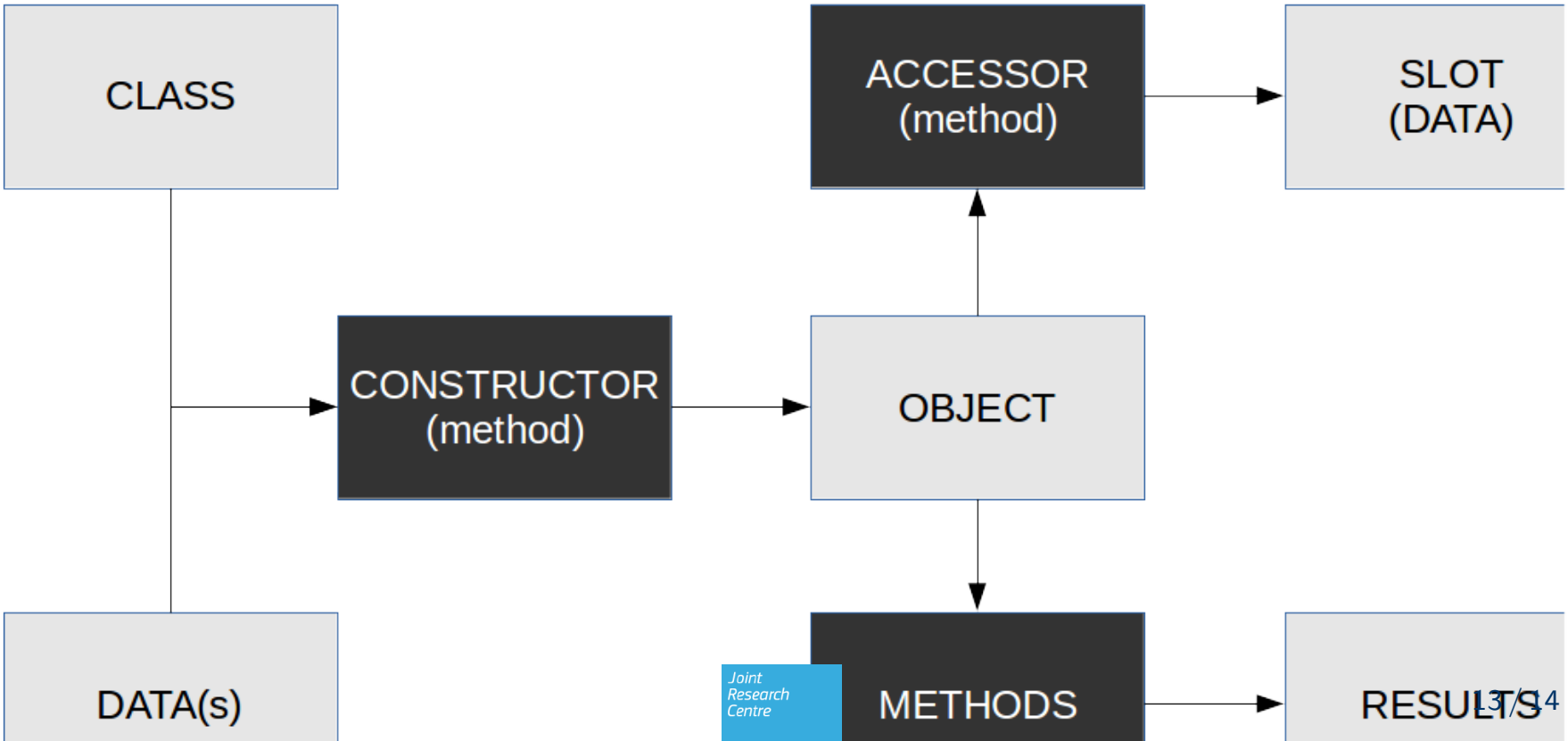
```
> # FLIndex ------------------------------
> plot(ple4.index)
> summary(ple4.index)
> # FLSR ---------------------------------
> ple4.sr <- as.FLSR(ple4, model="bevholt")
> ple4.sr <- fmle(ple4.sr)
> plot(ple4.sr)
> # FLlst --------------------------------
> flqs <- FLQuants(c=catch(ple4), b=stock(ple4))
> xyplot(data~year, groups=qname, data=flqs,
+          type="l")
```

OOP

- OOP = Object Oriented Programming
- A programming language model organized around "objects" rather than "actions"
- R implementation is called "S4"

S4 (OOP in R)

FLR & S4


CLASS
ACCESSOR
(method)
SLOT
(DATA)
CONSTRUCTOR
(method)
OBJECT
DATA(s)
METHODS
RESULTS

FLR & S4 tips

- Constructors have the same name as the class.
  - FLStock() creates an object of the class "FLStock"
  - FLIndex() creates an object of the class "FLIndex"
- Accessors have the same name as the slot.
  - catch.n() extracts the slot "catch.n" from an object "FLStock"
  - index() extracts the slot "index" from an object "FLIndex"
- Most classes have a set of basic methods
  - plot(), summary(), [, [<-