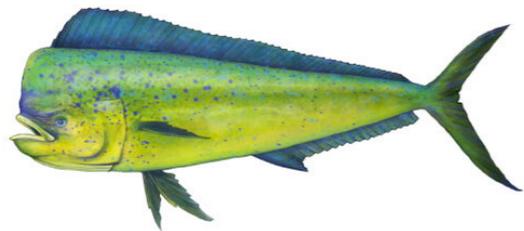


Seasonal variation of dolphinfish stocks (*Coryphaena hippurus*) in the Pacific Coast of Colombia



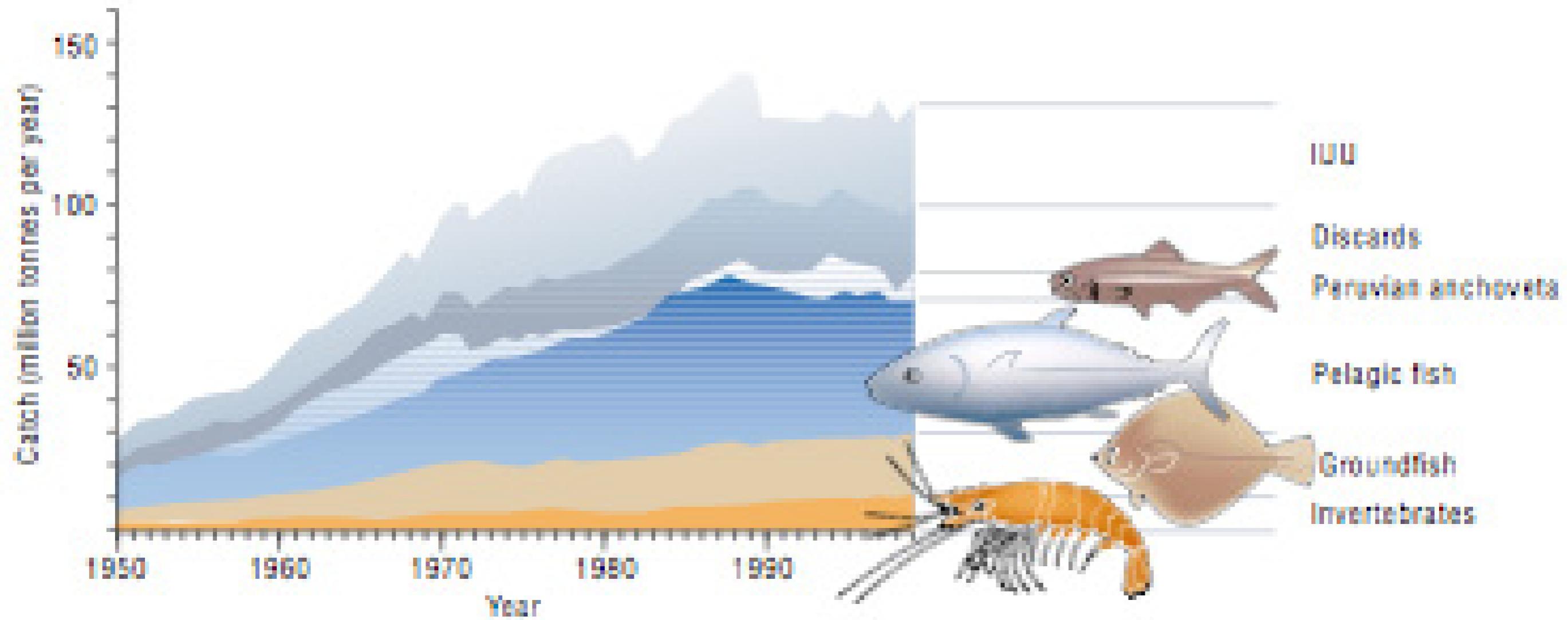
Ricardo Tellez y Susana Caballero

Laboratorio de Ecología Molecular de Vertebrados Acuáticos

Departamento de Ciencias Biológicas

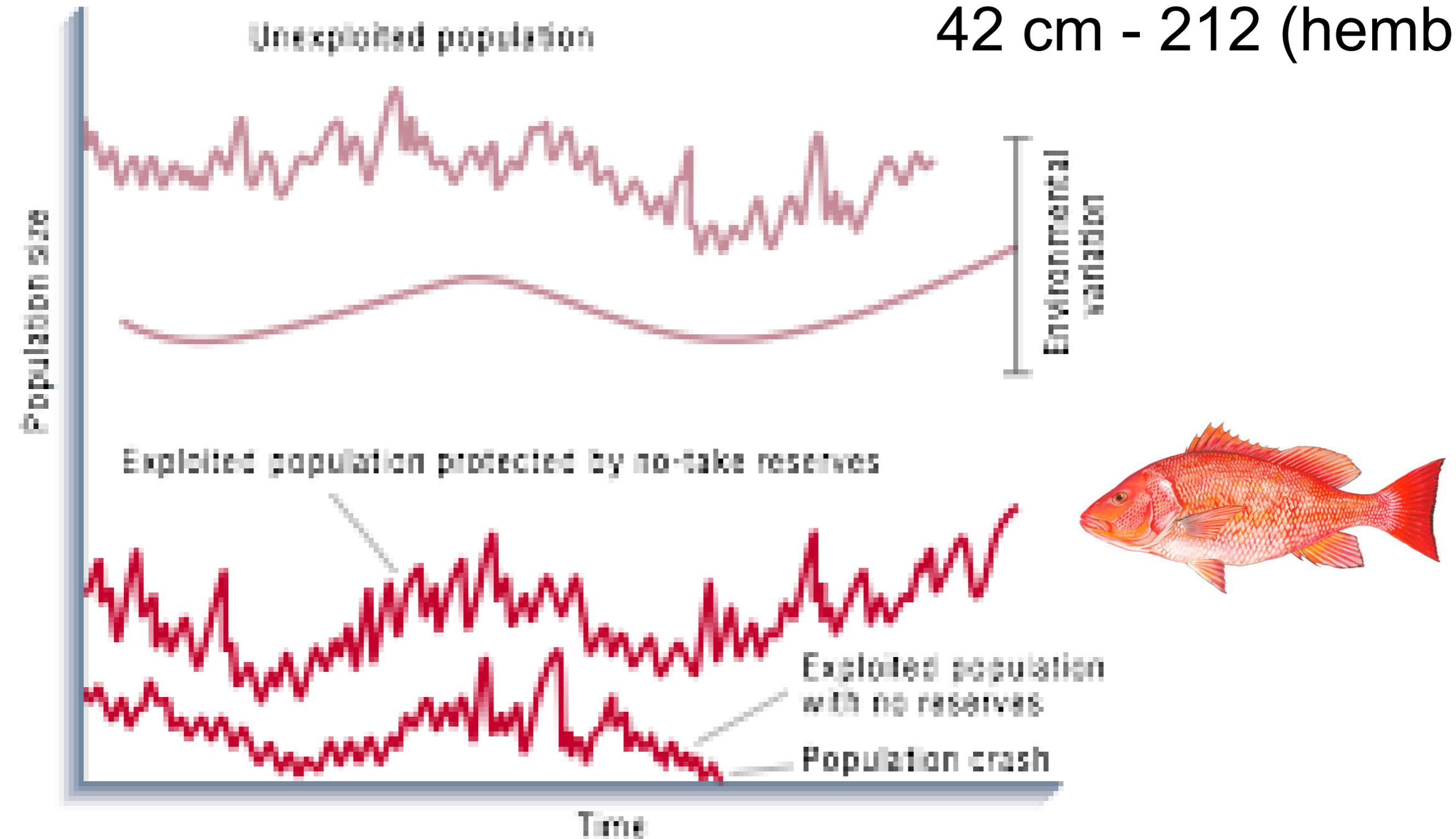
Universidad de los Andes

Bogotá, Colombia



Manejo de Pesquerías

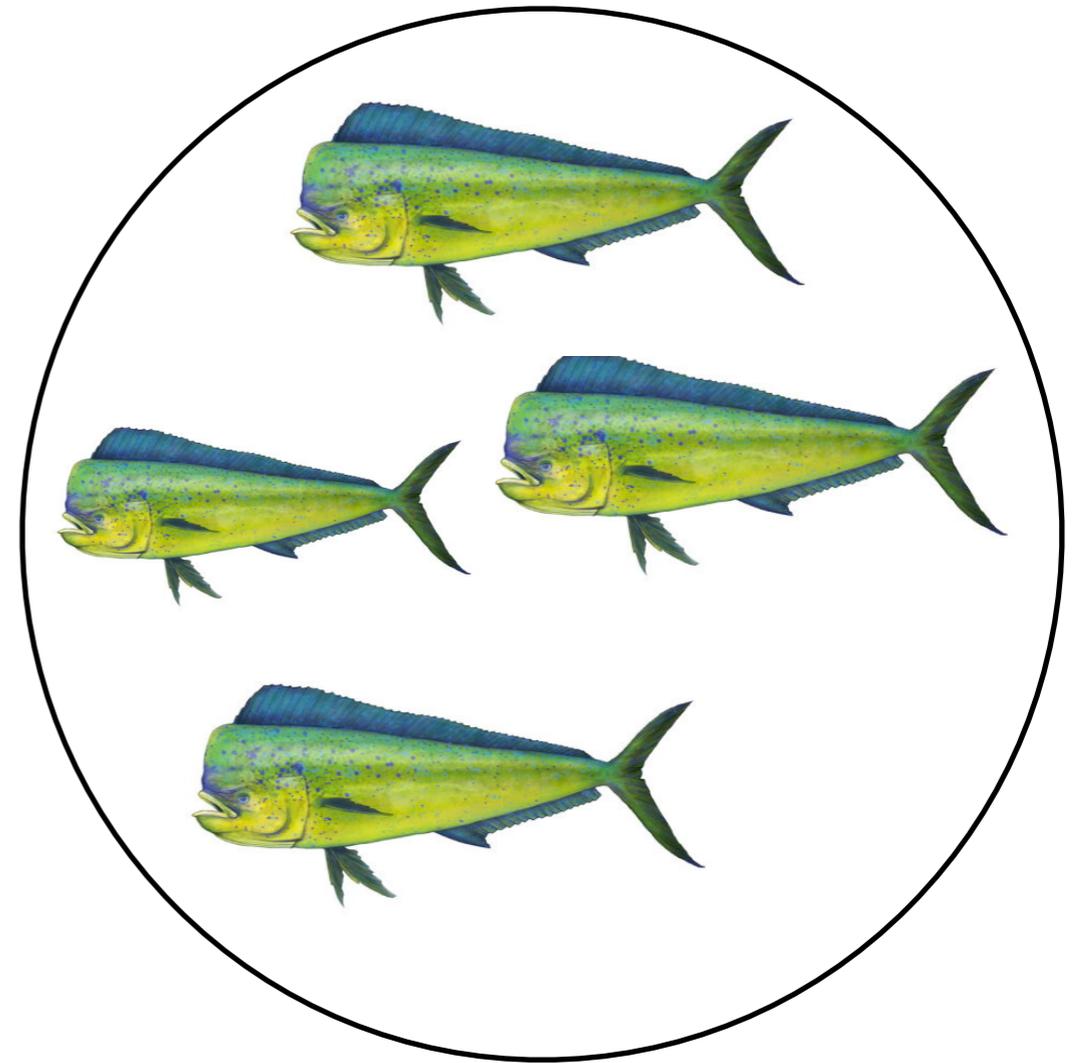
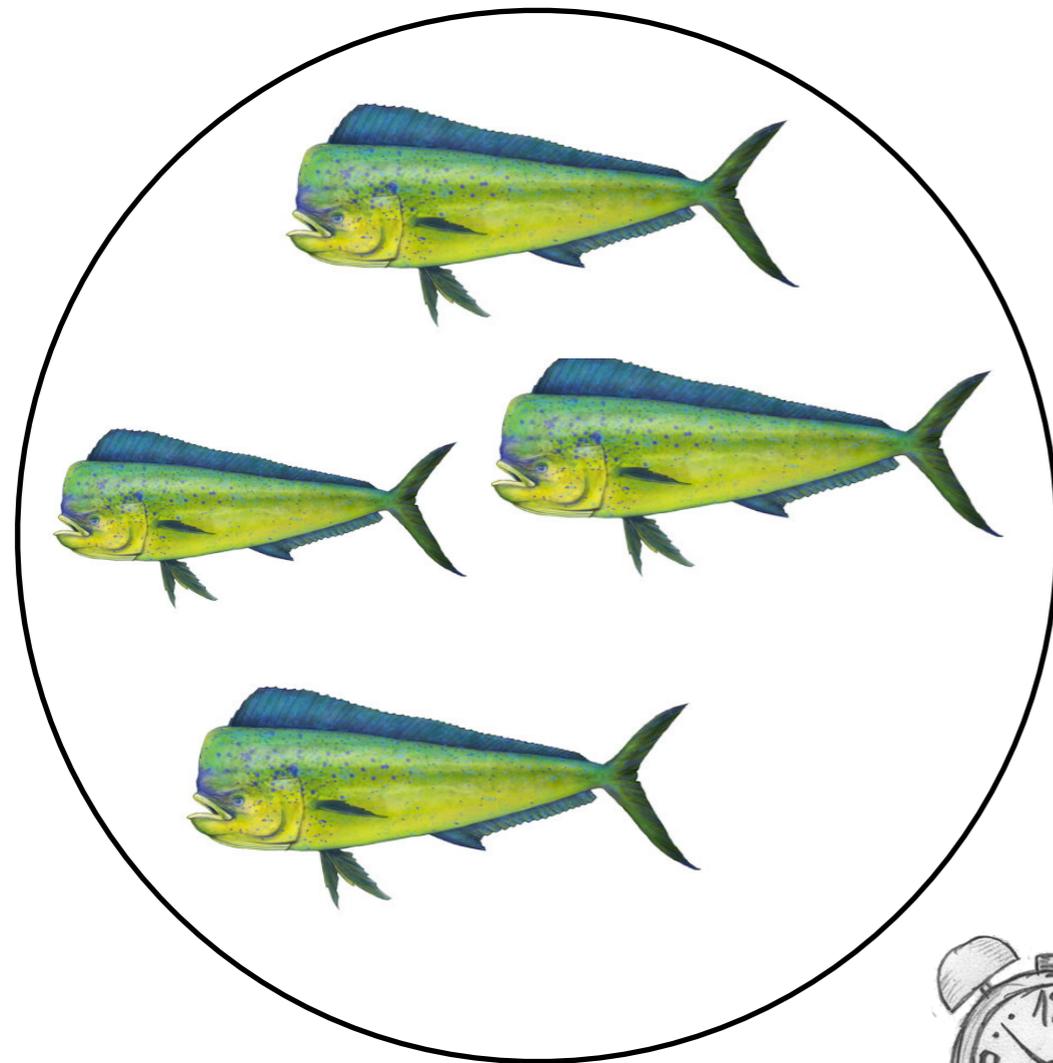
61 cm = 9,300,000
42 cm = 212 (hembra)



¿Cómo puede ser un recurso sostenible?

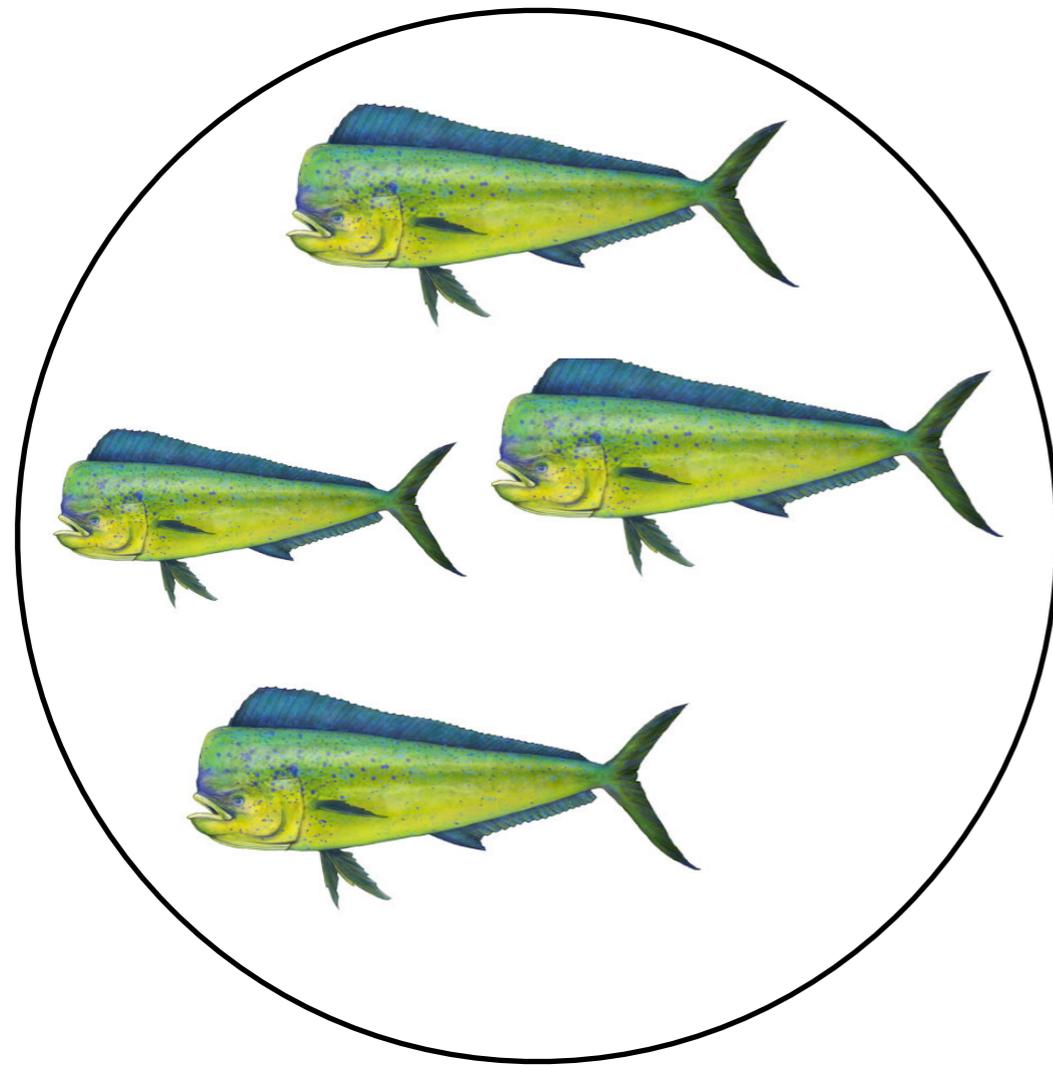
(Pauly et al. 2002: Nature)

Stock

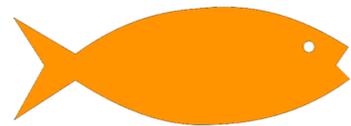
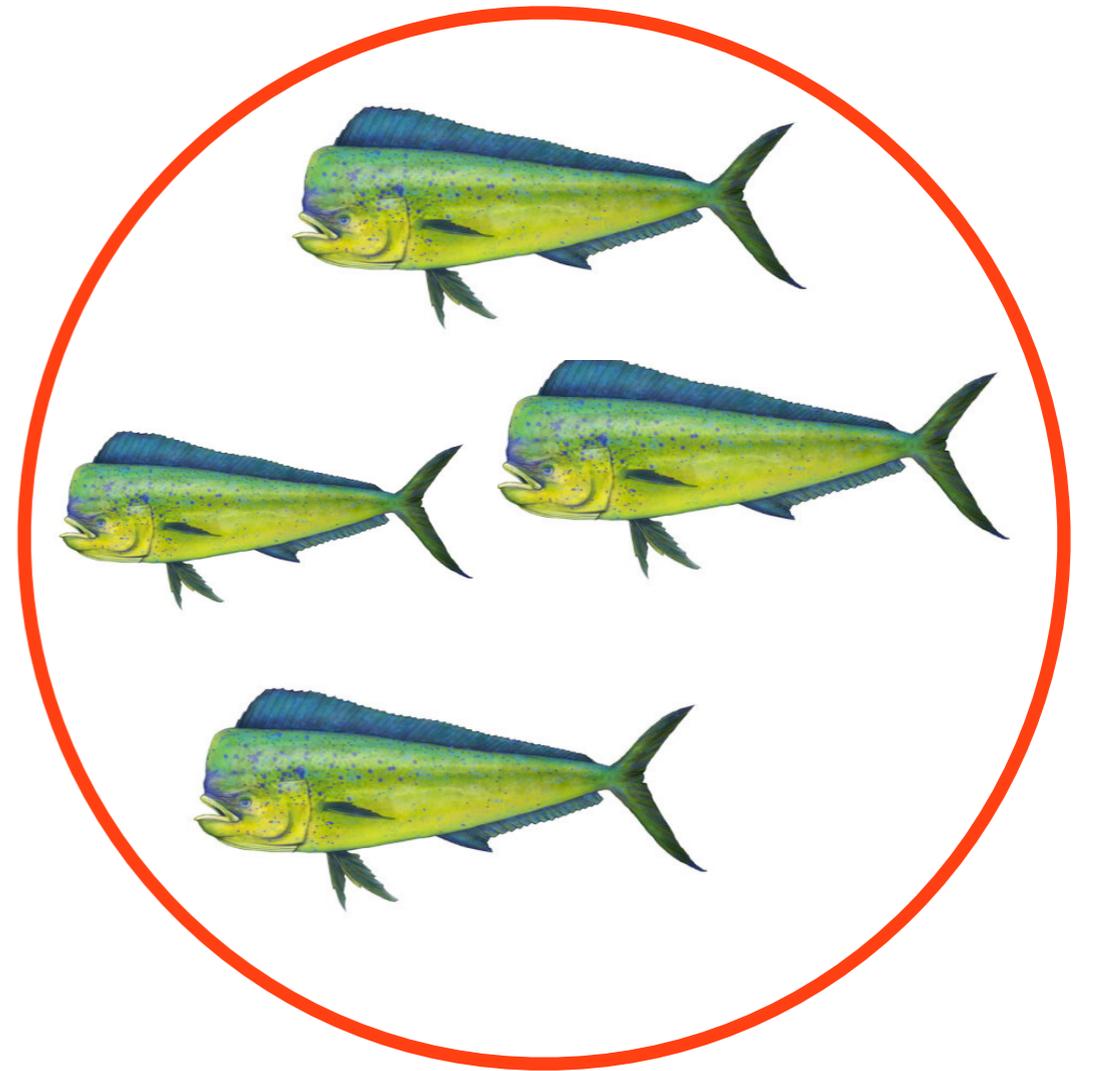


¿Unidad de manejo poblacional?

Pesquerías



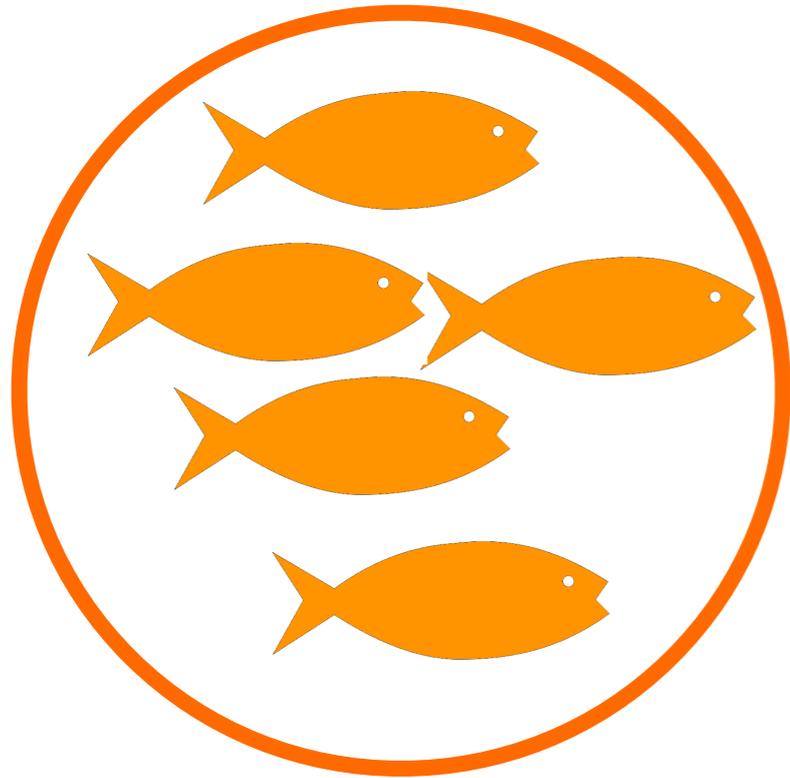
≠



≠



Manejo de Pesquerías

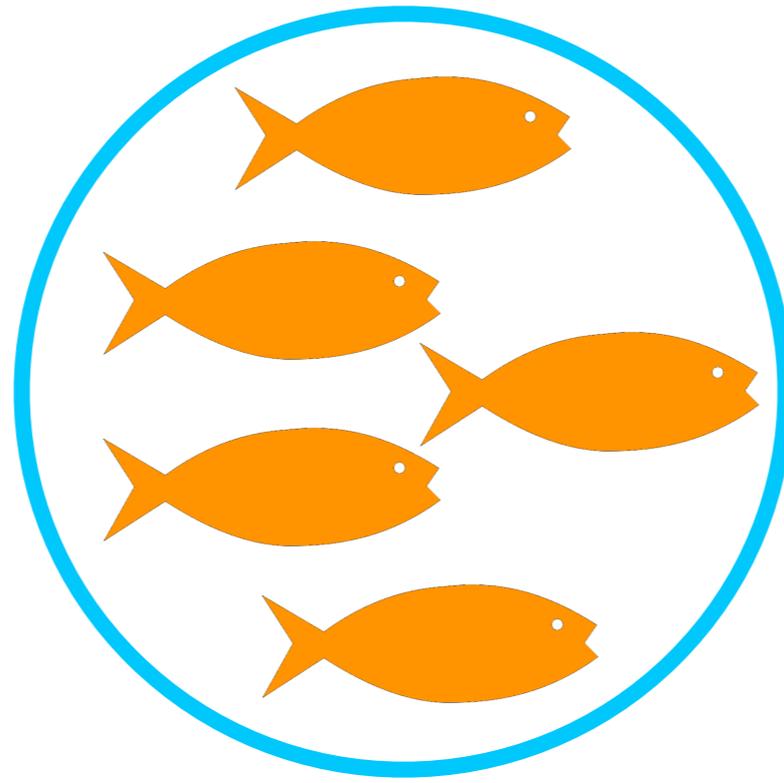
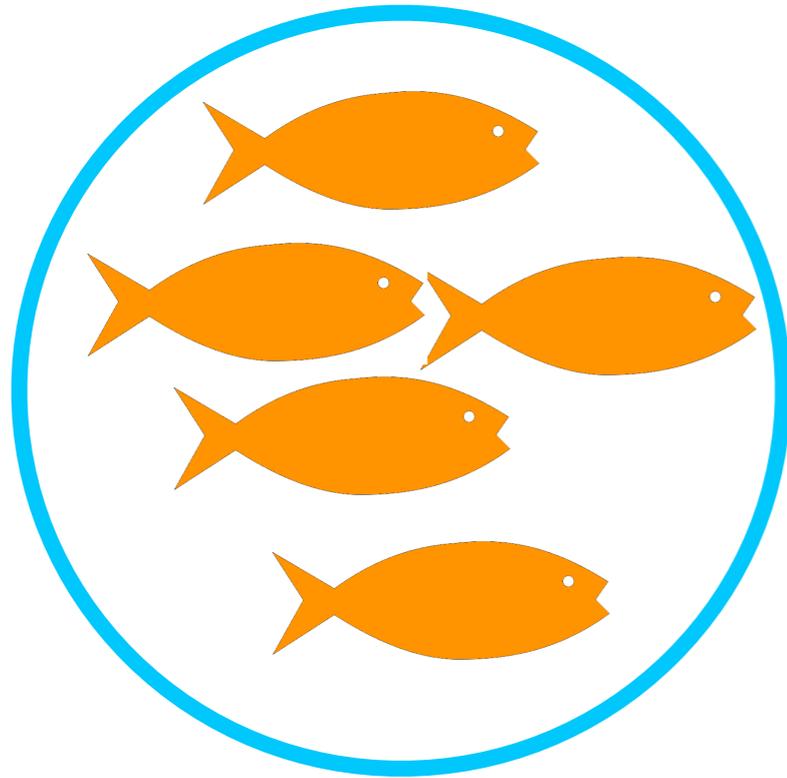


Población

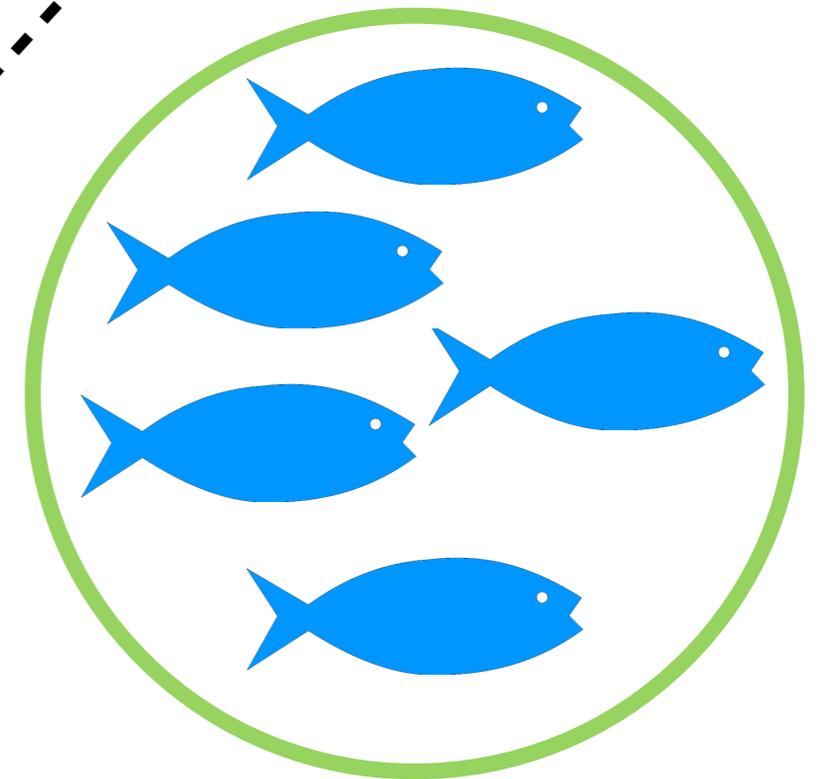
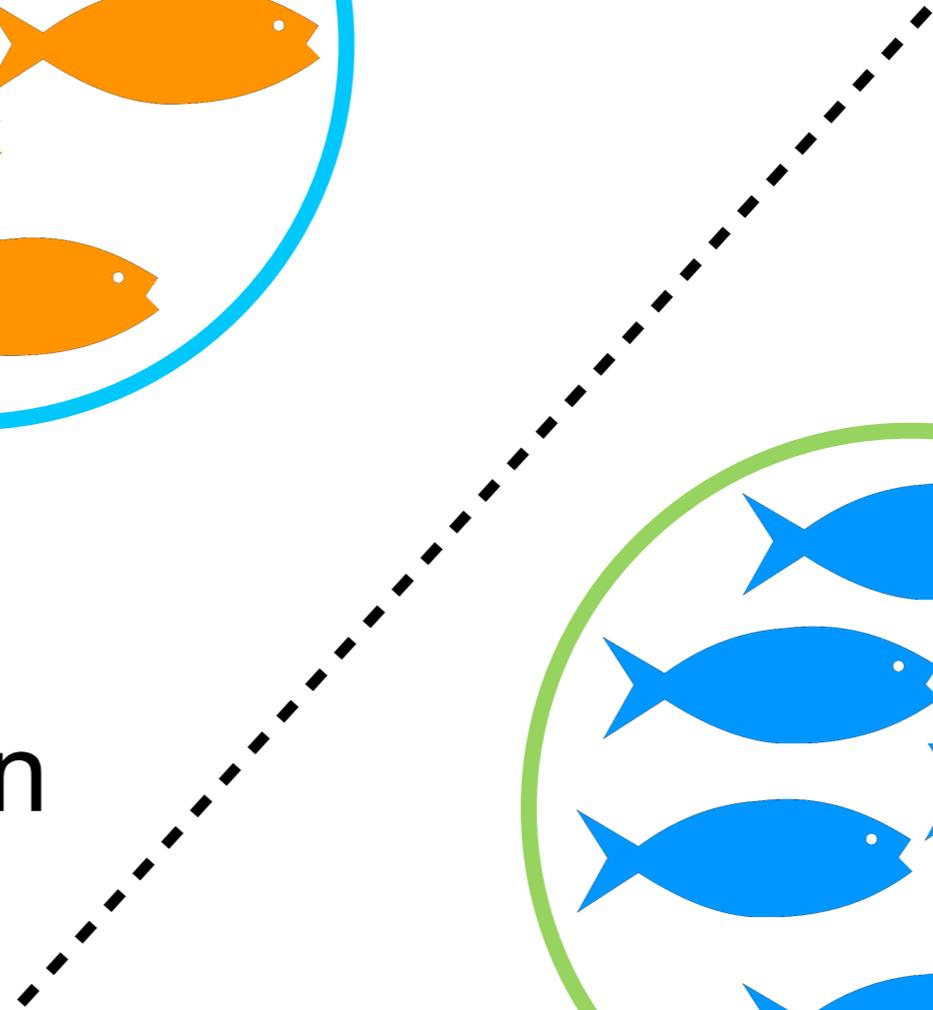
Centro de cualquier
plan de manejo

La unidad biológica reproducible
más pequeña

Sin embargo...



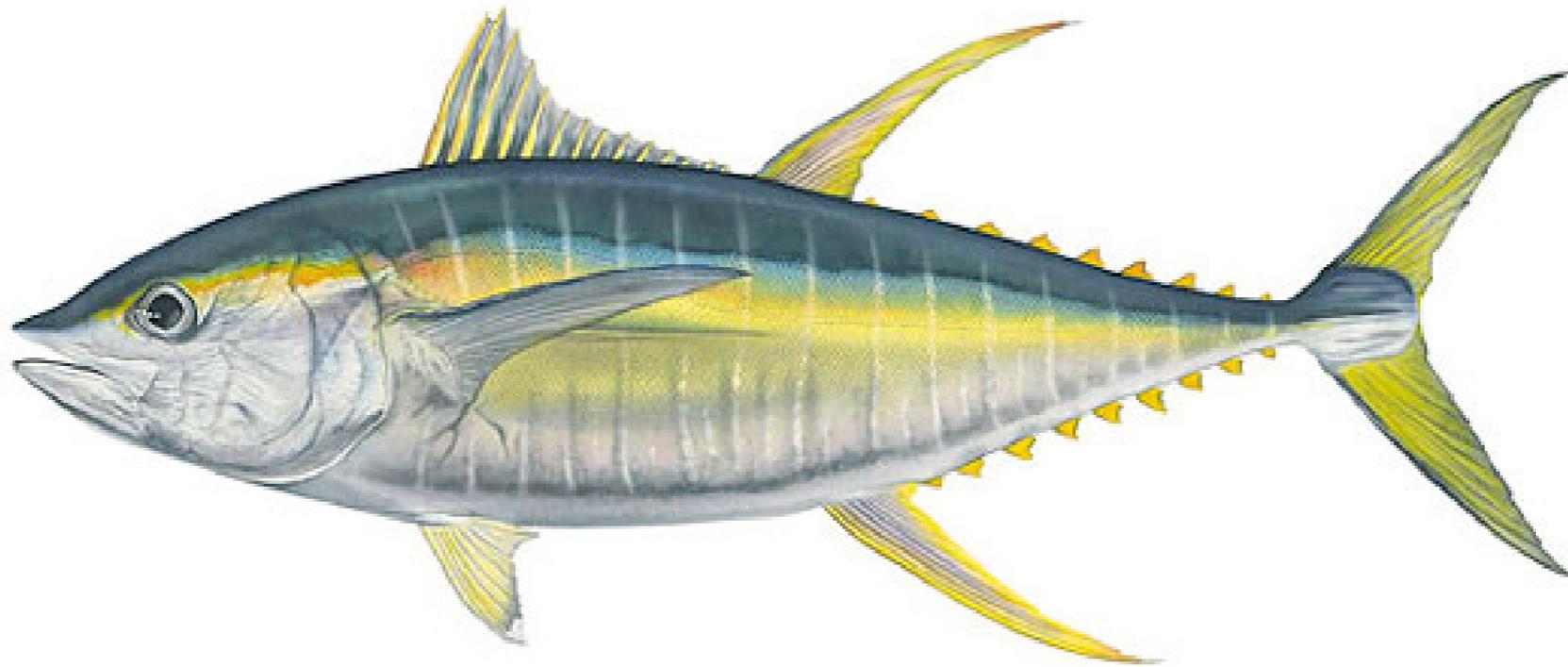
Poblaciones que compartan suficiente parentesco



Una primera

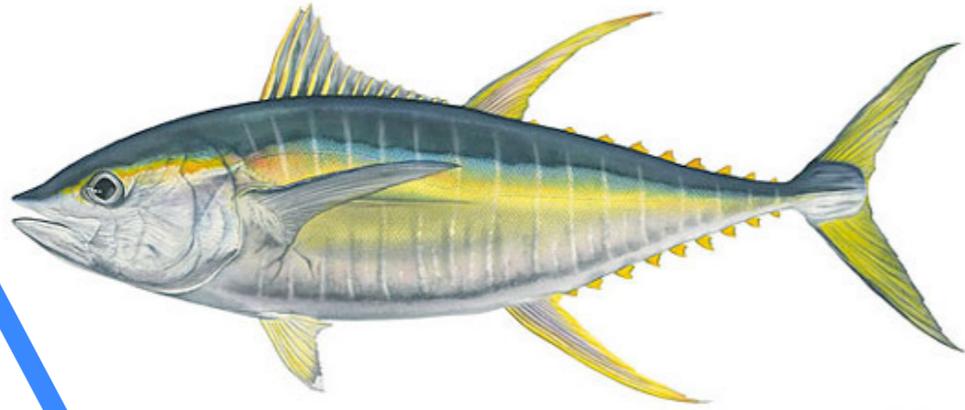
conclusión

Definición de stock biológico



Dificultad en peces pelágicos

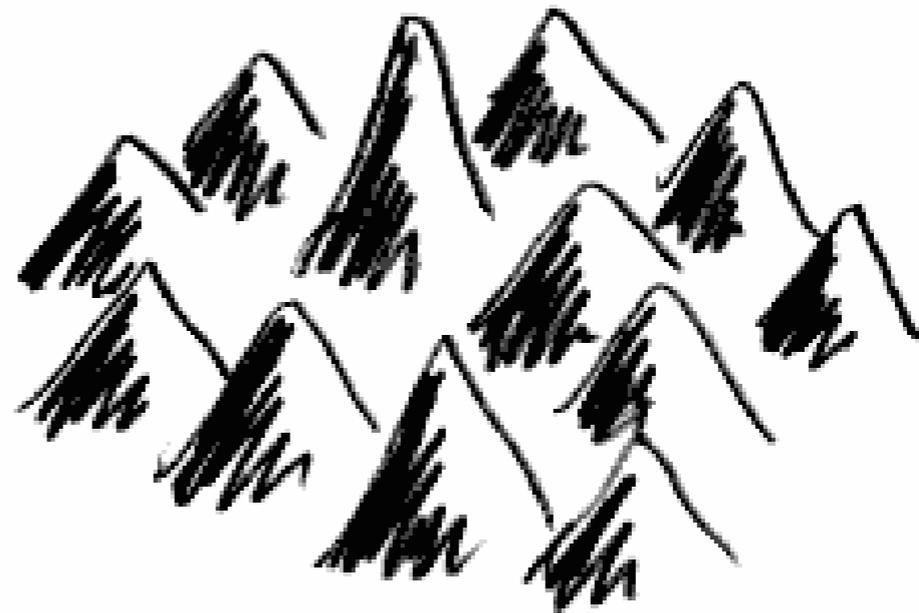
Peces pelágicos

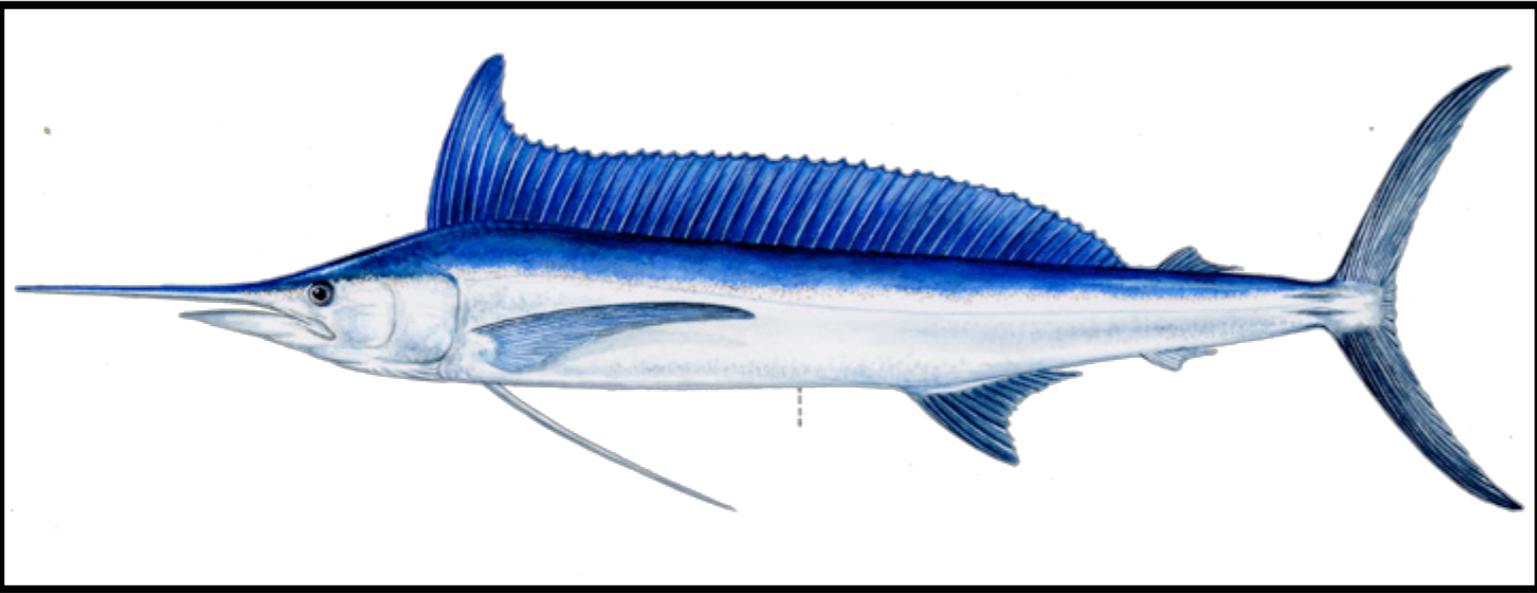


Huevos

Dispersión

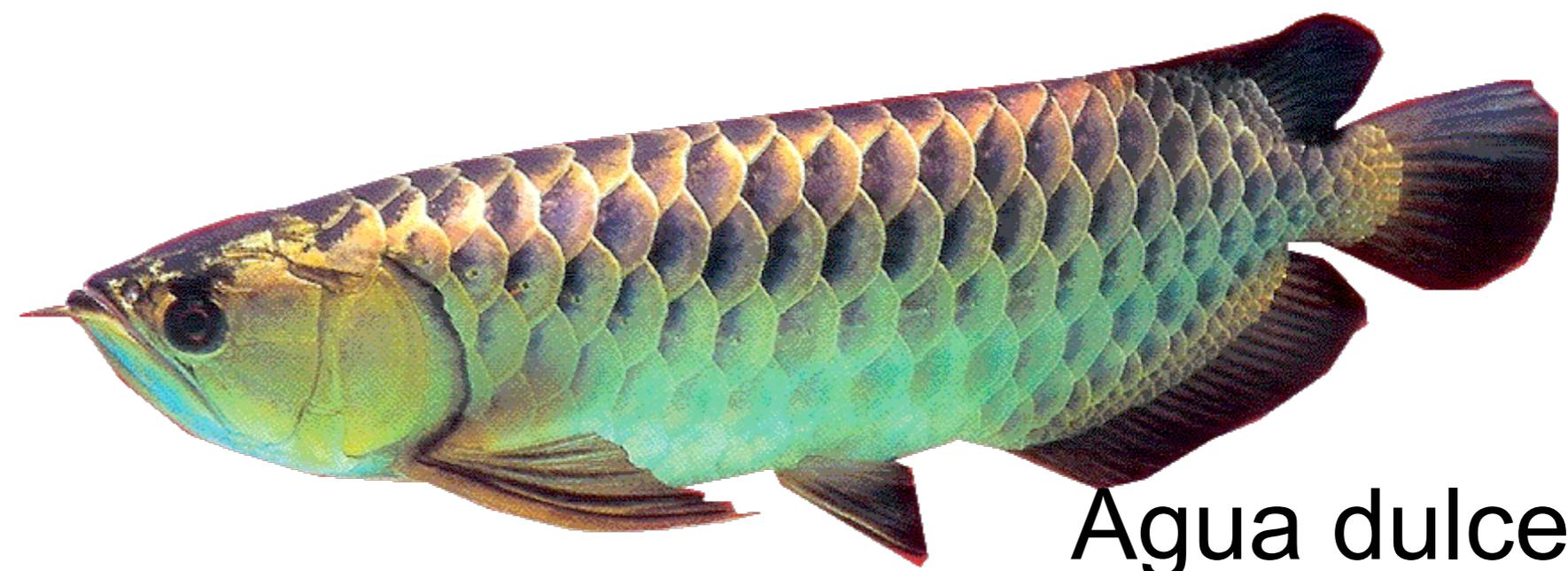
km





km →

$$F_{ST} = 0.062$$

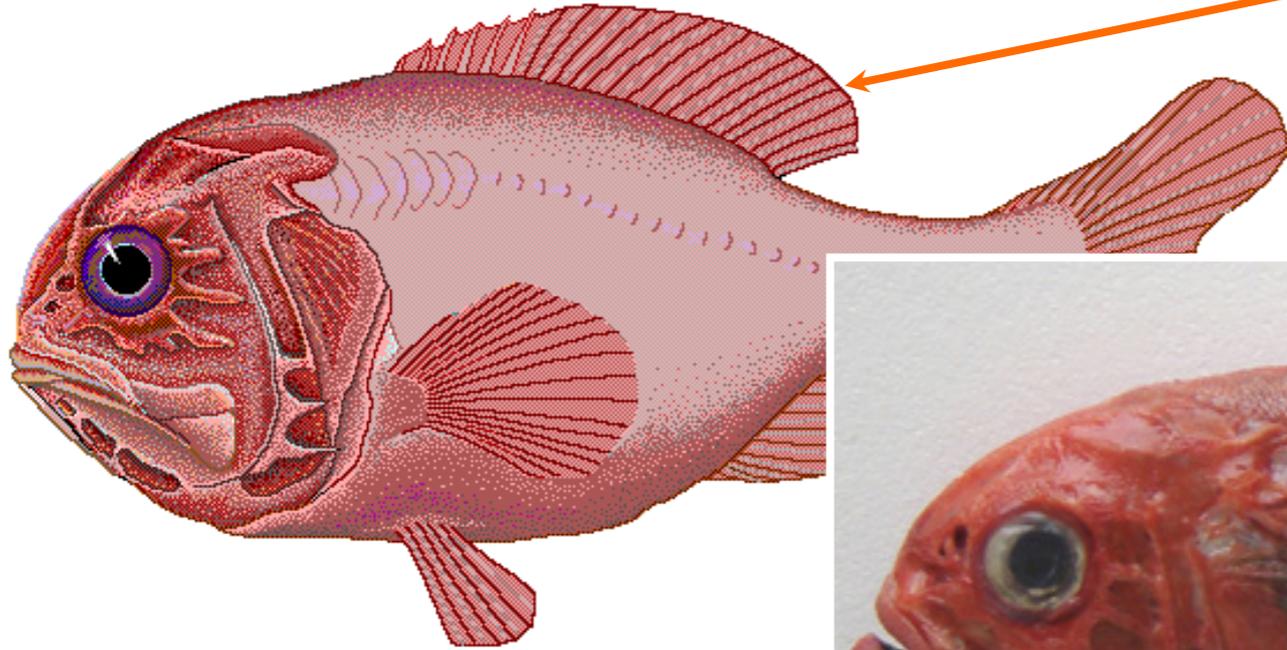


$$F_{ST} = 0.222$$

Homogeneidad...?

Homogeneidad

$F_{ST} = 0.01$ (alozimas)
 $F_{ST} = 0.008$ (mtDNA)

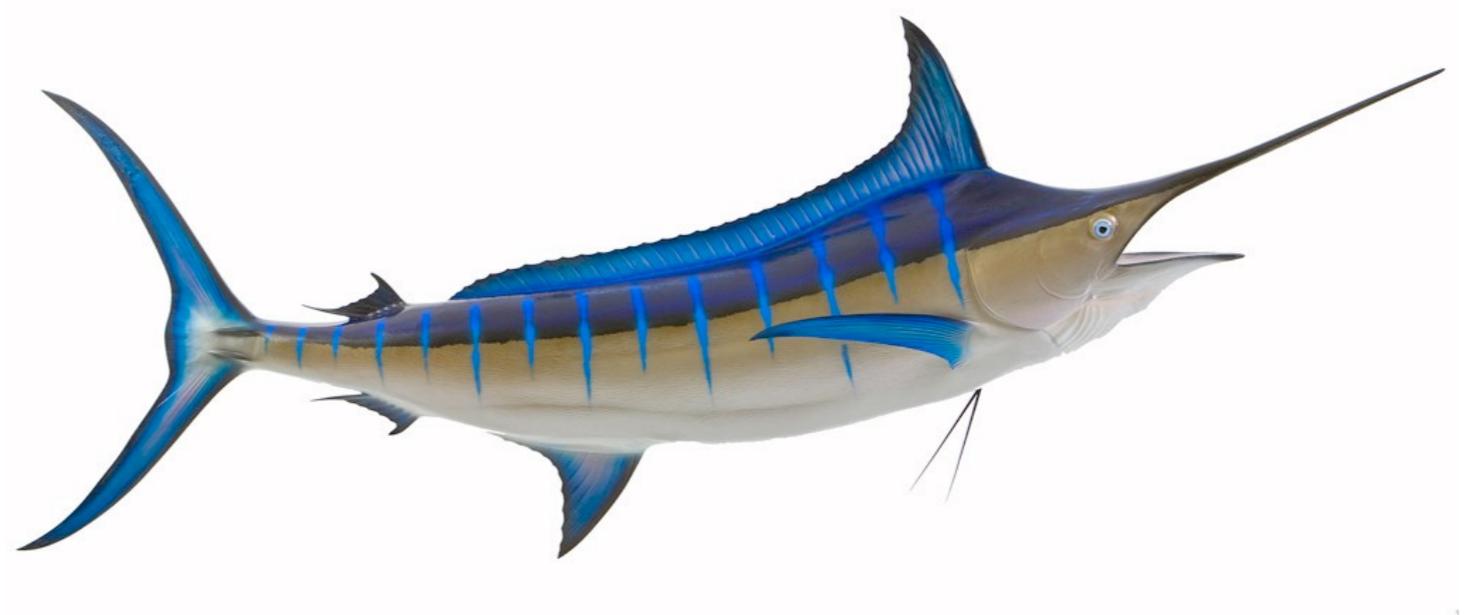
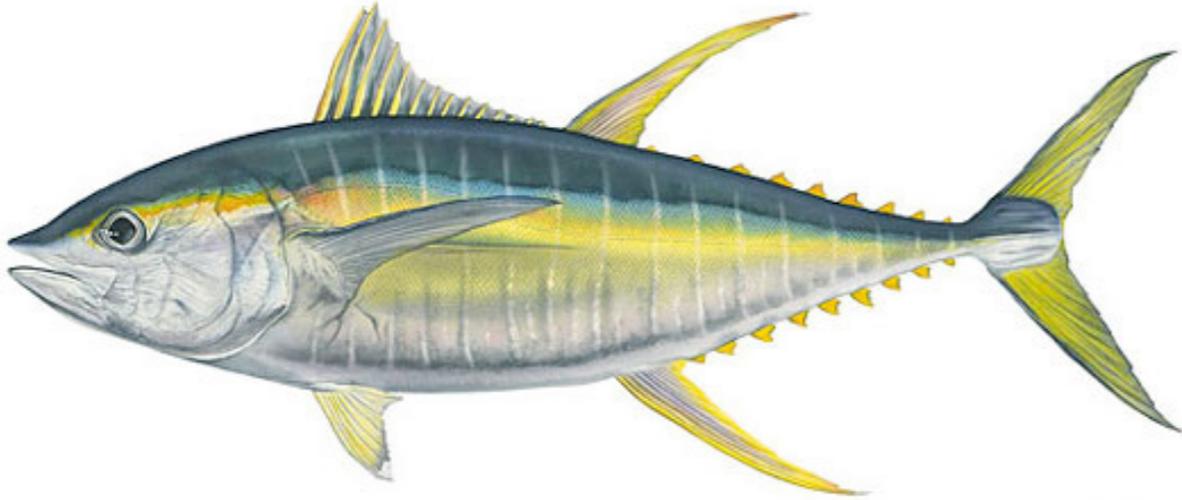


Hoplostethus atlanticus)



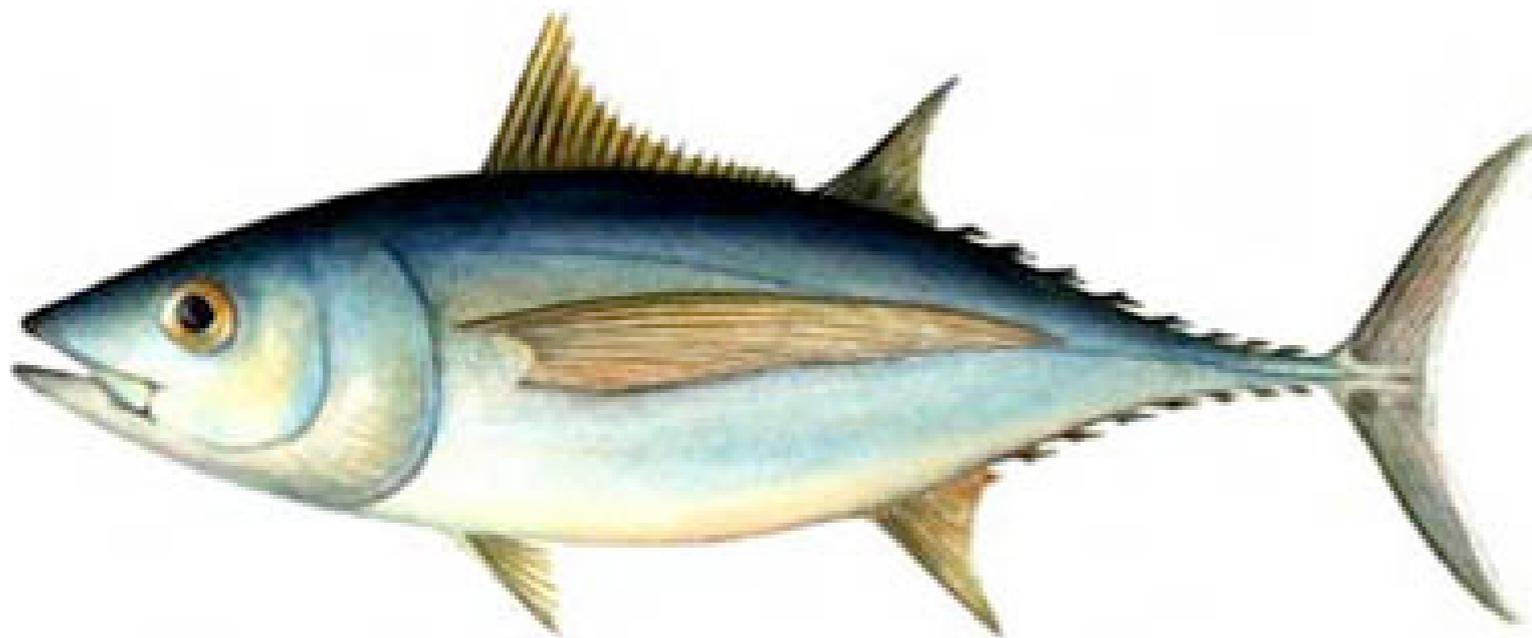
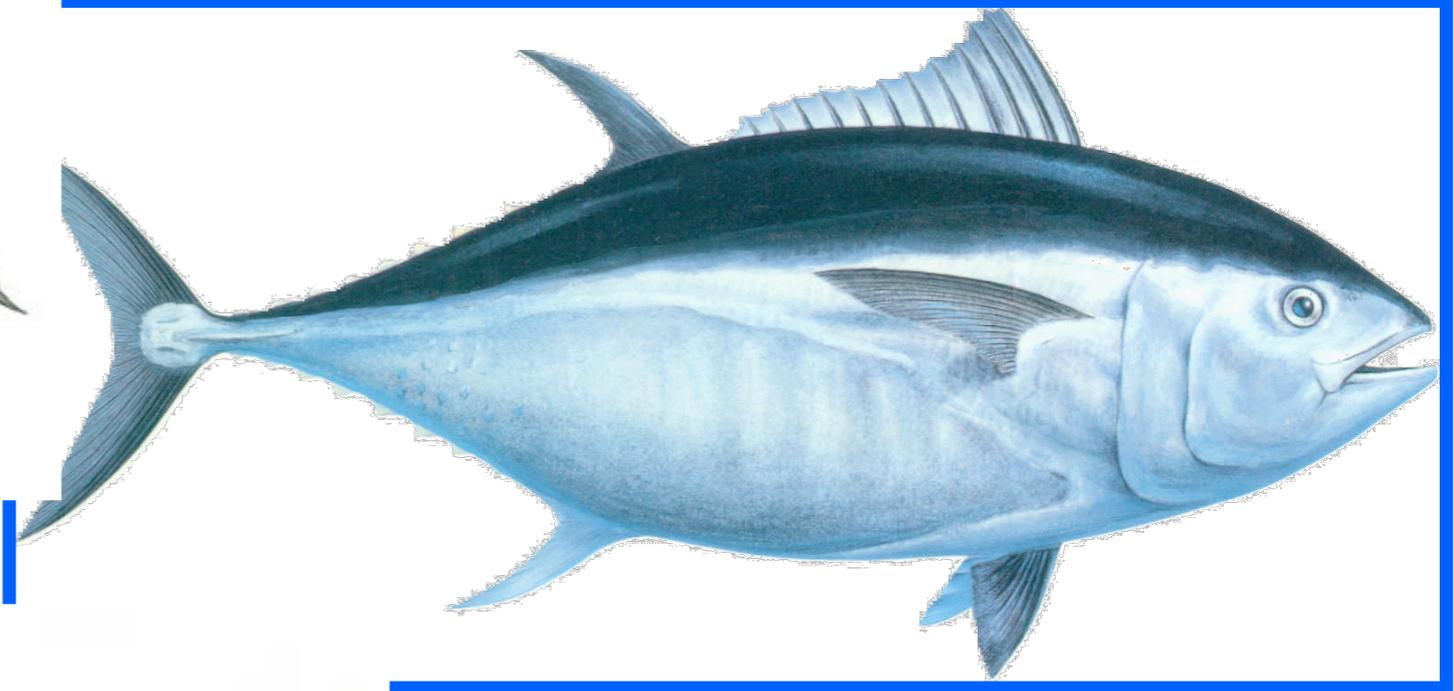
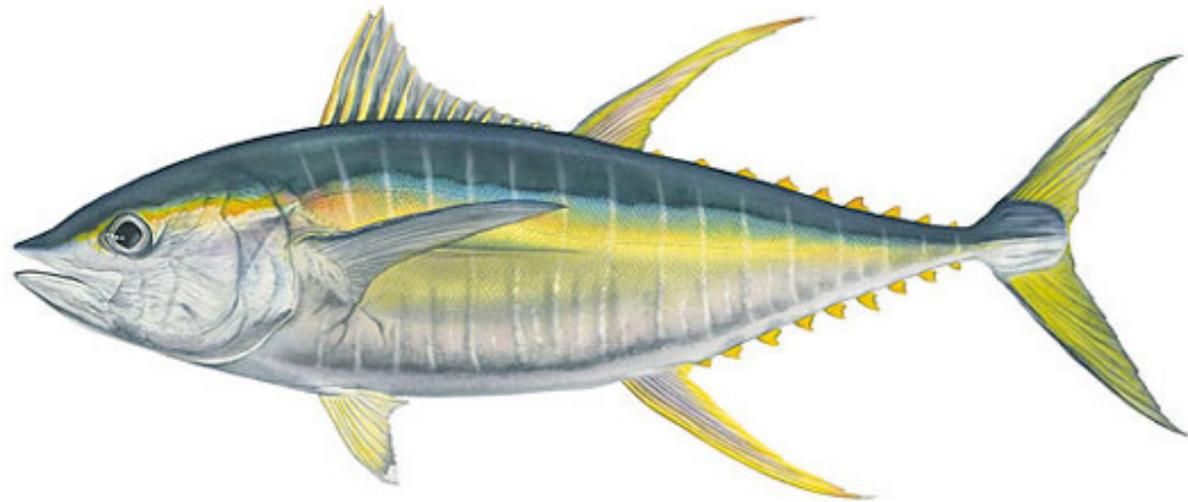
22 000 kilometros
Norte America-Australia

También sucede en Peces Pelágicos



Atunes (Pelágicos)

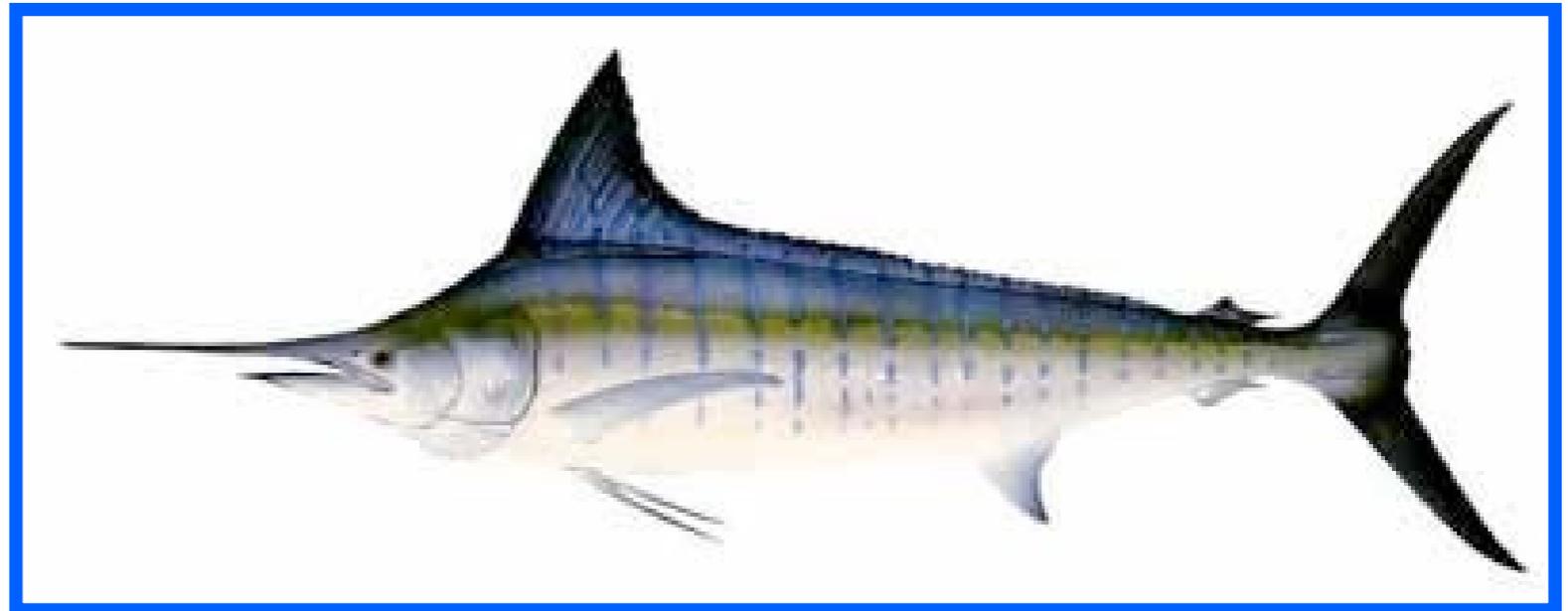
Sobrepesca
Atlántico (2)
Mediterráneo



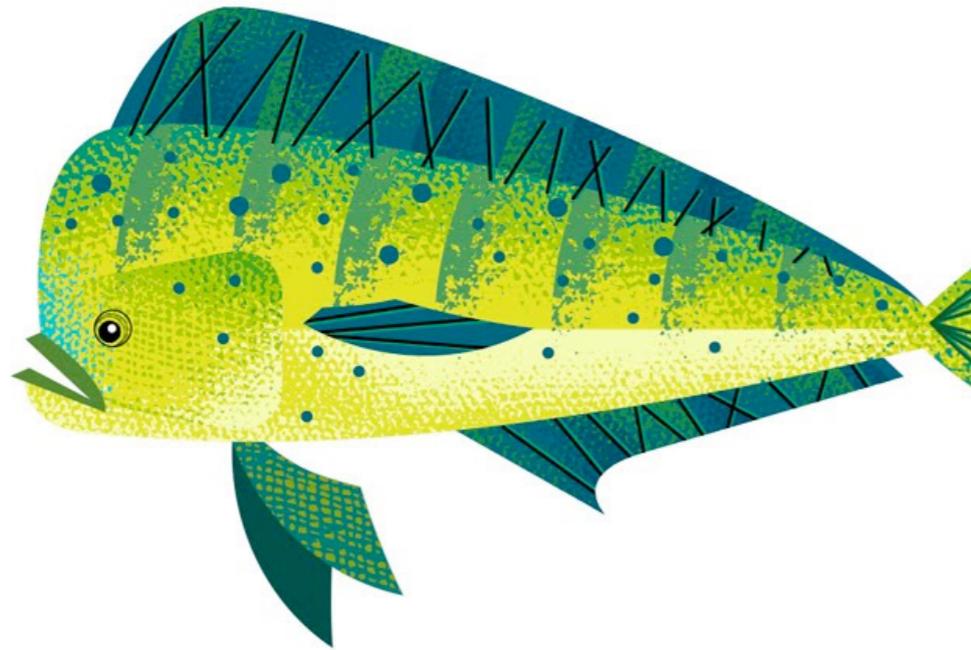
Caso Similar...



(Marlin negro)



(Marlin rayado)



Pez Dorado

mtDNA ND1



Inter-oceanicas



5 loci microsatelites

Golfo California

ND1-RFLPs

Hawaii & México





Migratorio

(Farrel 2009: *MsC Thesis*; Oxenford& Hunt, 1986: *Fish B-NOAA*; Palko et al. 1982: *NMFSe*)

Caribe

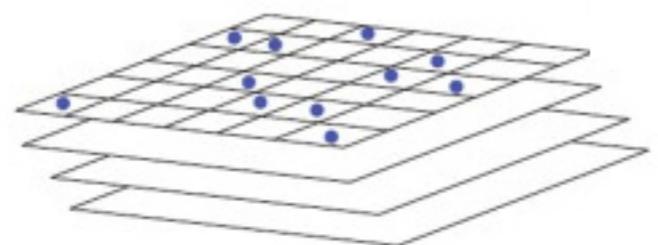
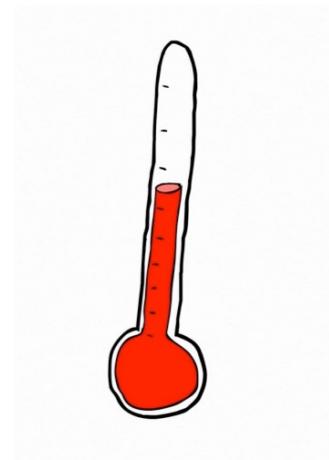
(Oxenford & Hunt 1986: *Fish Bull*)



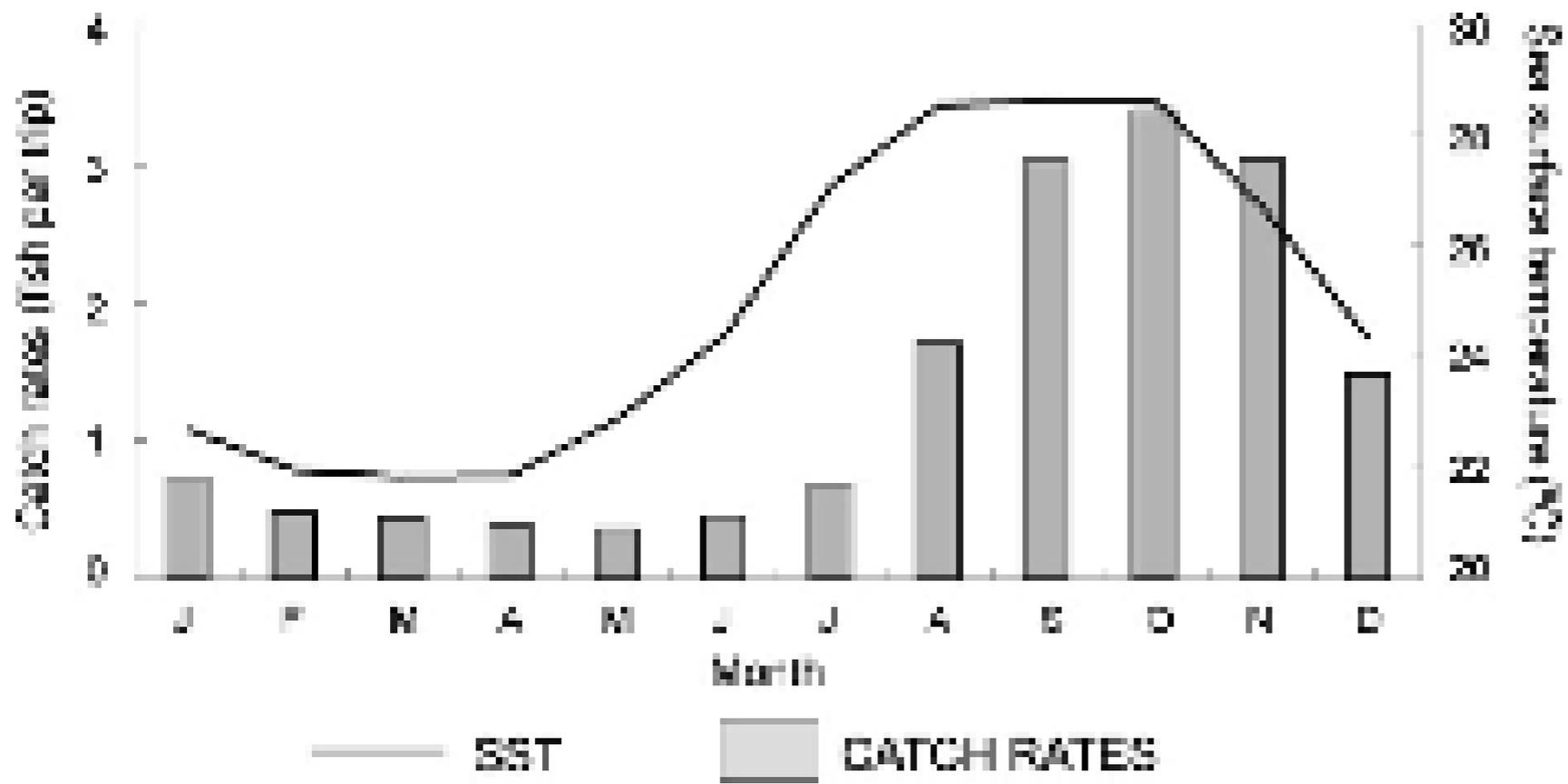
(Palko et al. 1982: *NMFServ*)

→ Datos de estacionalidad y tamaño

Caribe

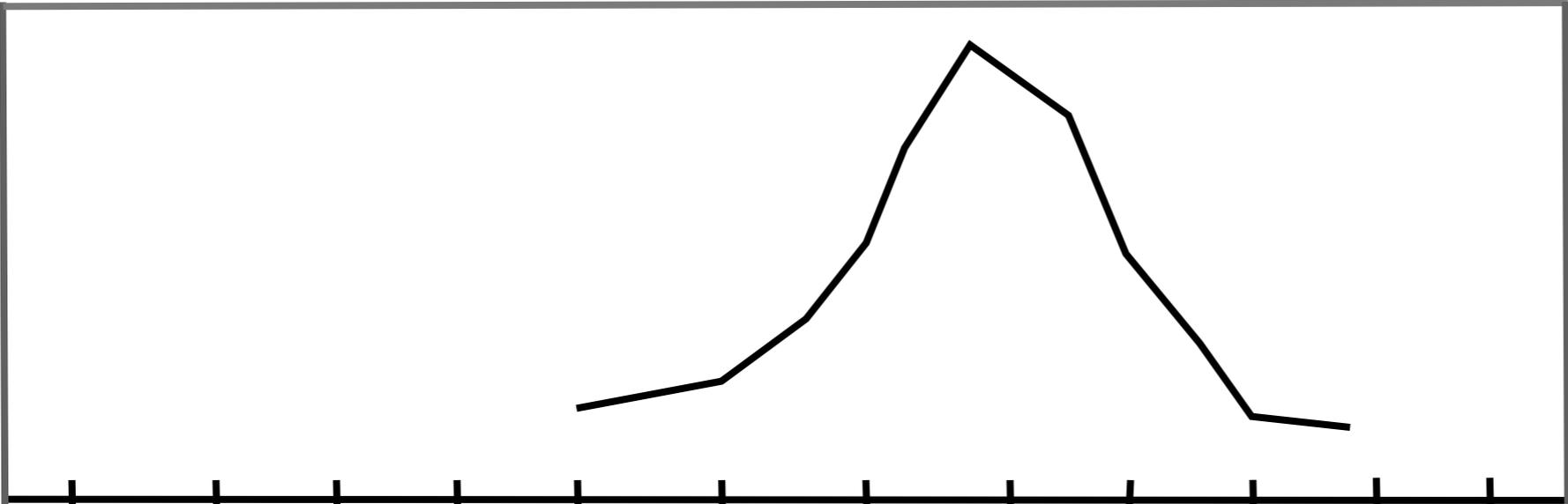


¿Y en el Pacífico?

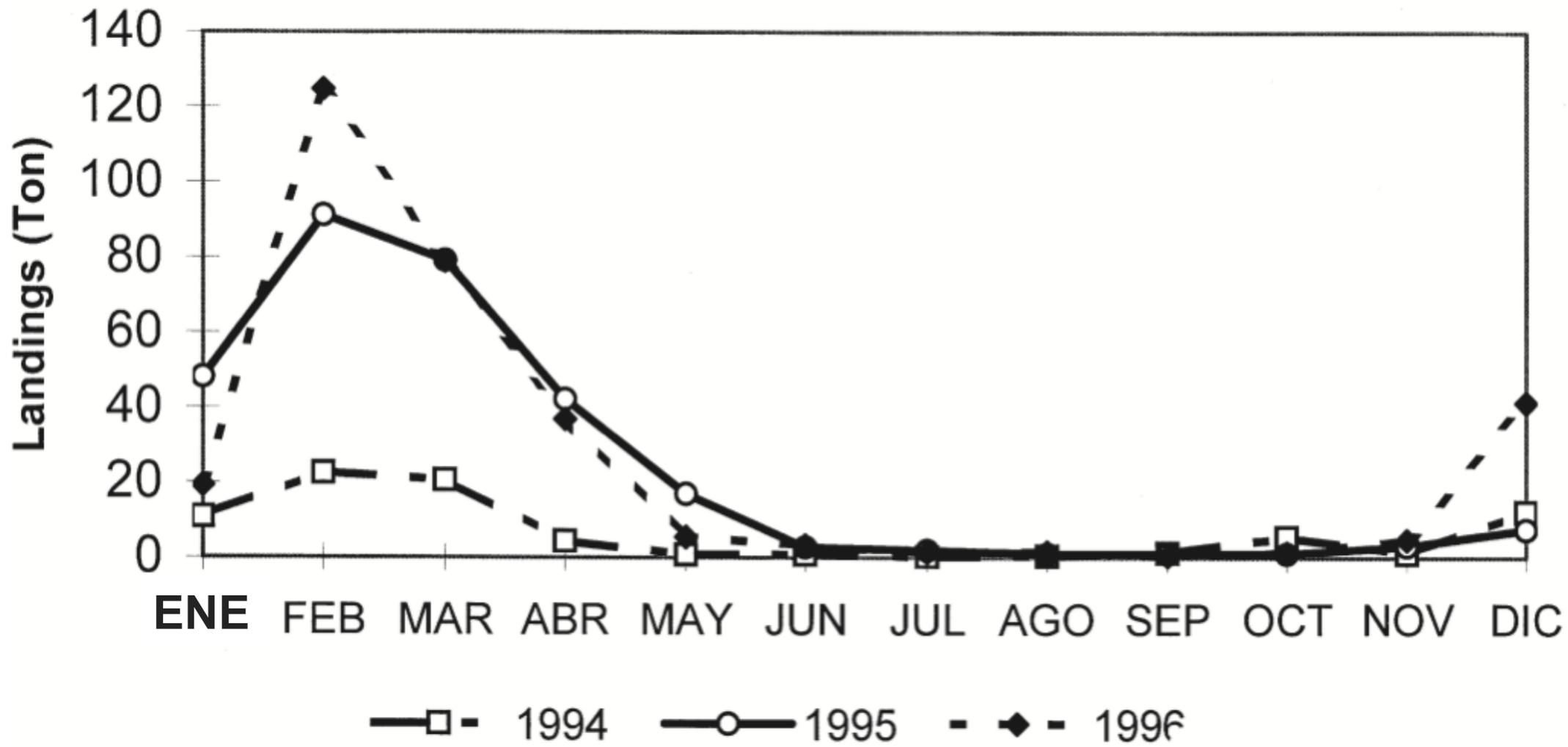




Costa Rica

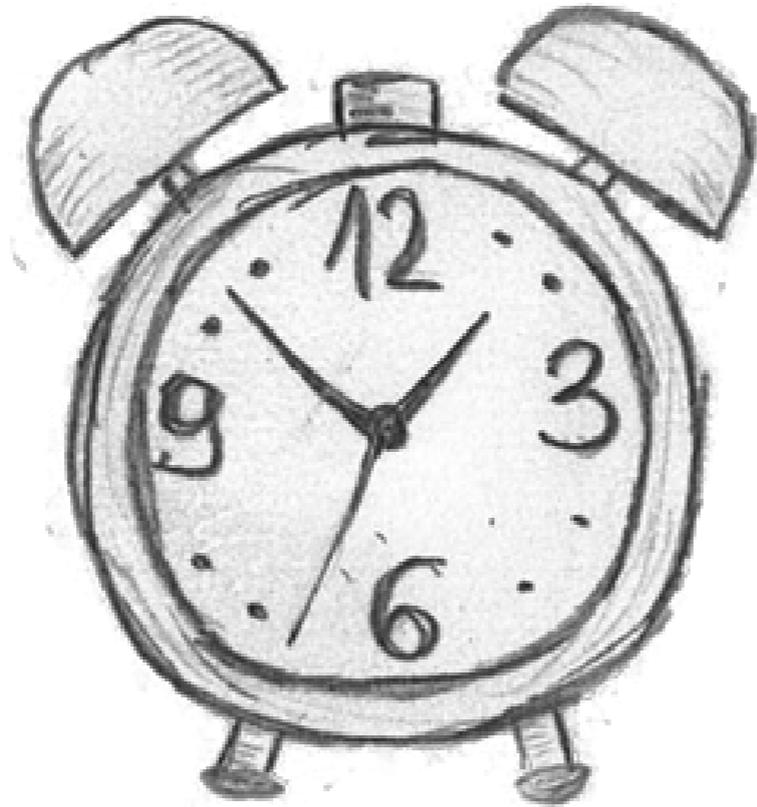


MAY JUN JUL AGO SEP OCT NOV DIC **ENE** FEB MAR MAY



Colombia

¿Qué está pasando?



Objetivo General

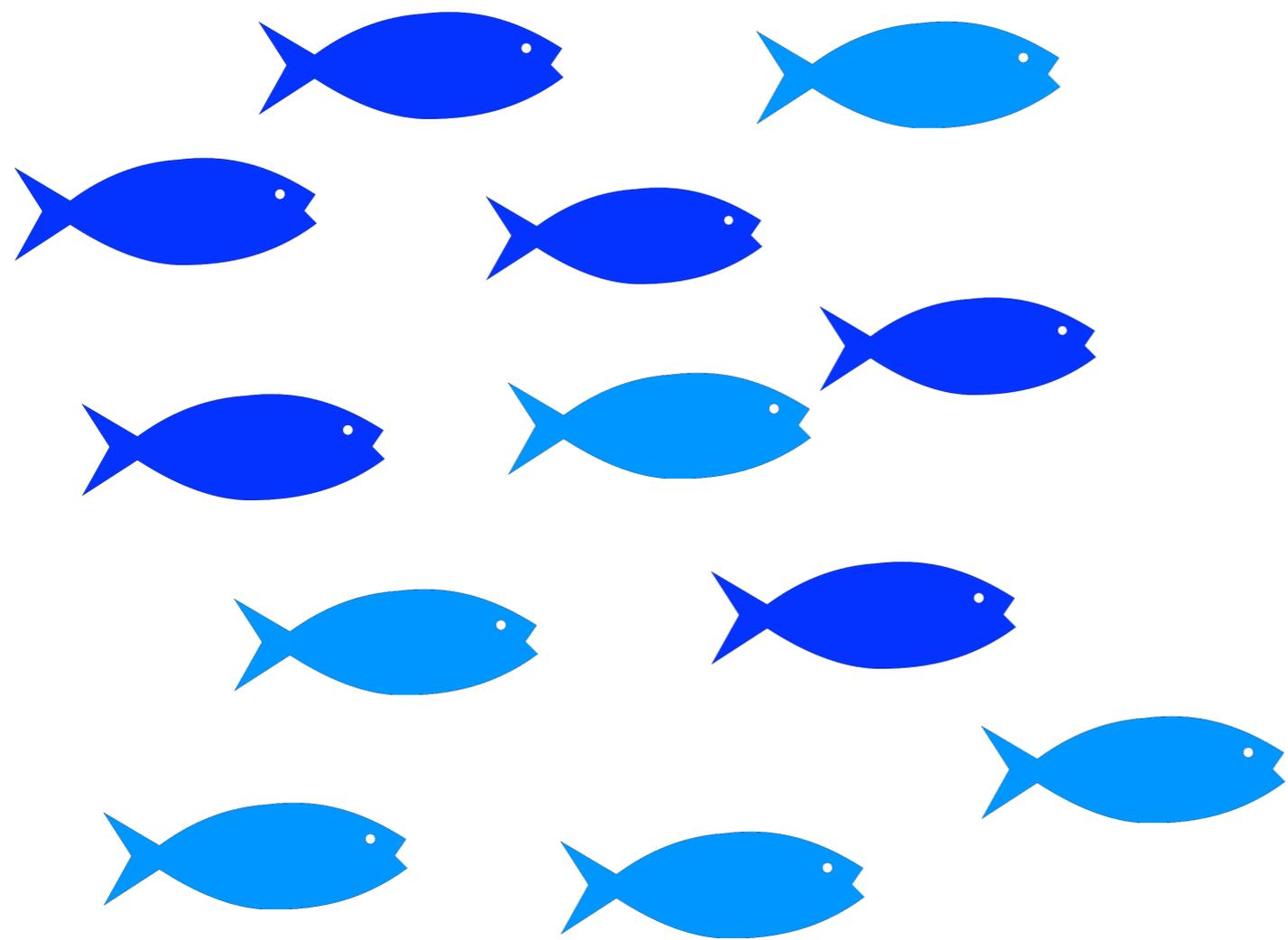
Evaluar si el Dorado presenta algún nivel de heterogeneidad genética en escala temporal



Migratorio

Recurso constante

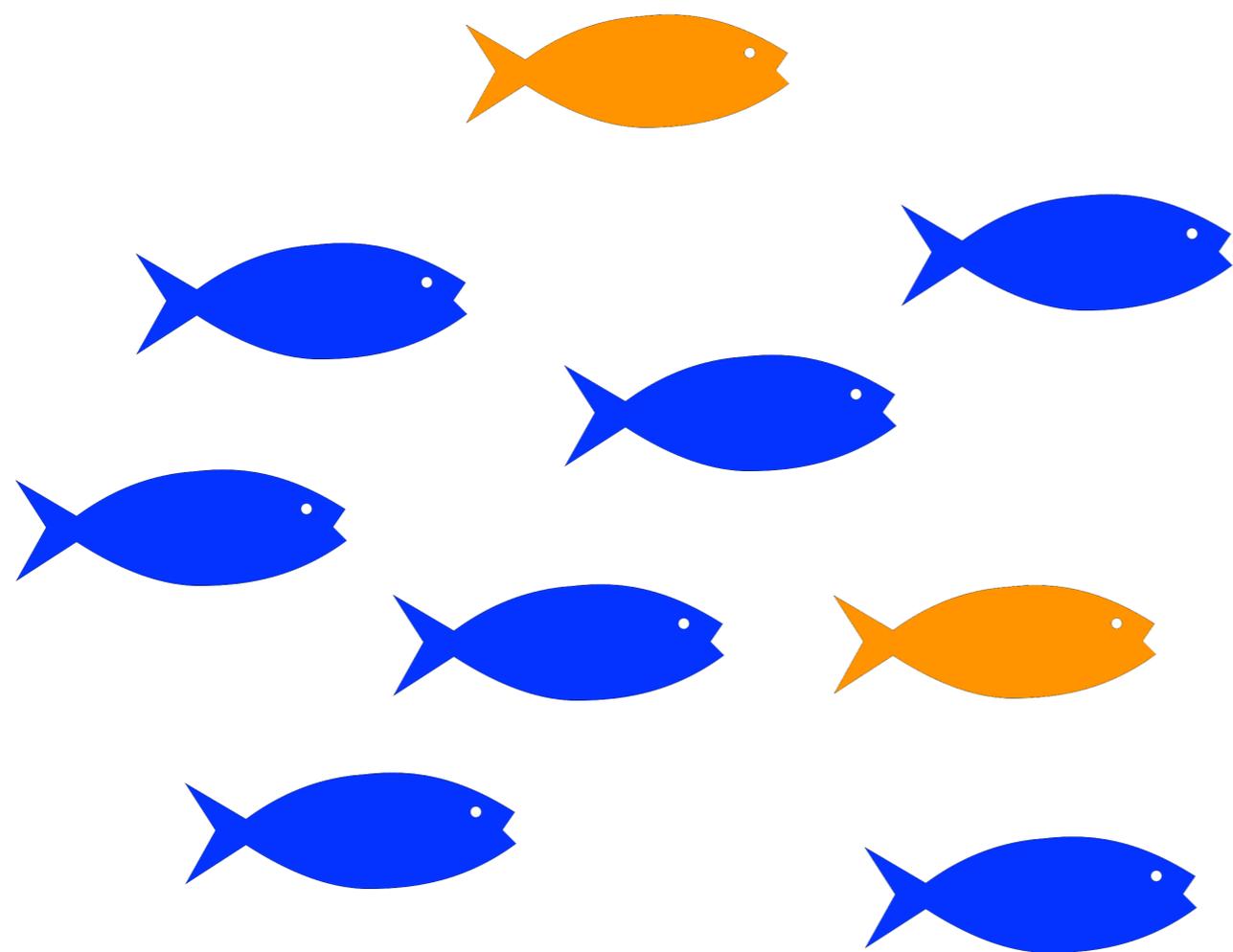
Ho =



Enero \longrightarrow Diciembre



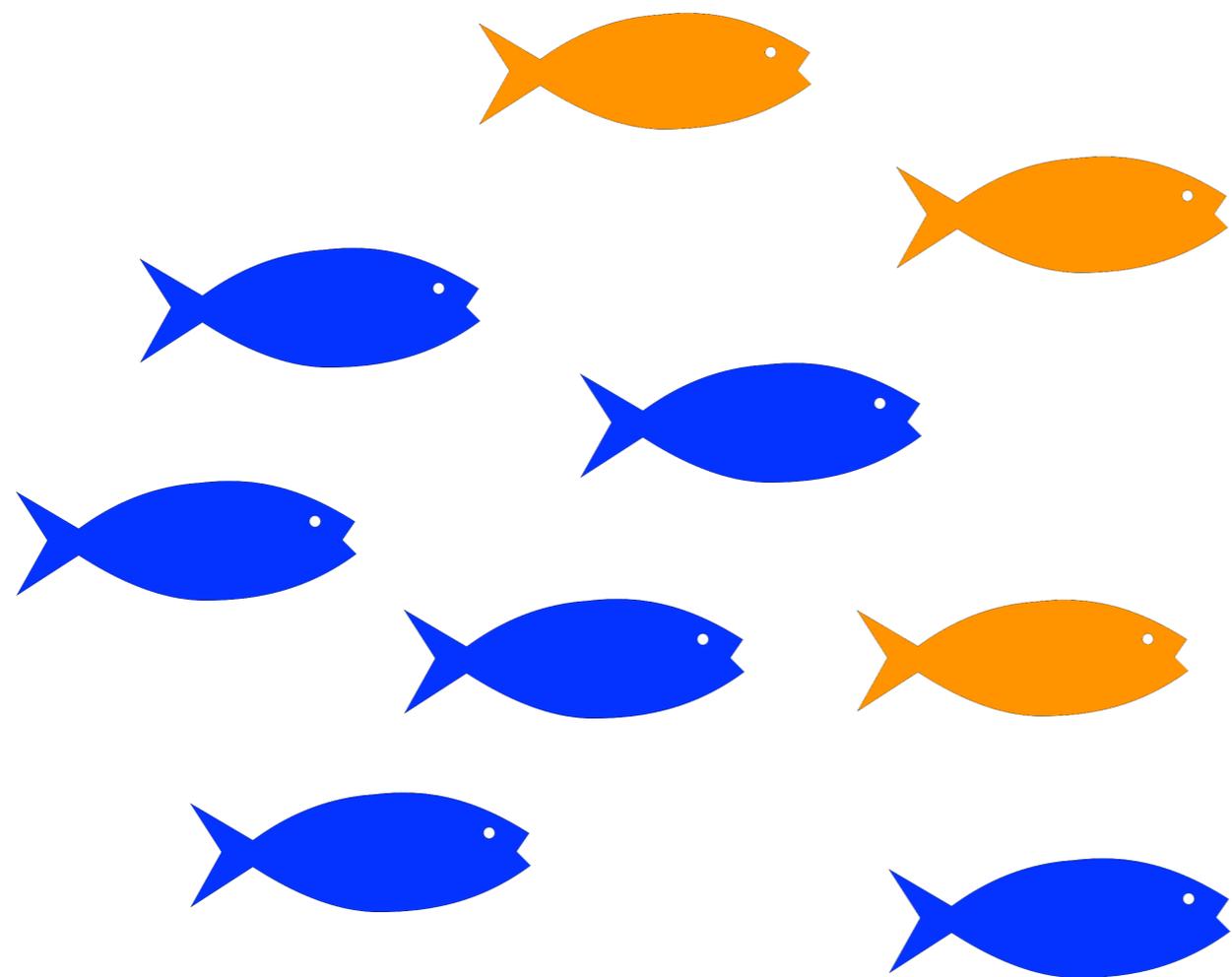
Ha =



Enero



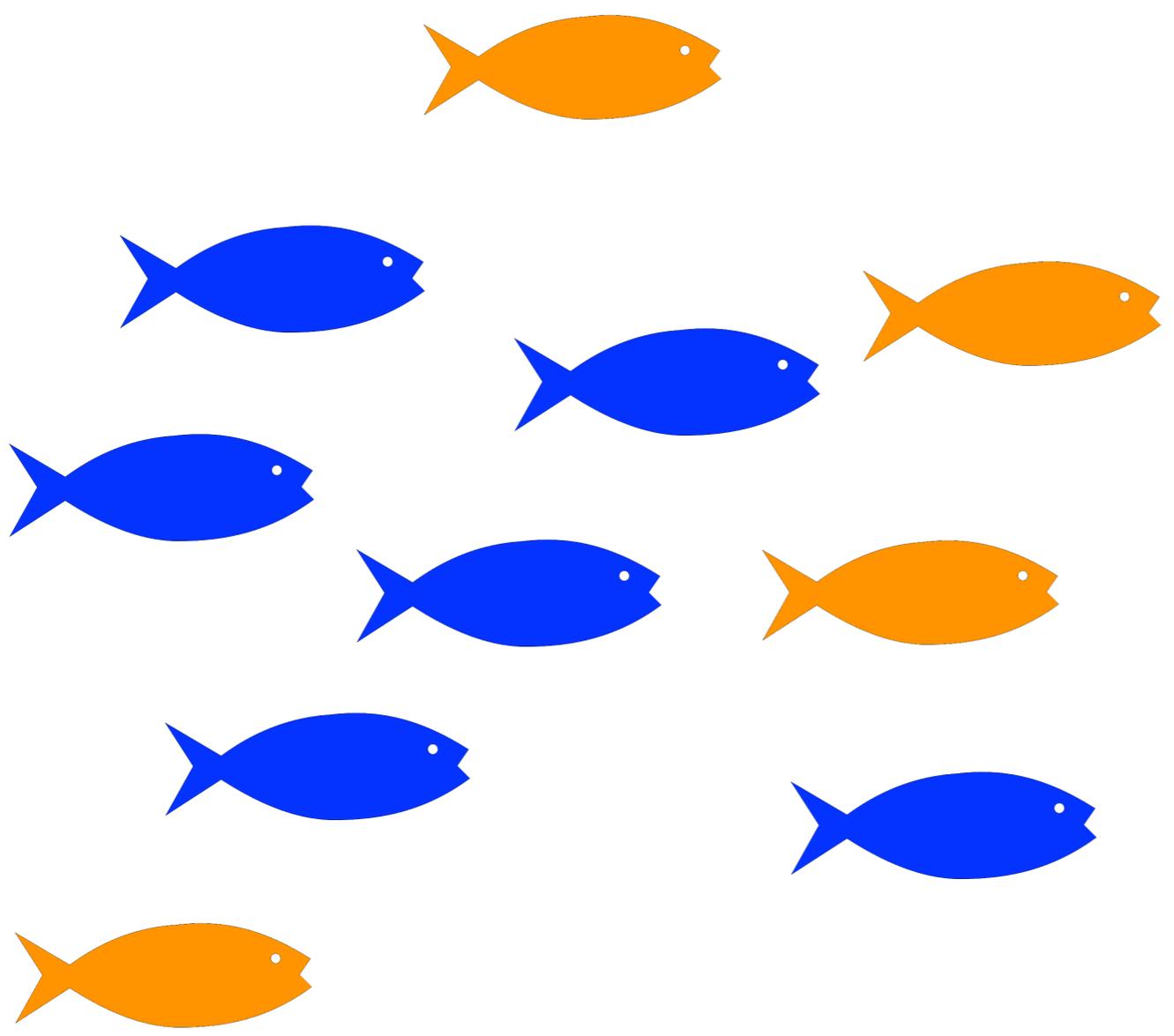
Ha =



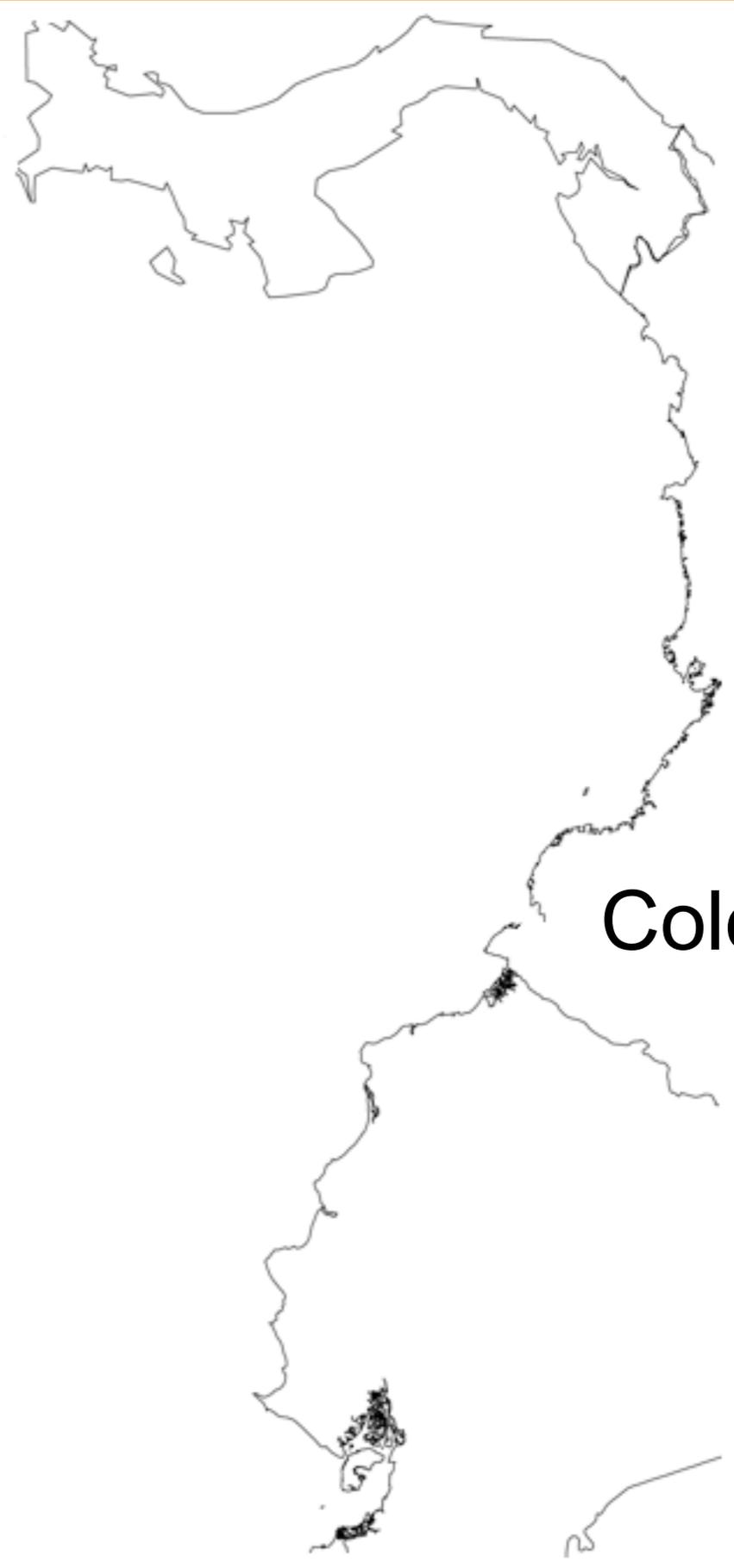
Marzo



Ha =

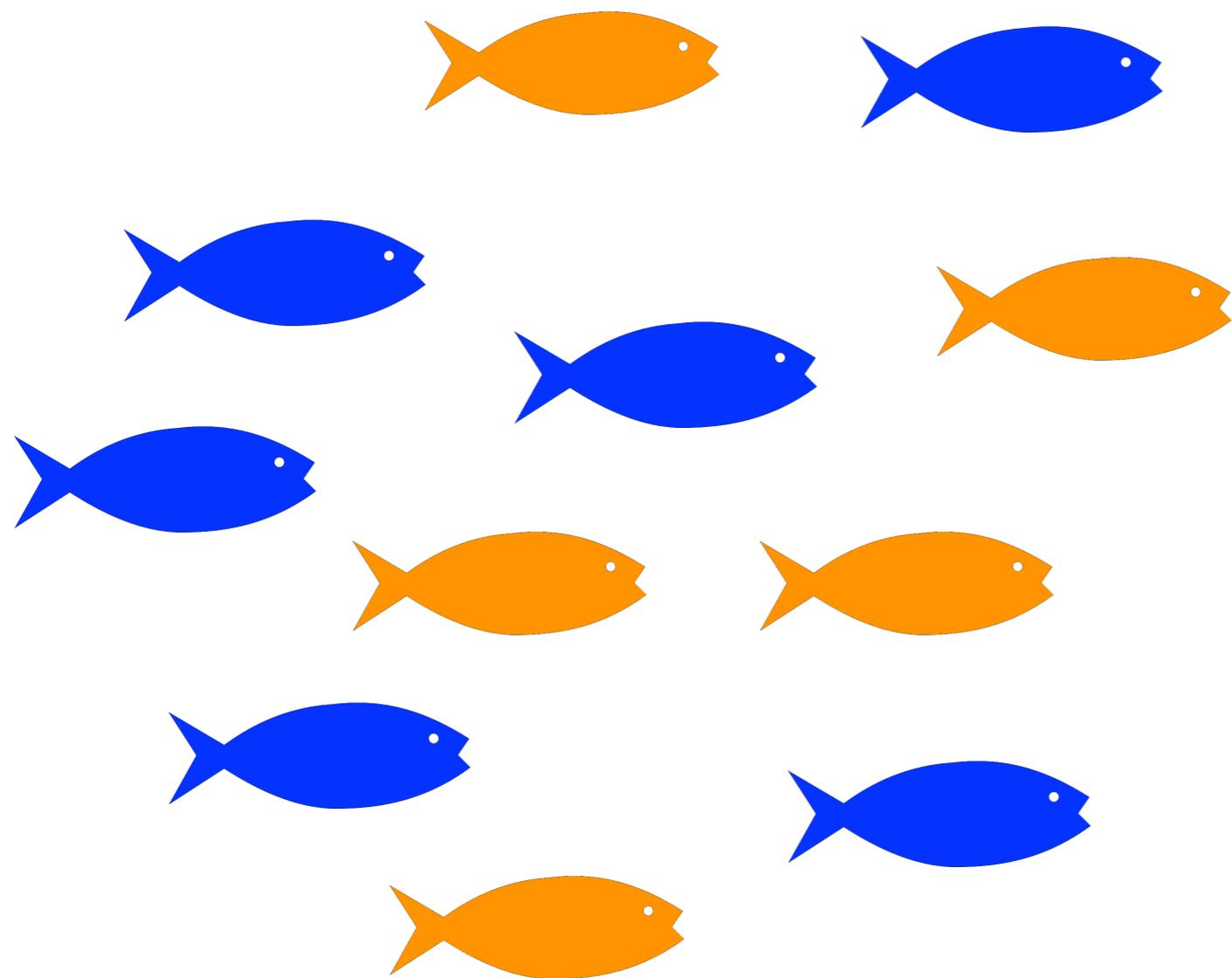


Mayo



Colombia

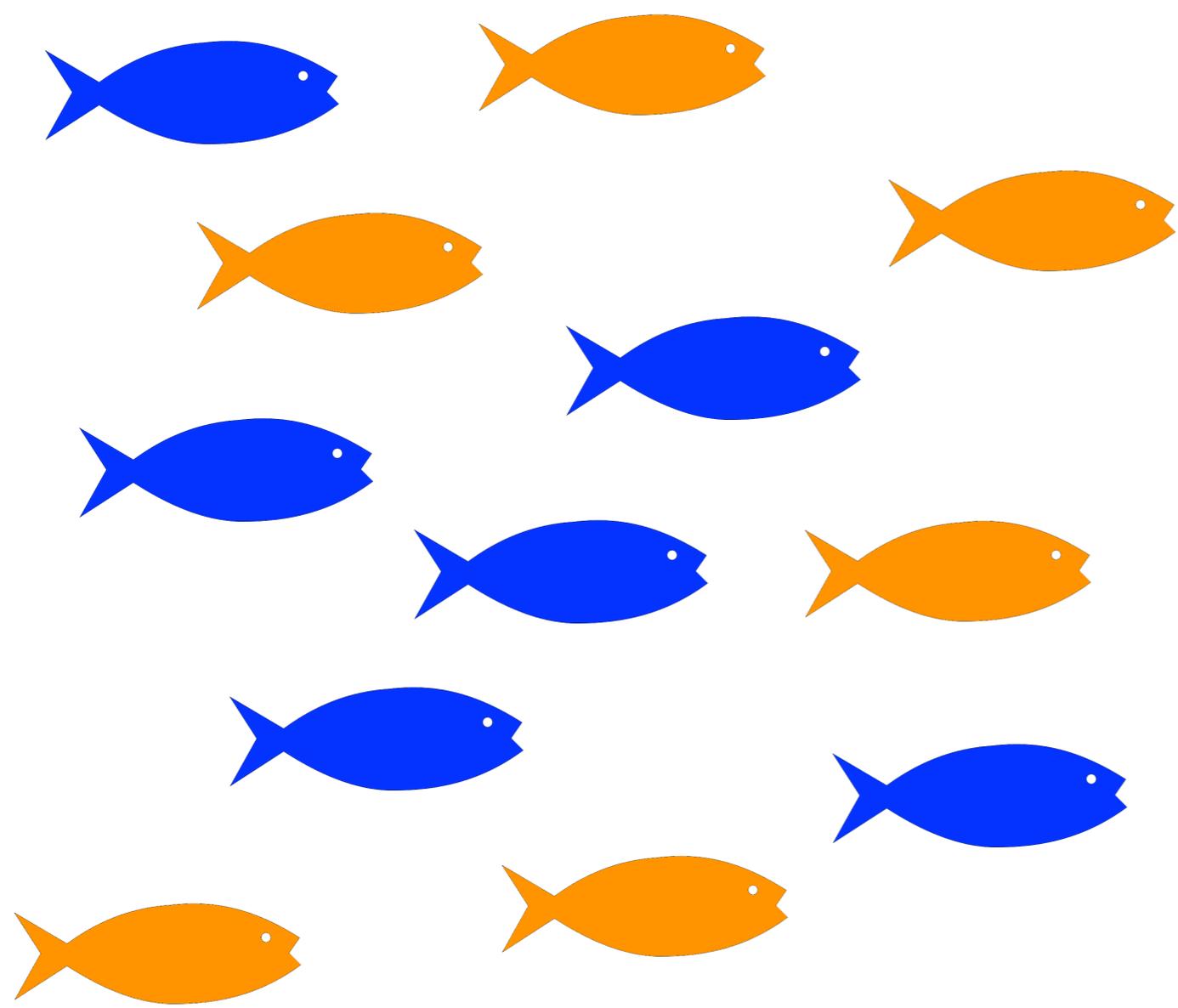
Ha =



Colombia

Julio

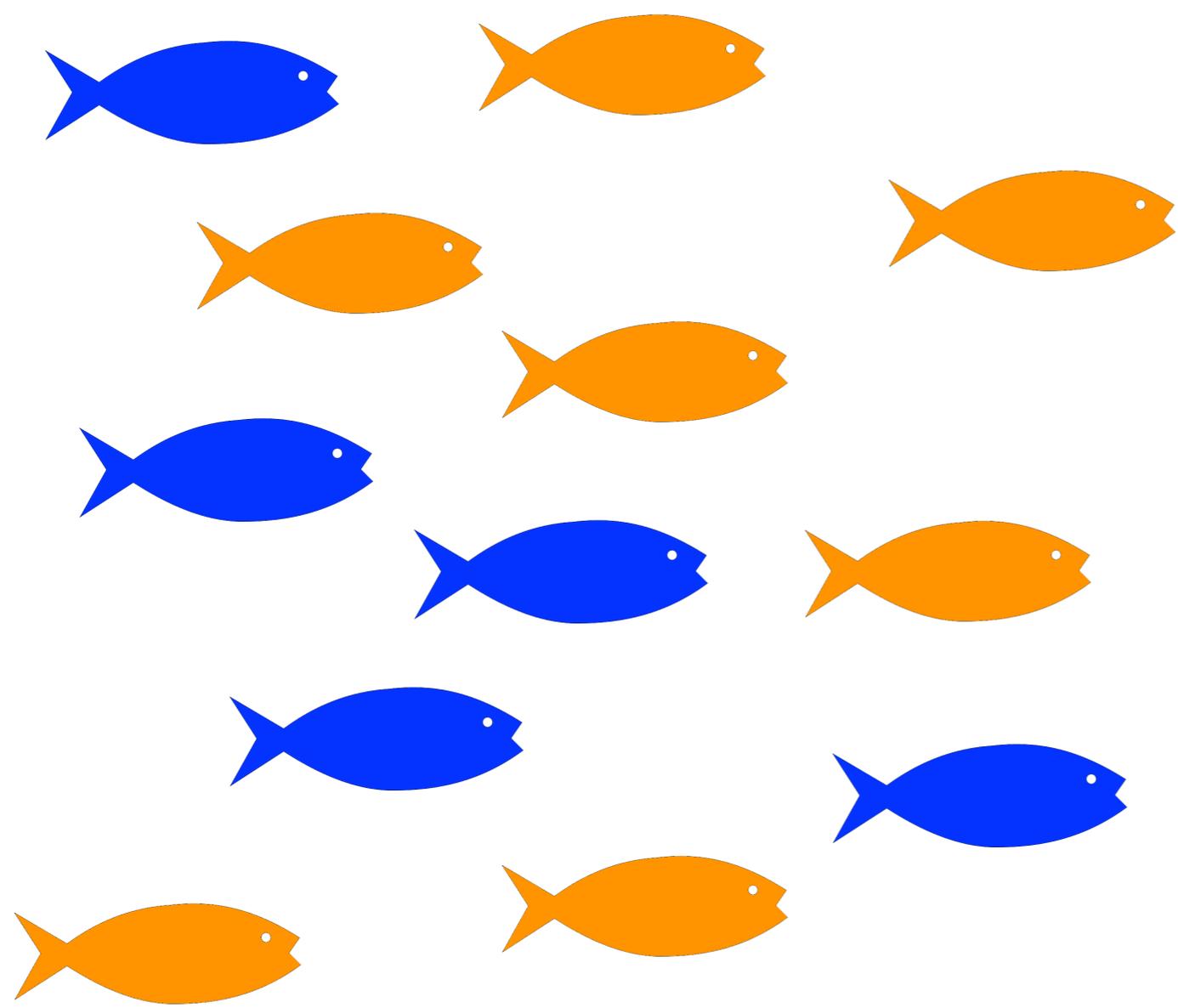
Ha =



Colombia

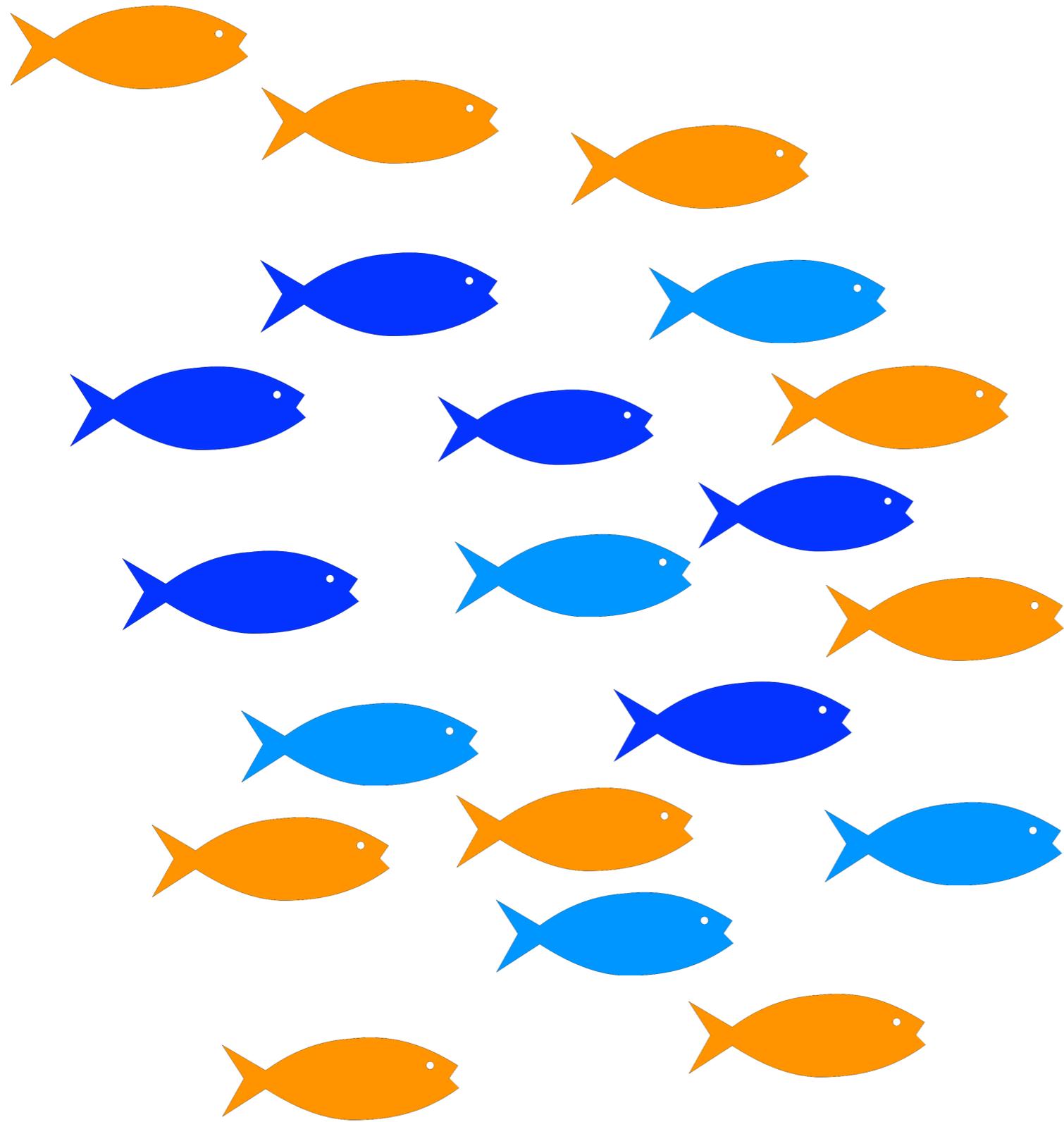
Septiembre

Ha =



Colombia

Septiembre

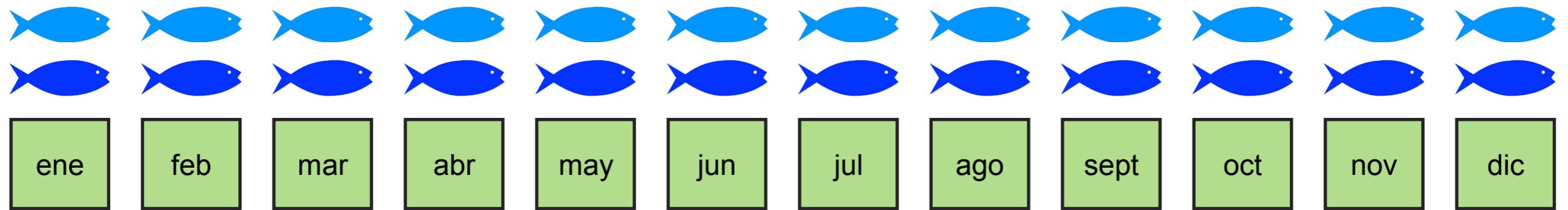


Colombia

Mitochondrial

Ho =

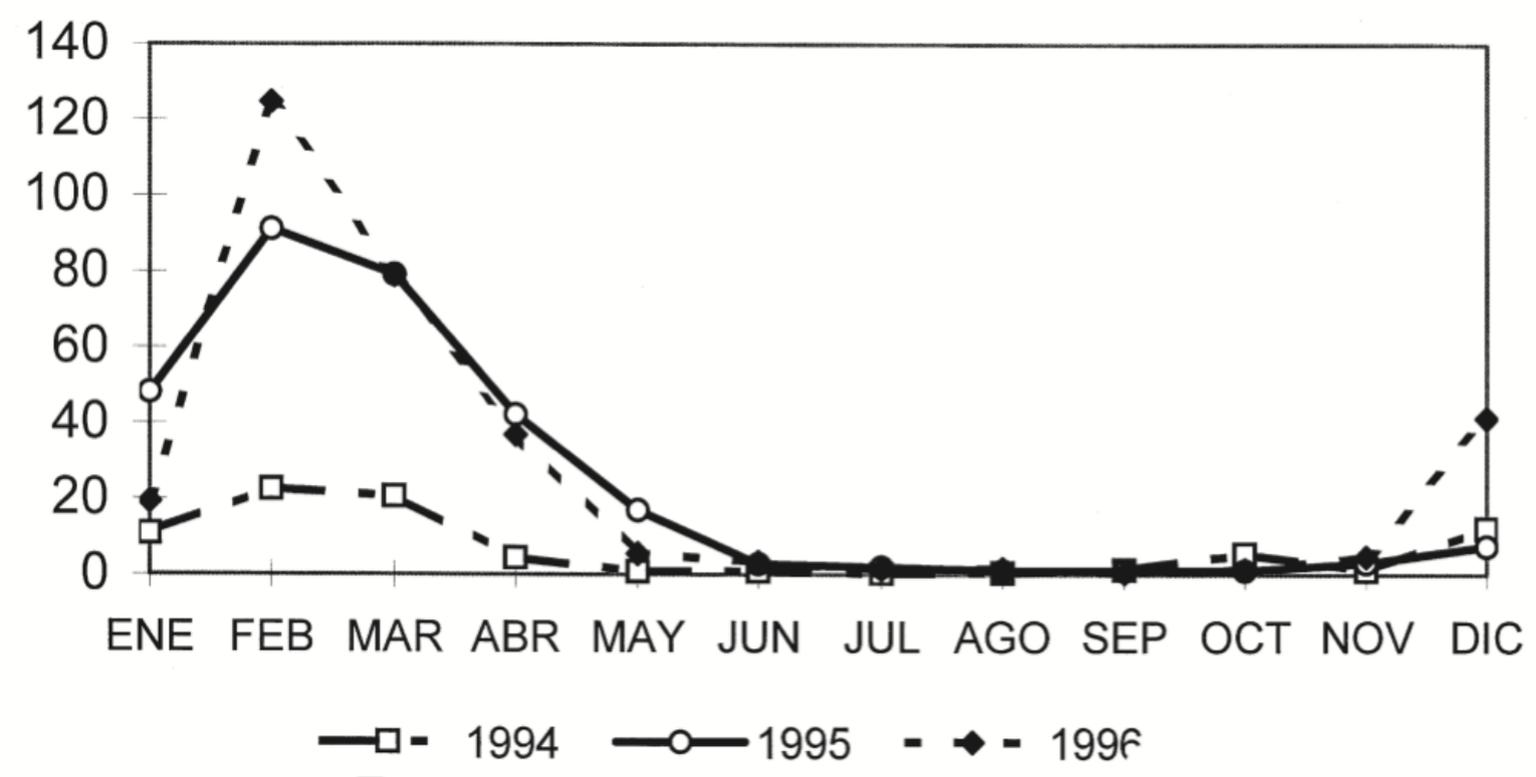
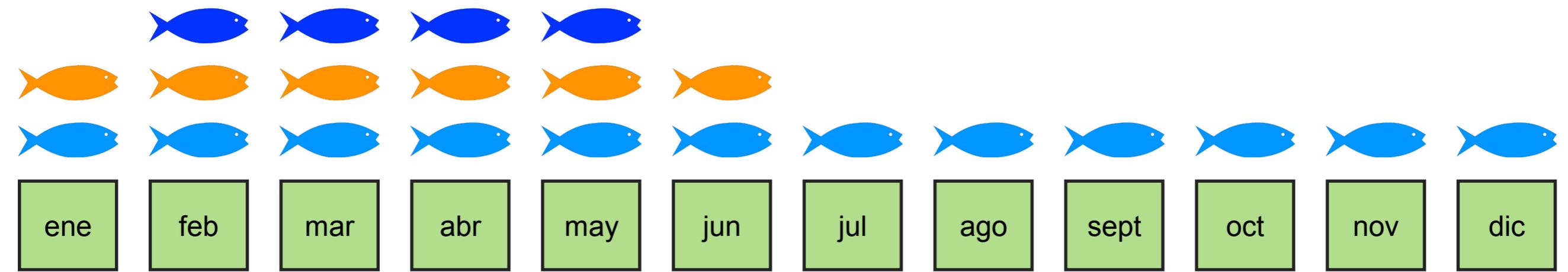
○ = Haplotipo



Enero → Diciembre

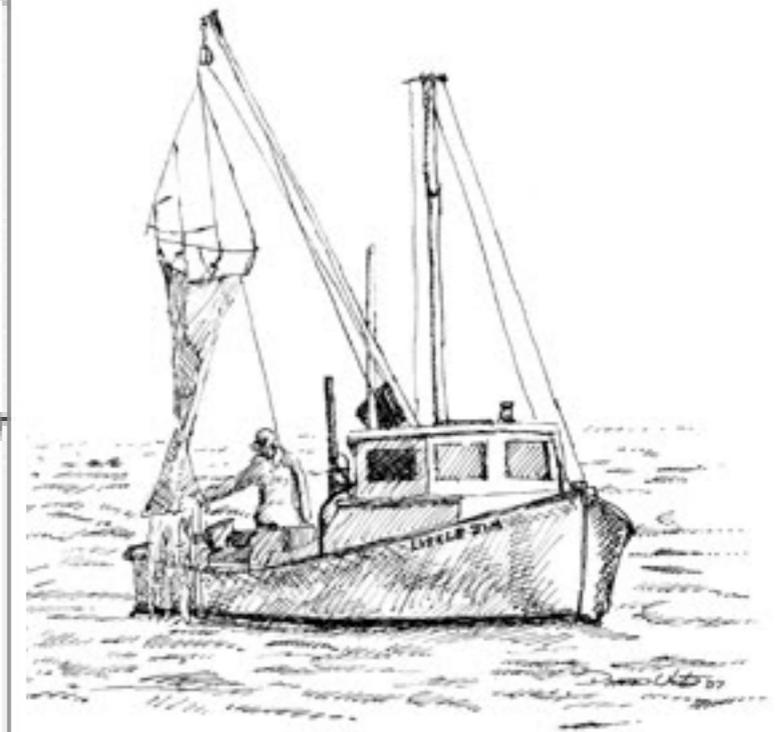
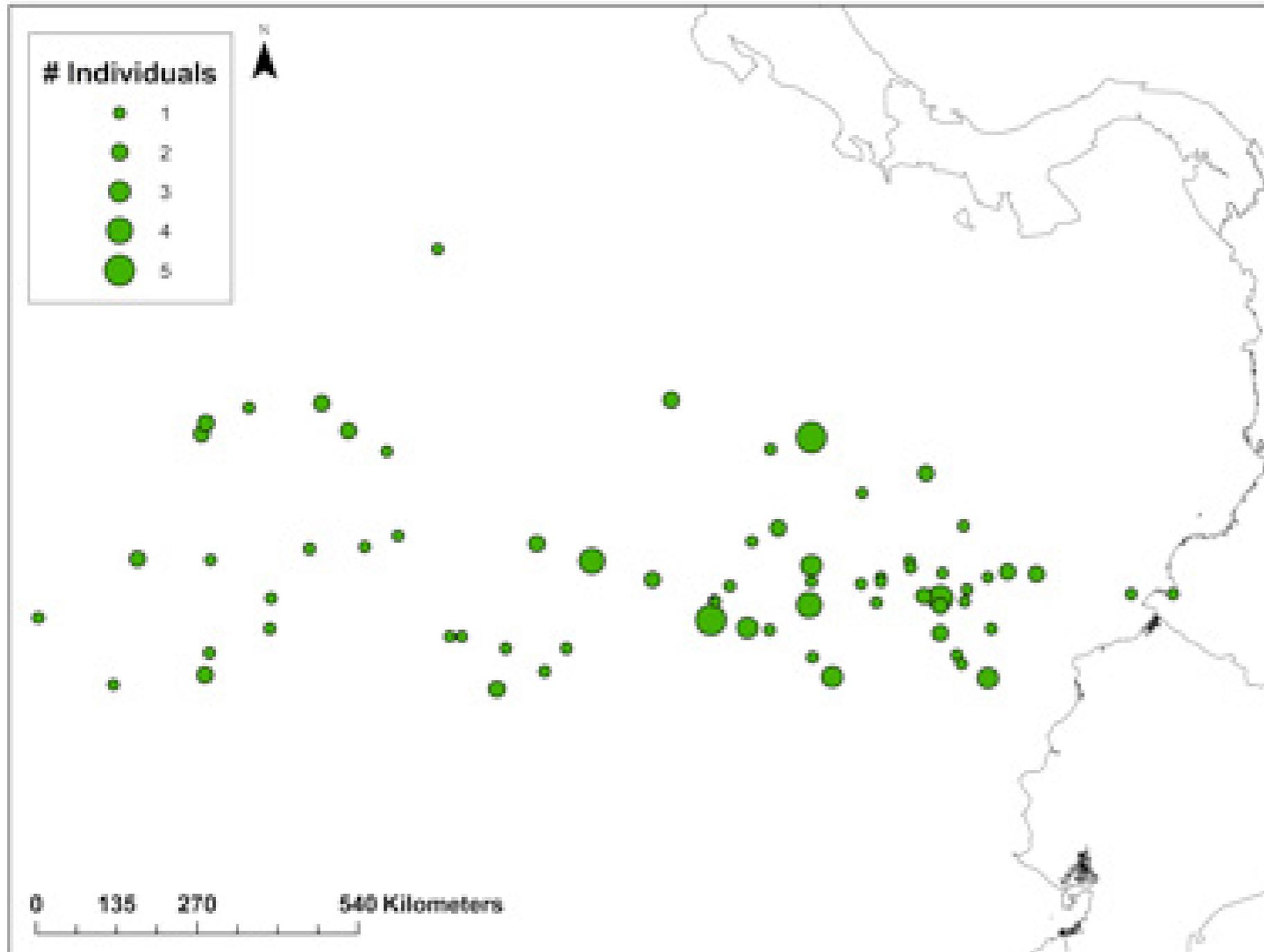
Mitochondrial

Ha =



Sitios de Colecta

N = 128

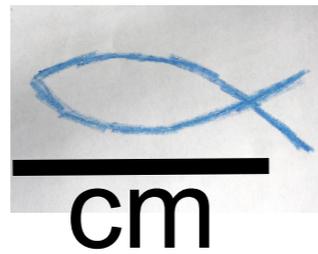
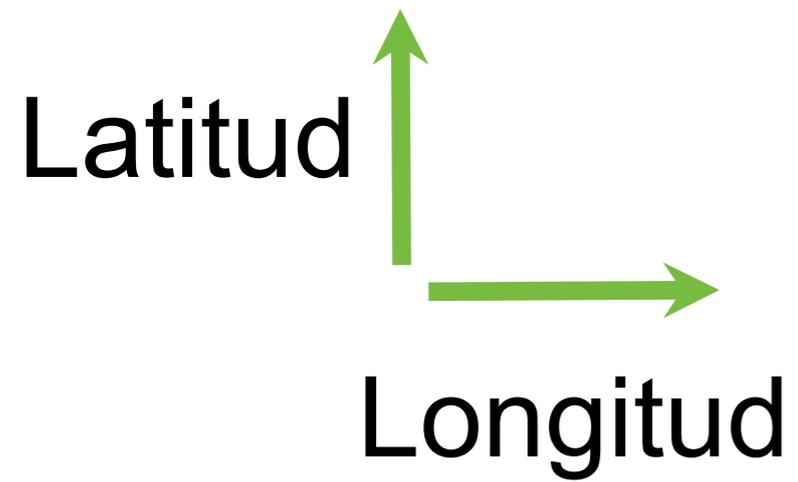


Nov 2010

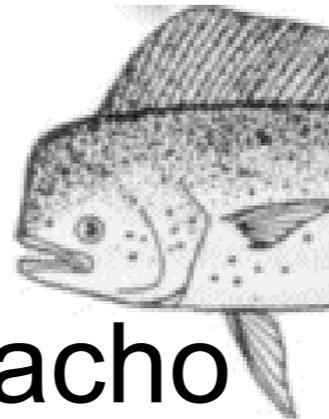


Dic 2011

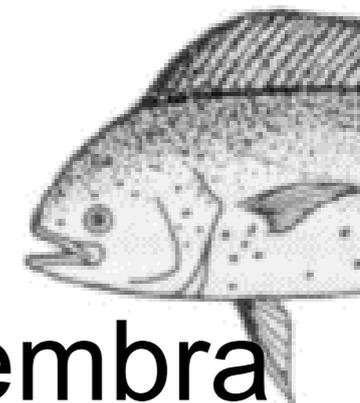
Datos



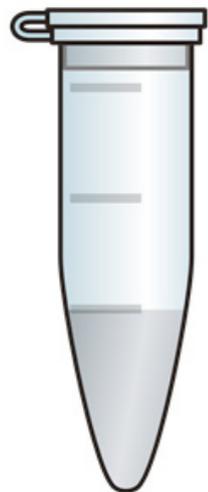
P

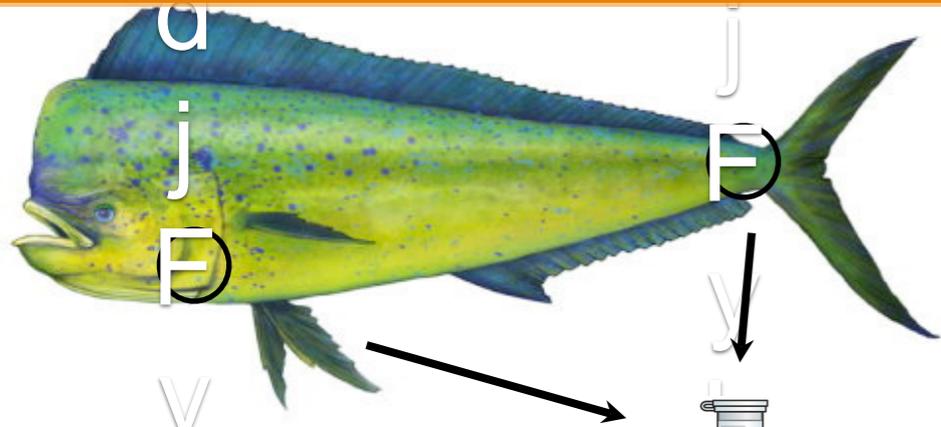


Macho



Hembra





Extracción, PCR

Secuenciación

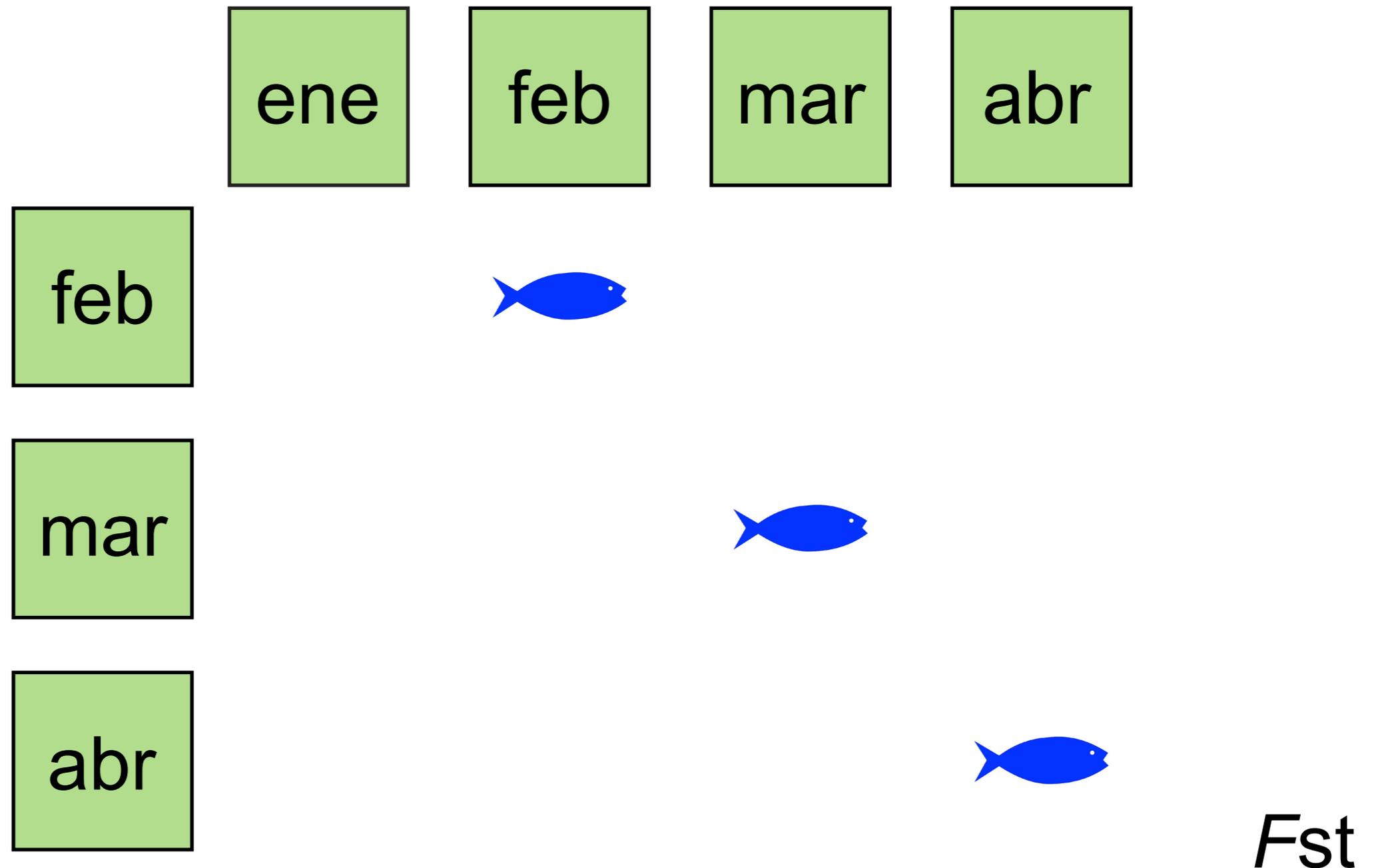
Cytb

ND1

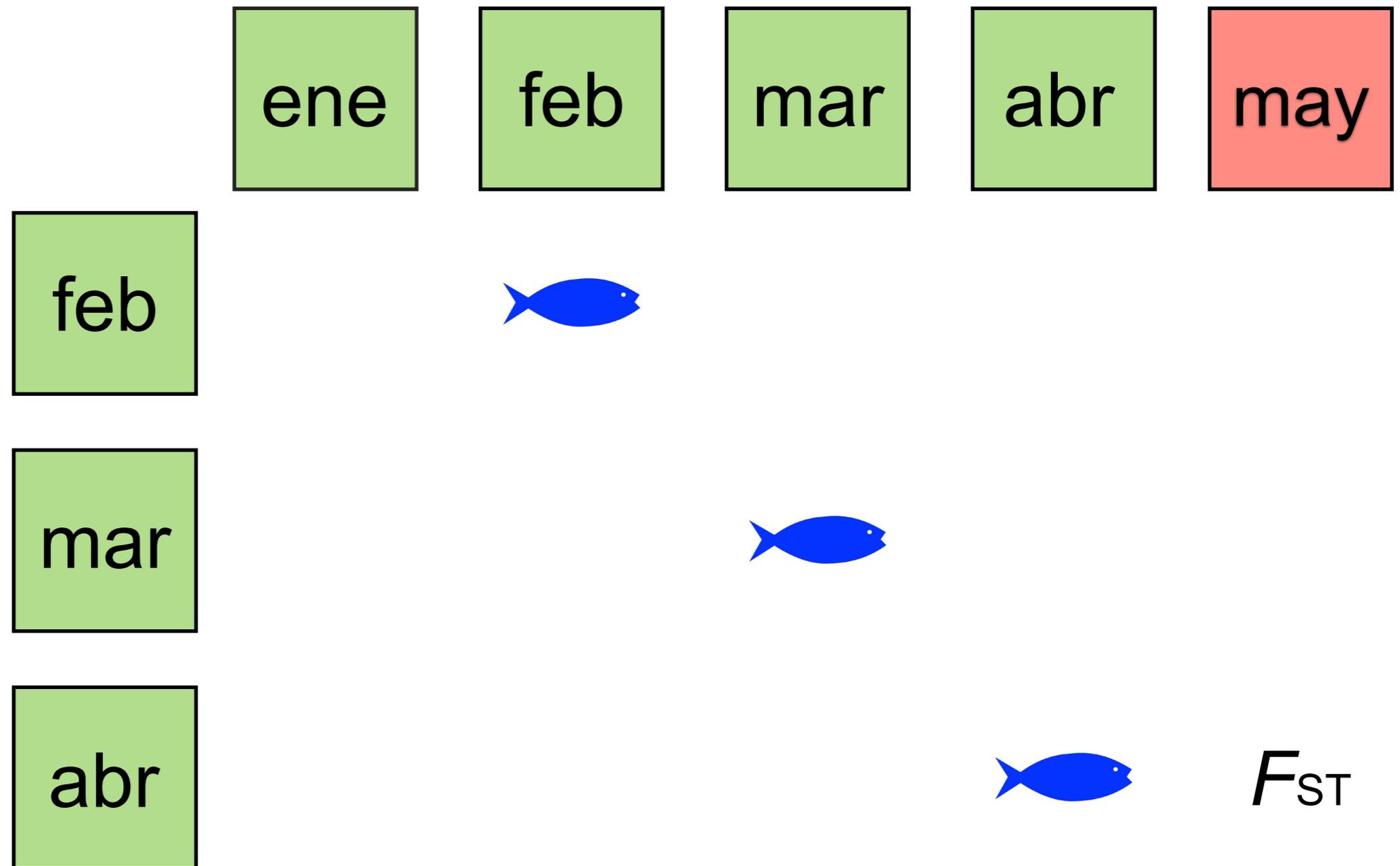
Genotipificación
(5 loci)



¿Cómo evaluar si hay heterogeneidad genética temporal?



¿Cómo evaluar si hay heterogeneidad genética temporal?

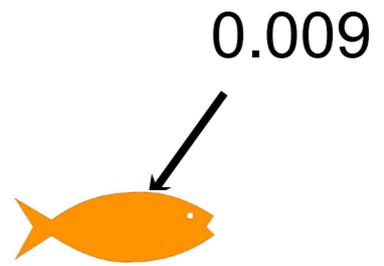
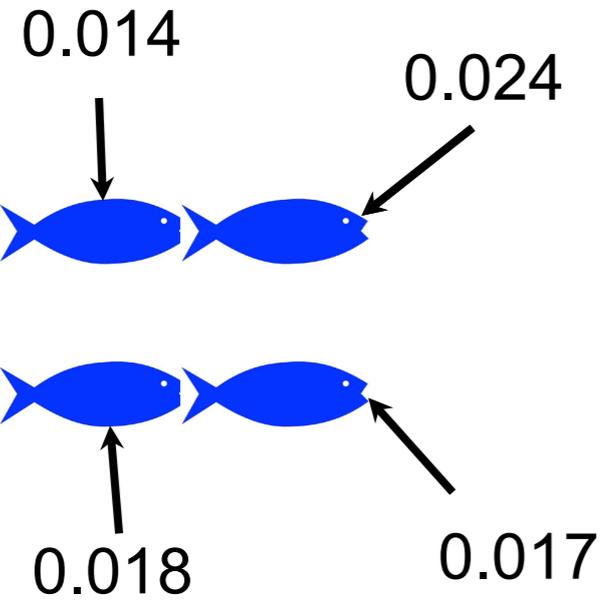


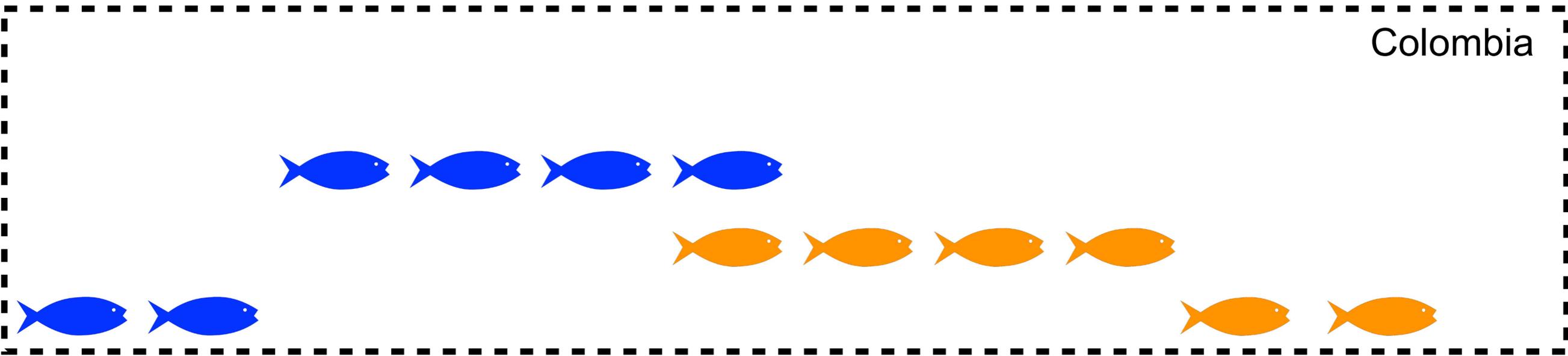
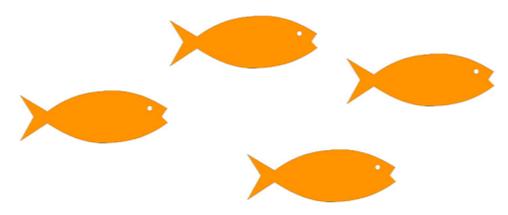
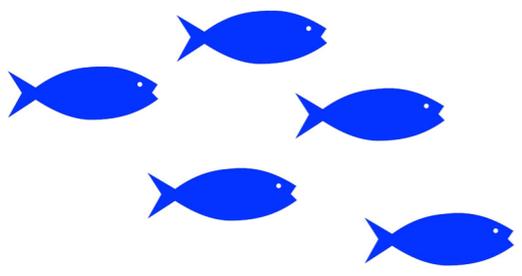
¿ Qué encontramos?

ene feb mar abr may jun jul ago sept oct nov dic

ene
feb
mar
abr
may
jun
jul
ago
sept
oct
nov
dic

F_{ST}





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feb

mar

abr

may

jun

jul

ago

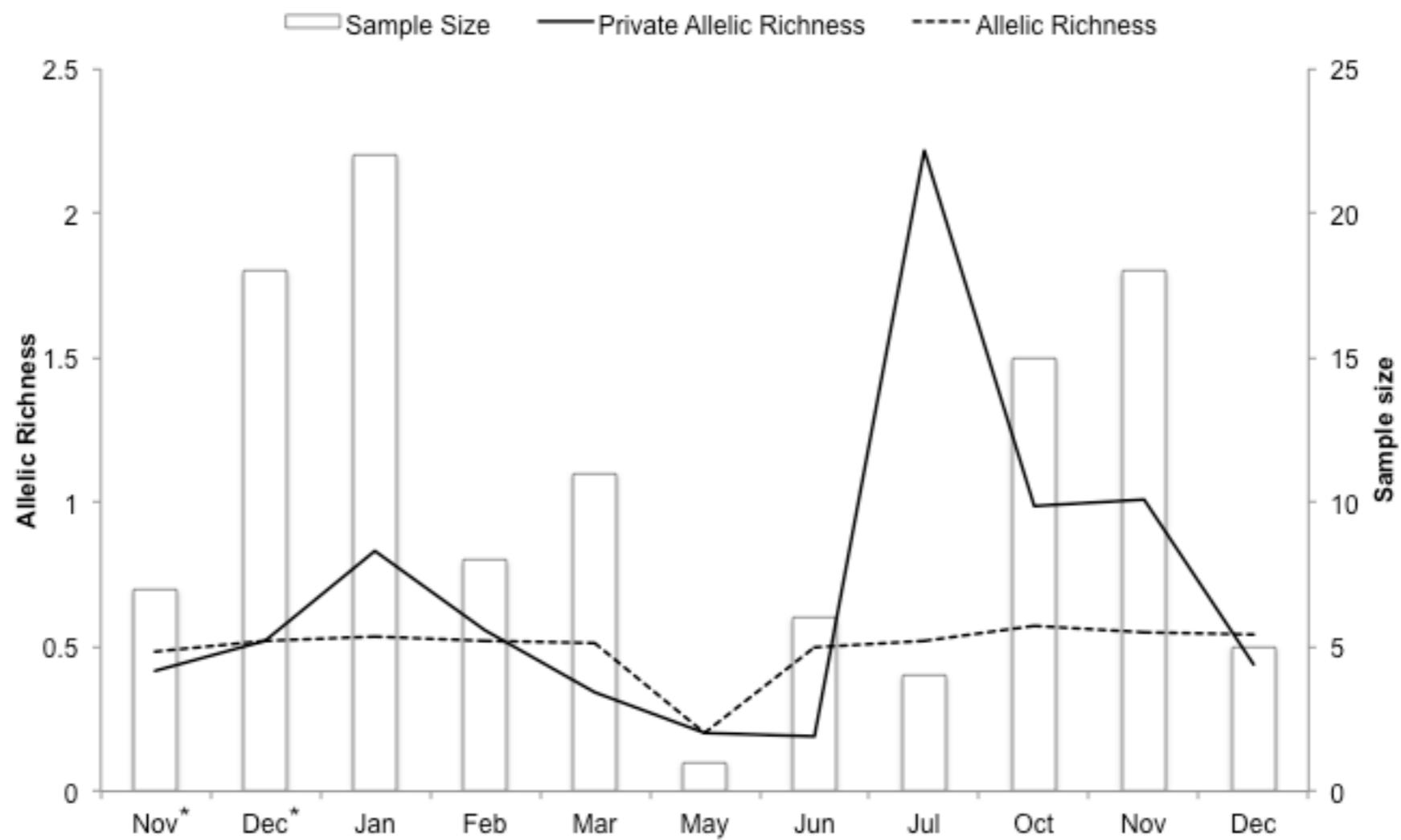
sept

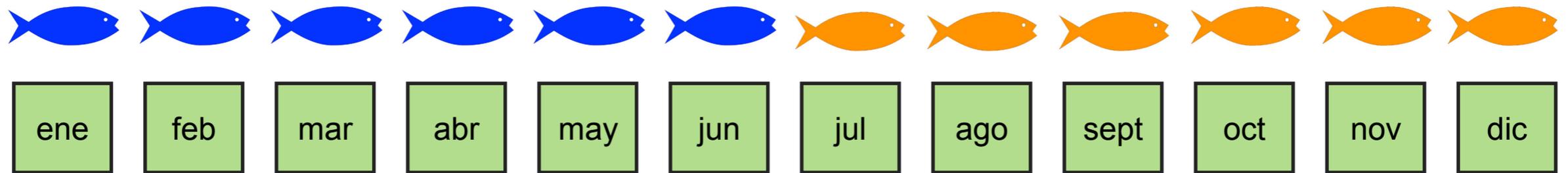
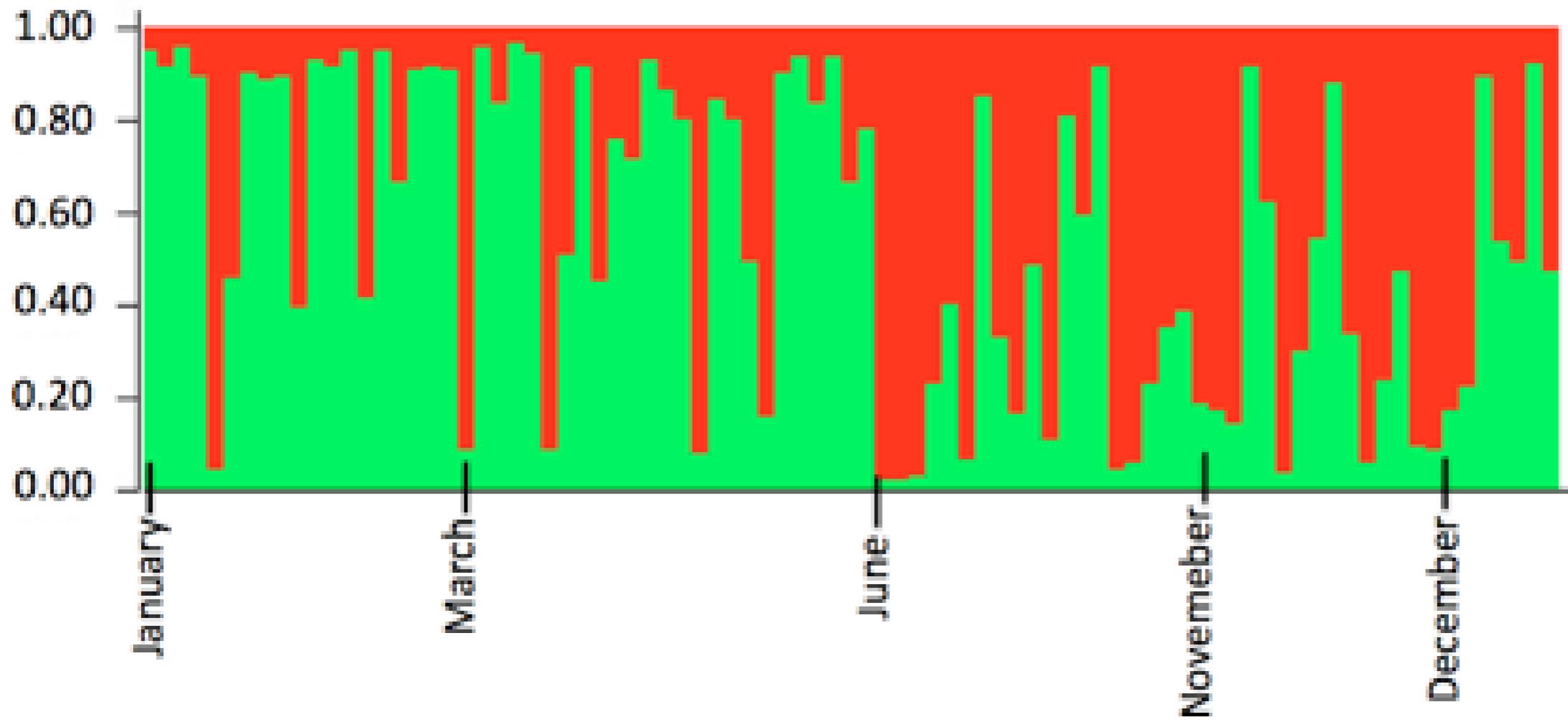
oct

nov

dic

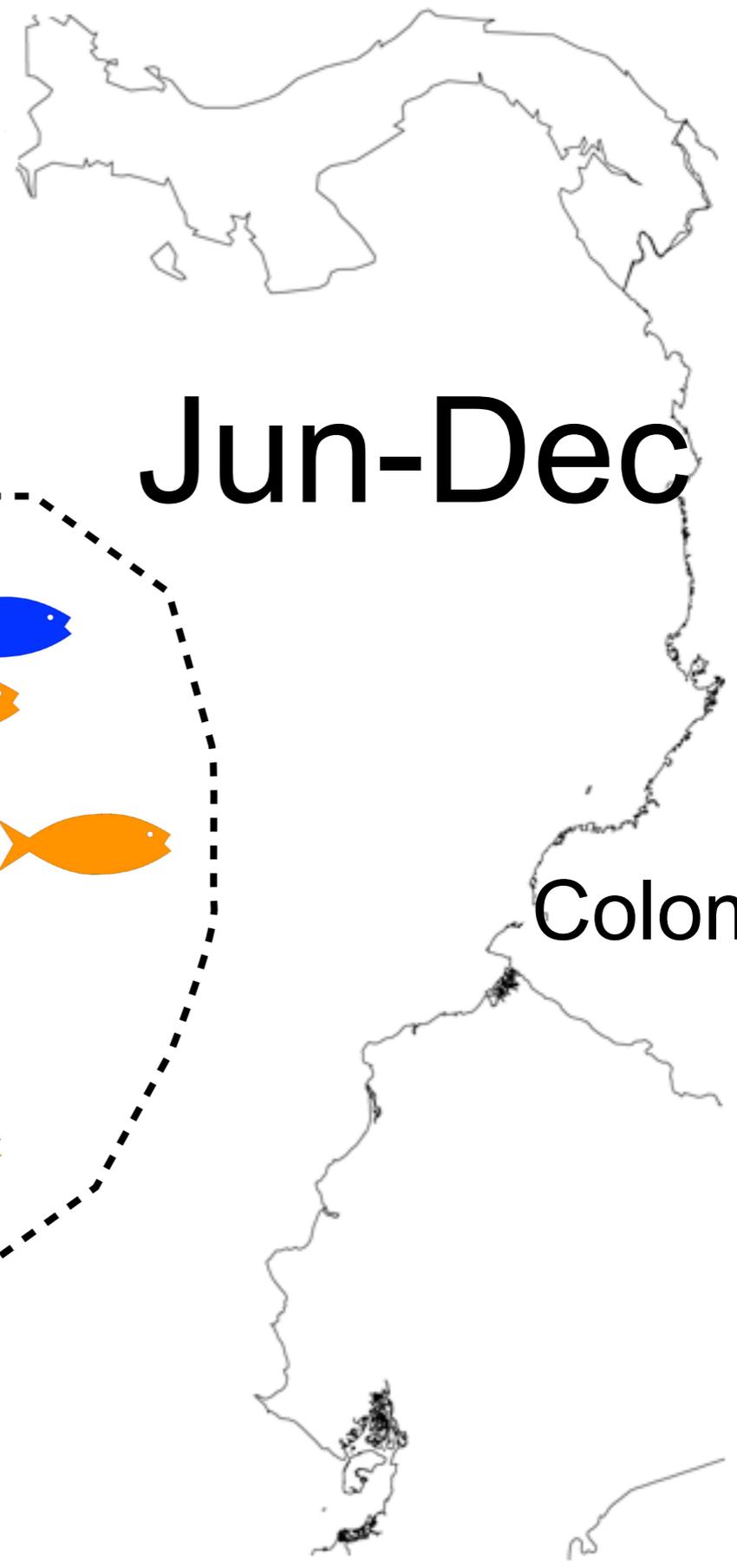
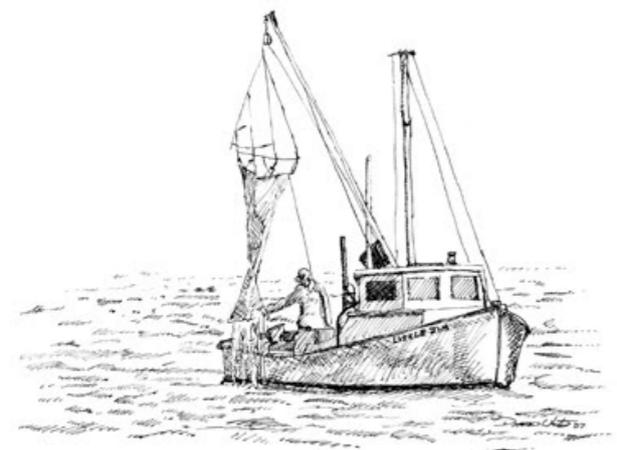
Riqueza de alelos





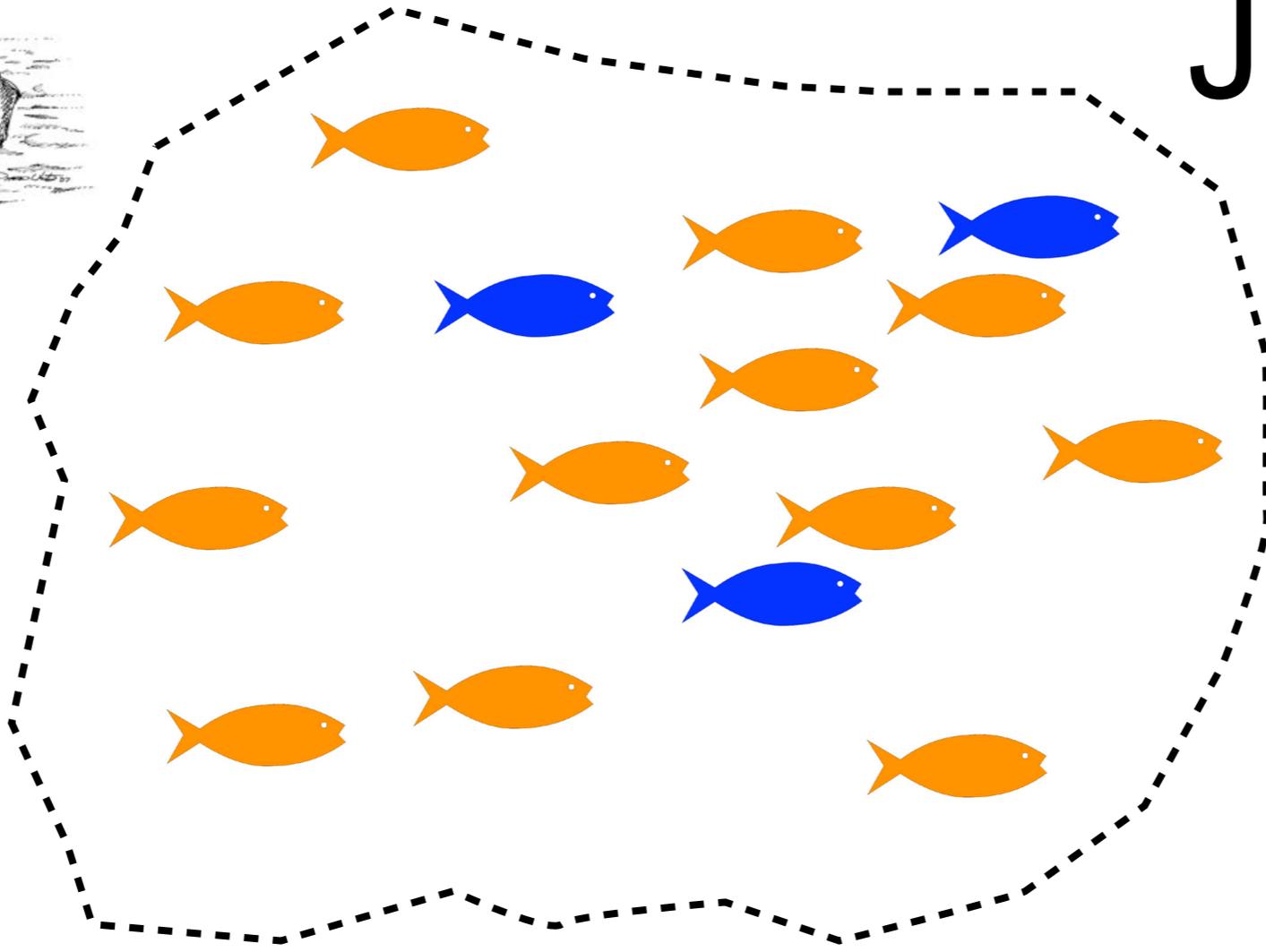
HWE

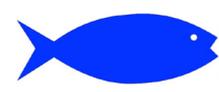
 : Stock local
 : Stock estacional

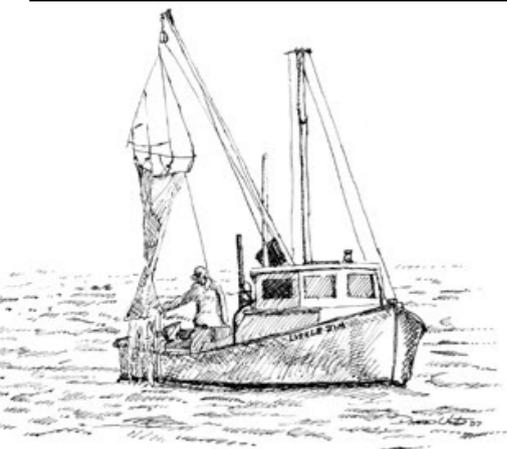


Jun-Dec

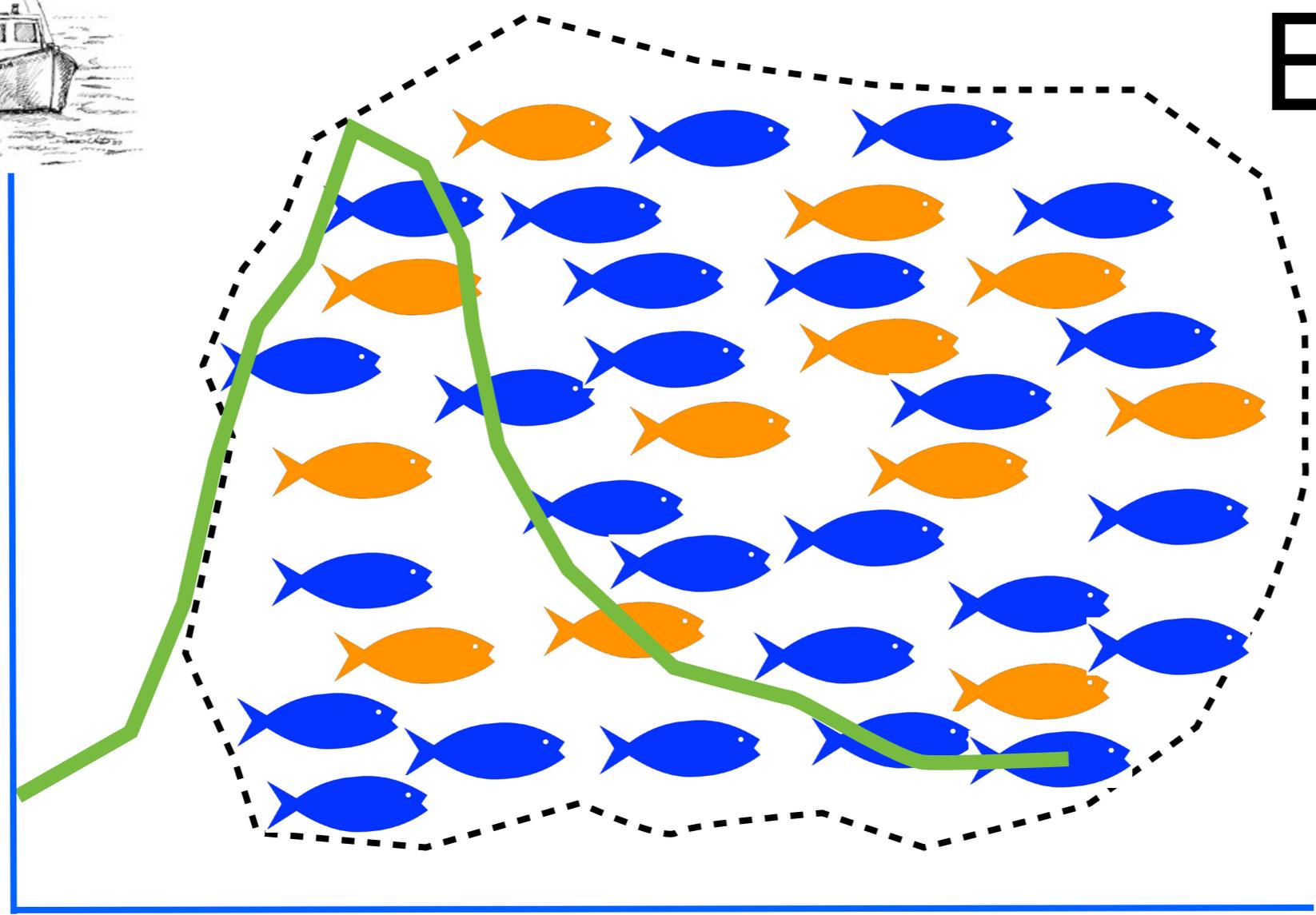
Colombia



 : Stock local
 : Stock estacional



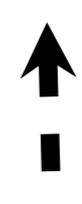
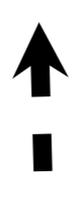
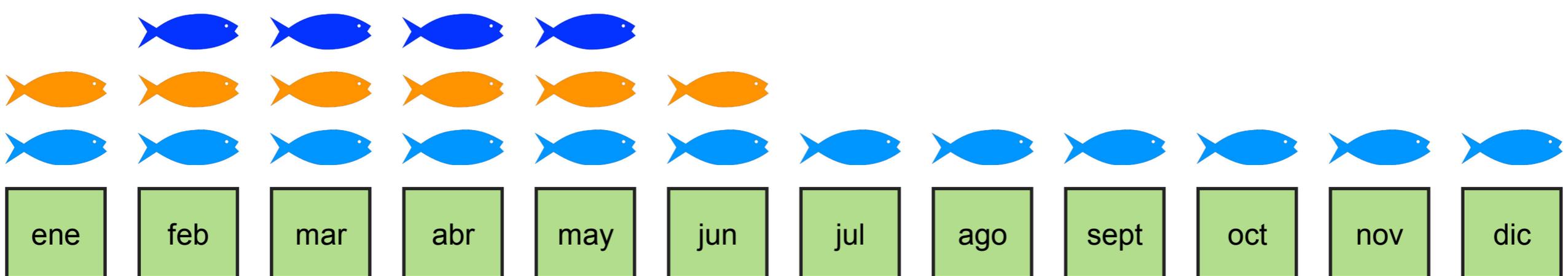
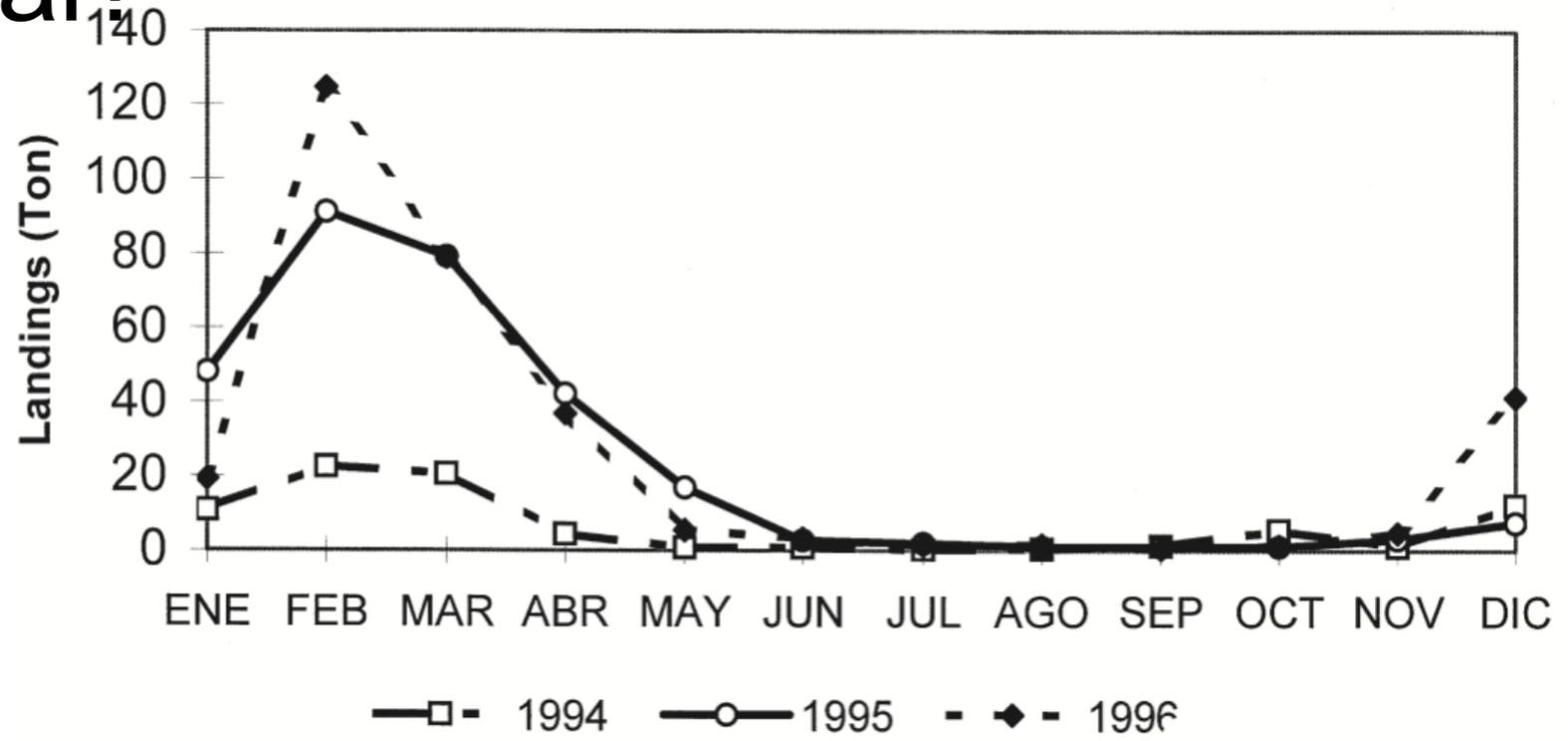
Ene-Jun



Colombia

ENE FEB ABR MAY JUN

Y la historia mitocondrial?



ene feb mar abr may jun jul ago sept oct nov dic

ene

feb

mar

abr

may

jun

jul

ago

sept

oct

nov

dic

ND1

F_{ST}

0.214

0.162



0.425



0.309



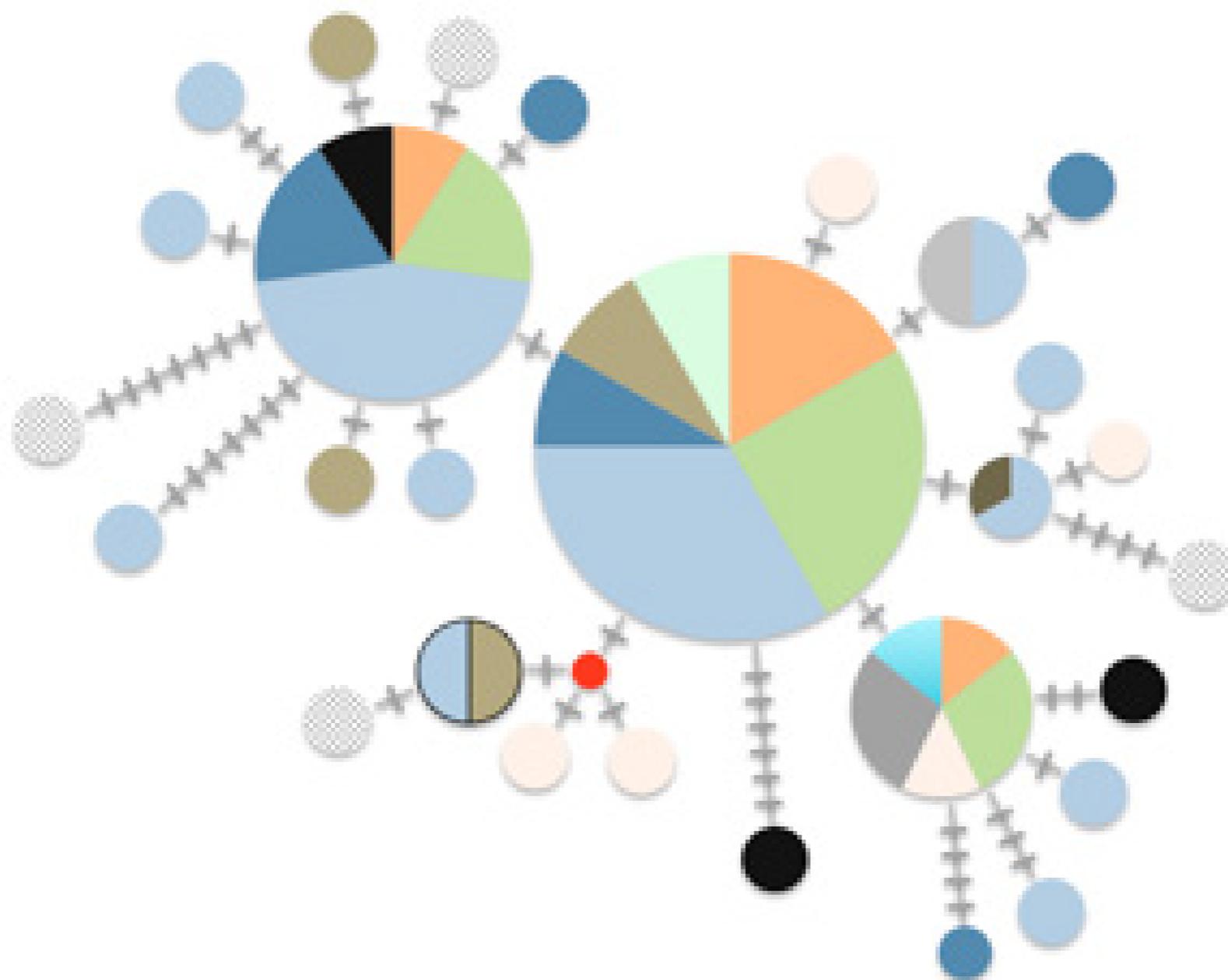
0.282

Además



ND1

N = 72

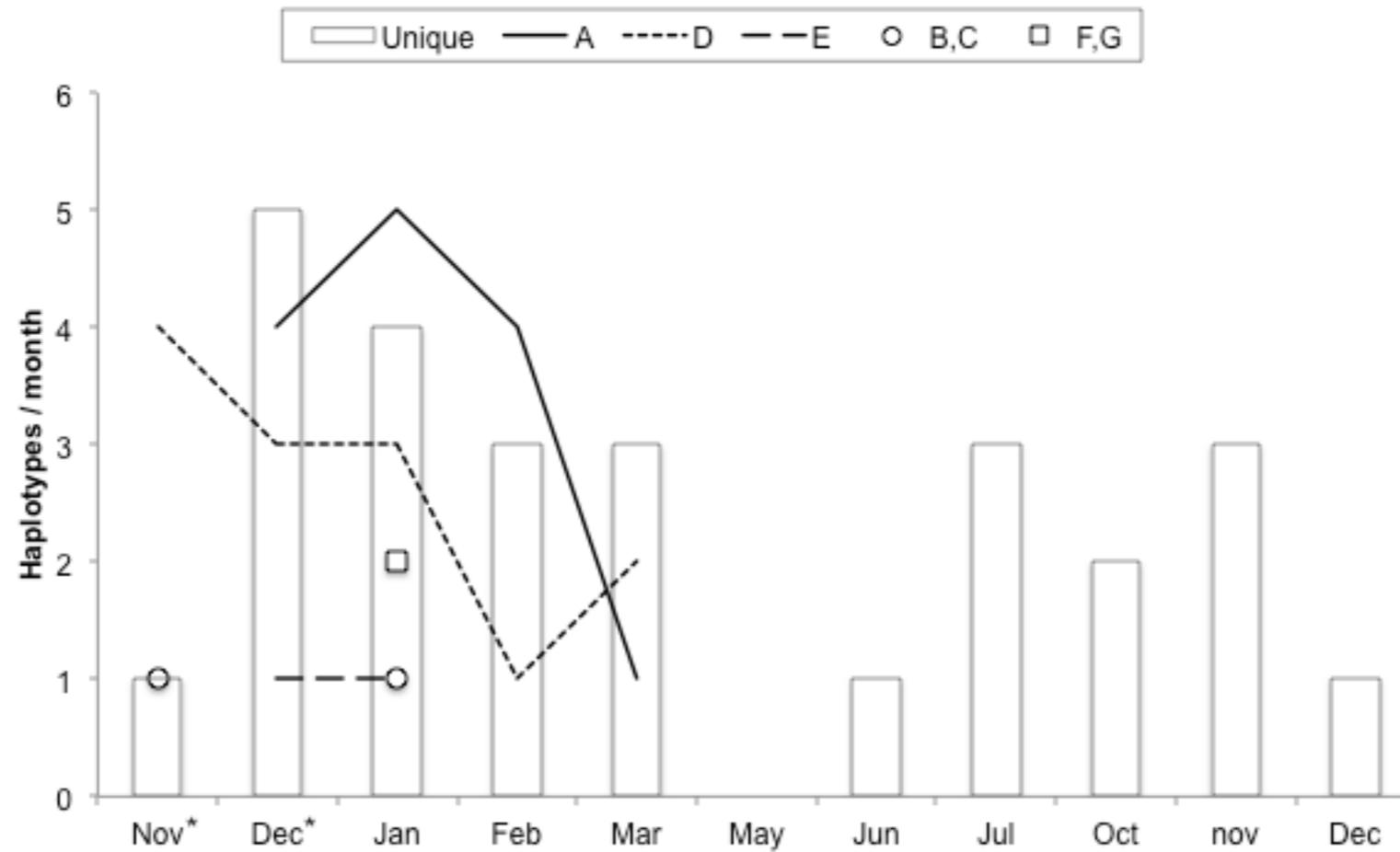


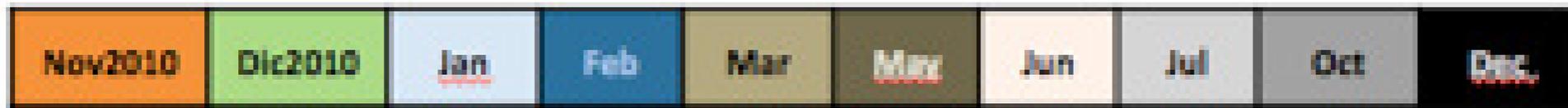
$h = 0.95$

$\pi = 0.081$

Clusters entre poblaciones no son evidentes

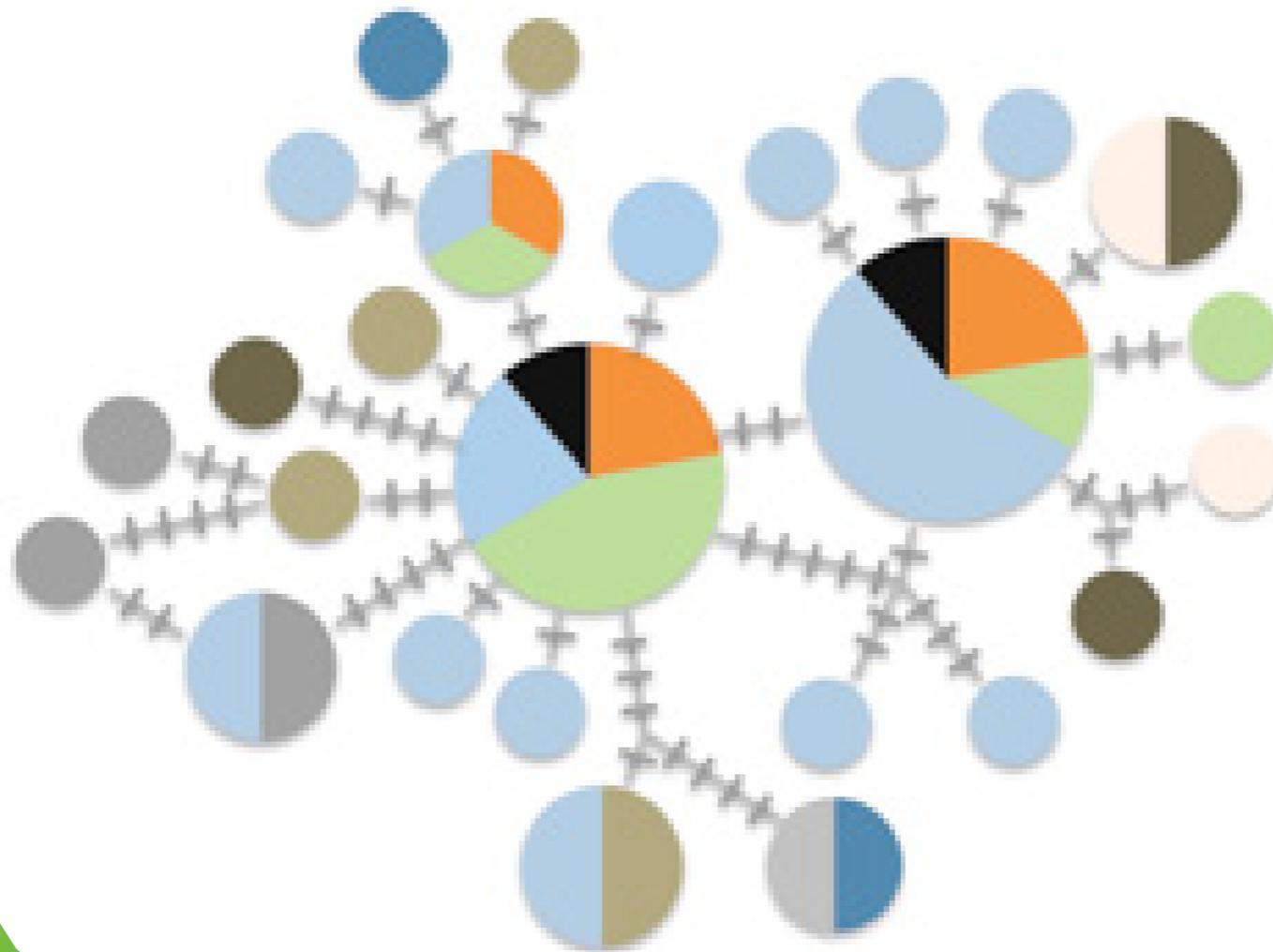
frecuencia de haplotipos NAD1





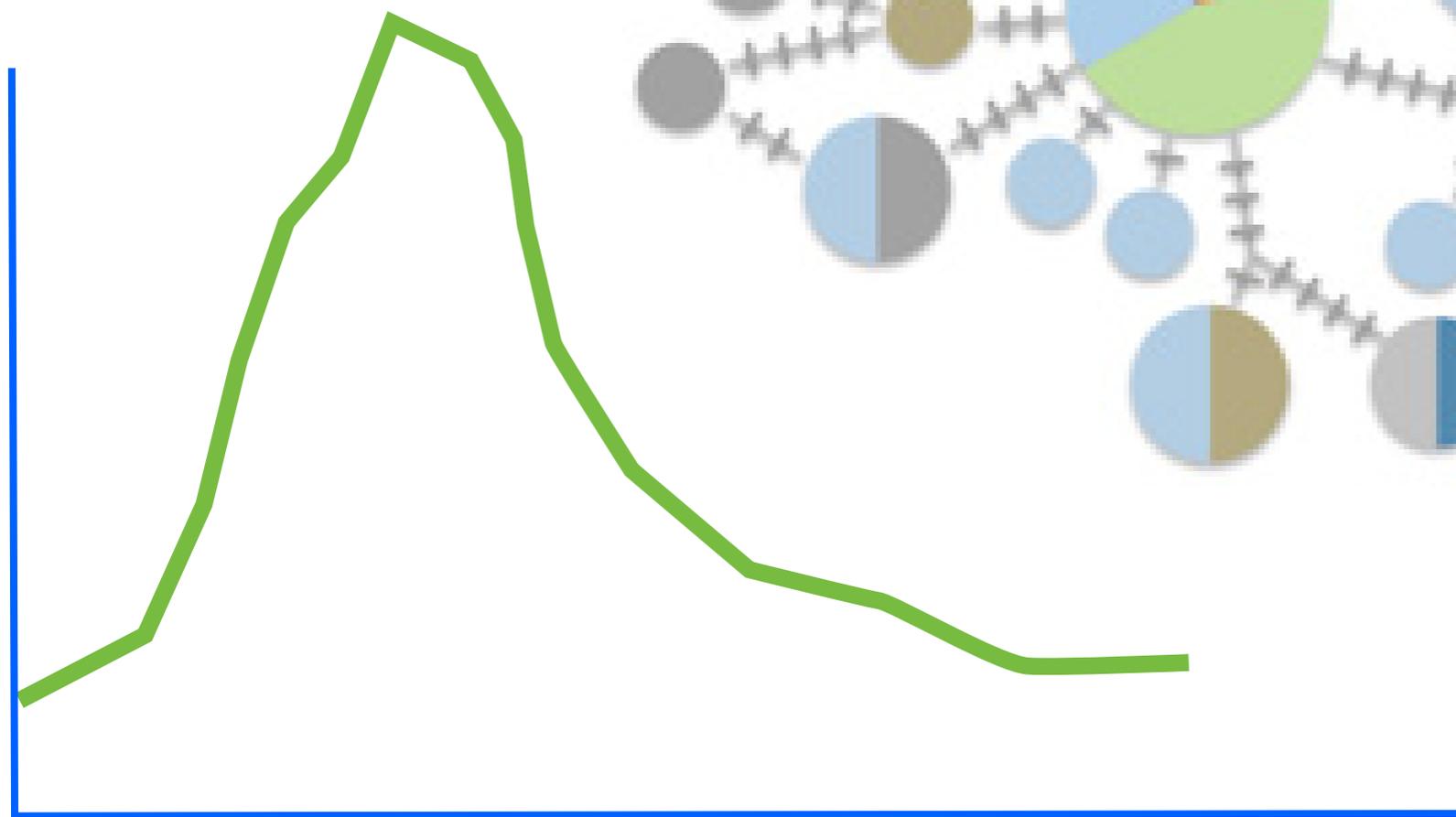
Cytb

N = 73



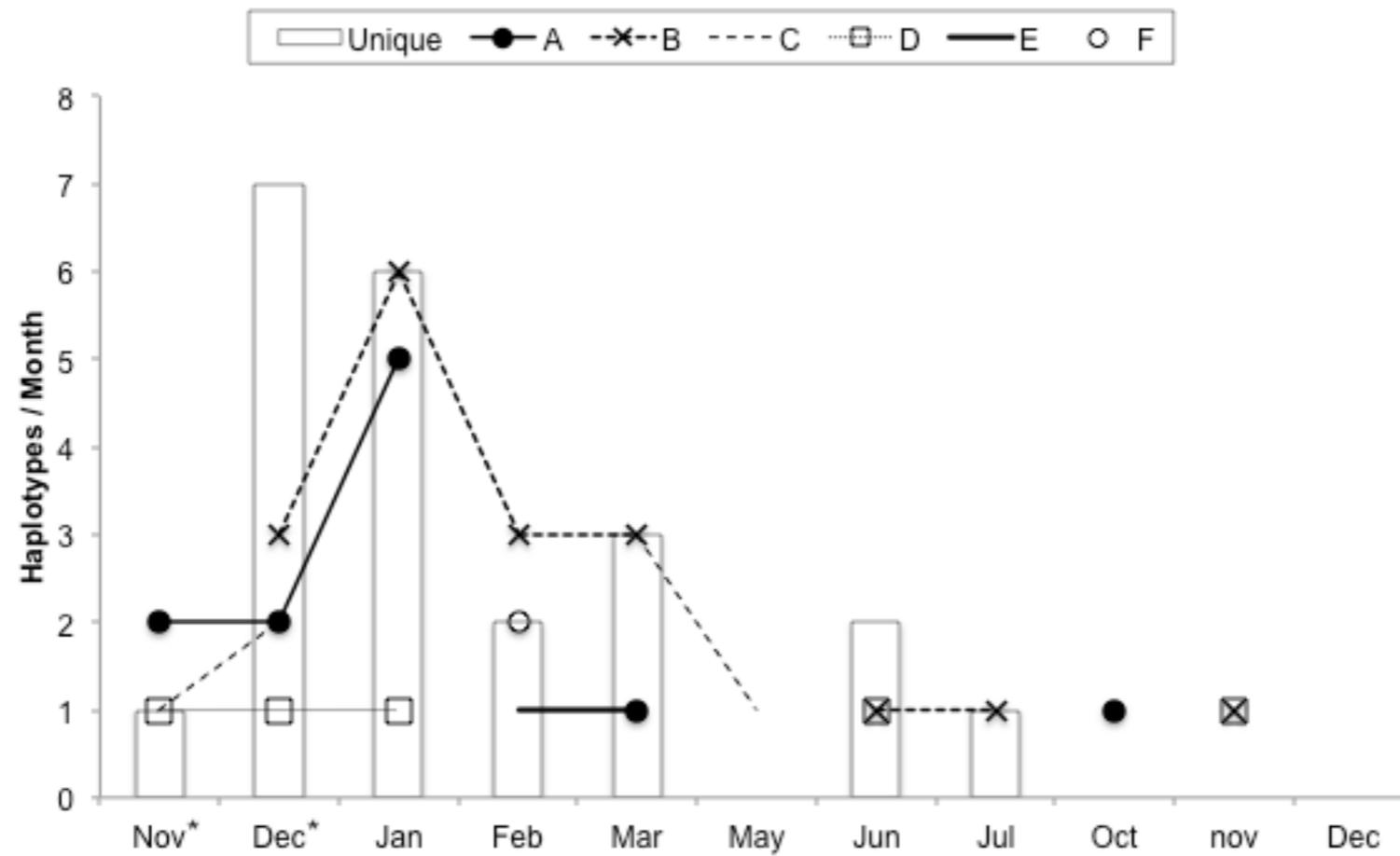
$$h = 0.95$$

$$\pi = 0.041$$



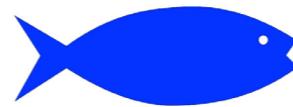
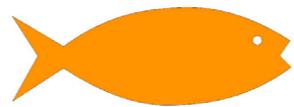
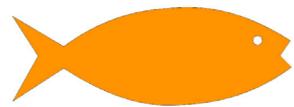
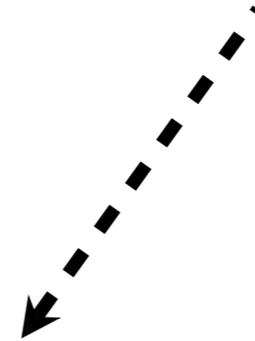
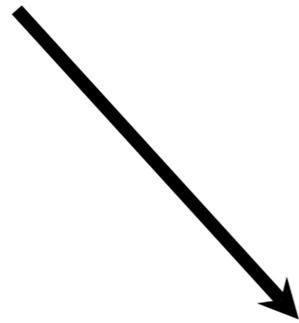
ENE FEB ABR MAY JUN

frecuencia haplotipos Cytb



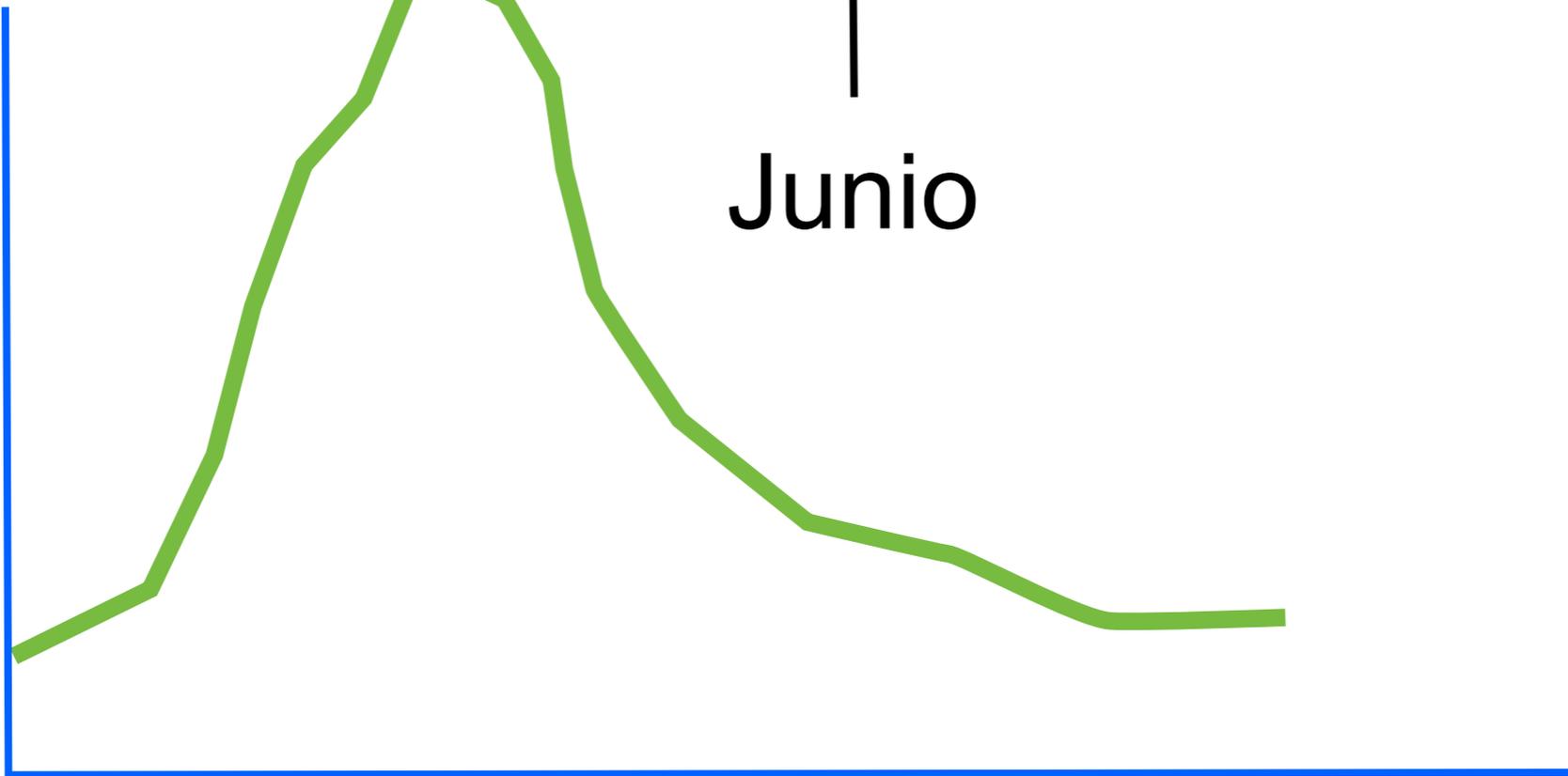
Nuclear

Mitochondrial



Junio

Enero



ENE

FEB

ABR

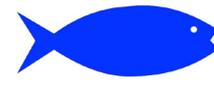
MAY

JUN

Conclusiones



: Stock local



: Stock estacional

- Hay un stock biológico residente
- El pico de abundancia estacional coincide con una mayor abundancia de individuos con diferentes frecuencias alélicas
- La variable (tiempo) está explicando la variación.

Consideraciones

Proponemos que se asigne el término “stocks temporales” (Enero-Junio) & “stock residente” (Junio-Diciembre)

Tamaños poblacionales para cada stock

Establecer cuotas de captura anuales

Pesquería sostenible

A futuro

¿De dónde pueden venir estos stocks?

Rastreo satelital

Muestreo más amplio

Agradecimientos

LAB

Familia

Amigos

Proyecto Semilla

INCODER