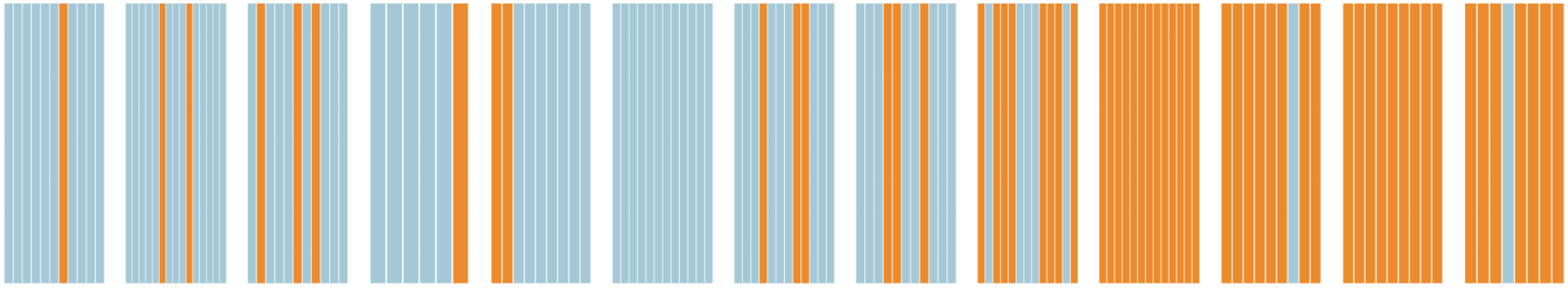

Genetics in support of fisheries and aquaculture management

17-19 September

Faro, Portugal

ICES CIEM

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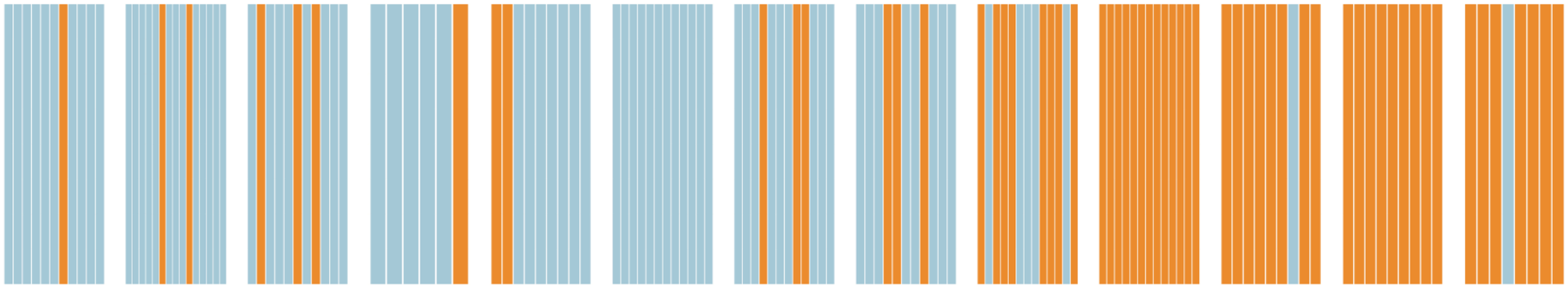


Genetic stock assessment

17-19 September
Faro, Portugal

ICES CIEM

Dr. Sarah Helyar

UAlg UNIVERSIDADE DO ALGARVE | CCMAR Centro de Ciências do Mar | DTU | QUEEN'S UNIVERSITY BELFAST | PRIFYSGOL BANGOR UNIVERSITY | European Commission

What do we mean by ‘genetic stock’?

- **Populations that have limited gene flow between them**
- **Due to e.g. natal philopatry**
- **Leads to a degree of genetic differentiation**
- **This can mean that there is a mismatch of management and biological units**
- **This can ultimately lead to either under utilisation or overexploitation**
- **Fisheries management can be improved by incorporating genetics into baseline data, models, monitoring programs, through out processing: i.e. at all stages of the supply chain.**

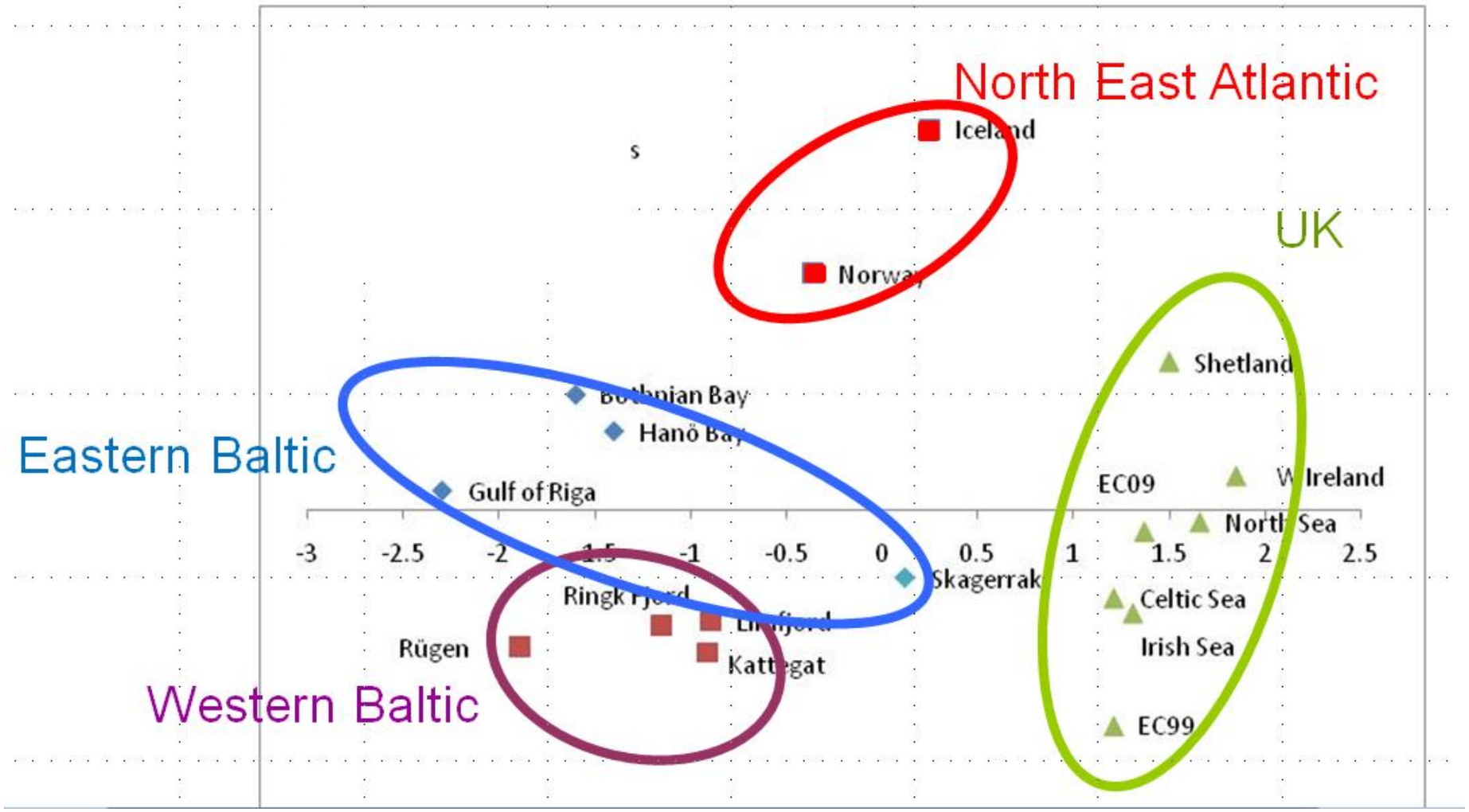


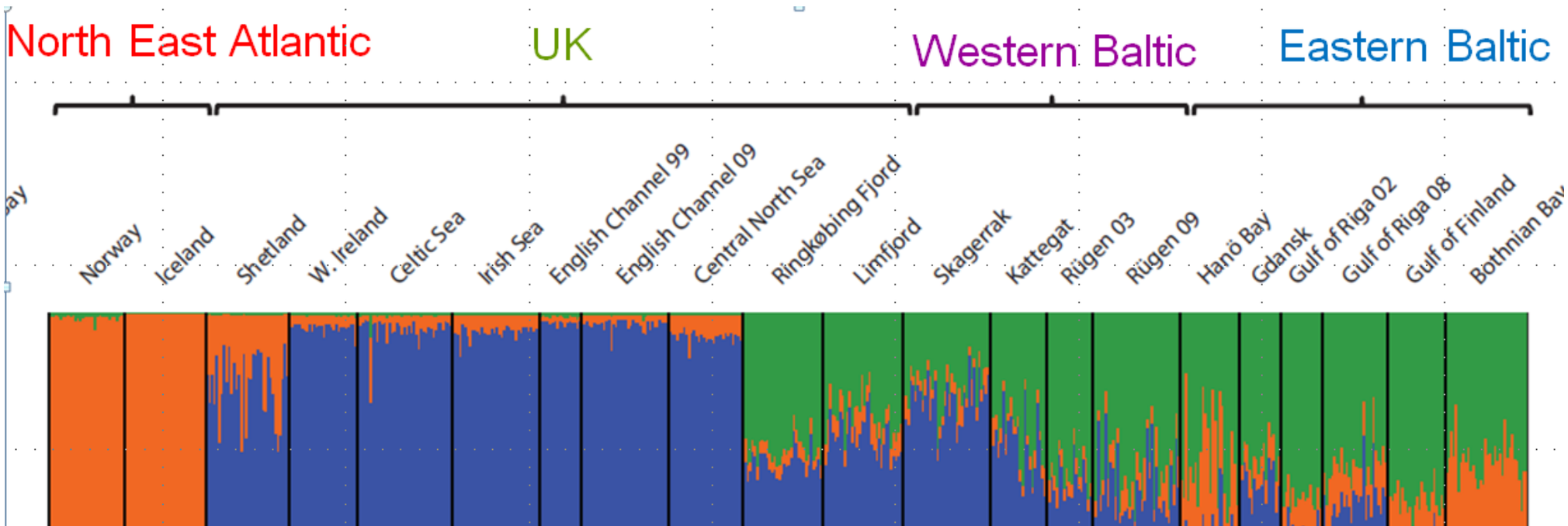

Case study 1: Atlantic herring

- **Highly migratory small pelagic species**
- **High commercial value (€850 million, all clupeids 2000-2004)**
- **Historically very high numbers**
- **Typical boom and bust**
- **Studied for over 100 years**
- **IUU estimated as ~35% in Baltic, ~50% in North Sea.**

Atlantic herring (*Clupea harengus* L.)

Neutral Loci only





Neutral vs. Non-neutral

- **SNPs developed from the transcriptome**

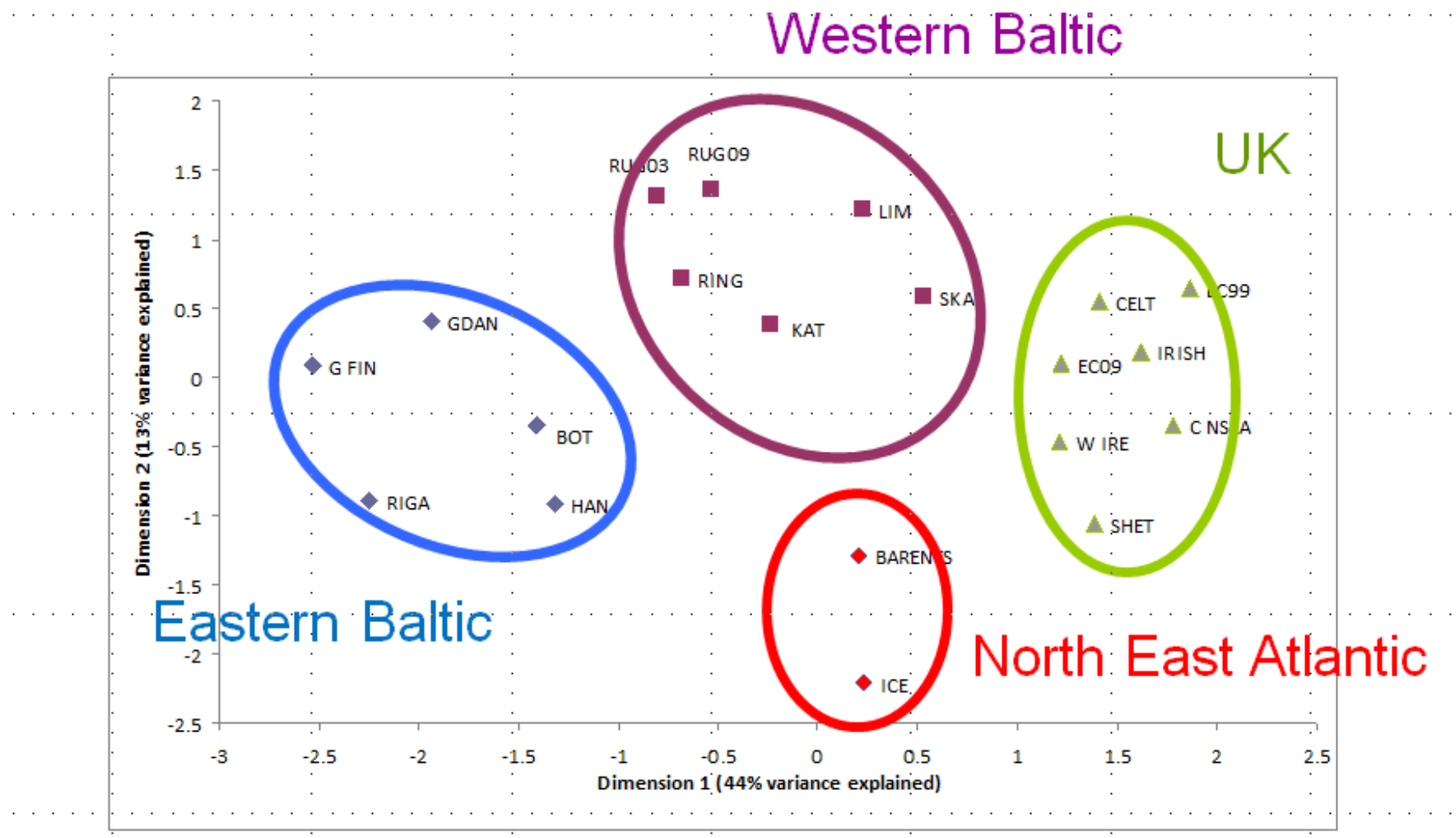
- **F_{ST} of a locus is significantly different to the expected distribution of F_{ST} under neutral expectations**

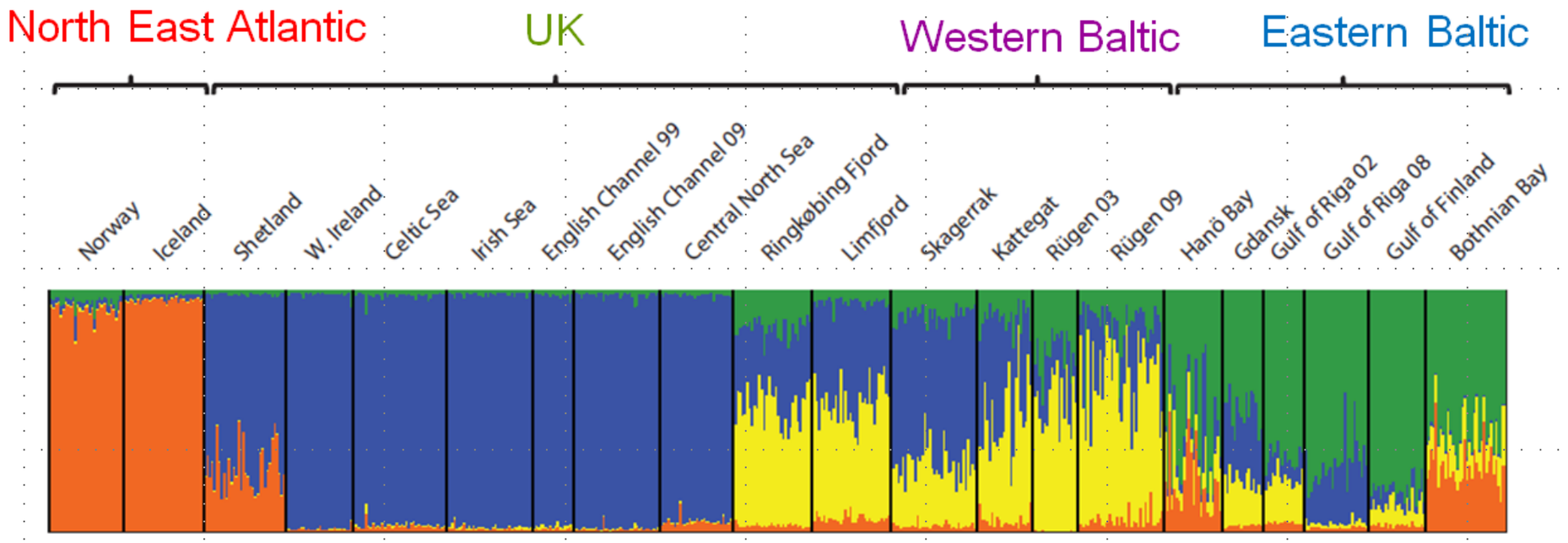
- **Must be removed when making inferences about neutral evolutionary processes, such as genetic drift and gene flow, as they may significantly bias results**

- **Can be used for investigating population structure (local adaptation) on ecological rather than evolutionary time scales**

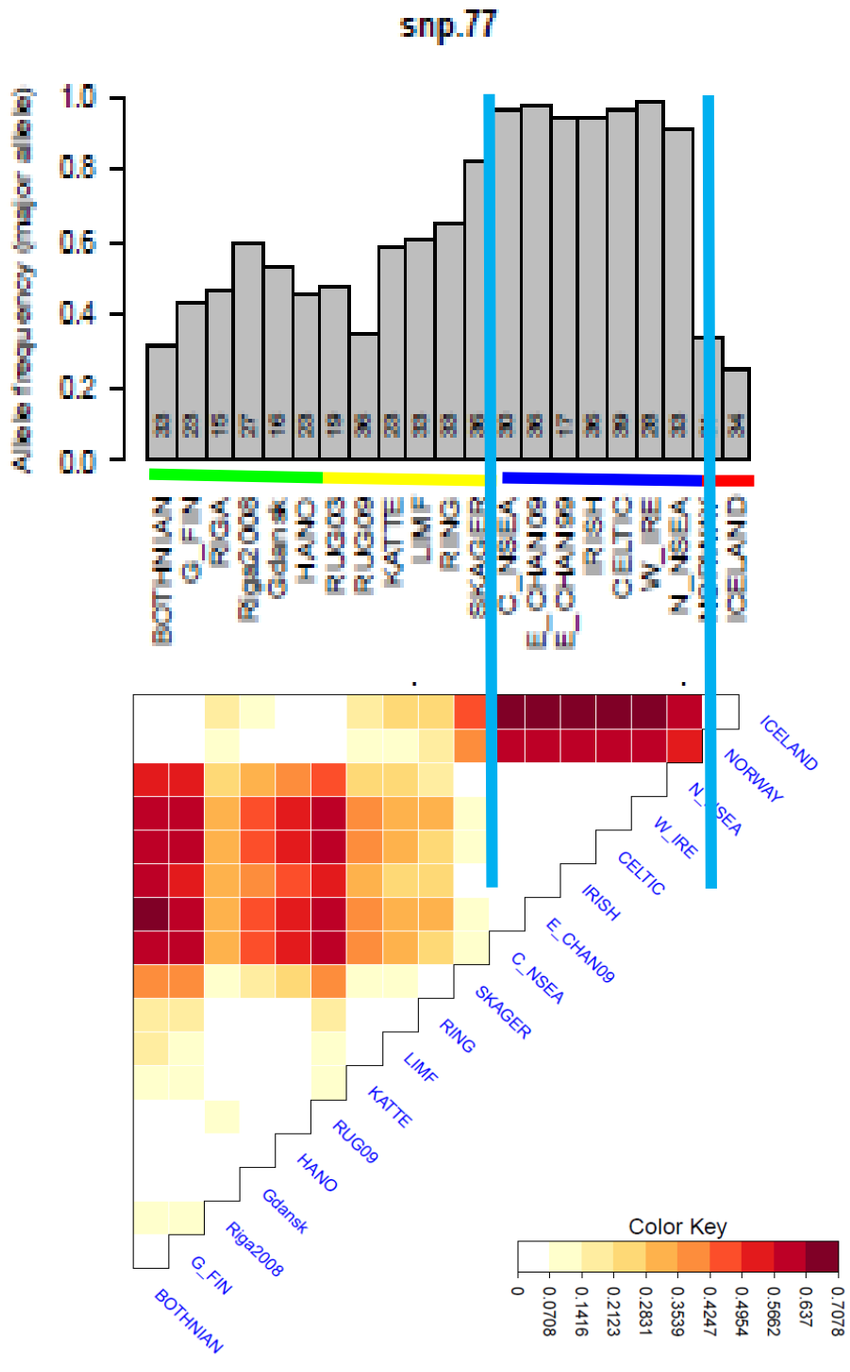
- **Can increase the power for assigning individuals to populations of origin**

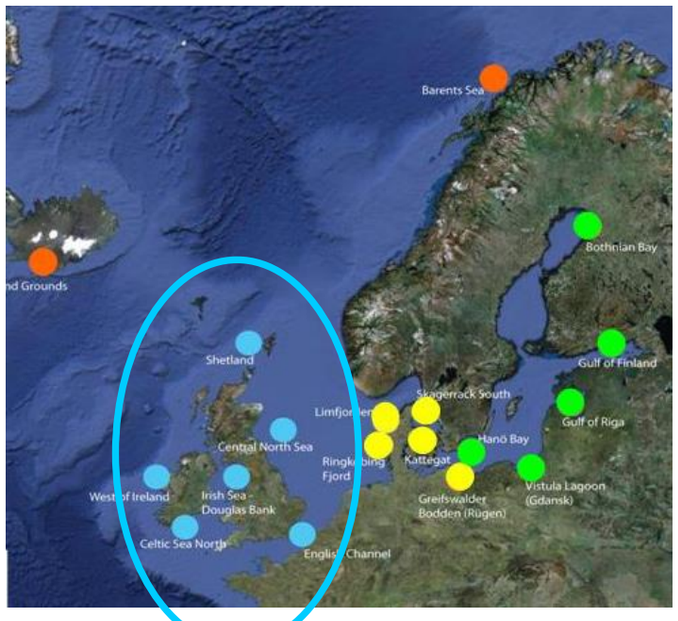
All Loci


Western Baltic
UK
Eastern Baltic
North East Atlantic
RUG03
RUG09
LIM
RING
SKA
KAT
GDAN
G FIN
BOT
RIGA
HAN
CELT
IRISH
ECO9
W IRE
SHET
BARENTS
ICE
Dimension 2 (13% variance explained)
Dimension 1 (44% variance explained)
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5

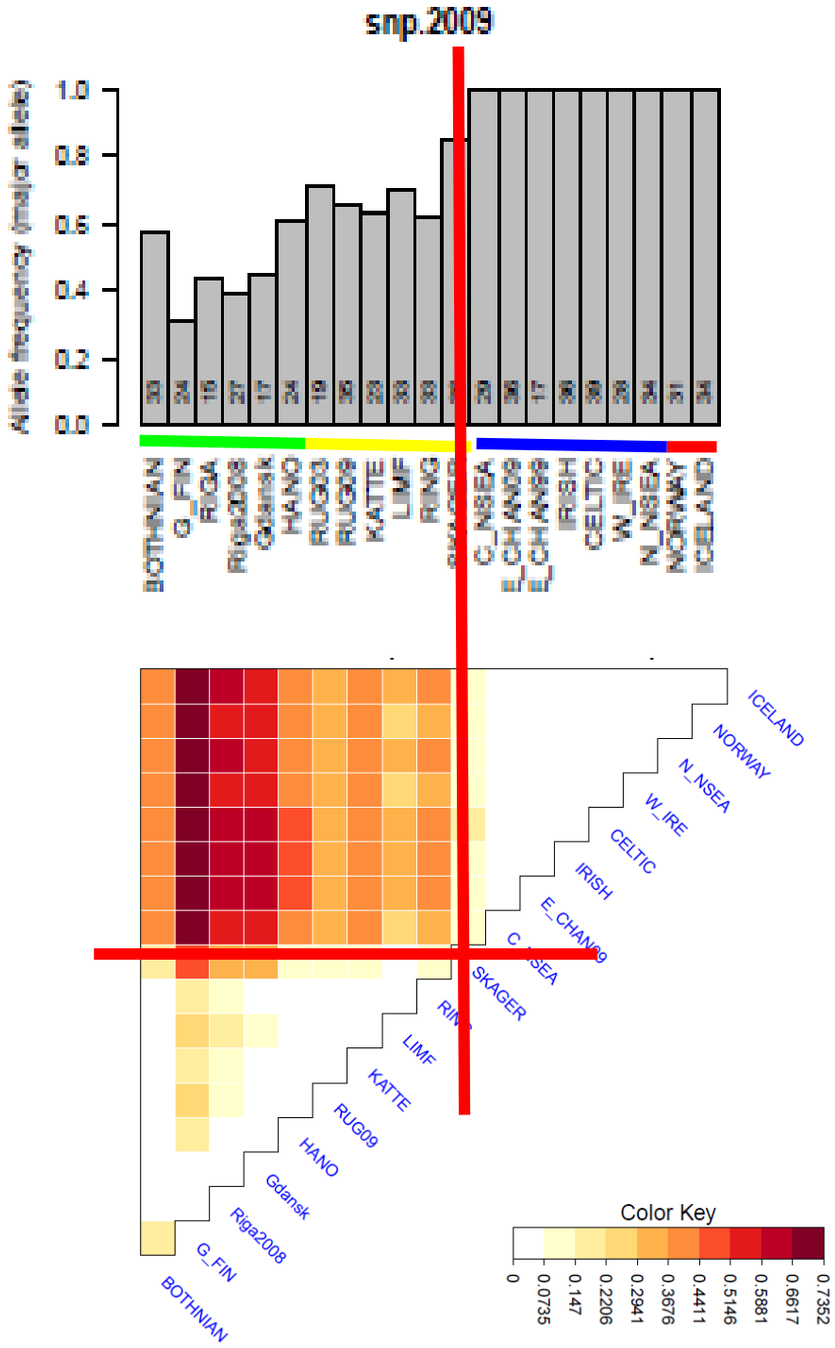

North East Atlantic
UK
Western Baltic
Eastern Baltic
Norway
Iceland
Shetland
W. Ireland
Celtic Sea
Irish Sea
English Channel 99
English Channel 09
Central North Sea
Ringkøbing Fjord
Limfjord
Skagerrak
Kattegat
Rügen 03
Rügen 09
Hanö Bay
Gdansk
Gulf of Riga 02
Gulf of Riga 08
Gulf of Finland
Bothnian Bay

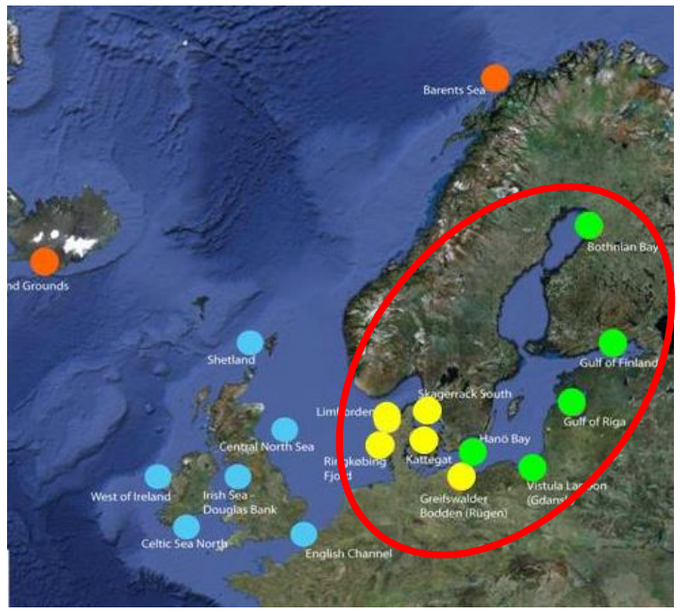
Loci under selection





Loci under selection

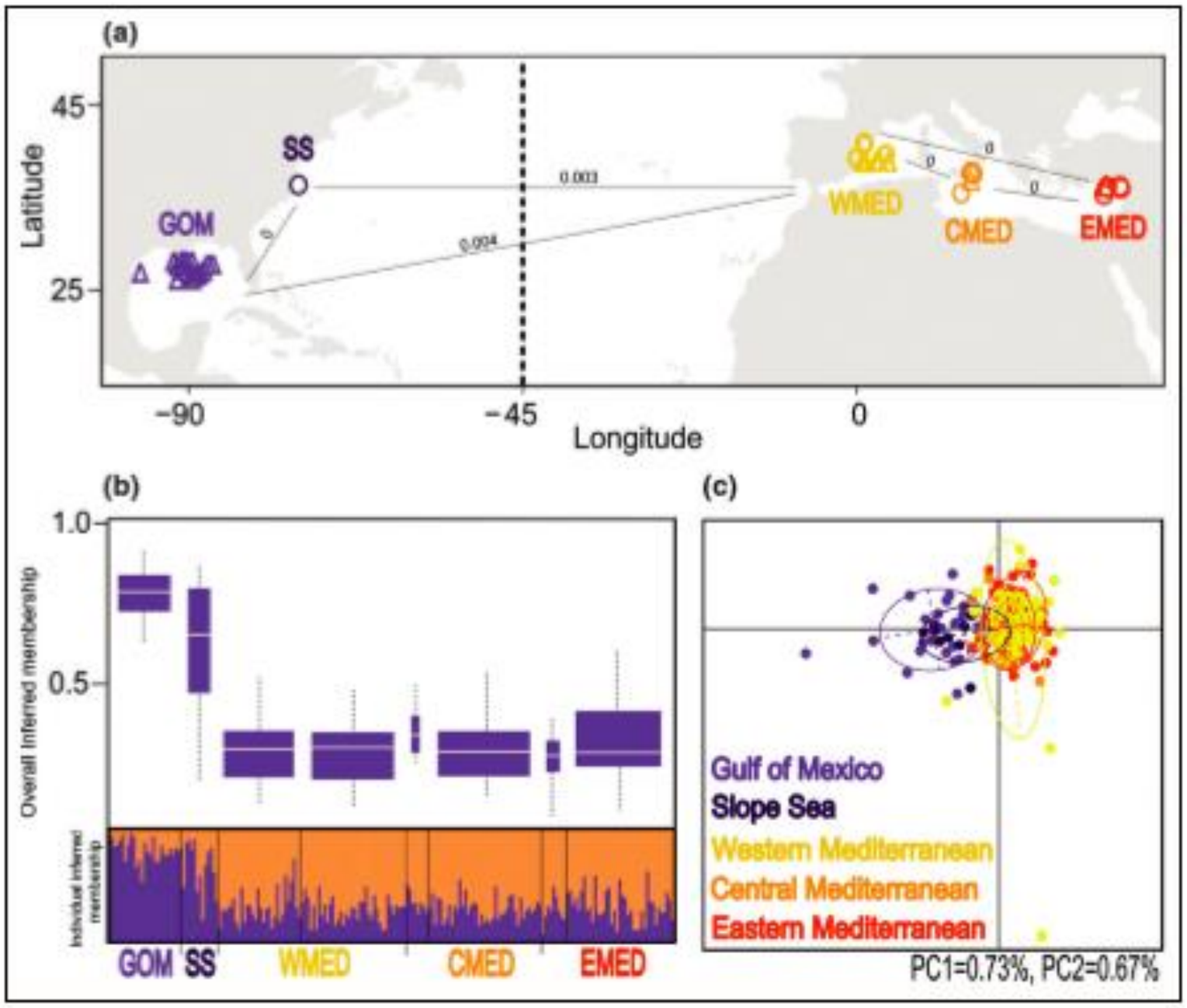




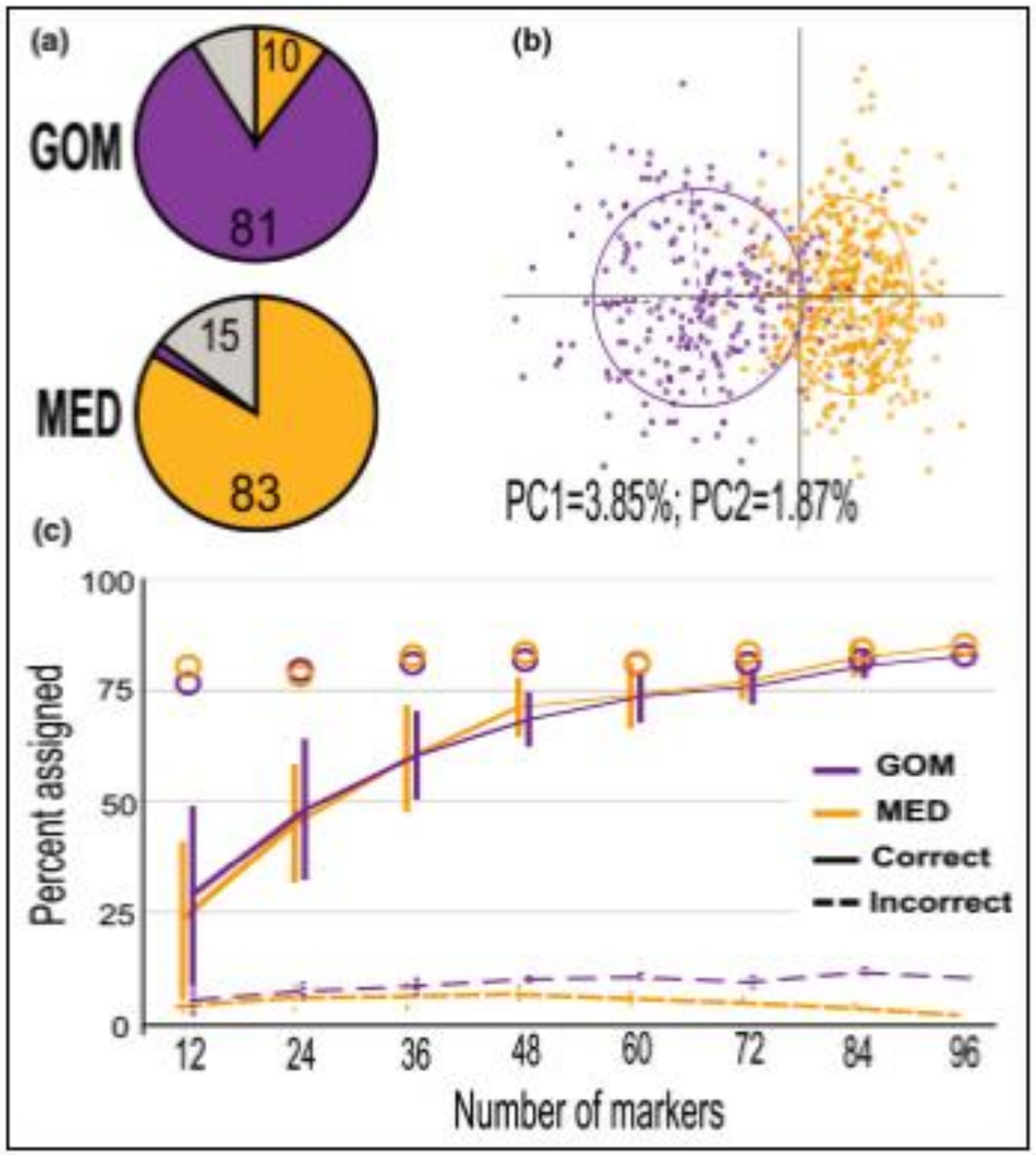
Application of makers to Mixed Stock Analysis

Management case scenario		*n*	NE Atlantic	North Sea	"Transition"	Baltic Sea
MIX 1—"Skagerrak"	**Simulated**	80	**0**/0 (0–4)	**40**/42 (24–51)	**60**/58 (41–71)	**0**/0 (0–17)
	29 June 2002	81	0 (0–8)	52 (25–56)	40 (18–56)	7 (6–37)
	2 July 2003	84	11 (0–20)	35 (18–47)	51 (27–65)	2 (1–30)
	1 July 2008	66	0 (0–8)	26 (9–34)	64 (32–76)	10 (6–43)
MIX 2—"W Baltic"	**Simulated**	50	**0**/0 (0–4)	**0**/0 (0–10)	**70**/70 (44–80)	**30**/30 (17–52)
	5 October 2009	52	5 (0–15)	0 (0–9)	69 (39–80)	27 (14–53)
	10 October 2009	52	5 (0–13)	0 (0–6)	55 (31–73)	40 (22–66)

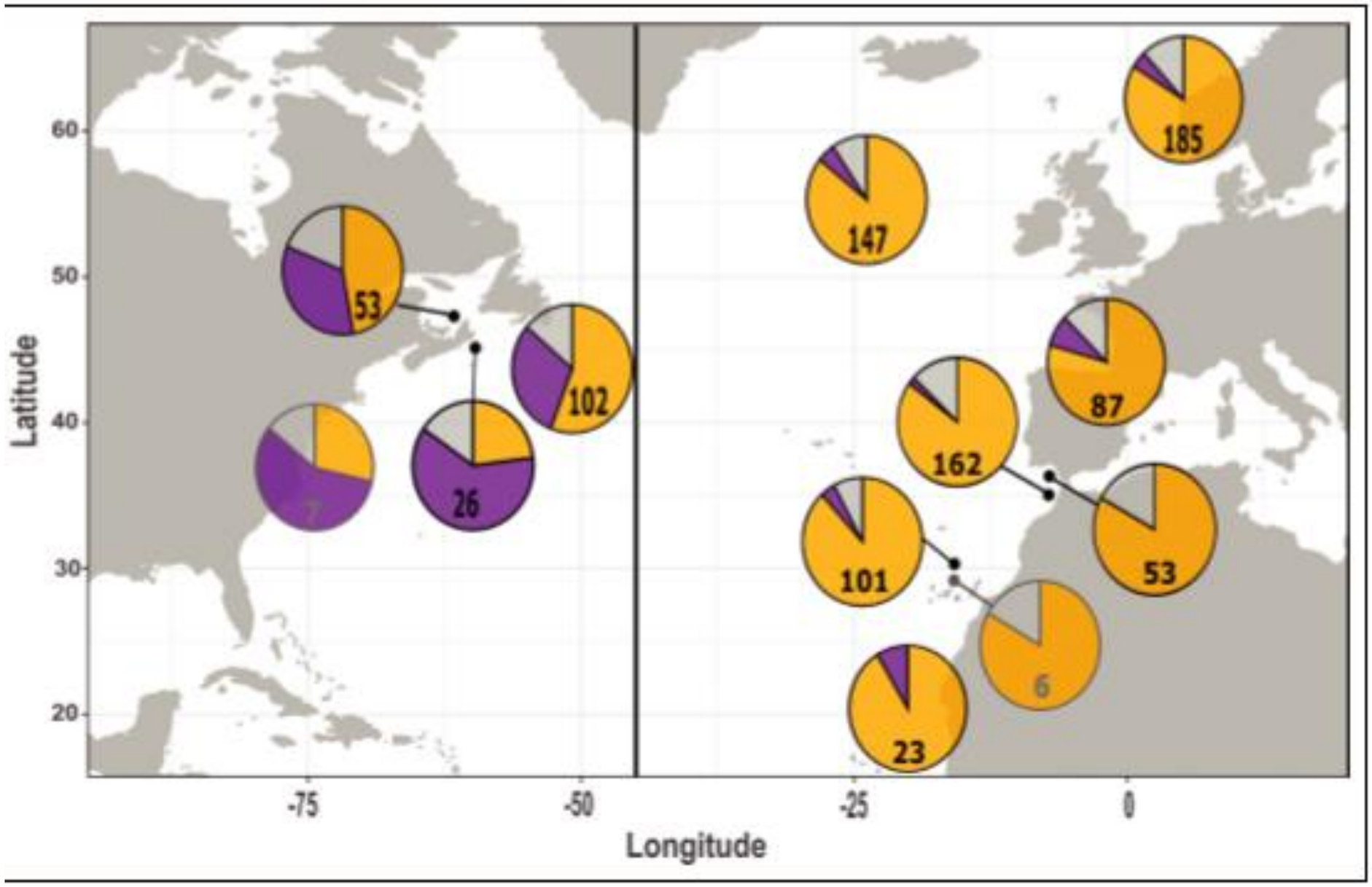
Case study 2: Atlantic Blue Fin Tuna



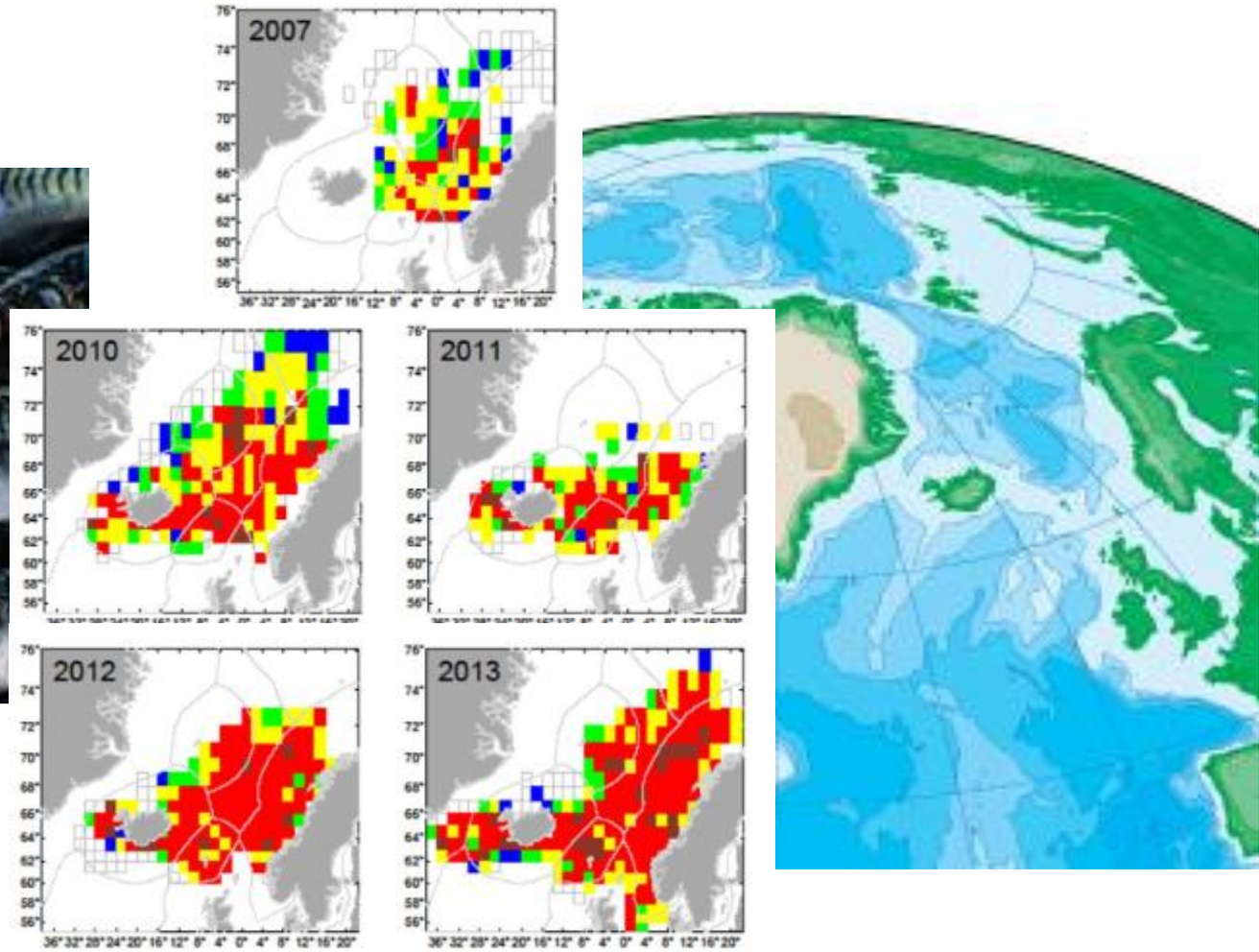
Case study 2: Atlantic Blue Fin Tuna

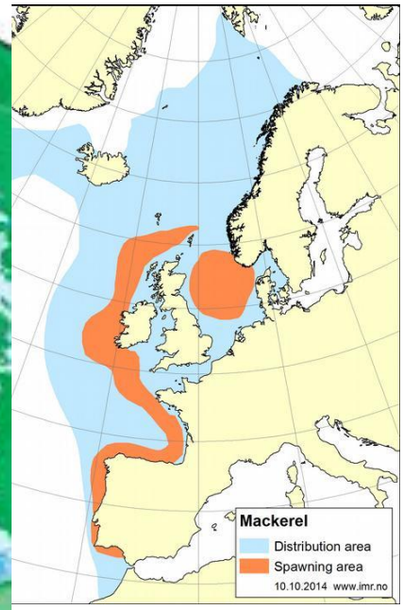


Case study 2: Atlantic Blue Fin Tuna

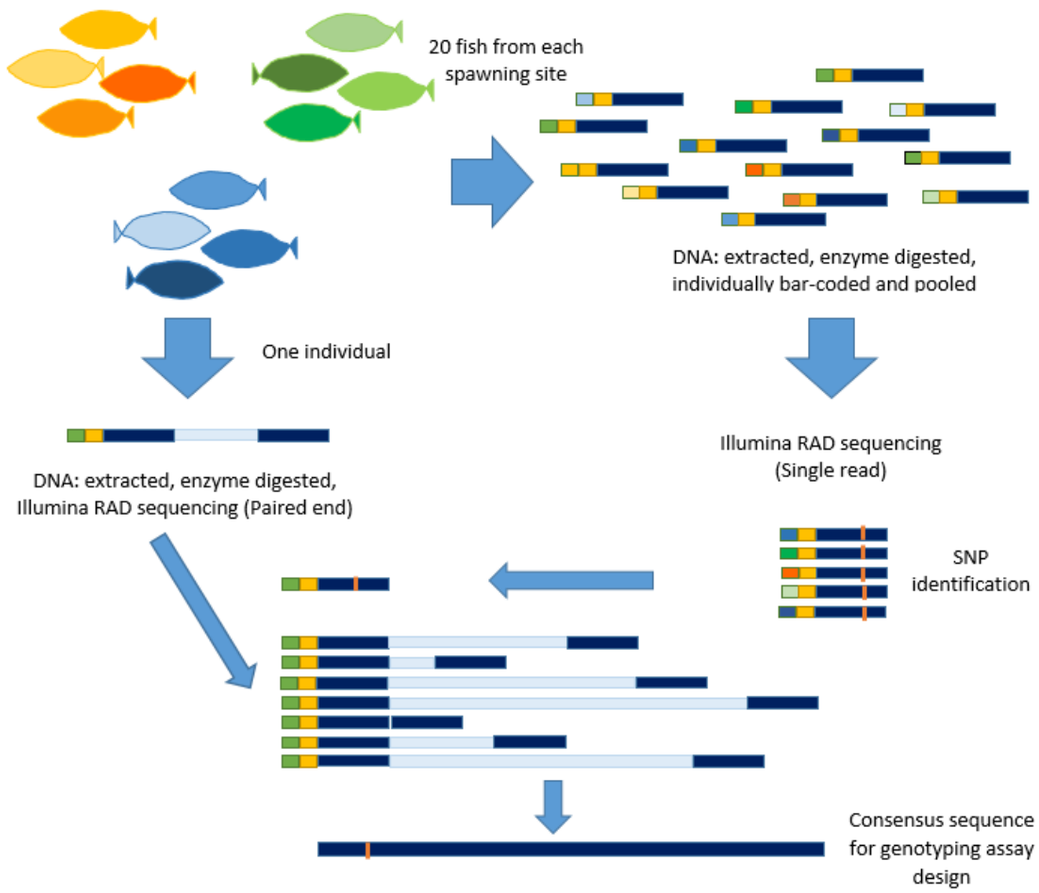


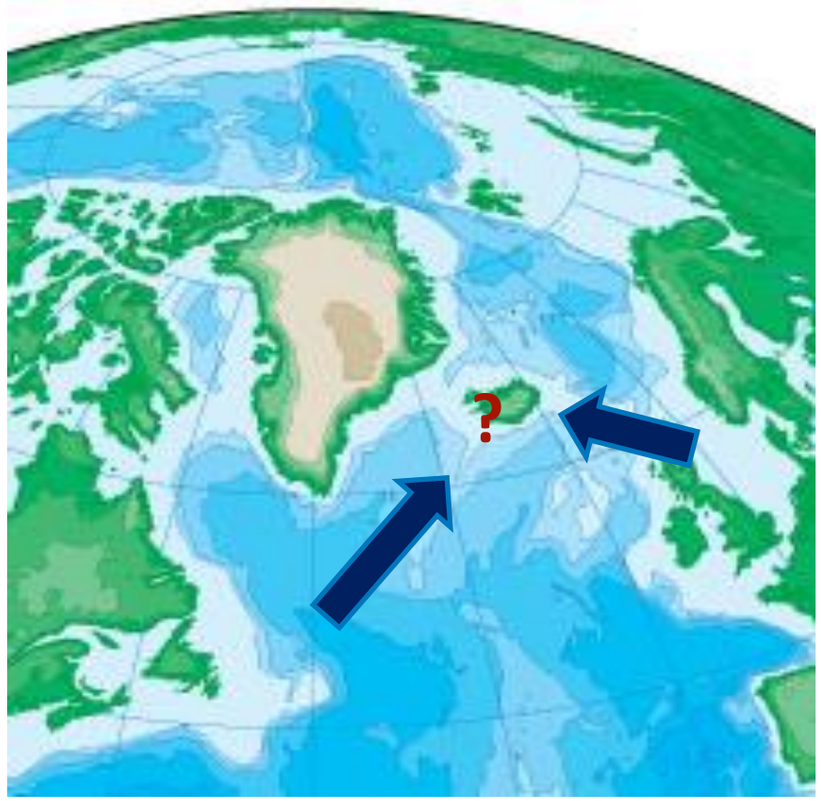
Case study 3: Atlantic Mackerel



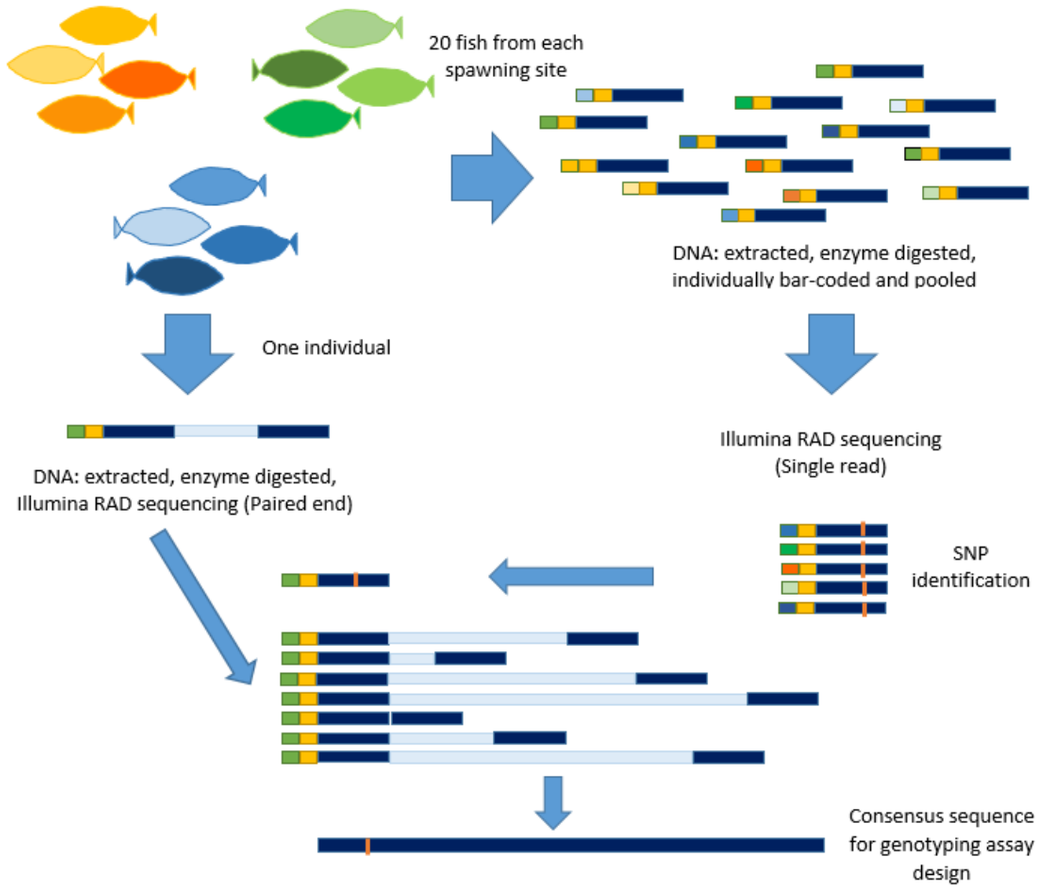


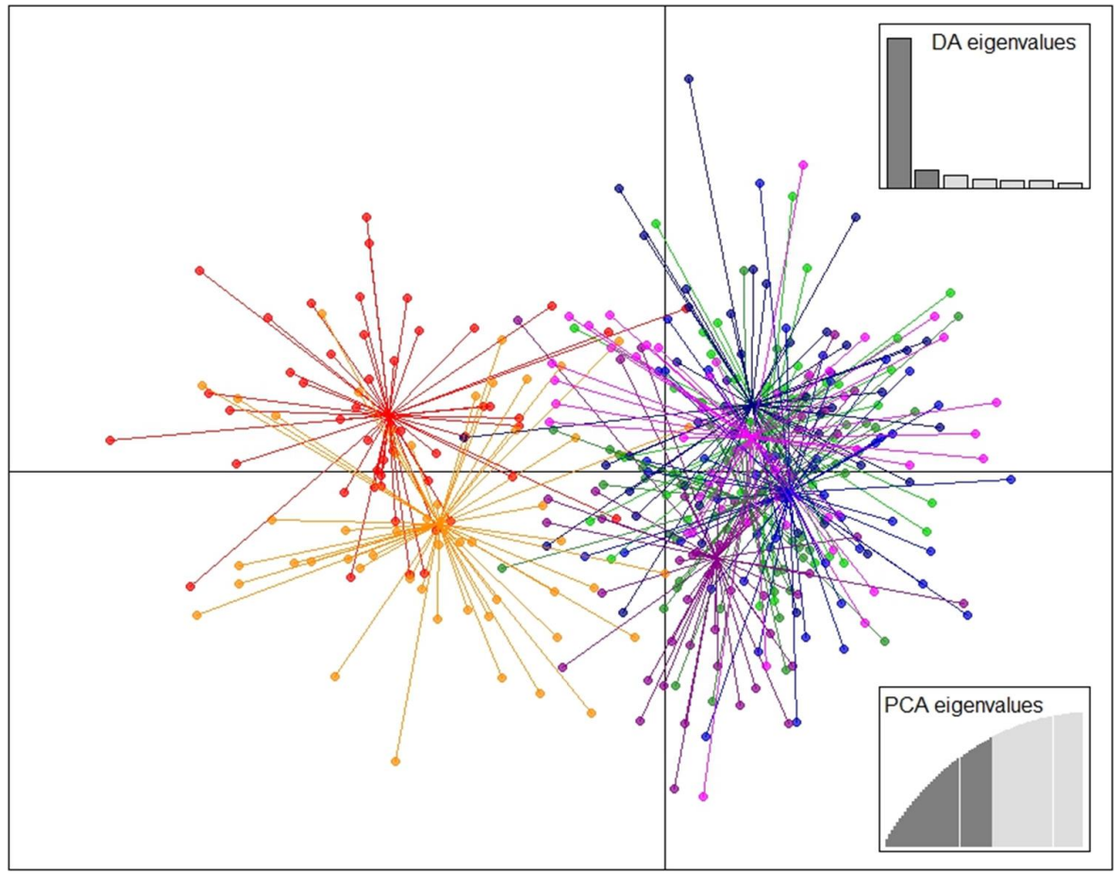
Case study 3: Atlantic Mackerel





Case study 3: Atlantic Mackerel





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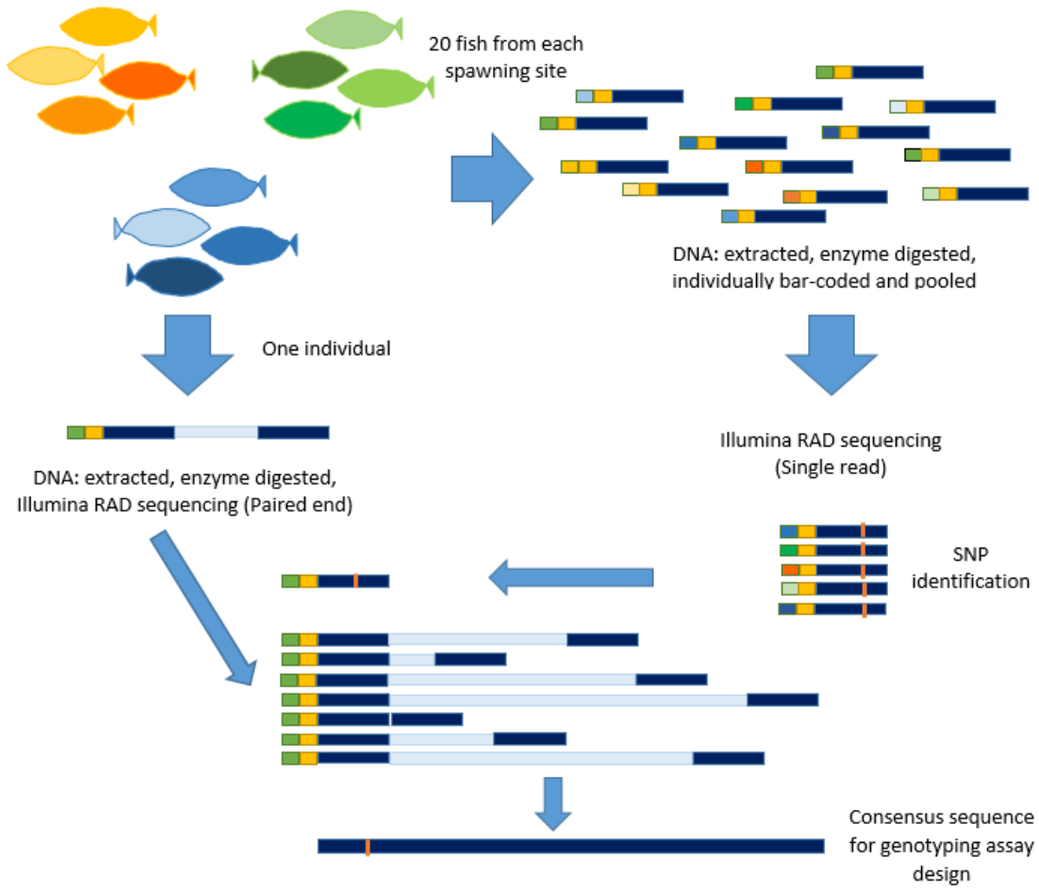

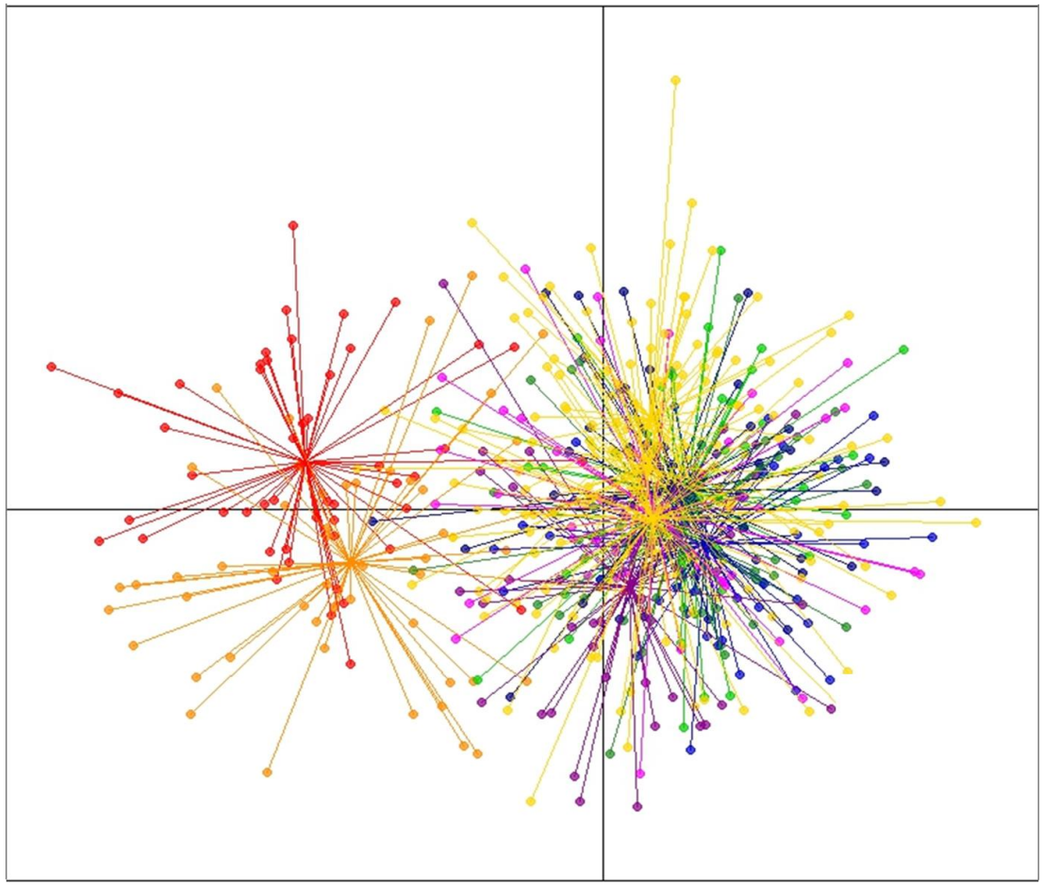

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