

Harvest control rules for stocks displaying dynamic production regimes

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Outline

What was expected (Abstract)

Separate HCRs for different regimes as a function of B

What was found

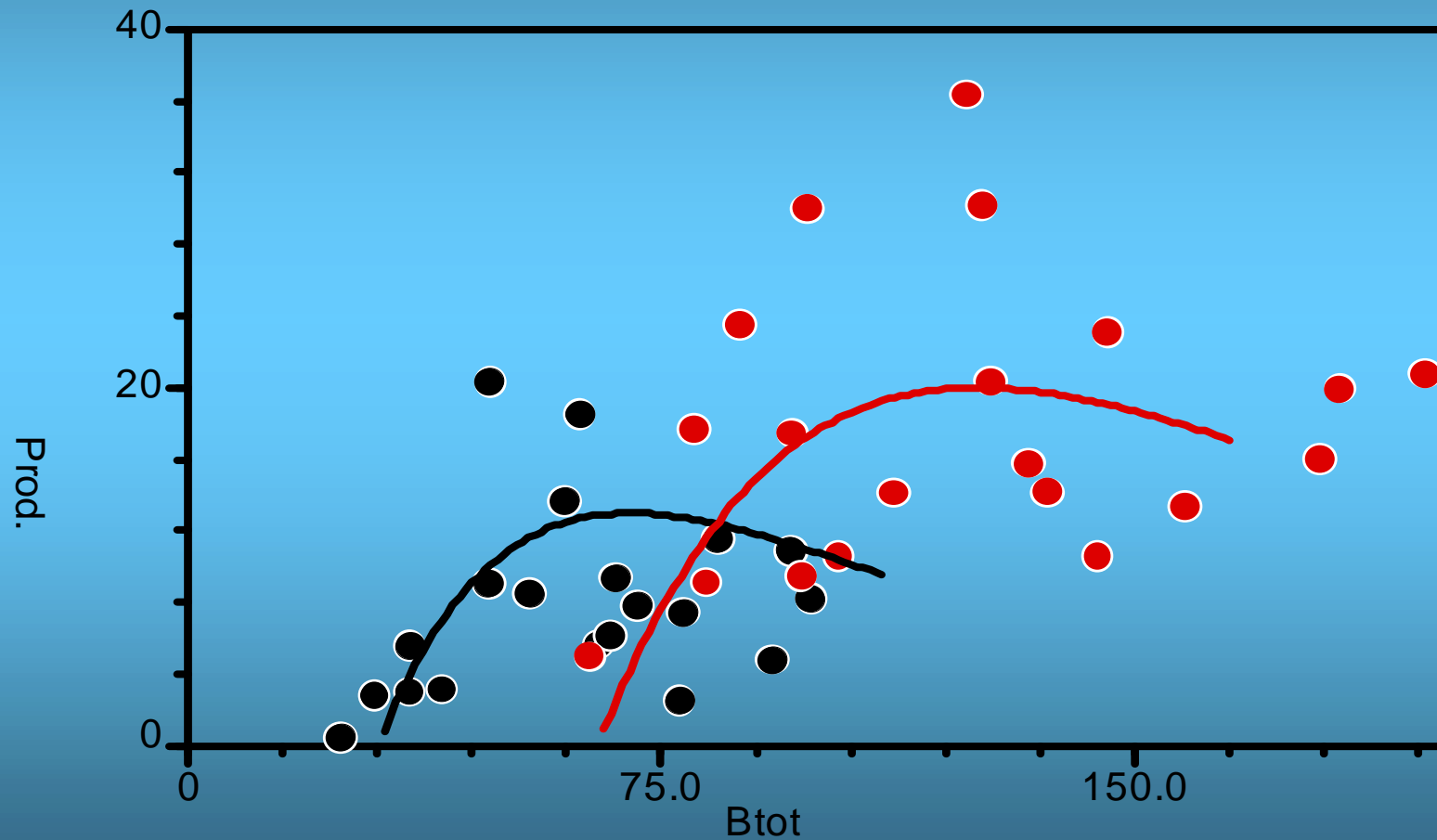
Regimes essentially independent of B

Lesson 1

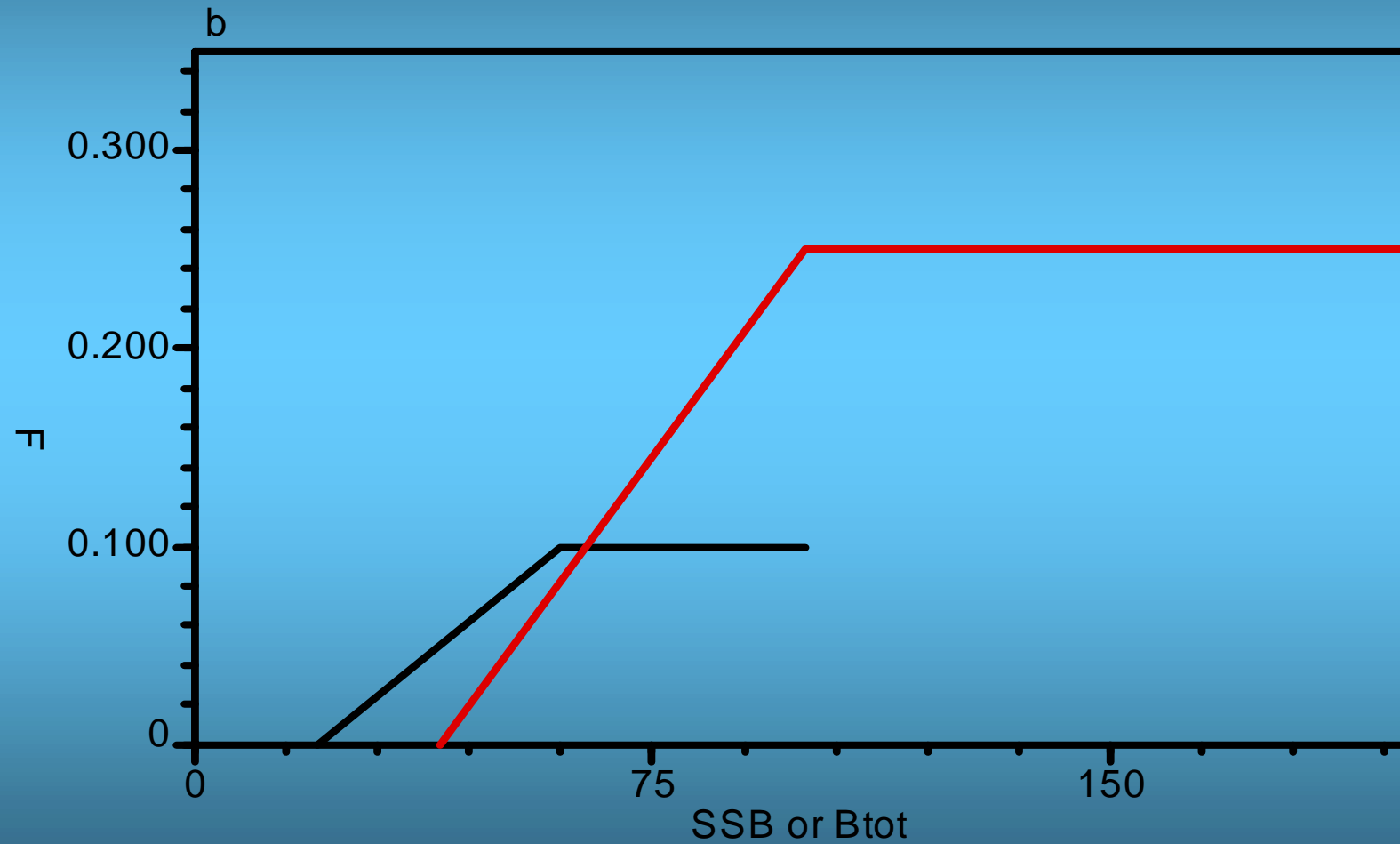
Dangers of writing abstract before work is done.

Expected

Hypothetical data from two production regimes



Expected HCRs from these hypothetical data



When to switch?

Sissenwine-Shepherd analysis

- **Links individual attributes (age based)**
 - **growth**
 - **natural mortality**
 - **maturation schedule**
 - **fishing pattern (partial recruitment)**

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Moving window Sissenwine-Shepherd

But all these things change (especially with regimes)

Add **moving data windows to capture temporal nature of Growth, natural mortality...**

Sample from years 1-10, 2-11,... from each input

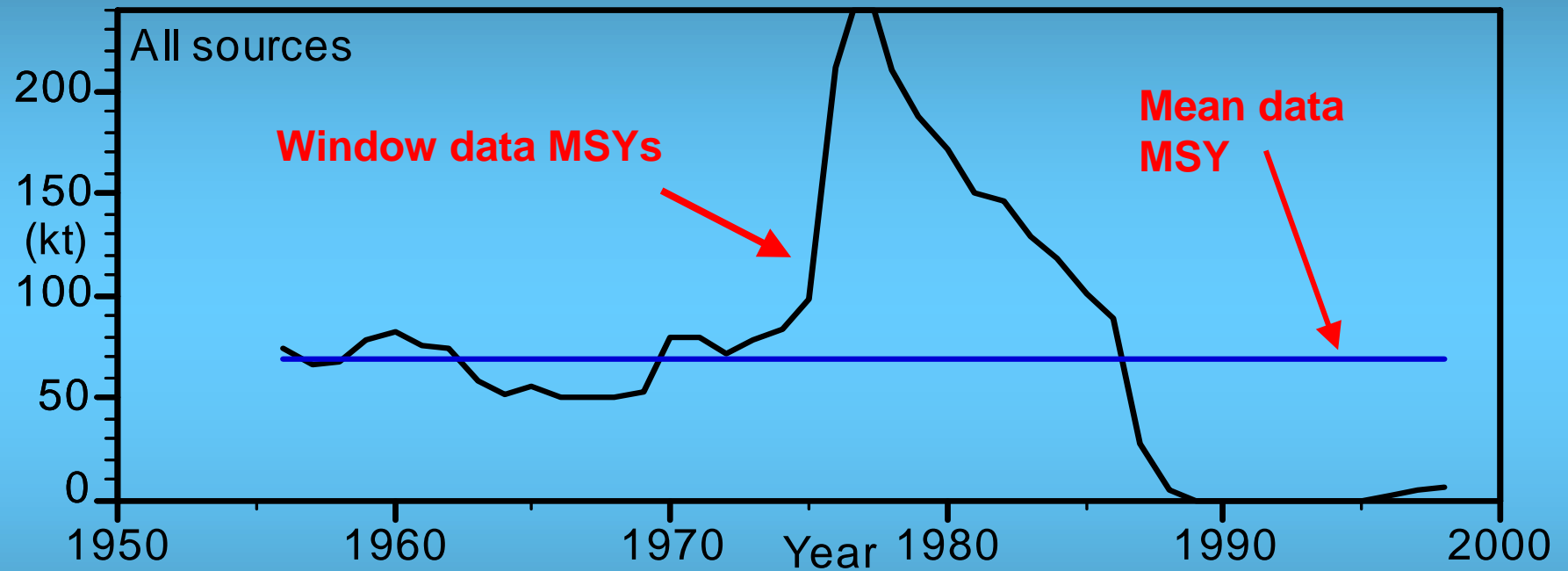
MSY as proxy for production within a window

10 years is arbitrary but

too few years – no fit to S-R

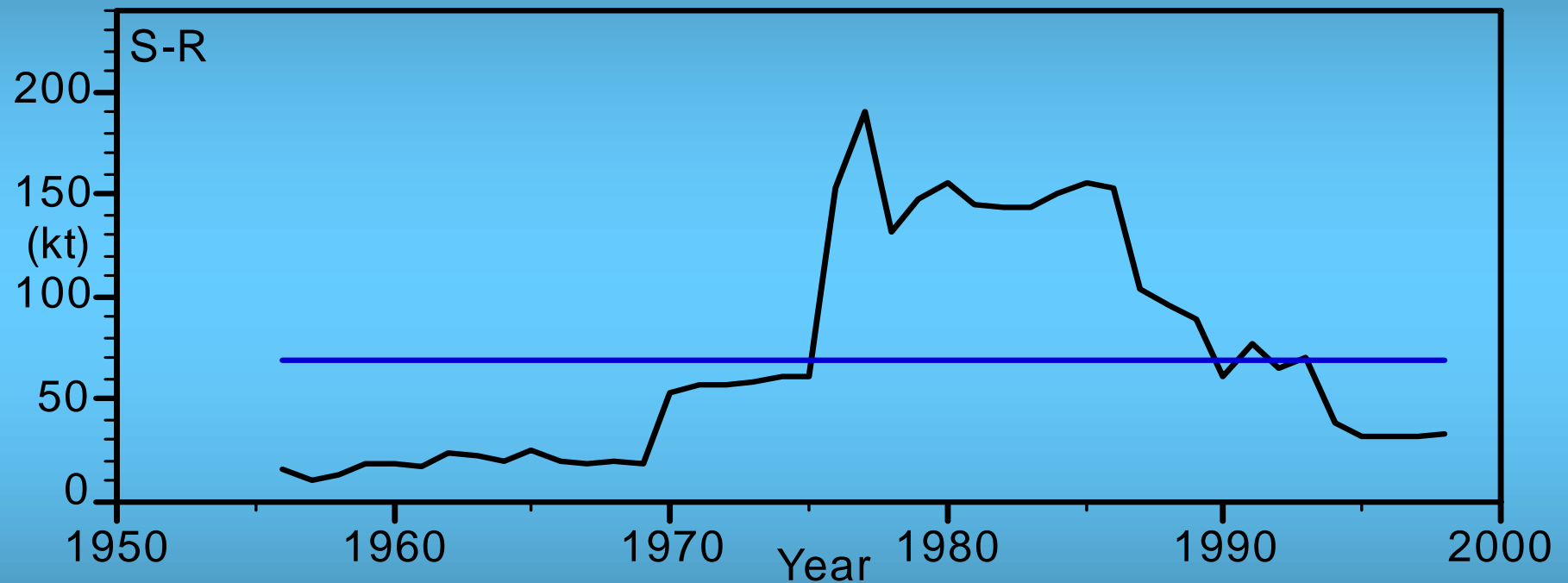
Too many – loss of temporal resolution

Moving window production analysis



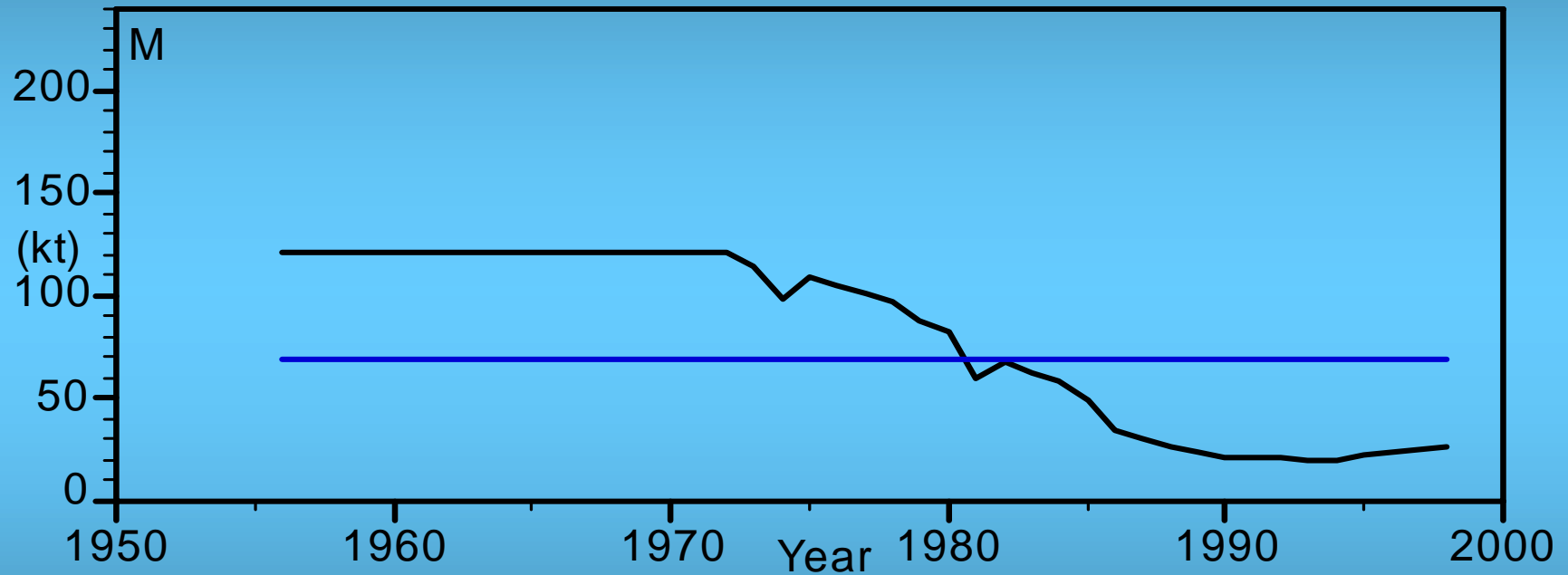
The MSYs among windows vary from 0 to over 200kt/year

4TVn cod production (MSY) influence of S-R



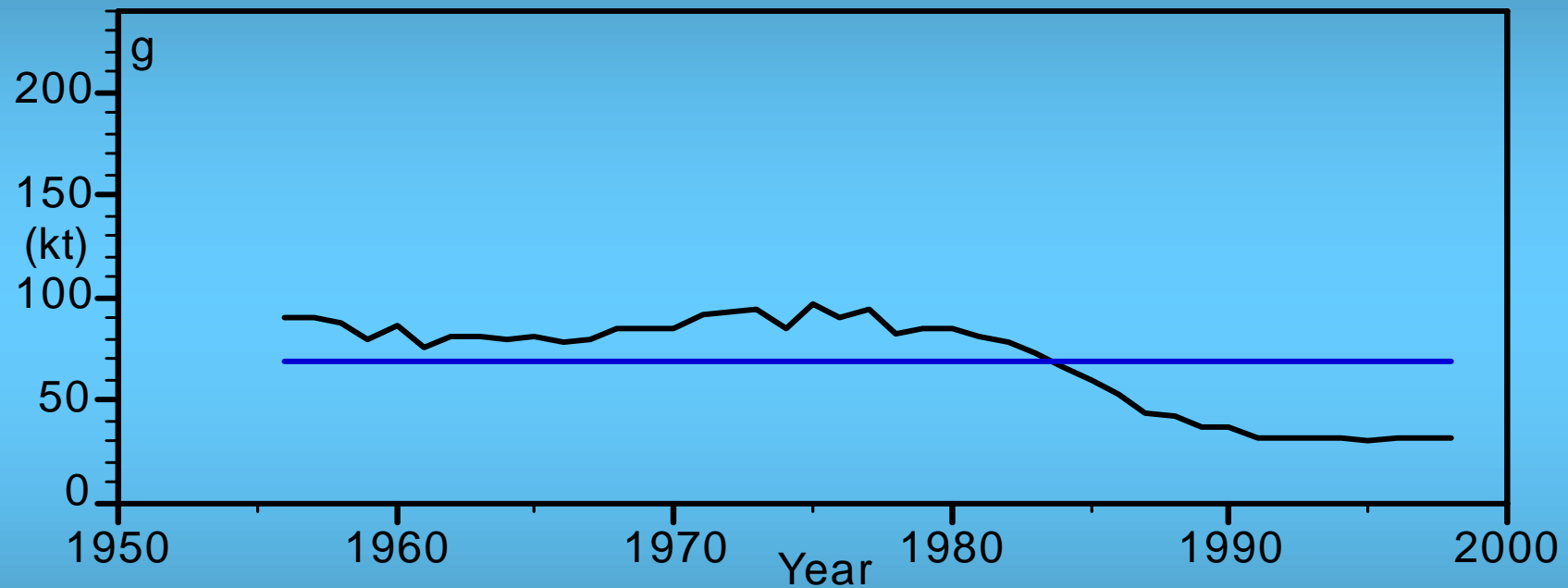
Influence of stock-recruitment alone ~ 10 – 150 kt/year

4TVn cod production (MSY) influence of M



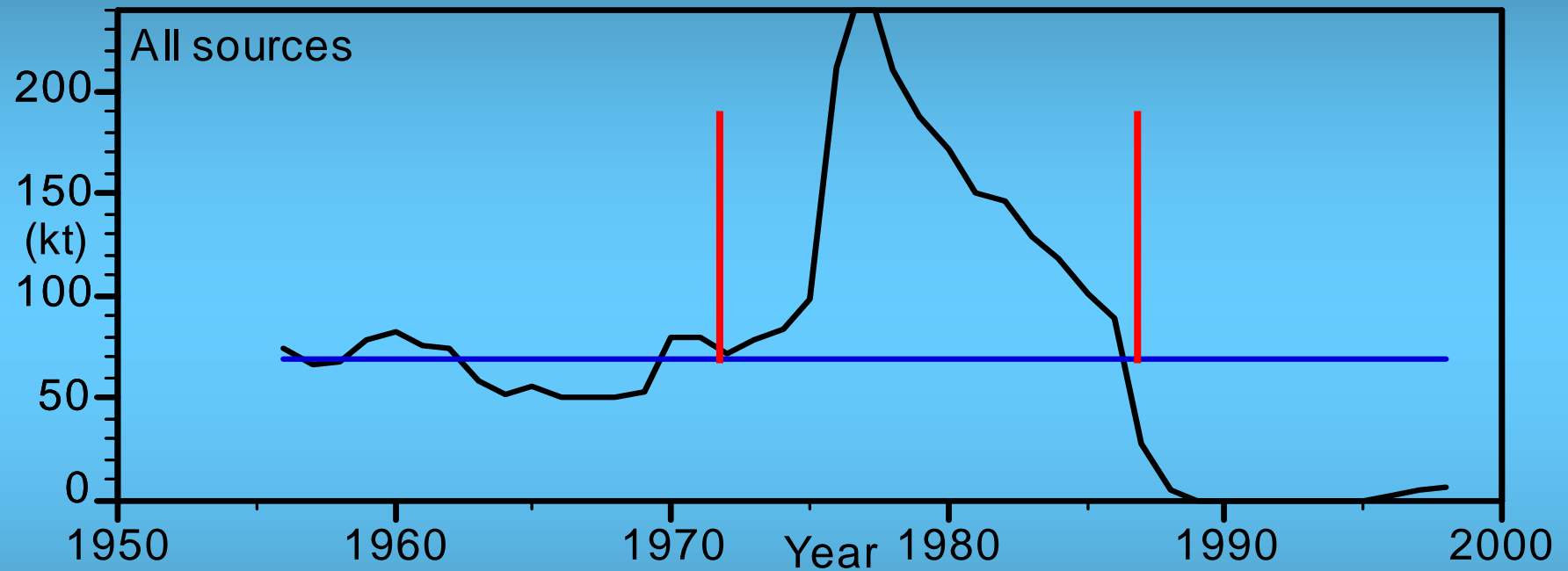
Influence of M alone ~ 20 – 120 kt/year
Out of phase with S-R on previous slide

4TVn cod production (MSY) influence of growth



**Influence of growth alone ~ 40 – 100 kt/year
In phase with M on previous slide**

Use these to define production 'regimes'

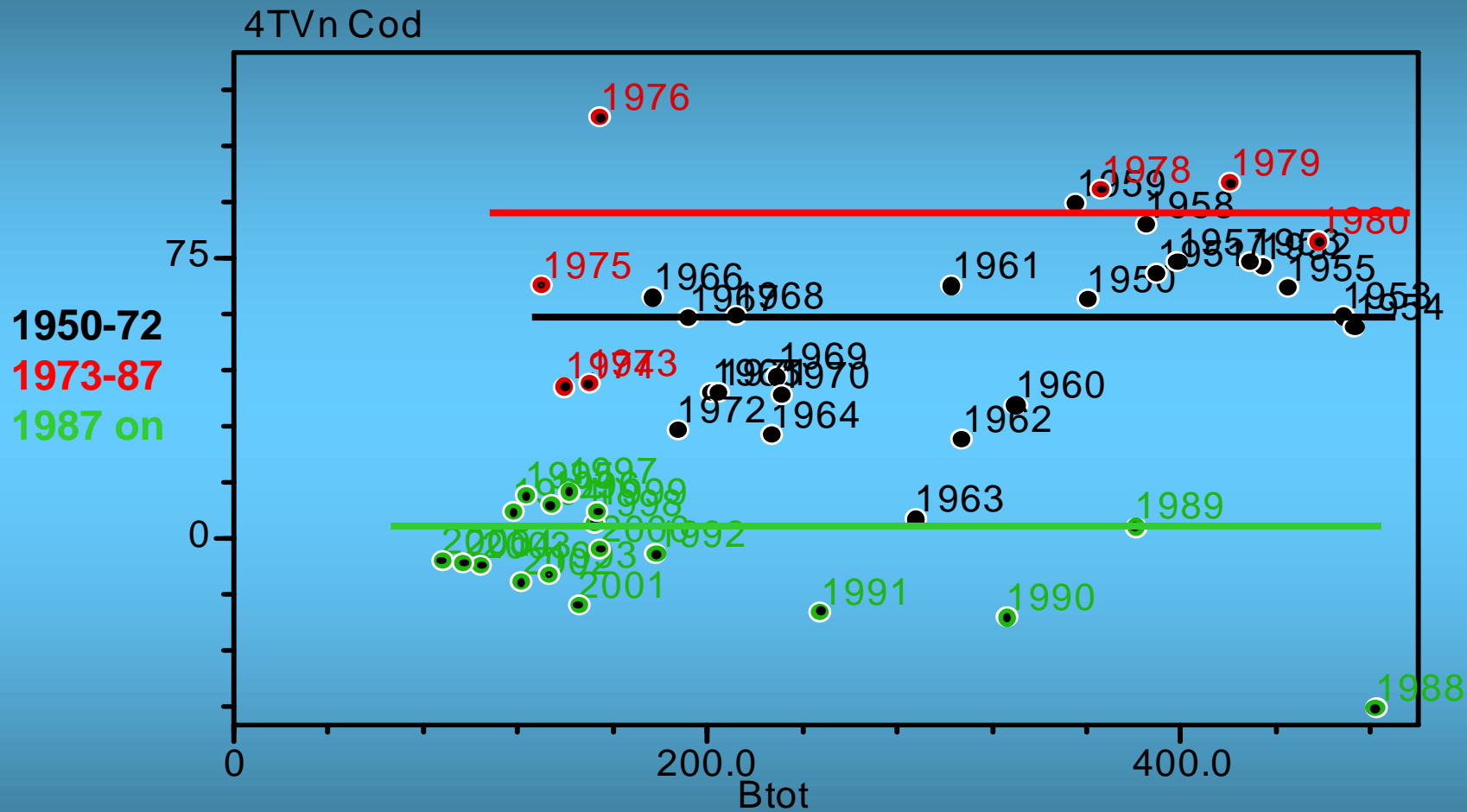


Average 1950-72 – poor S-R, good M and g

Good 1973-87 – all good

Poor 1987 on – all poor

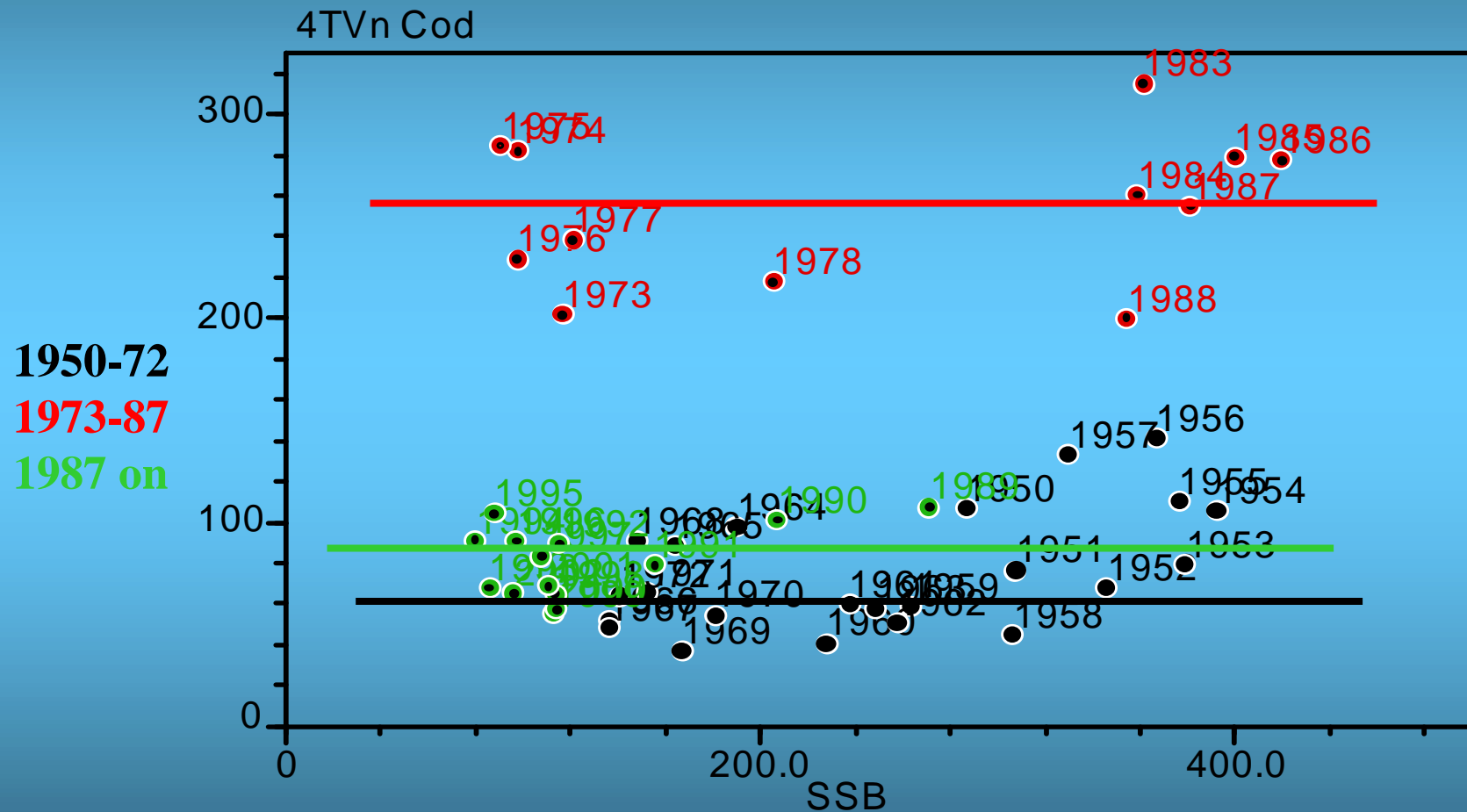
Production data coloured by regime vs total biomass



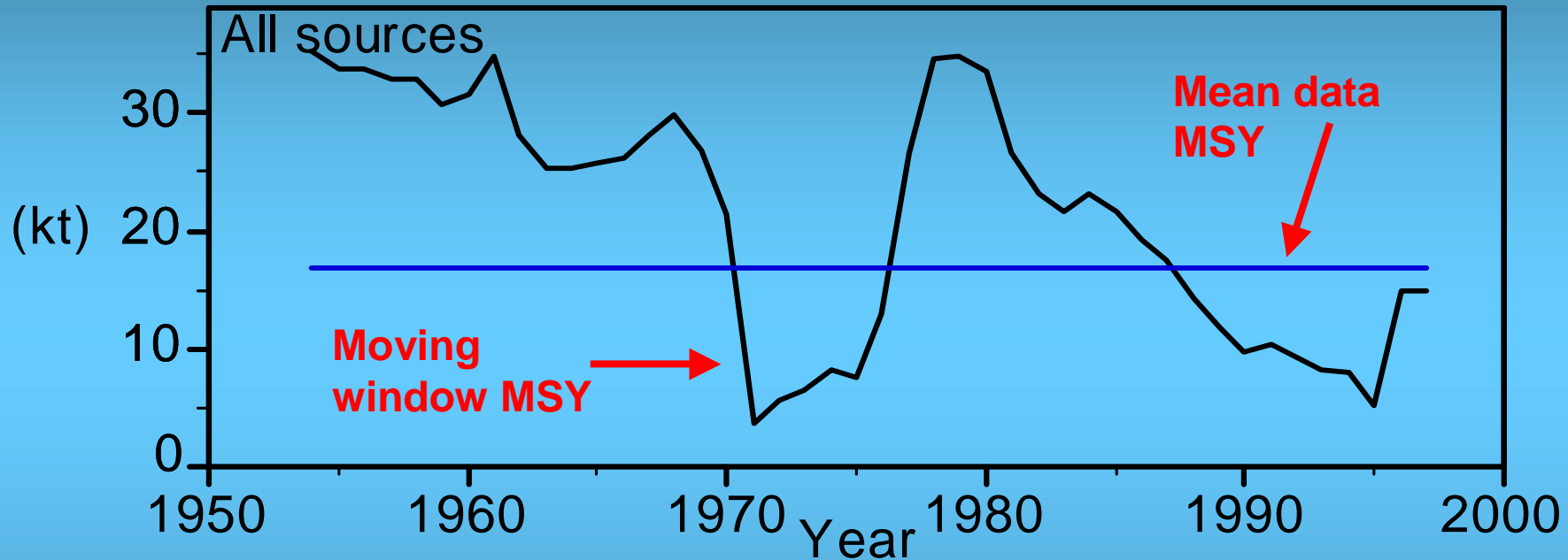
Each coloured set essential flat

Each coloured set covers broad range of biomass

Similarly partitioned S-R data (not as good but often used for defining BRPs)

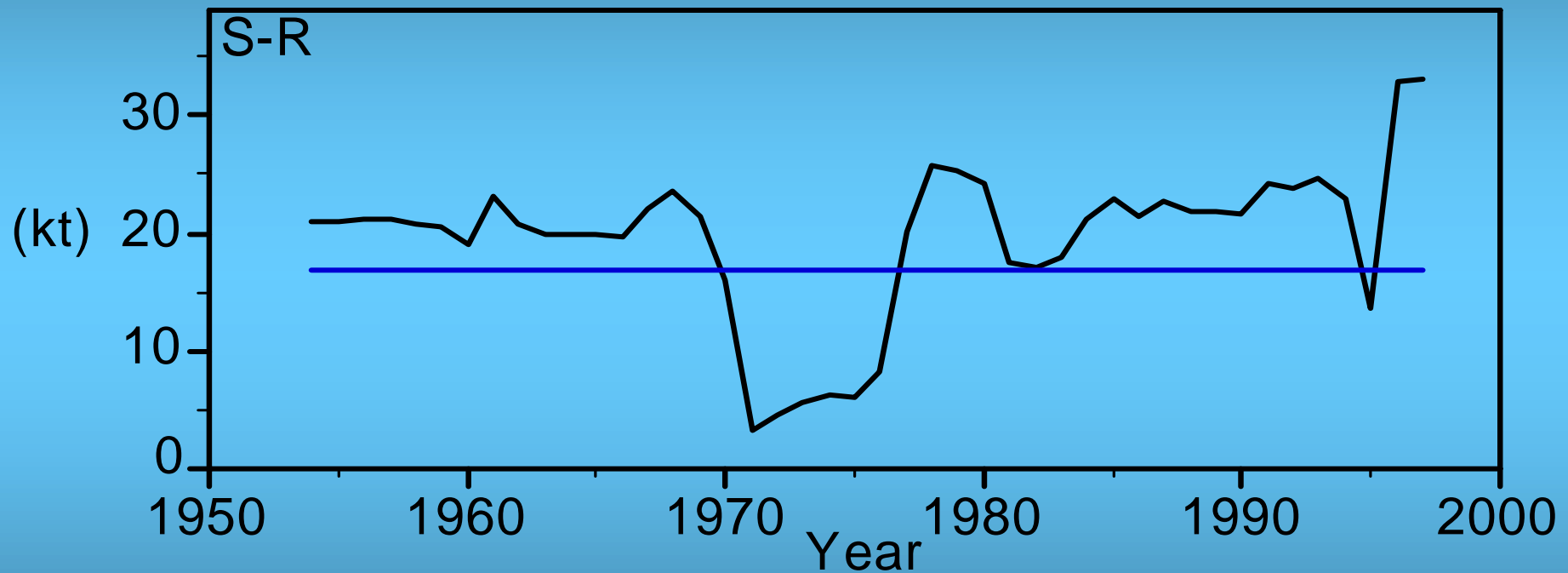


ESS Haddock production (MSY) all sources



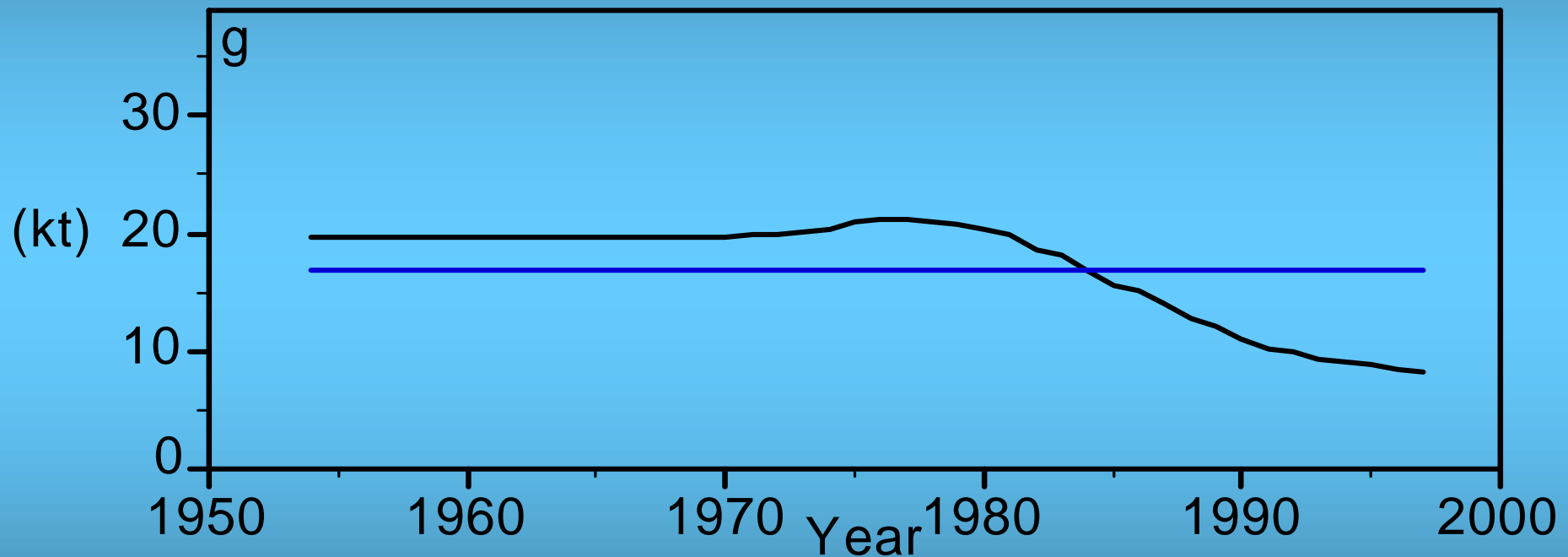
The MSYs from windows vary from 5 to over 30 kt/year

ESS Haddock production (MSY) influence of S-R



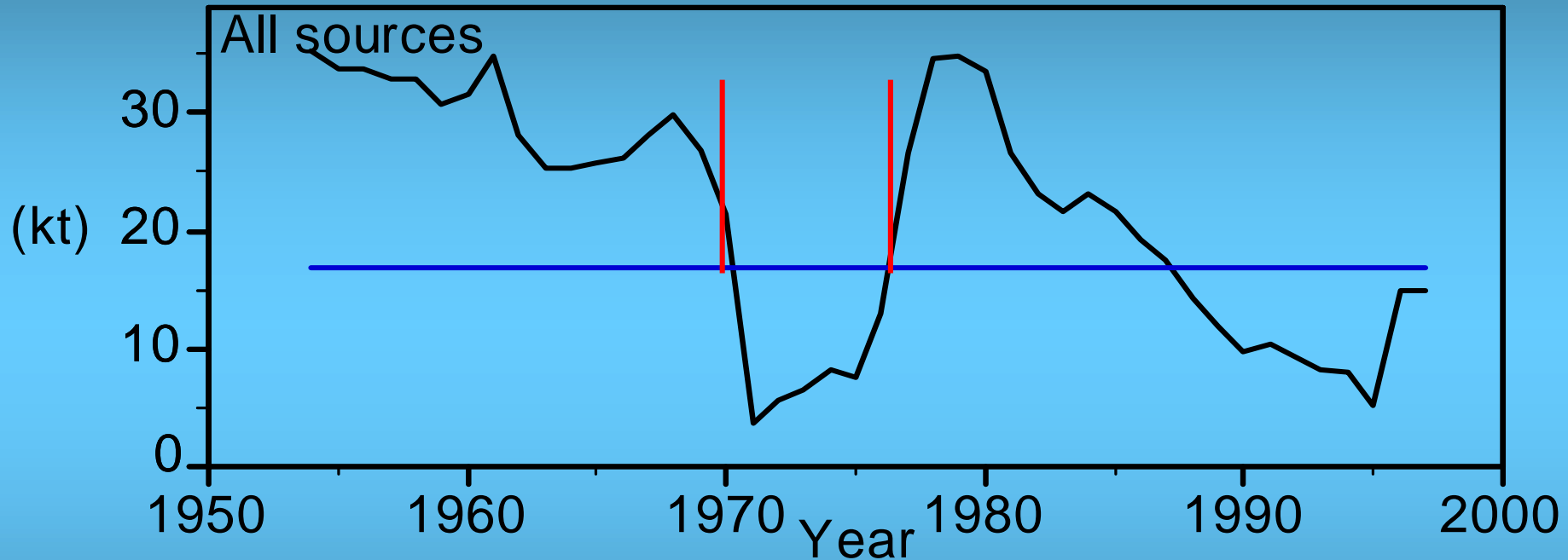
Effect of stock-recruitment alone ~ 5 – 30 kt/year

ESS Haddock production (MSY) influence of growth



Effect of g alone ~ 10 – 150 kt/year
As for cod, in phase with M

ESS Haddock production (MSY) all sources



Average 1950-69 – fair+ S-R, good M and g

Good 1970-78 – poor S-R

Transitional 1979 on – poor M & g, compensatory S-R

Conclusions from cod study

Production is more determined by 'regime' than biomass.

Within regime there is little response to biomass.

HCRs based on biomass alone would be inadequate.

**No indication that transition from regime to regime
is function of biomass.**

Need to know production and its determinants.

Premature to investigate switching among regimes

Conclusions from haddock study

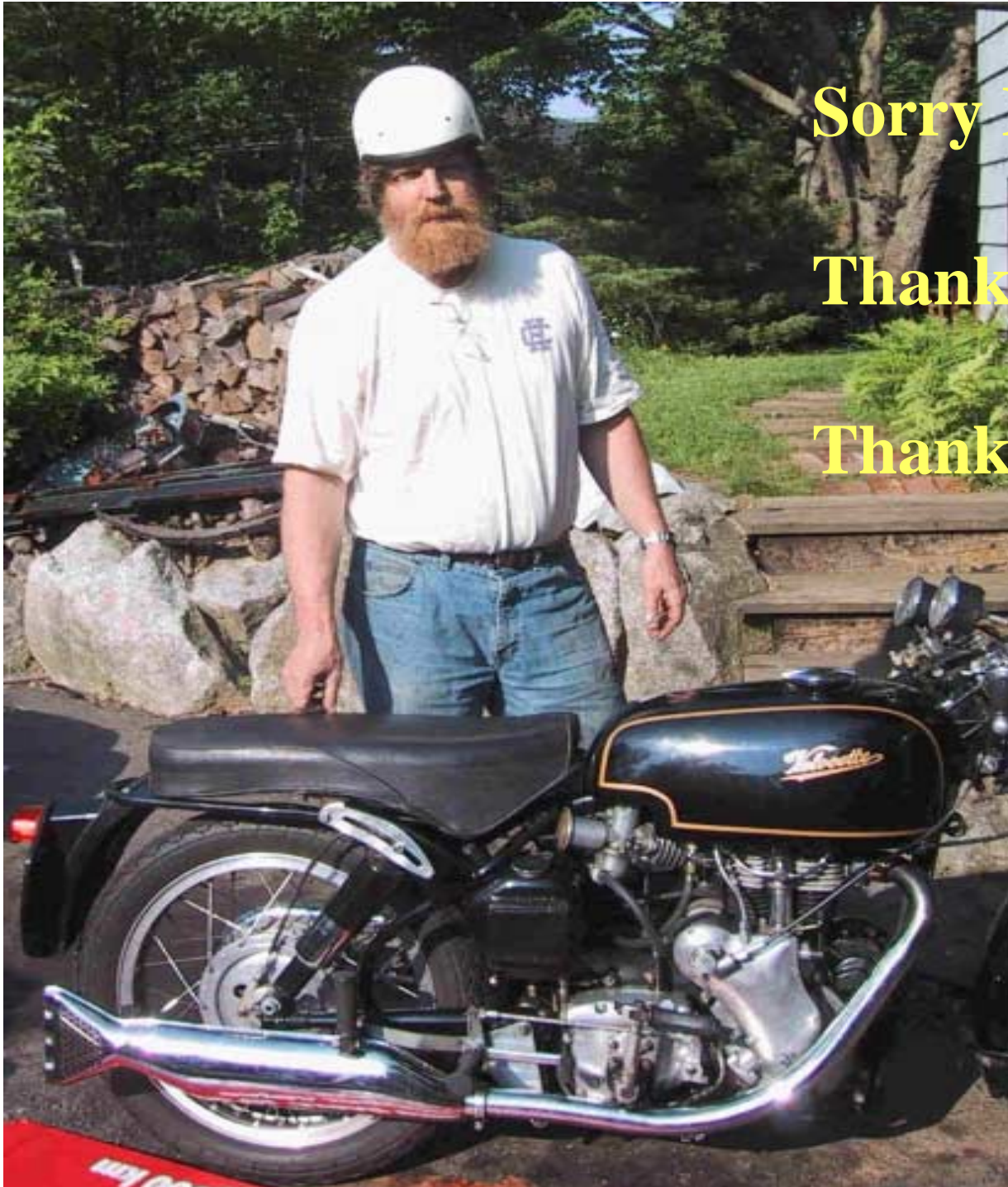
Production is influenced by 'regime' and biomass.

Within regime there was some response to biomass.

HCRs based on biomass alone would be inadequate.

**Some indication that transition from regime to regime
is function of biomass.**

Need to know production and its determinants.



Sorry I could not make it.

Thanks for your patience.

Thanks Peter.