



# Scabies in Bavarian Chamois (*Rupicapra rupicapra*) Population: or why haven't Chamois in Bavaria Scabies?

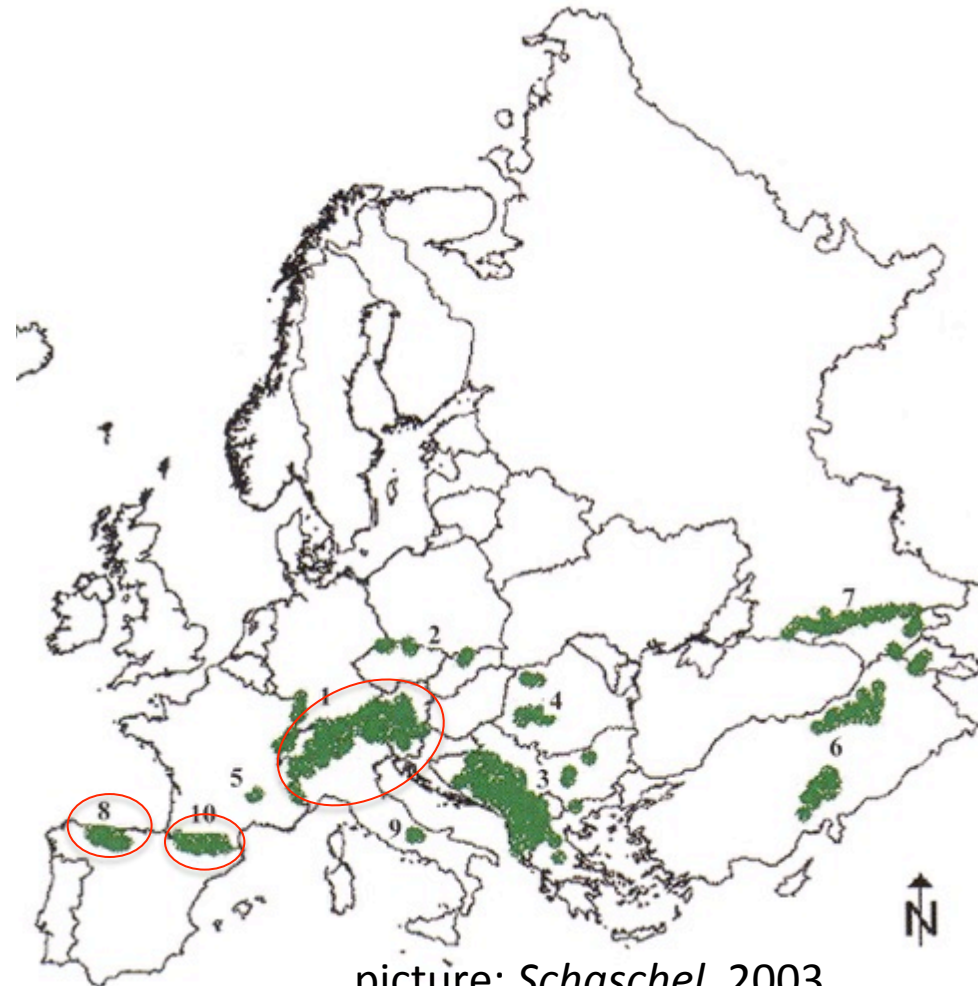
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# Which Chamois populations are affected

1. Alps
2. Tatra
3. Balkan
4. Carpathien
5. French
6. Asian
7. Caucasus
8. Cantabria
9. Abruzzi
10. Pyrenees



picture: Schaschel, 2003



# History of Scabies in the Alps

- Austria, first report 1824 (Schaschl 2003)
- Second epidemic started after World War II again in Austria
- Actually, scabies spreads in several countries with a speed of 3.38 – 4.64 km/year (Rossi et al. 2007, Turchetto et al. 2014)
- Once affected by scabies chamois population don't get rid of this pest (Schaschl 2003)

But, sole exception: Bavaria

- First report from 1824 to 1830 (Miller 1983, Boch & Schneidawind 1988)
- Second report from 1949 to 1992
- 2017: not affected - unimportant

Question is: why?

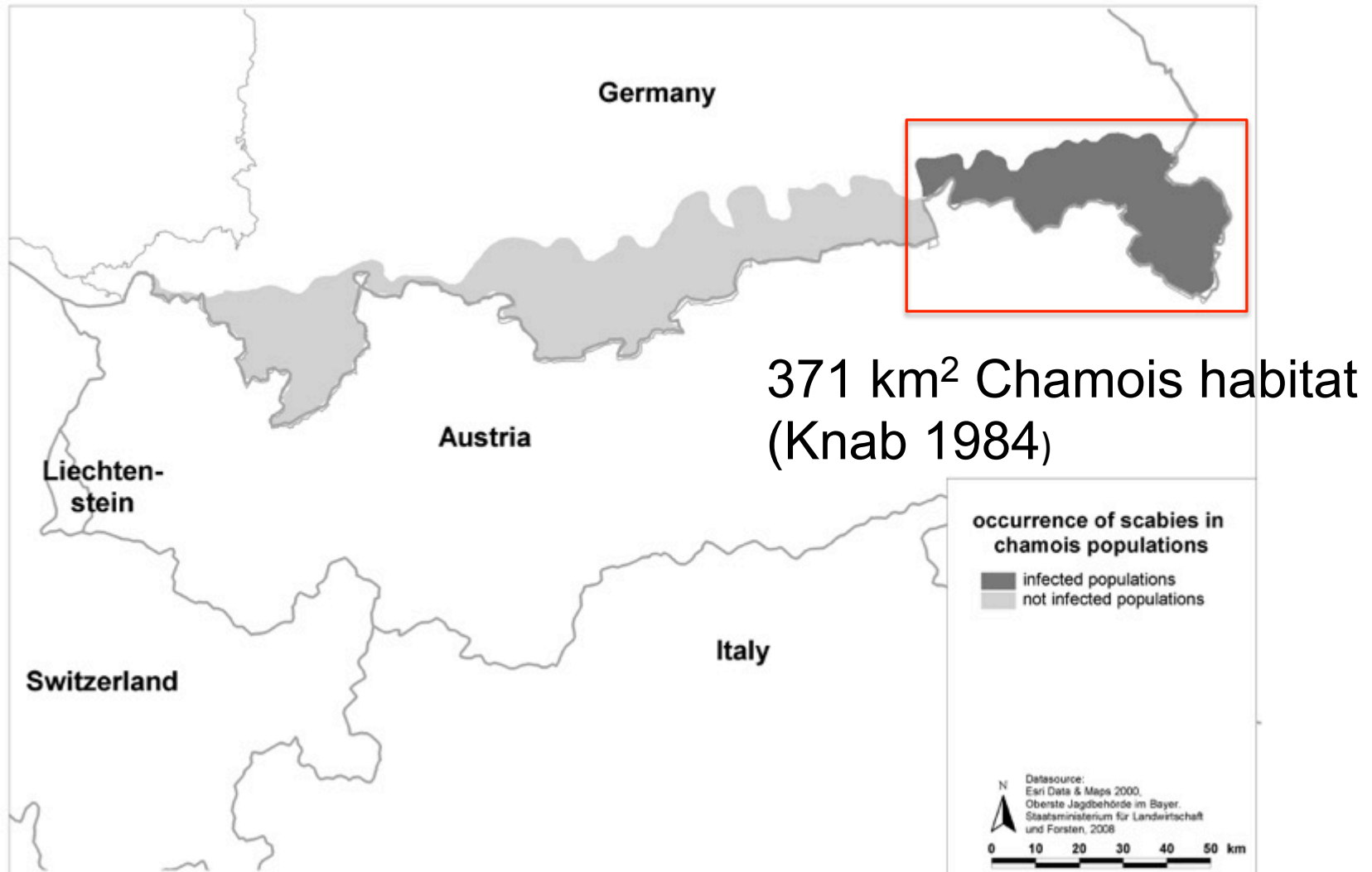


# Some factors fostering scabies

- Malnutrition (Onderscheka et al. 1978; Krutzer 1994)
- Deterioration in fitness (Wetzel & Rick 1972)
- Infestation with parasites (Boch & Schneidawind 1988)
- Vitamin A deficiency (Rossi et al. 1995)
- Concentration of animals (Krutzer 1994)
- High population density (Krutzer 1978, Rossi et al. 1995 + 2007, Prien 1994)
  - Encourage the transfer of the mite
  - Reduce fitness
  - Increase stress



# Studie area



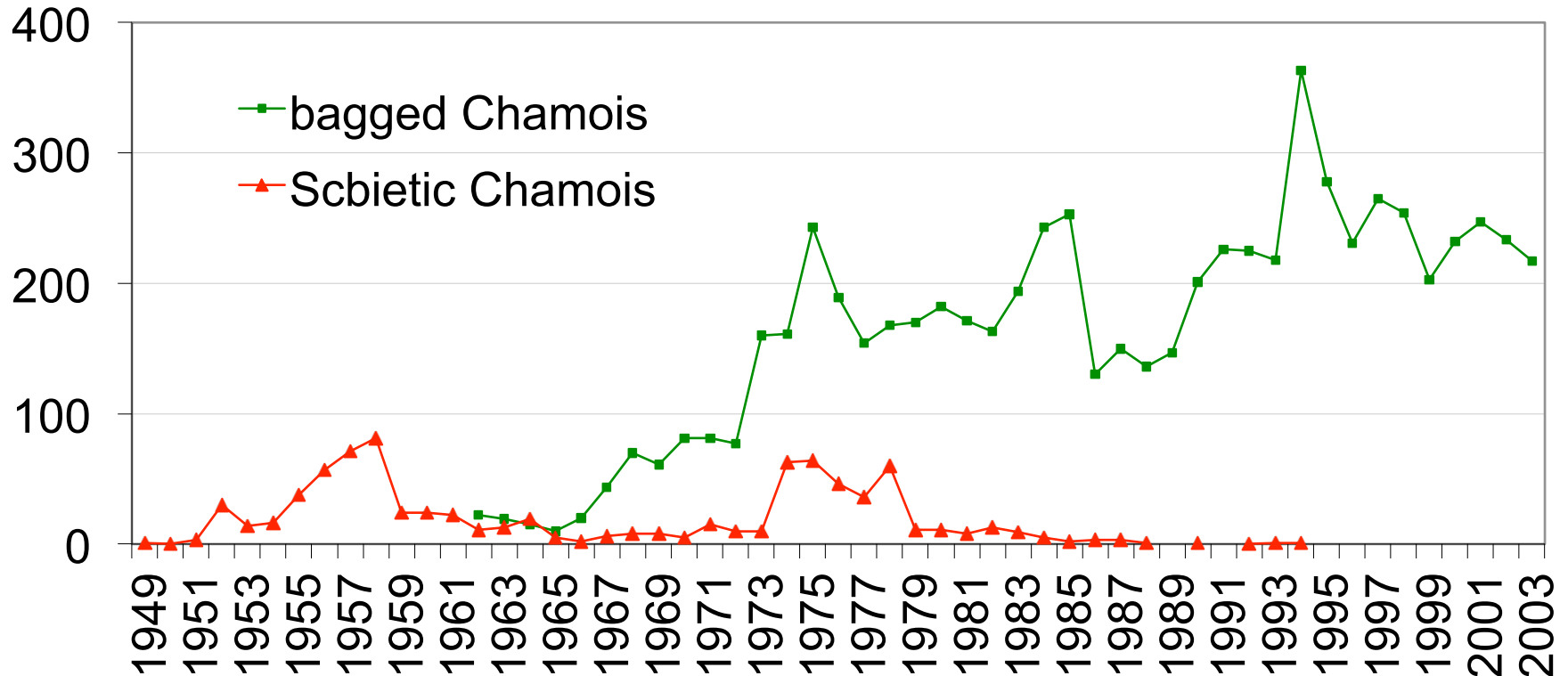


# Data

- Hunting Bag and scabies statistics from Upper Bavarian Forest Service for the state forest east of Inn valley 1974 - 2004 (only scabies 2005 – 2016)
- Hunting bag and scabies statistics of the district of Berchtesgaden Forest Office 1949 – 2003
- Hunting bag of Chamois in Bavaria 1960 - 2016



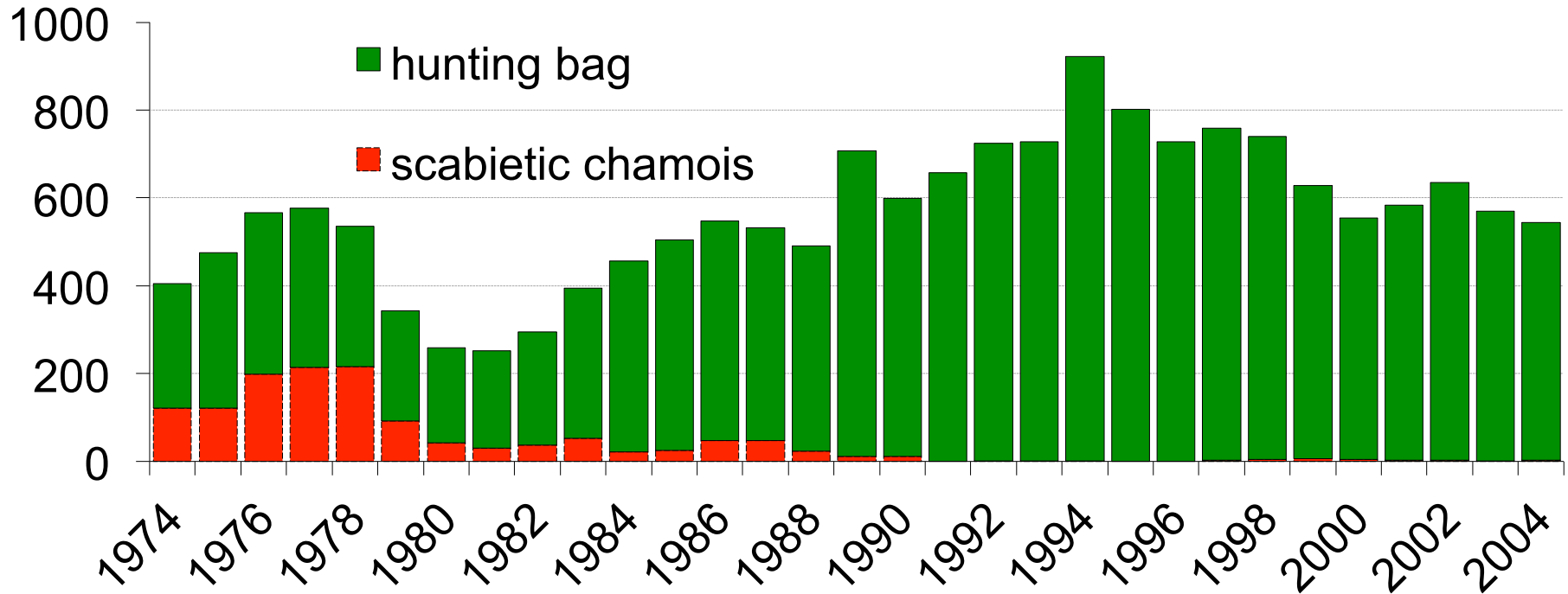
# Scabietic Chamois and hunting bag Berchtesgaden State Forest



Highly significant inverse correlation between Scabietic Chamois and hunting bag ( $r = -0.589$   $p < 0.001$ ) (Grauer & König 2009)



# Scabietic Chamois and hunting bag State Forest east of Inn valley



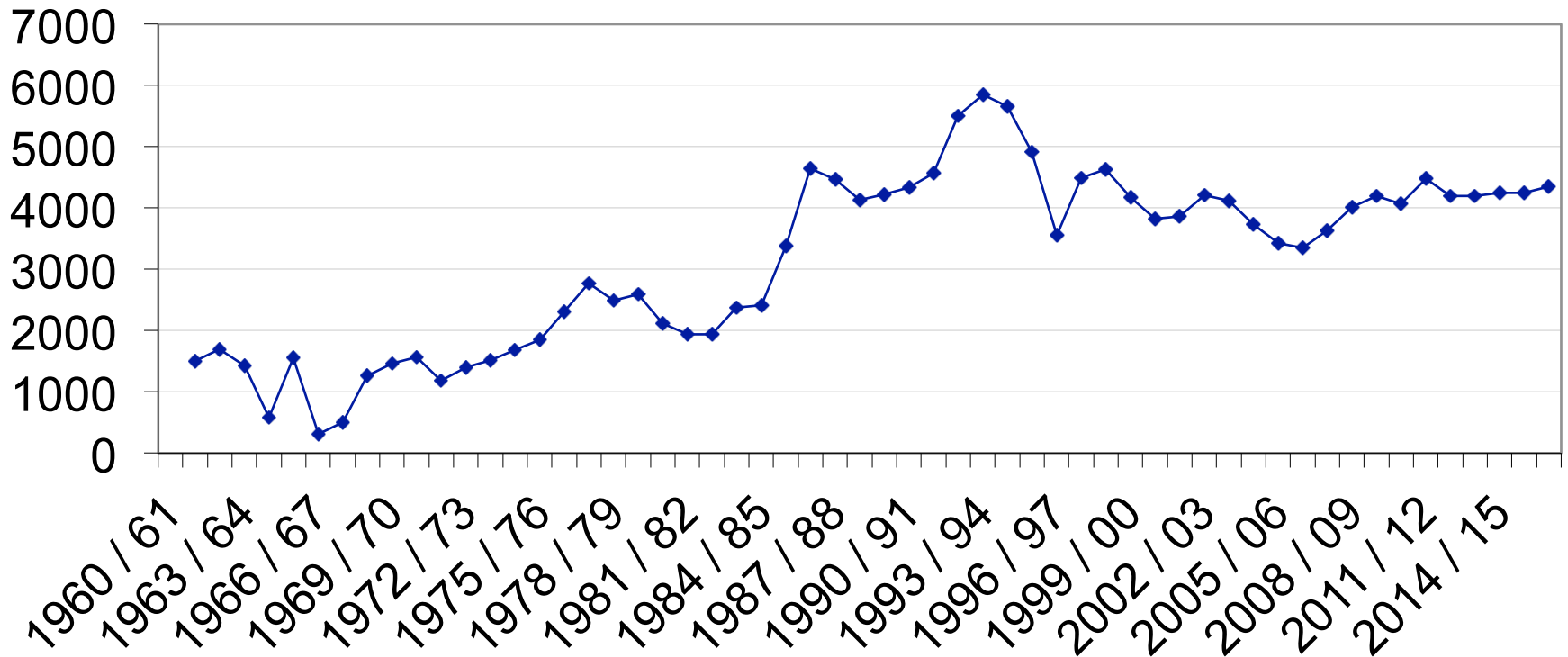
(Grauer & Köniç 2009)

- Inverse correlation hunting bag / scabietic chamois ( $r = -0.824$ ,  $p < 0.001$ )
- After increasing the hunting bag over 500 chamois a year, number of scabietic chamois / yr decreased on 0 to 3 cases / yr
- Since 2005 no cases reported





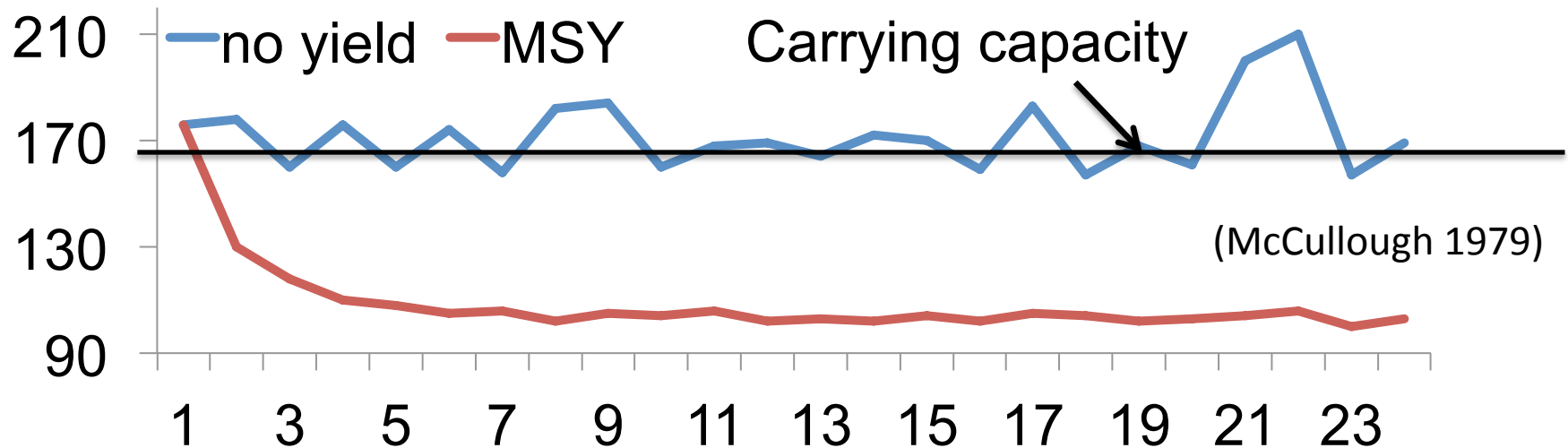
# Bavarian hunting bag of Chamois



- Up to 1986 hunting bag was lower than recruitment
- 1992 to 1995 hunting bag exceeded recruitment
- Since 1999 hunting bag uses recruitment



# How to interpret this results?



- Chamois were regulated until the 1980 by winter severity and diseases
- Increasing recruitment reduce loose by winter and disease
- After reduced population density chamois are regulated by hunting > increased fitness and reduced stress



# Chamois Population in Bavaria today

Abundance of chamois is reduced to a level, where

- the fitness of the population is improved and most of the individuals are healthy enough to be not vulnerable to scabies.

According to Schaschl (2003) optimal size is 5 to 8 Chamois / 100 ha

- Bavarian State Forest east of Inn Valley (study area):  
7,3 chamois / 100 ha
- Entire Bavarian Chamois population: 11,2 chamois / 100ha
- Count data from west Bavarian Alps: 11,7 chamois / 100 ha



# Conclusion

- Twice in 19<sup>th</sup> and 20<sup>th</sup> century scabies infected chamois in Bavaria
- Twice the spread of scabies was stopped by reducing population-density
- Today we have a healthy chamois population
- Since 2000 we have a recruitment rate about the same level
- Today, yield is at the same level of the early 80's und above the yield in the 60's and 70's
- At 20% of the chamois area we have an increasing population
- At the former scabies area we have approximately 5.8 chamois / 100 ha
- Increasing game bag over a large area prevents scabies



Thank you for your attention

