Agrar- und Ernährungswissenschaftliche Fakultät

C | A | U

Christian-Albrechts-Universität zu Kiel

Institut für Tierzucht und Tierhaltung

Different inbreeding concepts and impact of foreign dairy cattle breeds in German Angeln-dairy cattle

D. Hinrichs and G. Thaller

Institute of Animal Breeding and Husbandry, Christian-Albrechts-University

Outline

- Introduction
- Material and methods
- Results
- Conclusion

Introduction

Red dairy cattle breeds

- **Some chrachteristic traits are, e.g. low calf mortillity and good udder health**
- **Red dairy cattle breeds offers possibilities for the identification of genes involved in the expression of very important traits**
- **However, breeds are different with respect to the age of the breed and the genetic composition**

Introduction

Angeln:

- Very old breed (oldest reports date back to the 17th century)
- Herdbook established in 1885
- Since the eighties of the last century foregin breeds were used
- Breed has been of great importance in the development of other red dairy breeds

Introduction

Pedigree based inbreeding coefficients (1)

- Classical inbreeding coefficinet according to Sewall Wright (1922)
- Most common inbreeding concept in animal breeding
- However, did not take the age of the inbreeding into account

Introduction

Pedigree based inbreeding coefficients (2)

- **Ballou (1997)**
  - **Ancestral inbreeding coefficient based on classical inbreeding coefficient of parents**
- **Kalinowski et al. (2000)**
  - **Splits classical inbreeding coefficients in two parts, i.e. “new” and “old” inbreeding**

Introduction

Aim of this study

- **Estimation of different inbreeding coefficients**
- **Analysis of impact of foreign dairy cattle breeds**
- **Impact of foreign dairy cattle breeds on important ancestors**

Material and methods

Pedigree information

- Provided by VIT, Verden
  - 75,264 animals
  - 1950 was defined as base
  - Includes information about the proportion of foregein blood

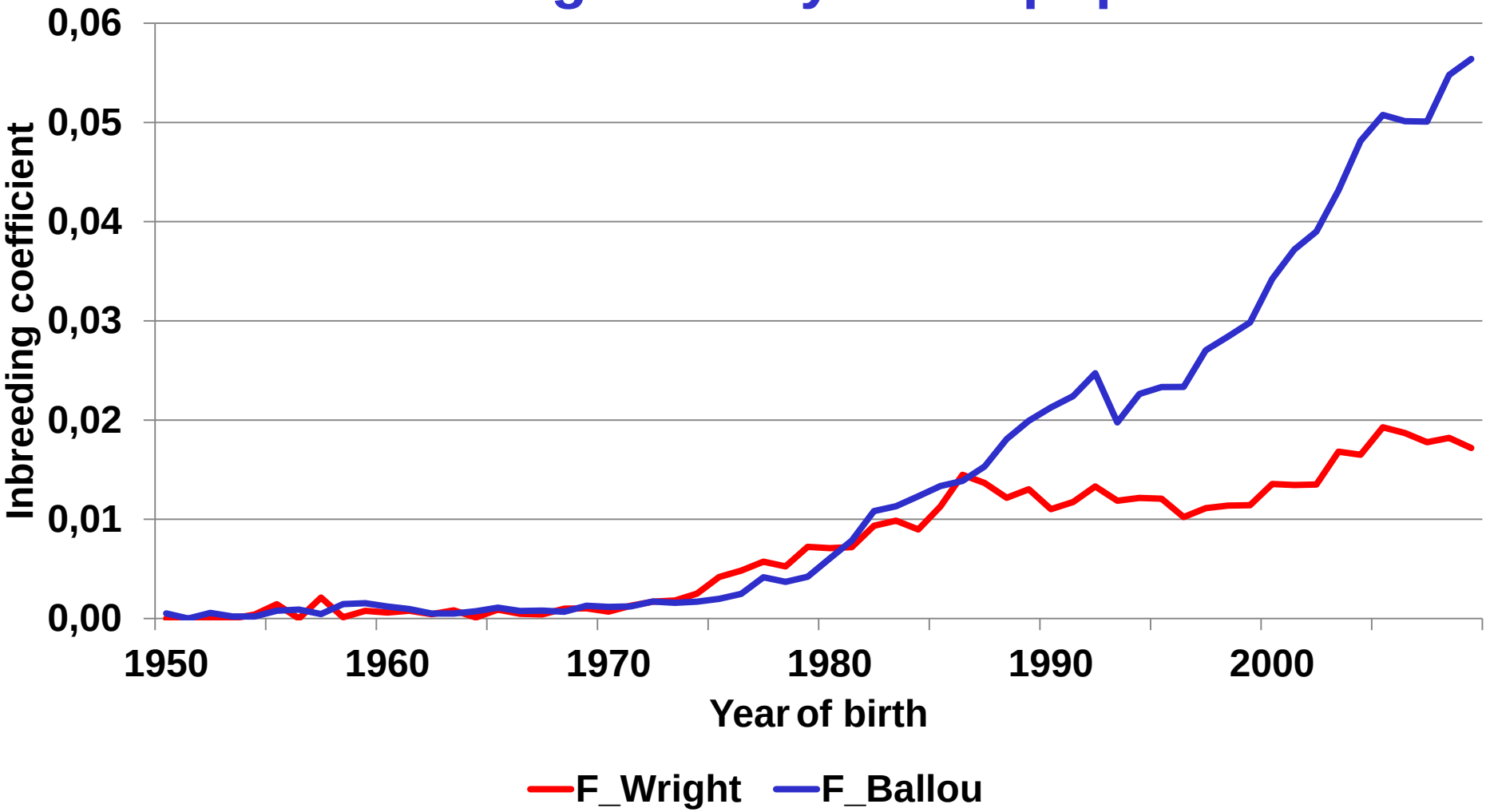
Material and methods

Estimation of pedigree based inbreeding coefficients

- **Wrights inbreeding coefficients estimated with the method of Meuwissen and Luo (1992)**
- **Coefficients according to Ballou (1997) and Kalinowski et al. (2000) were estimated by gene dropping using the programm package GRAIN22**

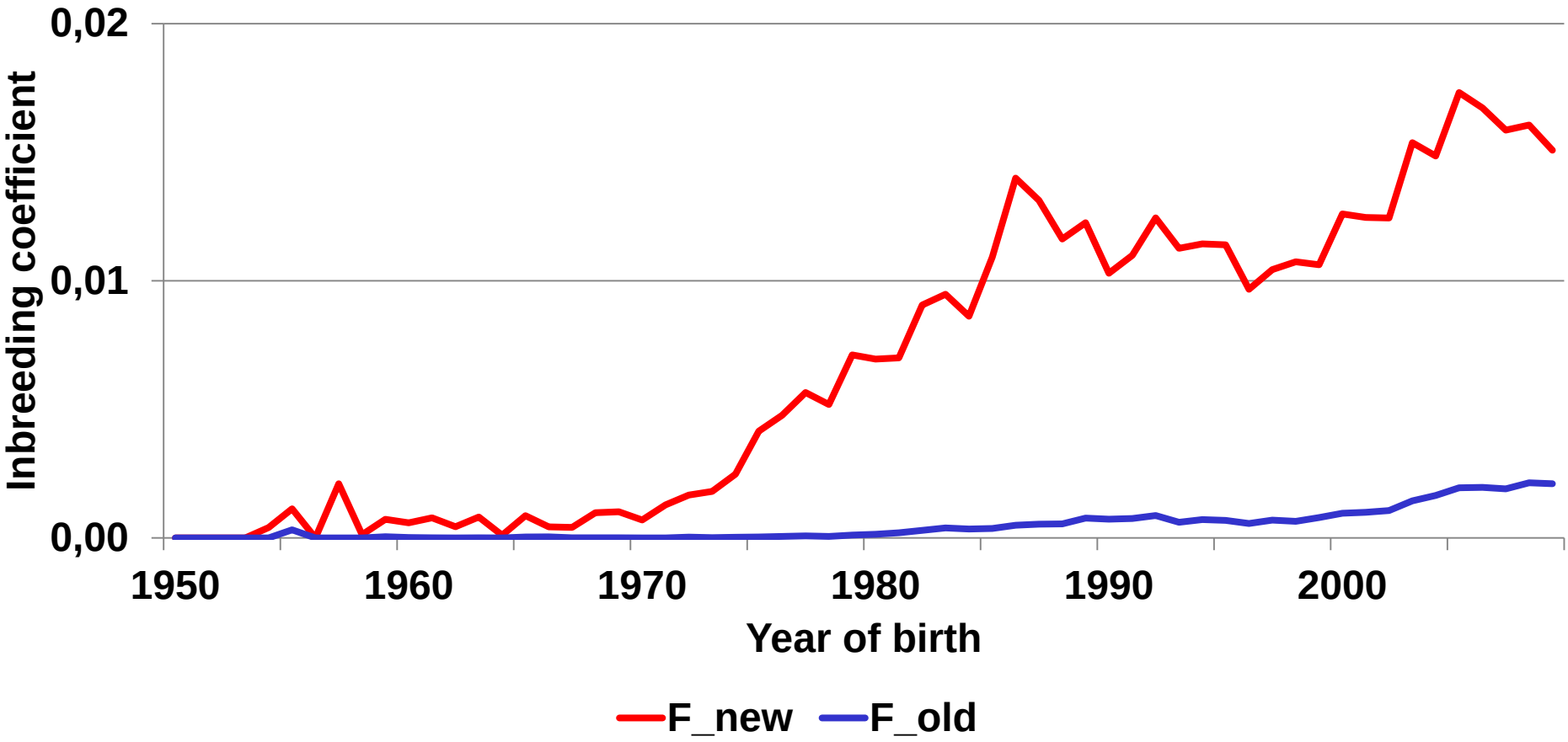
Results

Development of classical and ancestral inbreeding within the Angeln dairy cattle population



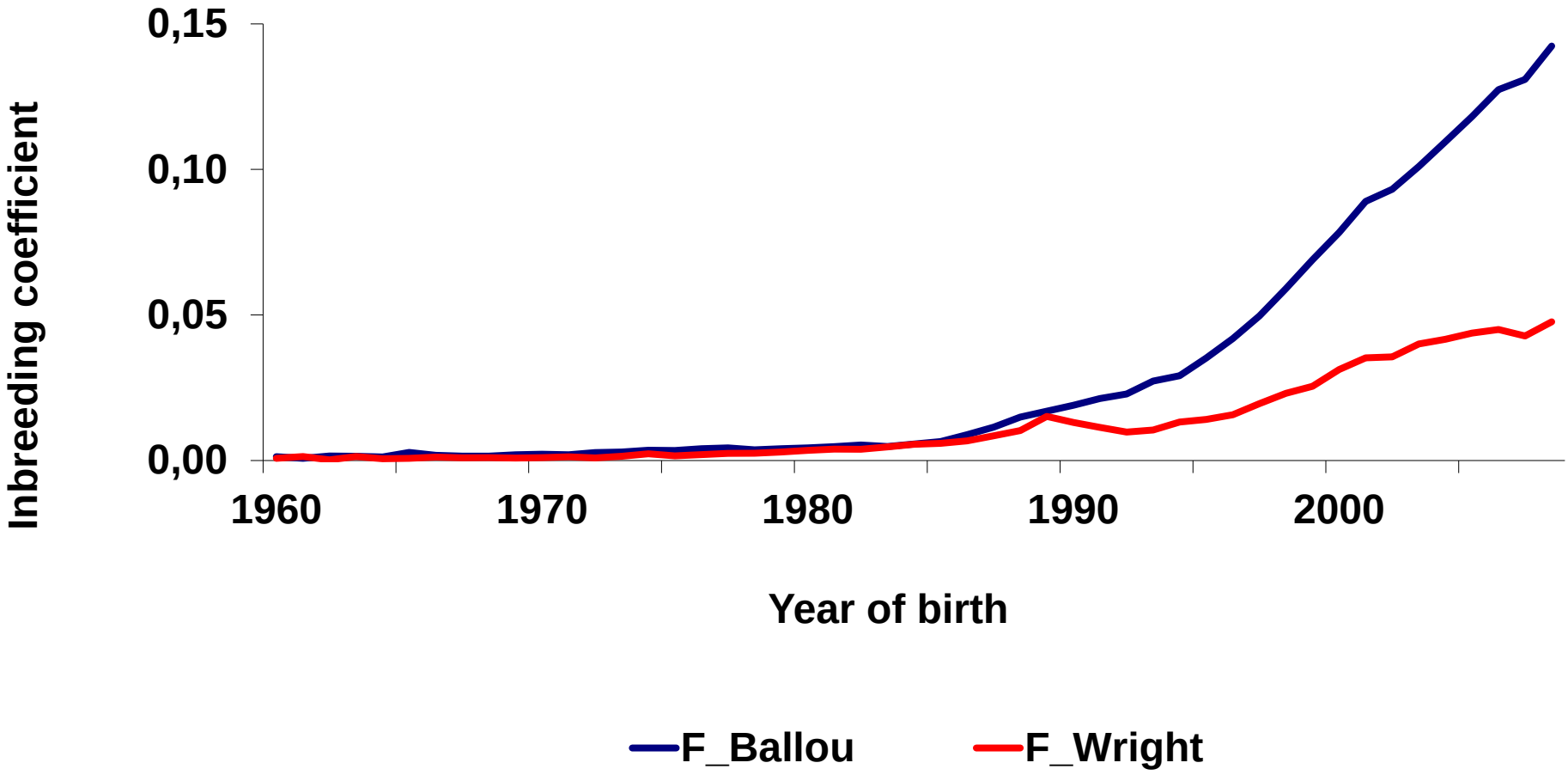
Results

Development of “new” and “old” inbreeding within the Angeln dairy cattle population



Results

Development of classical and ancestral inbreeding within the German Holstein population



Results

Correlations between different inbreeding coefficients for Angler (blue) and German Holstein (red)

	F_{Wright}	F_{Ballou}	$F_{Kalinowski}$	F_{New}
F_{Wright}	1.00	0.14	0.63	0.99
F_{Ballou}	0.77	1.00	0.54	0.09
$F_{Kalinowski}$	0.89	0.85	1.00	0.56
F_{New}	0.99	0.70	0.72	1.00

Results

Key ancestors of the German Holstein population

Name	Year of birth	Reference population (%)
Elevation	1965	16.00
Chief	1962	16.00
Ivanho	1952	2.00
Cleitus	1981	4.00
Bell	1974	7.00
Dam of Valerian	1966	4.00
Blackstar	1983	5.00
Starbuck	1979	5.00
Aerostar	1980	2.00
Ned Boy	1979	2.00

Results

Key ancestors of the Angler population

Name	Year of birth	Reference population (%)
73430	1980	8.00
37274	1999	5.00
68894	1994	5.00
72448	1998	5.00
72479	1997	4.00
72234	1991	4.00
73258	1972	4.00
6513	2000	3.00
62488	1990	3.00
72280	1992	3.00

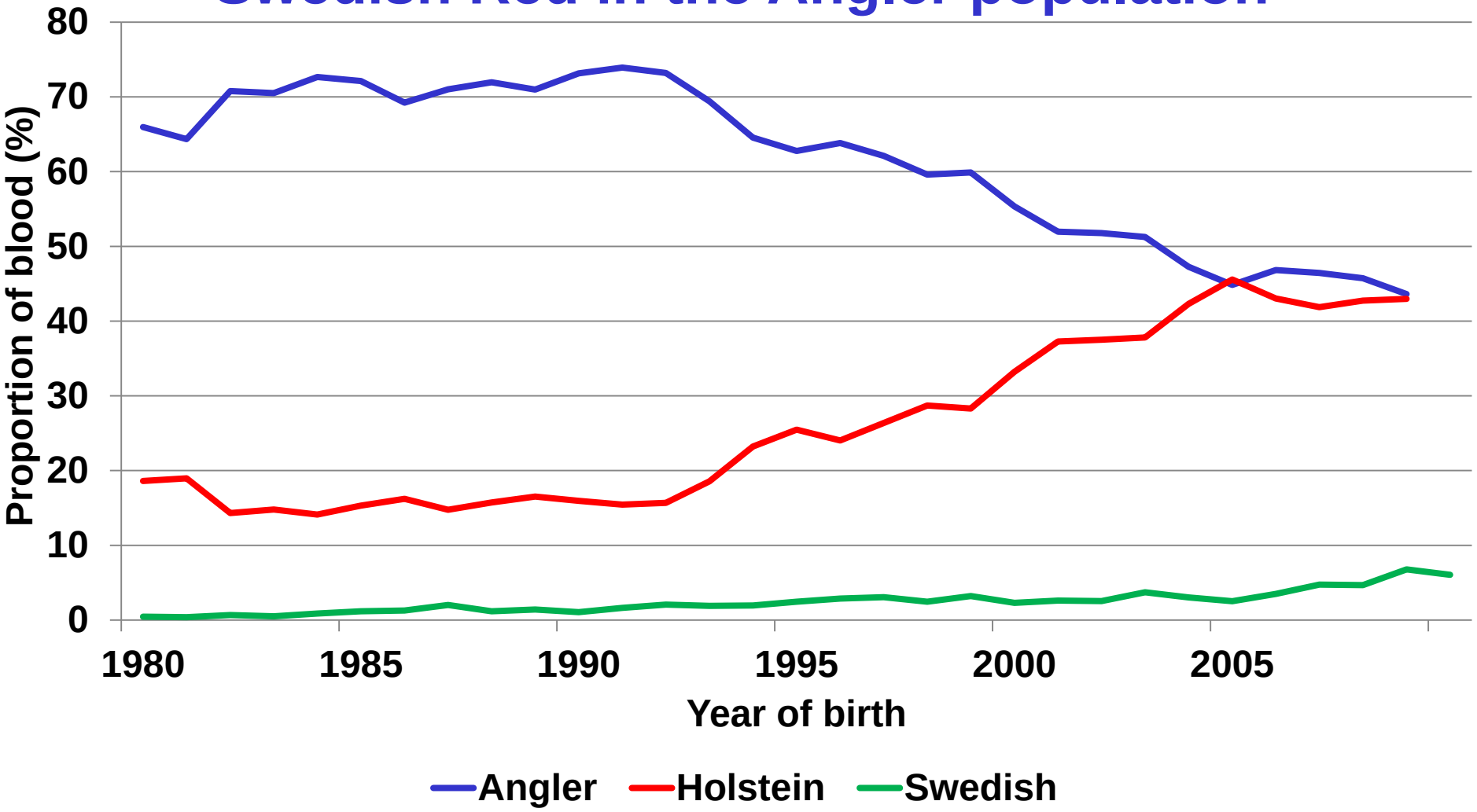
Results

Key ancestors of the Angler population

Name	Year of birth	Reference population	P Ang.	P Hol.	P Srv.
73430	1980	8.00	0.00	95.31	0.00
37274	1999	5.00	21.88	74.61	0.00
68894	1994	5.00	0.00	91.02	0.00
72448	1998	5.00	73.44	6.25	14.06
72479	1997	4.00	65.63	0.00	34.38
72234	1991	4.00	0.00	83.59	0.00
73258	1972	4.00	0.00	100.00	0.00
6513	2000	3.00	9.38	48.34	37.50
62488	1990	3.00	0.00	91.41	0.00
72280	1992	3.00	0.00	94.92	0.00

Results

Development of the impact of Red Holstein and Swedish Red in the Angler population



Conclusion

- **Average inbreeding level in the Angeln dairy cattle population is lower as in German Holstein**
- **Foregin dairy cattle breeds showed an increasing impact over time**
- **Most important ancestors are highly influenced by other dairy cattle breeds**

Conclusion

- **Practical tools are needed for the management of inbreeding and to manage the impact of other dairy cattle breeds**
- **These tools should use genomic information**
- **Due to small population sizes international cooperation between Red dairy breeds are needed**

Thanks for your attention

The H.W. Schaumann Stiftung

and

The Stiftung Schleswig-Holsteinische-Landschaft

are acknowledged for financial support