Tree-Ring Analysis

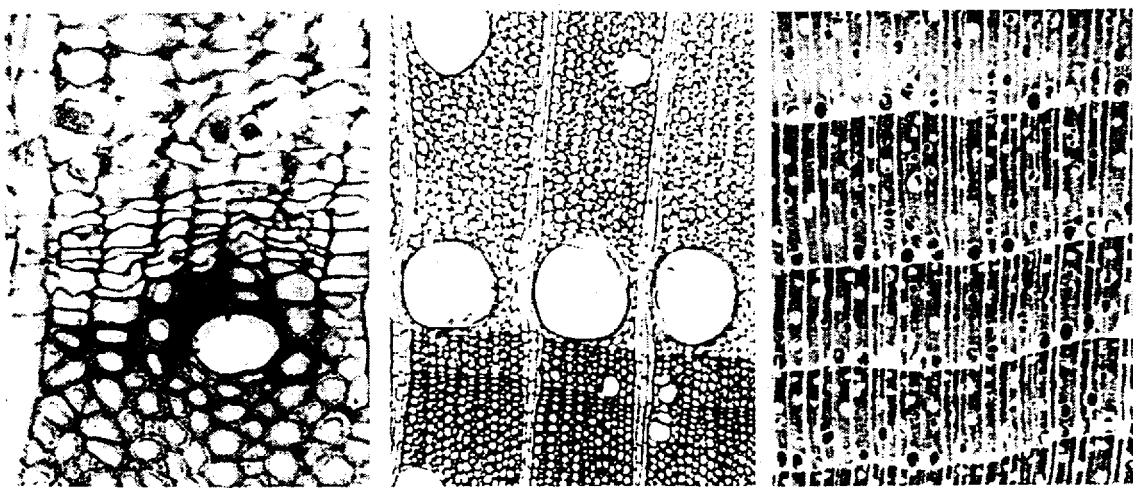
Biological, Methodological and Environmental Aspects

Edited by

R. Wimmer

and

R.E. Vetter



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Chronologies for Historical Dating in High Asia/Nepal

Burghart Schmidt, Thomasz Wazny, Kuber Malla, Elisabeth Höfs and Mitra Khalessi

INTRODUCTION

In the year 1985, during his first journey, the Tibetologist, D. Schuh from the University Bonn, Germany, explored the southern Mustang and the Muktinath Valley in search of historical records related to that area (Fig. 14.1). He was truly impressed by the numerous caves in the hills on the northern bank of the Dzong River. These caves, constructed by humans, can easily be seen by those who travel from the Kali Gandaki valley up to the sanctuary of Muktinath. In the following year, D. Schuh – accompanied by R. Bielmeier, C. Cueppers and B. Schmidt – started a preliminary survey of these cave-systems below the Dzong village with the goal of obtaining more information about these remnants of an old culture (Schuh, 1992–1993). One bigger cave had painted walls and wood that was suitable for tree-ring investigations. Therefore, this first survey also allowed a first trial of crossdating of historical timber from southern Mustang in Nepal.

In 1992, a research programme was started by the Nepalese Department of Archaeology and the German Research Foundation. This interdisciplinary project was initiated by Tibetologists and architectural historians. The project was designed by settlement archaeologists, historical settlement geographers and ethnologists, together with archeozoologists and researchers with backgrounds in applied photogrammetry and dendrochronology. One major goal of this 'Nepal–German Project on High-Mountain Archaeology' was the investigation of the settlement history (settlement processes), and the formation of states in the High Himalaya, characterized by Tibetan culture and tradition (Haffner and Pohle, 1993). For this reason the construction of a tree-ring chronology was performed by the Dendrochronological Laboratory at the University of Cologne.

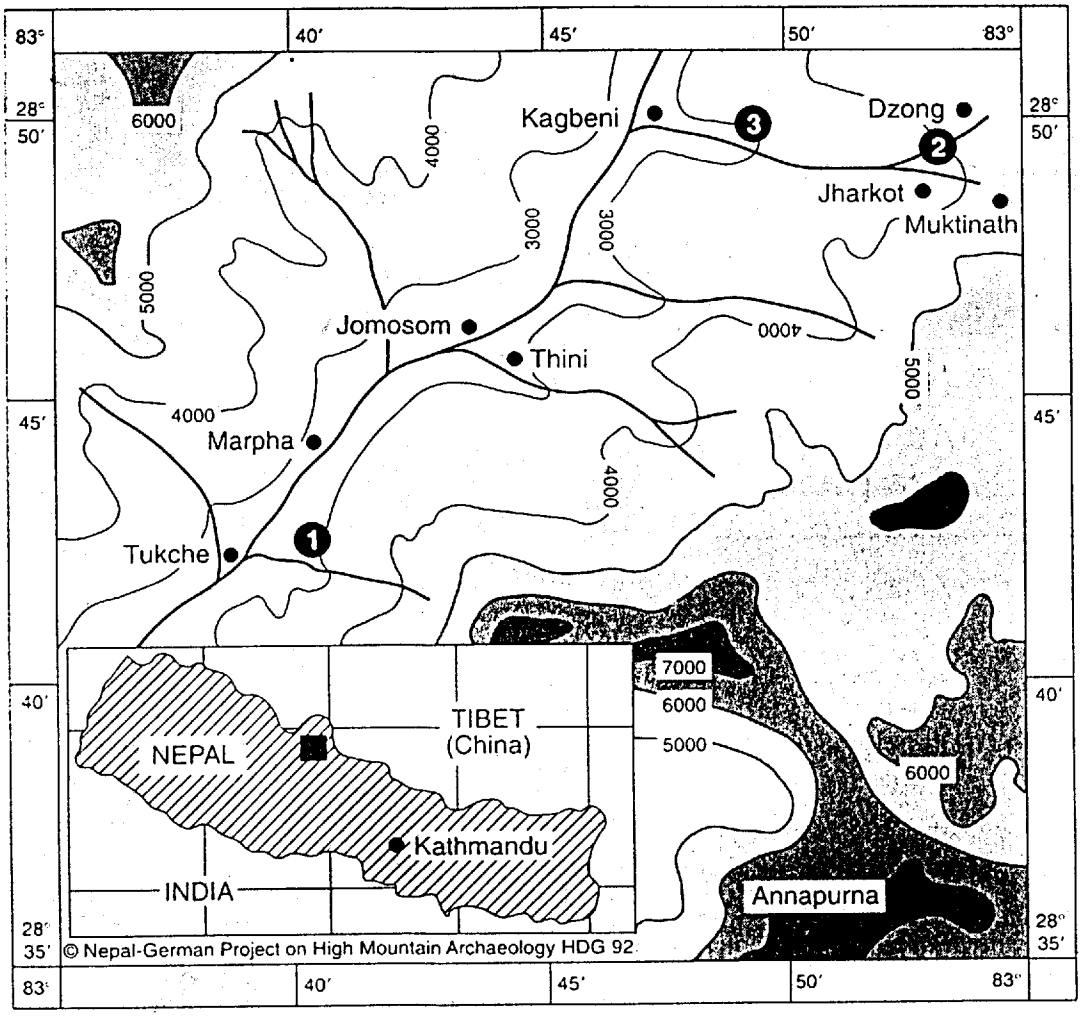

Fig. 14.1. Map of the southern part of Mustang district (numbers indicate sample locations).

MATERIAL AND METHODS

In previous trips to the area (1989 and 1992) about 400 wood samples were collected with the aim of constructing a tree-ring calendar for the Southern Mustang region. Samples were taken from living trees of nearby forests at Thini as well as from numerous houses and ruins between Marpha in the south and Dzakot (Jharkot) in the north. Because with the living pine tree samples from Thini we were only able to establish a chronology back to the year 1804, pillars from an old ruined monastery in Muktinath (felling year: 1906) were additionally sampled. The monastery samples extended our chronology back to 1768. With this basic chronology we were able to work further back, and a strong chronology back to 1455 has been established (Schmidt, 1992–1993).

Between 1993 and 1997, in cooperation with historians, another set of historical samples were taken from different structures. The objects and locations are listed in Table 14.1. During that time cores from about 350 living trees were taken from sites in the districts of North and South Mustang as well as from Manang and Khumbu.

The tree species used in this dendrochronological research were *Pinus wallichiana*, *Abies spectabilis* and *Picea smithiana*.

Investigations were carried out according to standard methods in dendrochronology. Details can be found elsewhere (e.g. Eckstein *et al.*, 1984; Schweingruber, 1988; Schmidt *et al.*, 1990). In order to improve working conditions in the field, a laboratory was established in Jomosom (2700 m). The preliminary results which we obtained on site helped us to continuously adjust our sampling strategies.

RESULTS AND DISCUSSION

A few hundred samples were taken from the ruins of the fortification Garab Dzong (Old Thini). The large number of dated timbers from the foundations of the ruin as well as from the other houses, monasteries and forts assure a well-replicated tree-ring chronology of Nepal that covers the period from AD 1324 to 1997.

The Manang district is located on the opposite side of the Annapurna range, at a distance of about 50 km. The longest site chronology from that area was obtained for Ngawal and spans 300 years from AD 1697 to 1996 (Table 14.2). The chronologies from Manang show high correlation with the

Table 14.1. Overview of the analysed historical samples from different objects and locations.

Objects	Location	Region	No. of samples
Castles	Djarkot	Mustang	30
	Kagbeni	Mustang	40
	Lupra	Mustang	10
	Ngawal	Manang	10
Monasteries	Djarkot	Mustang	10
	Kagbeni	Mustang	30
	Lupra	Mustang	15
	Braga	Manang	2
Houses	Djarkot	Mustang	90
	Khingar	Mustang	110
	Kagbeni	Mustang	120
Archaeological excavation	Garab Dzong	Mustang	900
	Muktinath valley	Mustang	35

Table 14.2. Chronologies of sites from the dry area of Mustang and the moister areas of Manang and Khumbu.

Region/site	Species	No. of trees	Period
North Mustang			
Tangbe	*Pinus wallichiana*	86	1850–1996
South Mustang			
Thini	*Pinus wallichiana*	40	1819–1993
Tukche	*Pinus wallichiana*	10	1890–1990
Manang			
Manang (north)	*Pinus wallichiana*	29	1738–1996
Manang (south)	*Pinus wallichiana*	13	1726–1996
Ngawal	*Pinus wallichana*	42	1697–1996
Pisang I	*Pinus wallichiana*	27	1738–1996
Khumbu			
Lamjura (north)	*Abies spectabilis*	25	1720–1997
Lamjura (south)	*Abies spectabilis*	18	1794–1997
Phakding	*Pinus wallichiana*	39	1919–1997
Monjo	*Pinus wallichiana*	22	1921–1997
Namche	*Pinus wallichiana*	30	1957–1997
Khumjung	*Abies spectabilis*	16	1901–1997
Tengpoche (north)	*Abies spectabilis*	16	1876–1997
Tengpoche (south)	*Abies spectabilis*	15	1911–1997
Thame	*Abies spectabilis*	22	1942–1997

chronologies from North and South Mustang. This let us conclude that historical timbers from Manang should also be datable with the standard chronology for Mustang (Fig. 14.2).

From the eastern part of Nepal, in the Khumbu area, we collected samples from Lamjura in the south up to Tengpoche in the north (Table 14.2). The growth patterns of these trees are less homogenous than in the drier area of Mustang (Fig. 14.3). The correlation of this site chronology with the one from Mustang/Manang (distance: about 200 km) is not significant.

Further comparisons with site chronologies from Nepal, established by Paul Krusic (Tree-Ring Laboratory, Columbia University) and Bhattacharyya *et al.* (1992) are planned to proof the dating-range of the Mustang calendar. In addition, dendroclimatic analysis of the South Mustang chronology is in progress.

From eastern Tibet, Bräuning (1994) has established chronologies for *Juniperus, Picea, Abies* and *Larix* for the purpose of dendroclimatological analysis (Bräuning and Lehmkuhl, 1996; Zimmermann *et al.*, 1997). More chronologies are available from Kashmir (Hughes and Davies,1987; Hughes, 1992) as well as Karakorum (Esper *et al.*, 1995).

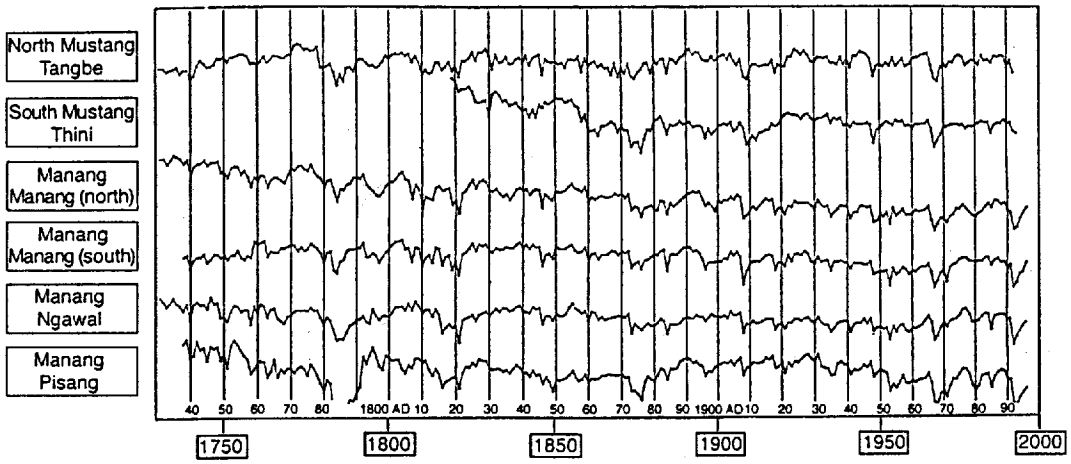

Fig. 14.2. Chronologies (ring widths) from North and South Mustang and from the Manang area. The growth patterns of both areas are highly correlated.

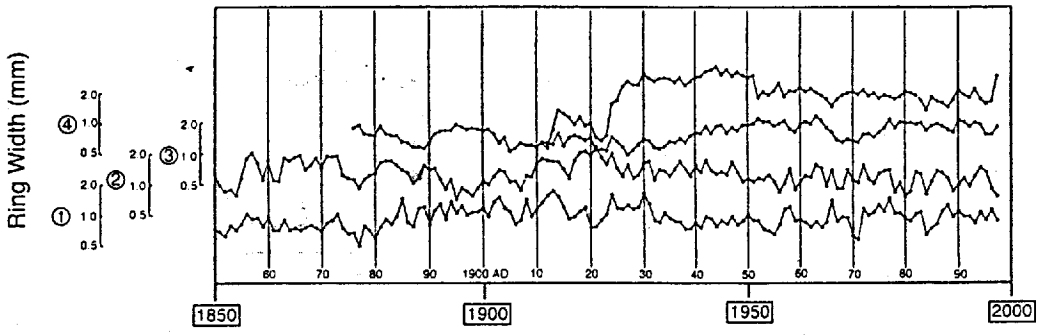

Fig. 14.3. Chronologies from the Khumbu area. 1: Lamjura (north), 2: Lamjura (south), 3: Tengpoche (north), 4: Tengpoche (south). The diagrams show the low similarity between site chronologies in this area.

CONCLUSIONS

In the closed area of South Mustang between Muktinath in the north and Tukche in the south of the Kali Gandaki valley, the dendrochronological results provide useful information about the history and dynamics of the local settlements as well as about the history of the local architecture, castles and monasteries along this old and famous trade route between Tibet and India.

In cooperation with the historians, more than 1700 samples were analysed which were taken from archaeological excavations, old houses, monasteries and castles. The large number of dated tree-ring series assure a good replication of this first tree-ring calendar of Nepal from AD 1324 to 1997.

With this tree-ring 'calendar' many historical objects from North Mustang and also from the Manang area can now be crossdated. Dendroclimatological studies are planned for the future to investigate the climate history and interactions with settlement dynamics of this high mountain area.

SUMMARY

In South Mustang, Nepal, dendrochronological results provide important information about the history and dynamics of the local settlements, local architecture, castles and monasteries along this old and famous trade route between Tibet and India. More than 1700 samples were analysed taken from archaeological excavations, old houses, monasteries and castles. A first master chronology was established for Nepal covering the time-span between AD 1324 to 1997.

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