



Centro Studi Faunistica dei Vertebrati - Società Italiana di Scienze Naturali  
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# Red squirrel (*Sciurus vulgaris*) in Lombardy:

a review of the *Sciurus Group* studies

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# **Members of the *Sciurus* group (1992-2000)**

**Luigi CAGNOLARO (promoter)**

**Carlo M. BIANCARDI and Claudio GNOLI  
(coordinators)**

**Lorena AQUILINI**

**Claudio ARISTARCHI**

**Guido CANU**

**Franco DELL'ACQUA**

**Laura RINETTI**

**Alessandra SPERANZA**

**Andrea VIGANO**

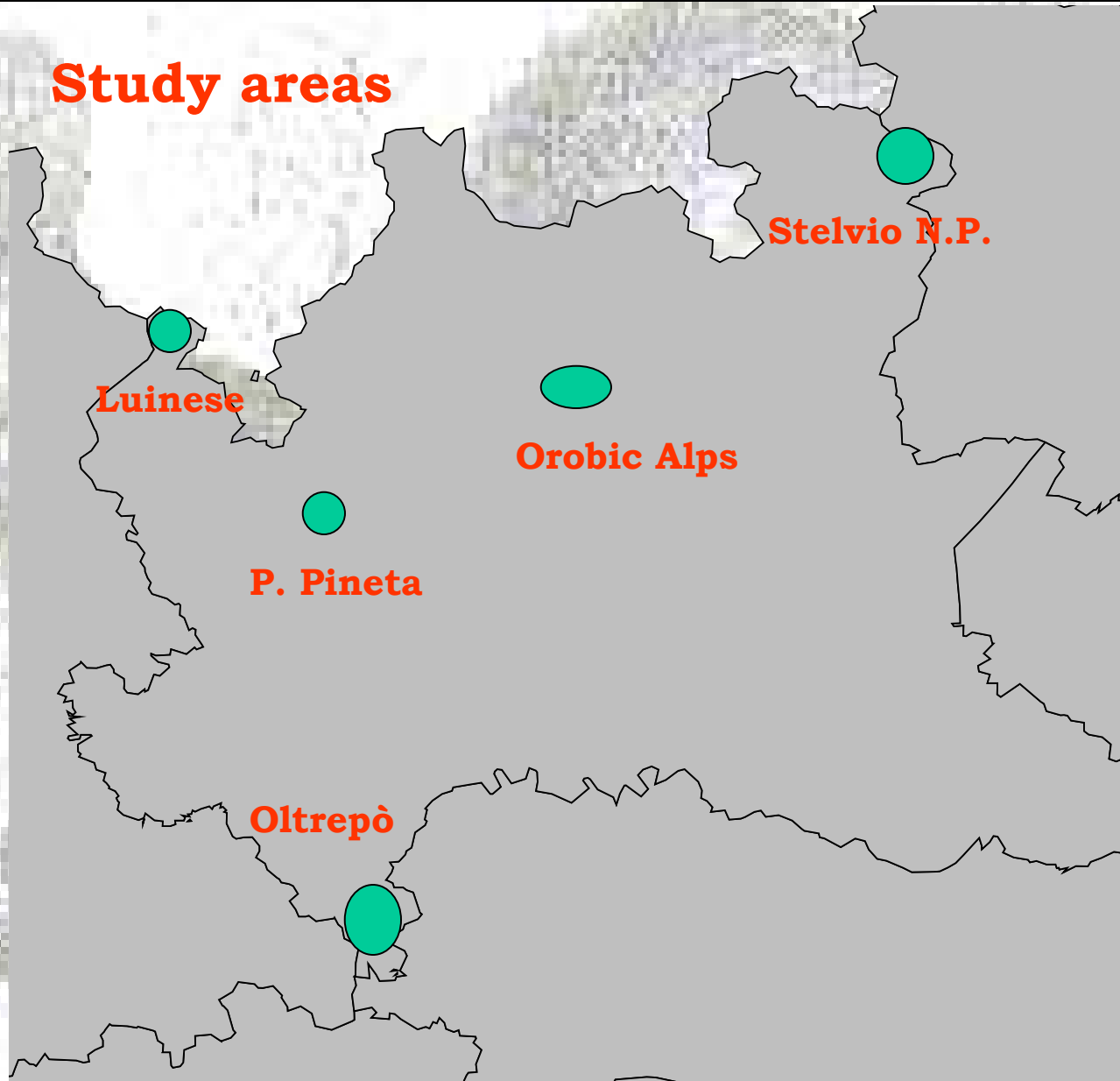


# Aims and Methods

- Presence and distribution
  - Questionnaires (foresters and GEV)
- Frequency of the colour phases
  - observations and counts on line transects
- Estimation of population density
  - Drey counts by quadrat counts on 1 ha patches or by line transects
  - Feeding remains counts on quadrats of 5 x 5 m

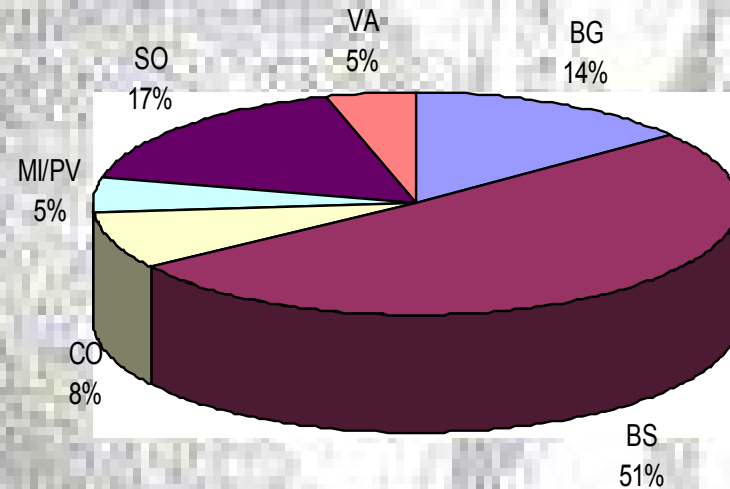


## Study areas





# RESULTS



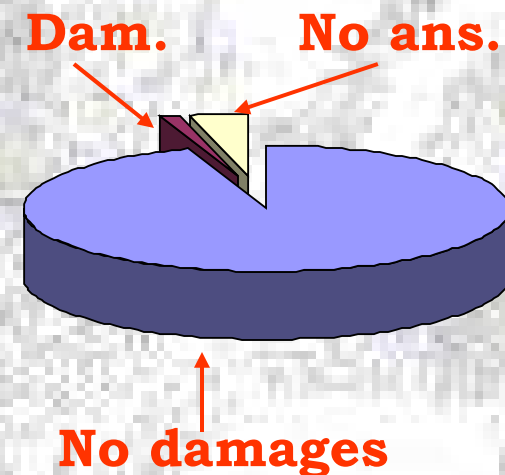
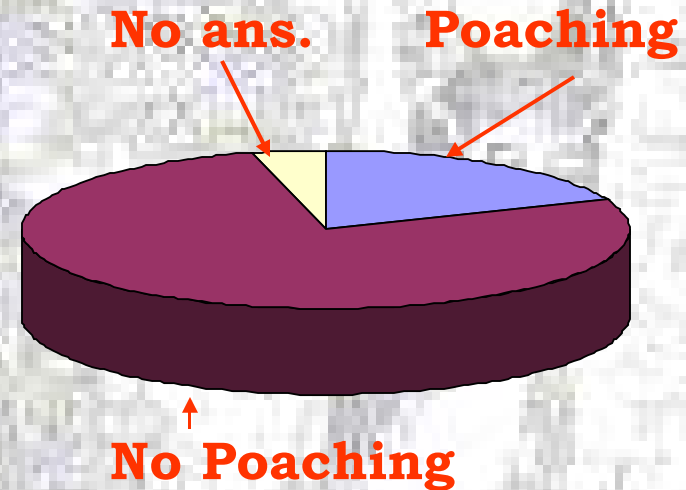
## 1) Questionnaires

**Squirrels are present in 8 districts of Lombardy (from Cremona and Mantua we didn't get replies)**

**Observations of squirrels (94%) or of their feeding signs (56%) were often cited by foresters and GEV, while dreys were not (11%)**



- Are there poachers who catch red squirrels?  
25 out of 132 said “yes”
- Red squirrel can damage spruce, beech and larch, as said by 3 out of 132 respondents



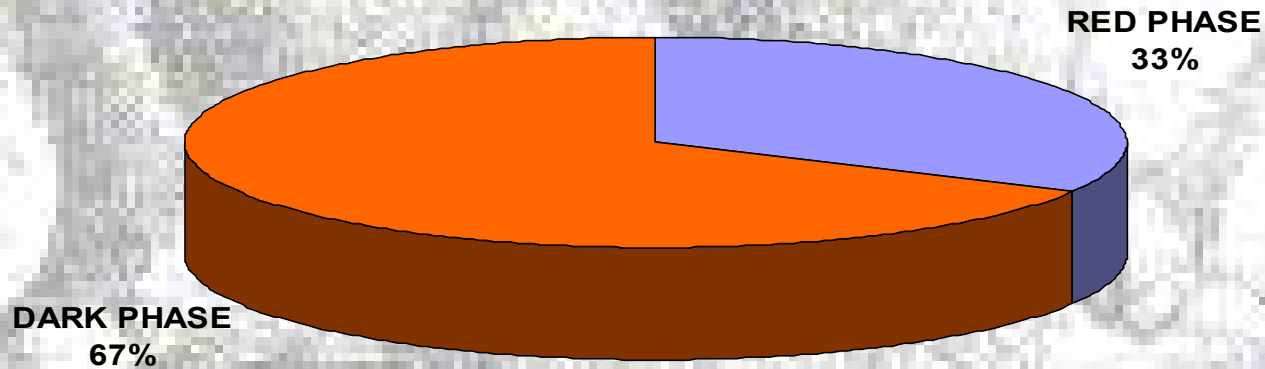


# RESULTS

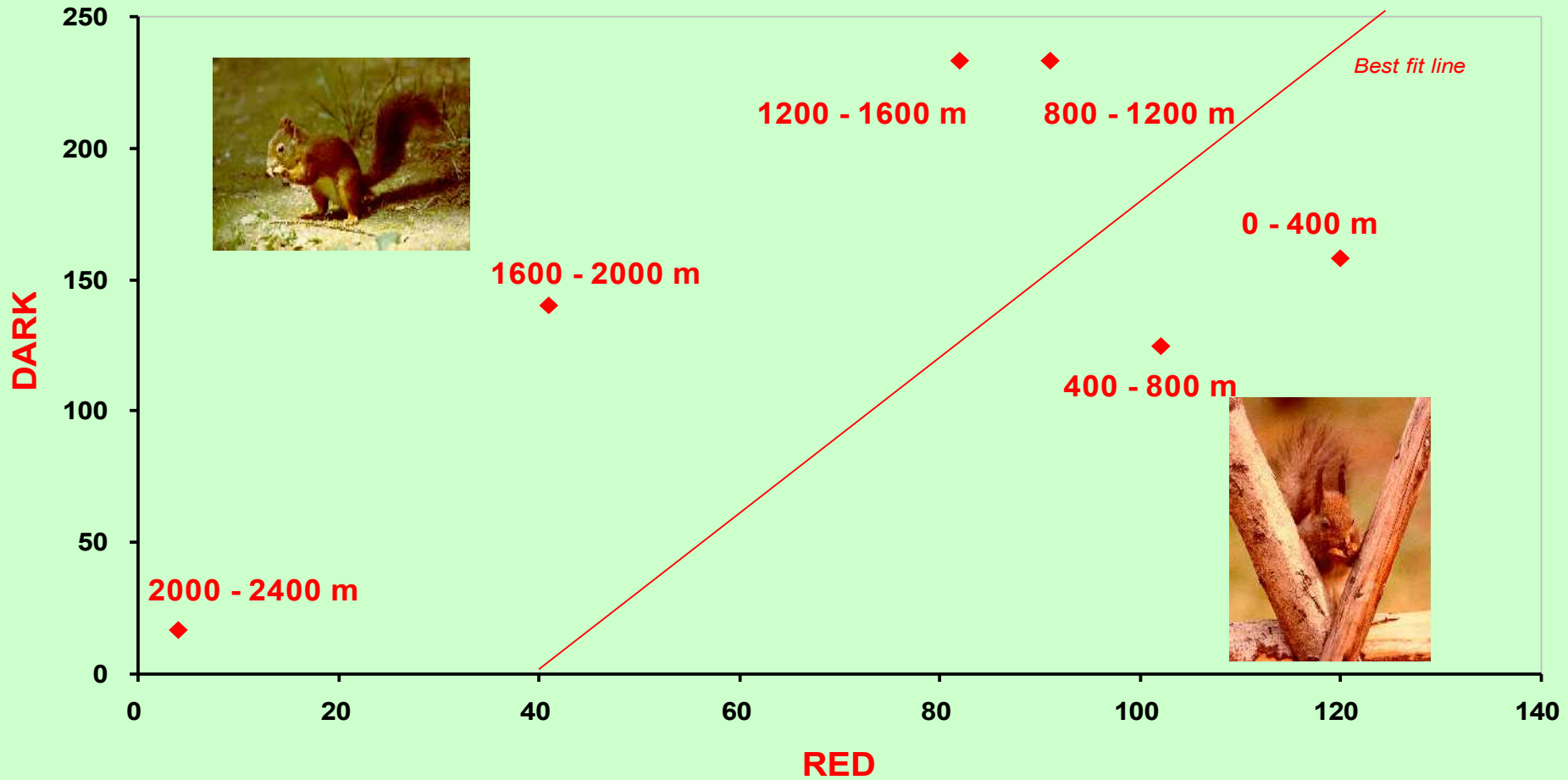
Colour phases (N = 1346)

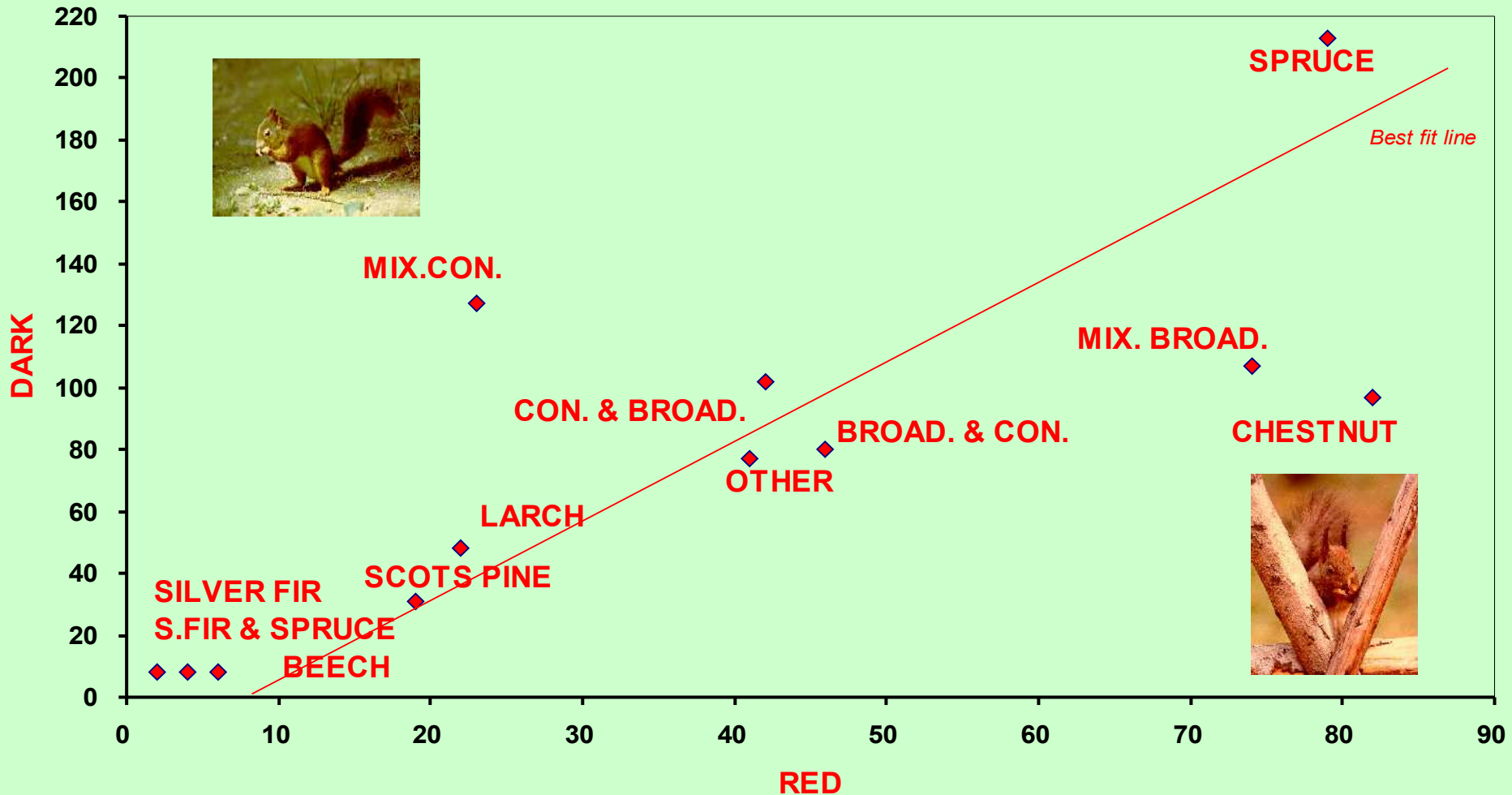


## 2) Colour phases



Colour phase ratio (dark/red) = 2:1





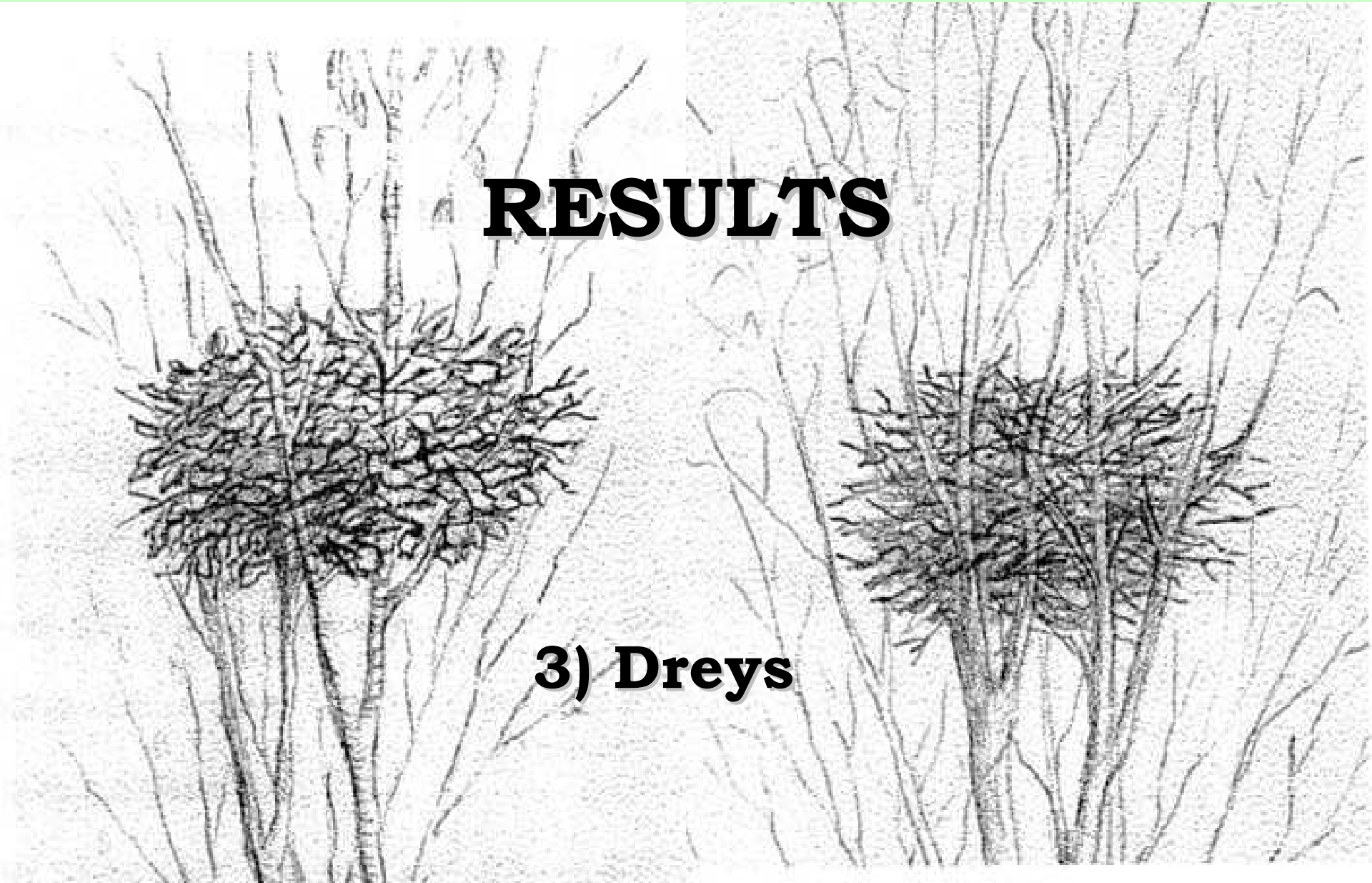


- Phase ratio change significantly in favour of the dark phase ascending in altitude ( $G = 48.56$ ; d.f. = 5;  $p < 0.01$ )
- Phase ratio change significantly in different kind of woods ( $G = 50.38$ ; d.f. = 11;  $p < 0.01$ )
- A kind of woods can extends for 2 or 3 altitude belts: the only significant difference within a wood category concern the mix. broadleaf woods ( $G = 11.23$ ; d.f. = 2;  $p = 0.004$ )



# **RESULTS**

## **3) Dreys**





# Drey counts

	<i>quadrats transects</i> (Ha)	<i>transects</i> (km)	<i>dreys conif</i>	<i>dreys broad</i>
<i>S. Lucio</i>	11	.	37	.
<i>Piazzatorre</i>	12	.	50	.
<i>Uzza '93</i>	28	.	127	.
<i>Uzza '94</i>	22	.	110	.
<i>P. Pineta</i>	.	26.8	113	1
<i>Luinese '94</i>	.	24	.	120
<i>Luinese '95</i>	.	24	.	125
<i>Luinese '97</i>	.	24	.	51
<i>Luinese</i>	.	*all	79	576
<i>Oltrepò</i>	6	19.3	40	46



## Luinese: dreys counted

range: 250 - 1100 m a.s.l.

•Tronzano - Val Molinera: 160

•Val Veddasca: 266

•Colmegna-Agra-Dumenza: 174

•Montegrino: 32

•Mesenzana-Brissago: 12

•Castelveccana: 30

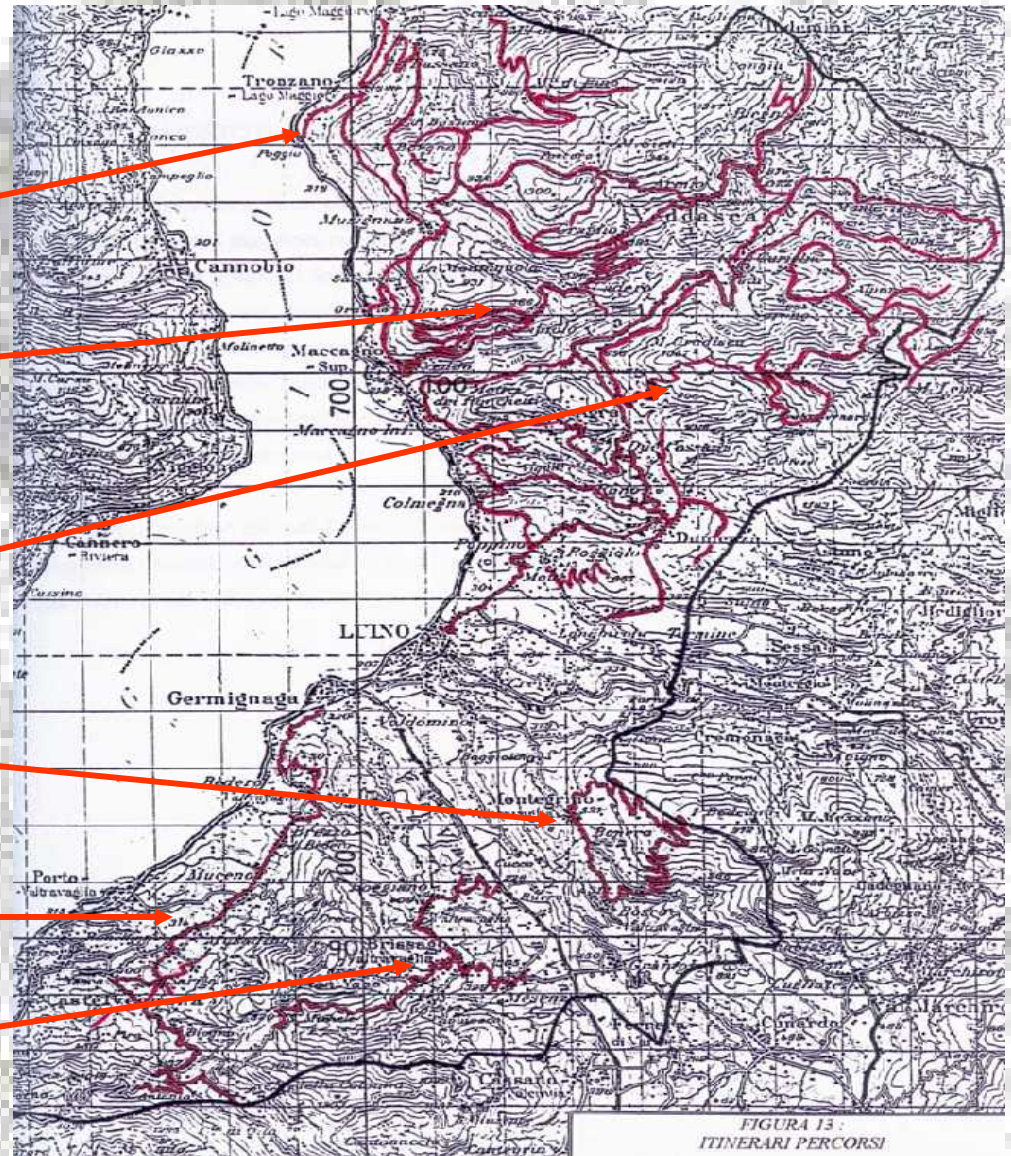
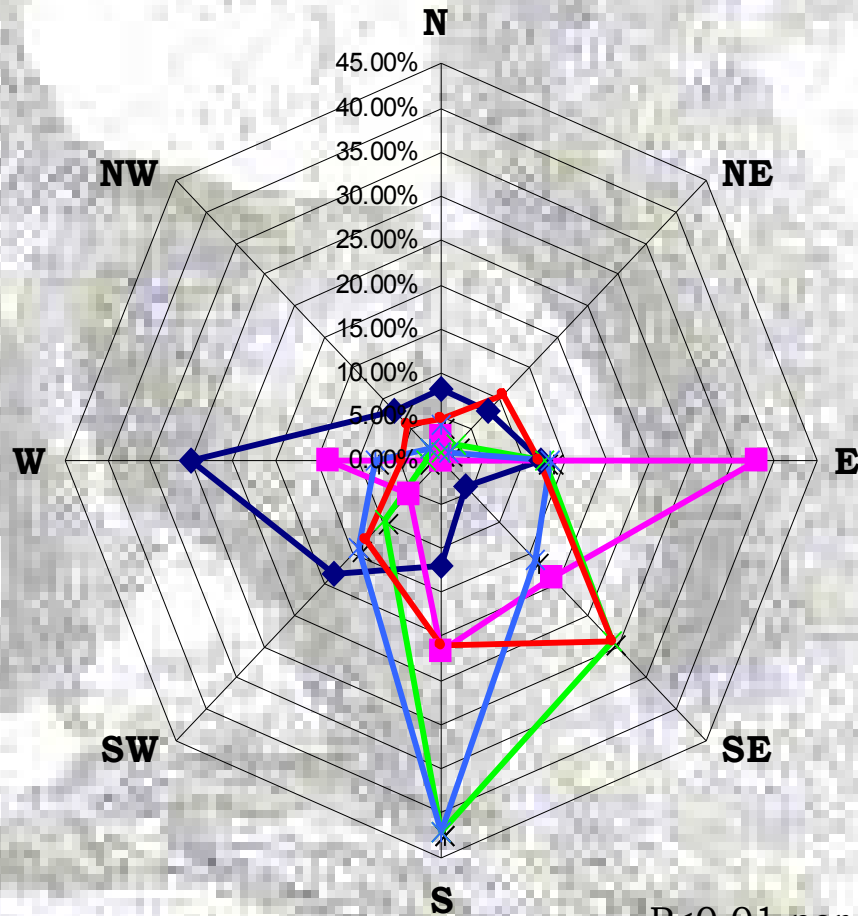


FIGURA 13:  
ITINERARI PERCORSI



## Drey aspect



- ◆ Piazzatorre (BG)
- Clusone (BG)
- × P.Pineta
- \* Luinese
- Oltrepò

$P < 0.01$  per series and on the whole set of data

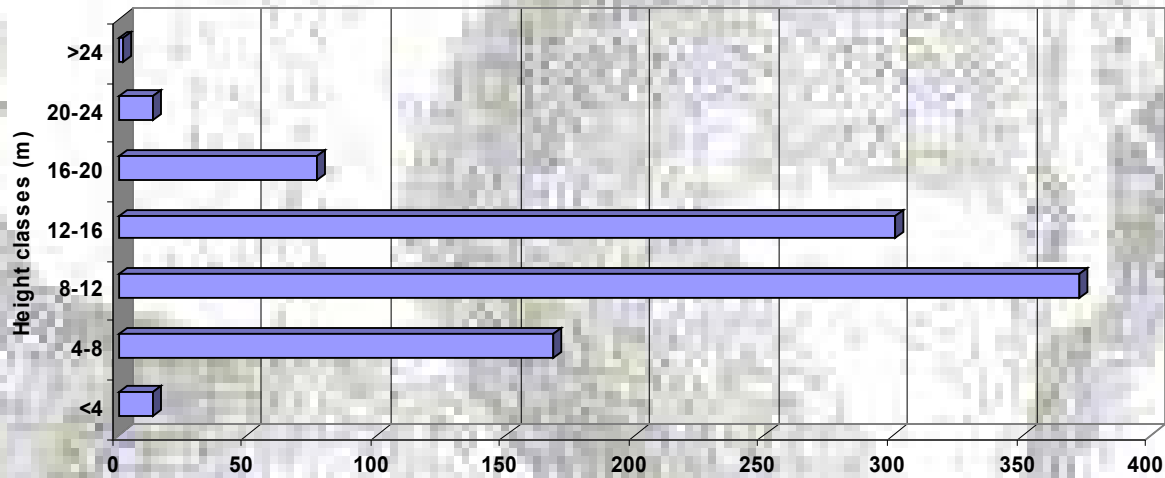


<b>Type of wood</b>	<b>N. of dreys</b>	<b>Type of wood</b>	<b>N. of dreys</b>
Mixed broadleaf woods	265	Black locust woods	8
Larch woods	252	Beech woods	7
Mixed broadleaf + conifers	245	Shrubs	3
Chestnut woods	171	Moor with trees	2
Chestnut + other broadleaf woods	130	Downy oak woods	1
Mixed conifers woods	89	Isolated tree	1
Ash and alder	5		

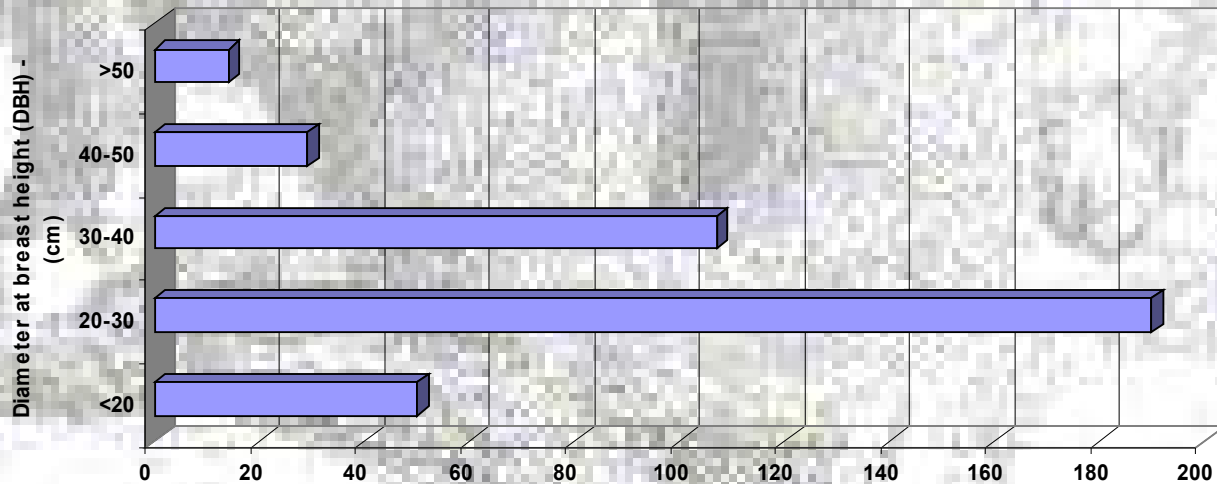
<b>Tree species</b>	<b>N. of dreys</b>	<b>Tree species</b>	<b>N. of dreys</b>
<i>Castanea sativa</i>	357	<i>Acer sp.</i>	9
<i>Larix decidua</i>	245	<i>Populus tremula</i>	6
<i>Pinus sylvestris</i>	114	<i>Alnus incana</i>	5
<i>Larix x marschlinii</i>	75	<i>Pinus strobus</i>	4
<i>Quercus pubescens</i>	58	<i>Corylus avellana</i>	3
<i>Picea excelsa</i>	52	<i>Populus canescens</i>	3
<i>Abies alba</i>	44	<i>Ostrya carpinifolia</i>	2
<i>Betula pendula</i>	44	<i>Populus alba</i>	2
<i>Fraxinus excelsior</i>	38	<i>Platanus hispanica</i>	1
<i>Robinia pseudoacacia</i>	38	<i>Prunus avium</i>	1
<i>Tilia sp.</i>	29	<i>Quercus cerris</i>	1
<i>Pinus nigra</i>	22	<i>Salix caprea</i>	1
<i>Fagus sylvatica</i>	21	<i>Ulmus minor</i>	1
<i>Quercus robur</i>	18		



### Height of the dreys



### Trees' diameter





<b><i>Analysis of a drey</i></b>	<b><i>Stelvio</i></b>	<b><i>Luinese</i></b>
<b><i>Drey measures</i></b>	32 x 30 x 12 cm	40 x 19 x 13 cm
<b><i>Total weight</i></b>	666 g	210 g
<b><i>Frame weight</i></b>	334 g	100 g
<b><i>Stuffing weight</i></b>	332 g	110 g
<b><i>N. of twigs</i></b>		64
<b><i>Max. diameter of the twigs</i></b>		5 mm
<b><i>Lenght of the twigs</i></b>		10-40 cm
<b><i>Ramifications of the twigs</i></b>		0-4



# Quadrat counts

<b>Study area</b>	<b>Dreys/Ha</b>	<b>Sq/Ha (*)</b>
S. Lucio	3.4 (year)	0.7
Piazzatorre	4.1 (3.1-4.7)	0.8 (0.6-0.9)
Uzza ('93)	4.5 (pre-br.)	0.9
Uzza ('94)	5.0 (pre br.)	1.0
M.te Alpe	1.8 (1.7-2.0)	0.3 (0.3-0.4)

(\*) Value of 5.17 dreys per squirrel (Wauters & Dhondt, 1990)





# Transects

<b>Study area</b>	<b>Area</b>	<b>Dreys/Ha</b>	<b>Sq/Ha (*)</b>
<b>P. Pineta</b>	<b>53.6 Ha</b>	<b>2.1 (year)</b>	<b>0.4</b>
<b>Luinese '94</b>	<b>120 Ha</b>	<b>1.0 (pre br.)</b>	<b>0.2</b>
<b>Luinese '95</b>	<b>120 Ha</b>	<b>1.0 (pre br.)</b>	<b>0.2</b>
<b>Luinese '97</b>	<b>120 Ha</b>	<b>0.4 (pre br.)</b>	<b>0.1</b>
<b>Val Staffora</b>	<b>98.6 Ha (**)</b>	<b>0.8 (pre br.)</b>	<b>0.2</b>

(\*) Value of 4.85 or 5.17 dreys per squirrel (Wauters & Dhondt, 1990)

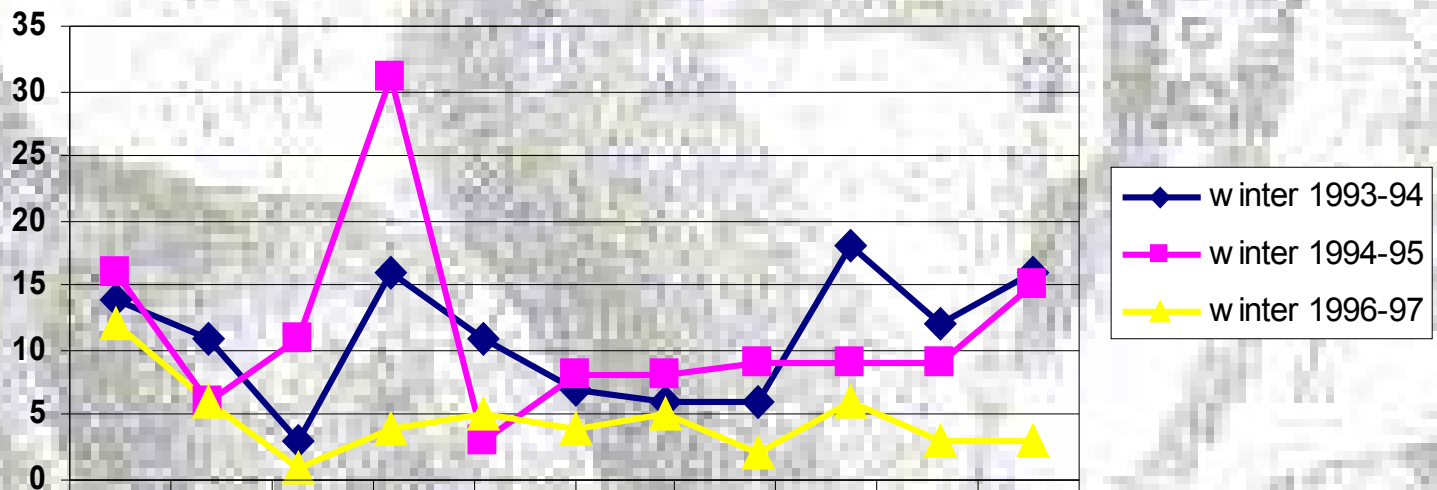
(\*\*) Area calculated with Distance 3.5<sup>©</sup>



## Drey counts in Luinese transects

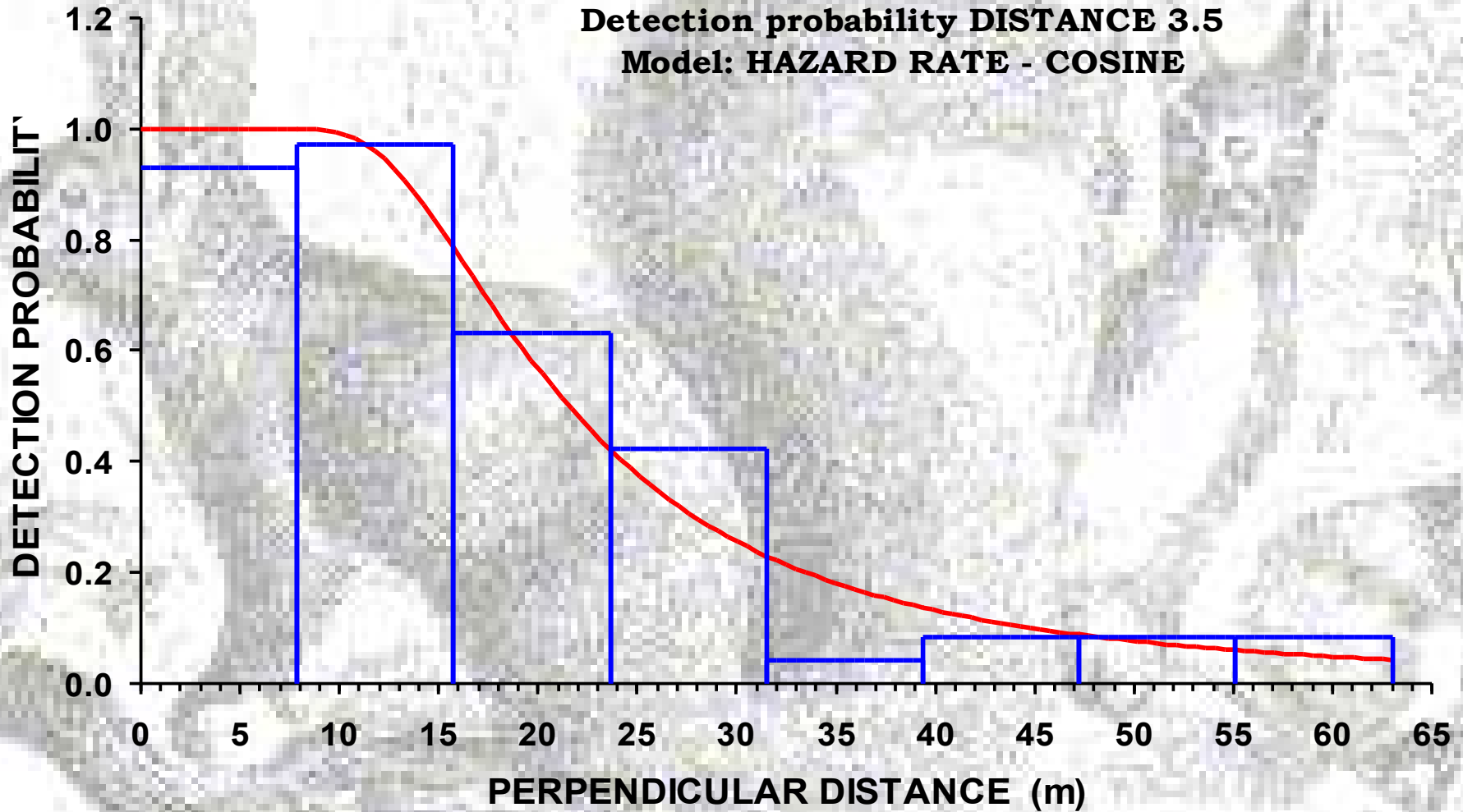
Veddasca South: Maccagno - Biegno (8 tr.; 17 km)

Veddasca North: Maccagno - Curiglia (3 tr.; 7 km)



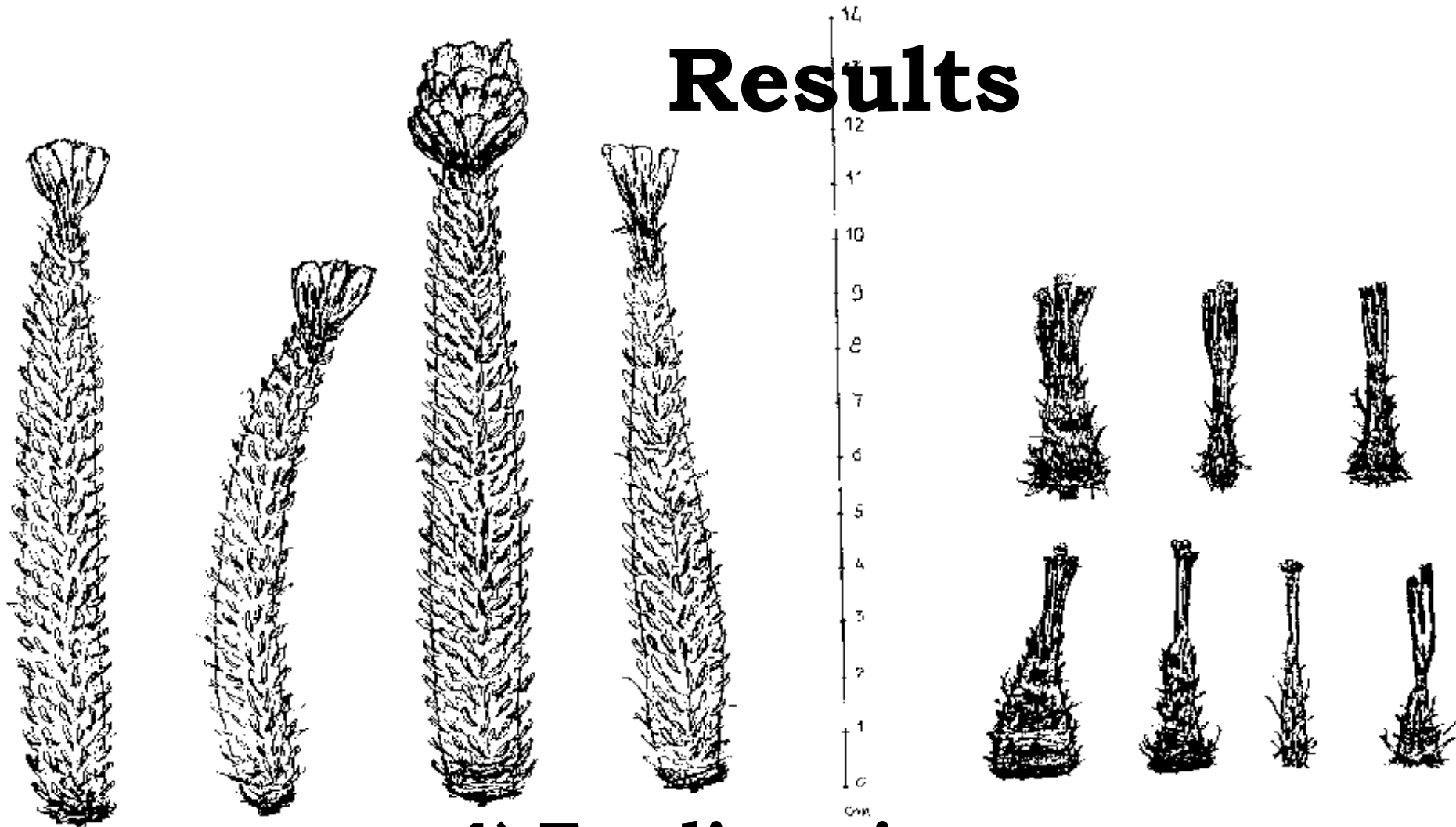
	Veddasca - Sout							Veddasca - North		
◆ winter 1993-94	14	11	3	16	11	6	6	18	12	16
■ winter 1994-95	16	6	11	31	3	8	9	9	9	15
▲ winter 1996-97	12	6	1	4	5	5	2	6	3	3

**Differences between the 3 year are significant  
 (Friedman Test = 12.318; d.f. = 2; p = 0.002)**





# Results



## 4) Feeding signs

Fig. 8 - Confronto dimensionale tra i strobili di Abete rosso (a sinistra) e quelli di Pino silvestre (a destra).

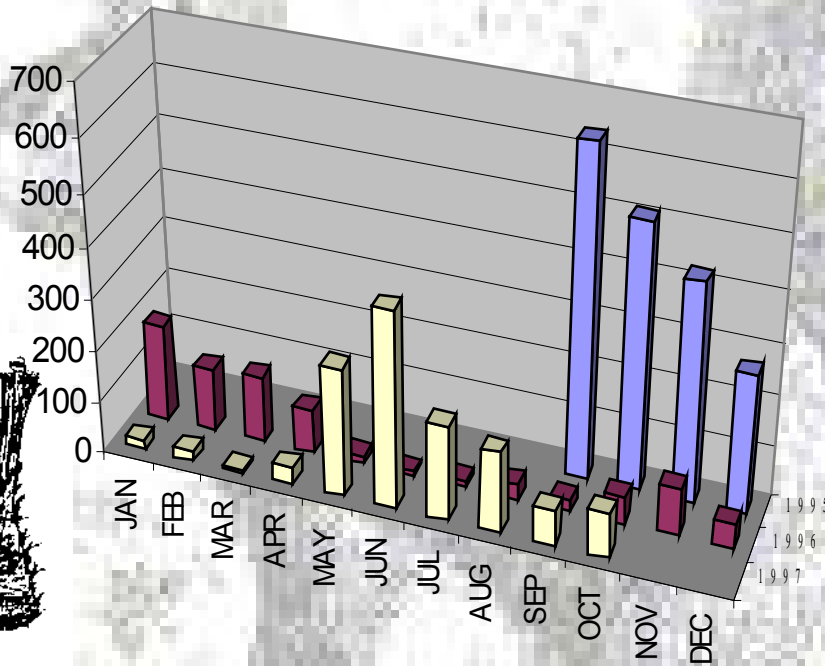


- Energetic requirements of a red squirrel = 330 - 420 kJ/day (Grönwall, 1982)
- Scots pine: 25.4-26.2 kJ/g (Grodzinski et al., 1970; Wauters et al. 2001); 0.28-0.35 g/cone (Purroy & Rey, 1974); 114-143 cones per day per squirrel (Purroy & Rey, 1974)
- Spruce: 25.1 kJ/g (Grodzinski et al., 1970)
- Corsican Pine: 15.5 kJ/g (Turcek, 1967); 0.31-0.37 g/cone (our study); 62-80 cones per day per squirrel (our assessment)

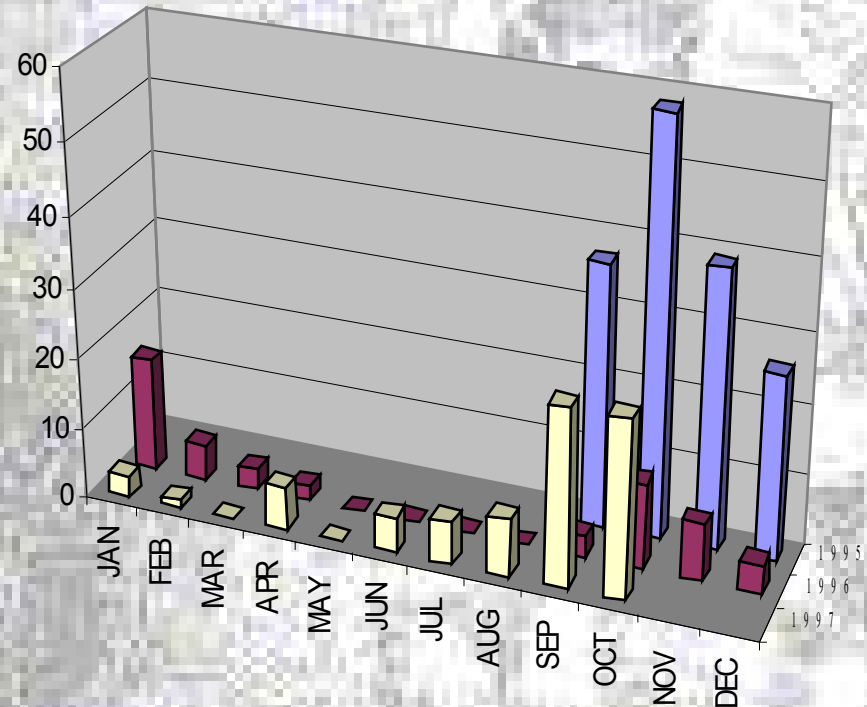


## P. Pineta: cones consumed from sep.'95 to oct.'97

### Scots pine



### Spruce



**Scots pine site: mean 197.6 cones Ha<sup>-1</sup> day<sup>-1</sup> (1.4- 1.8 sq/Ha)**  
**1995: 615.7 (4.3-5.4) - 1996: 89.1 (0.6-0.8) - 1997: 160.5 (1.1-1.4)**  
**Spruce site: mean 15.0 cones Ha<sup>-1</sup> day<sup>-1</sup>**  
**1995: 53.3 - 1996: 5.9 - 1997: 11.0**





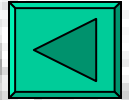
- In conifers woods there is a higher population density (considering dreys density) than in broadleaf woods (e.g. Oltrepò between Val Staffora and Monte Alpe).
- There are strong fluctuations in both the environments (e.g. Luinese 1994-97). This does not represent a real problem where there are large woodlands.
- The results should be considered as a starting point for new investigations



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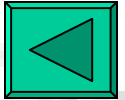


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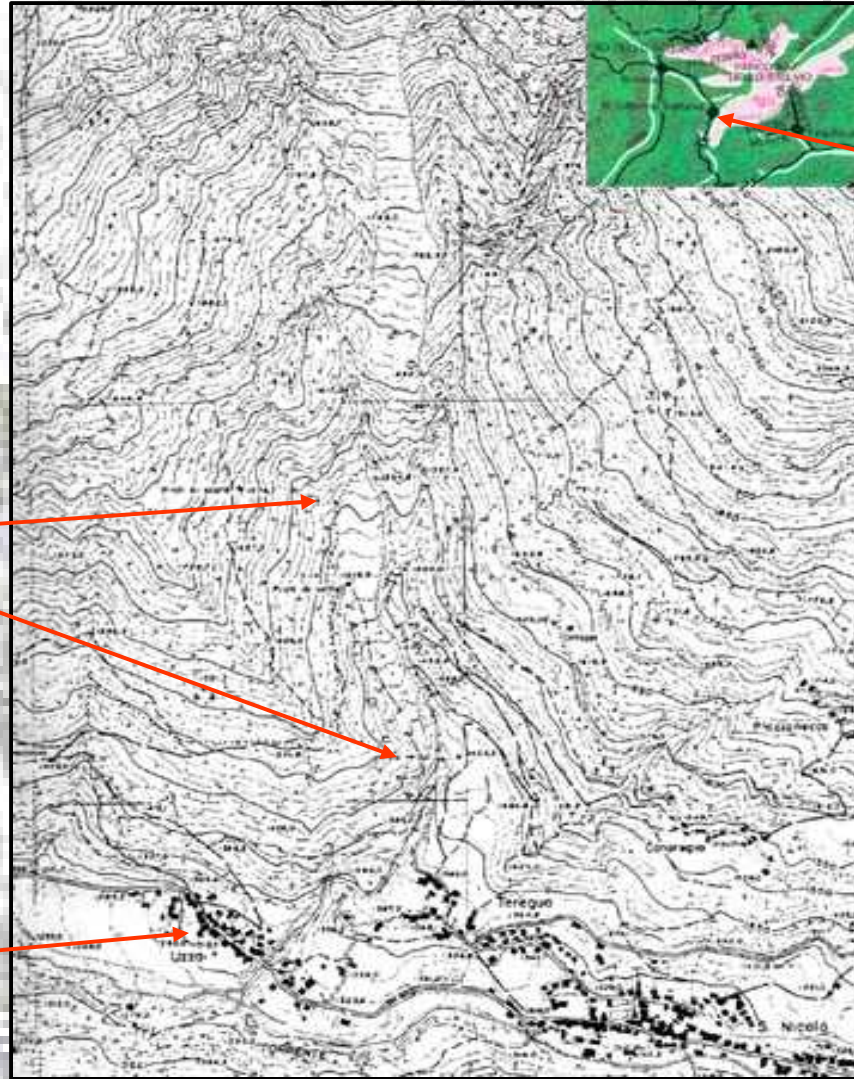
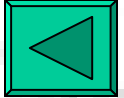
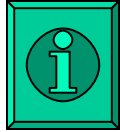
## OROBIC ALPS

- **Piazzatorre** wood (Val Brembana):  
Silver fir (*Abies alba*) and Spruce (*Picea excelsa*). Beech (*Fagus sylvatica*),  
*Sorbus aucuparia*, Oak (*Quercus petraea*)
- **San Lucio** wood (Val Seriana):  
Dominated by Spruce. Beech and  
Hazel (*Corylus avellana*)



# STELVIO NATIONAL PARK

- Study area was located in **Uzza** valley (**Valfurva**). Woods are dominated by Larch (*Larix decidua*) with Mugo pine (*Pinus mugo*) over 1800 m. Other species: Spruce (*Picea excelsa*), Juniper (*Juniperus communis*), Berberry (*Berberis vulgaris*).



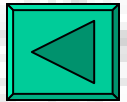
**Uzza valley**

**Uzza**

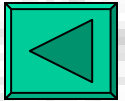
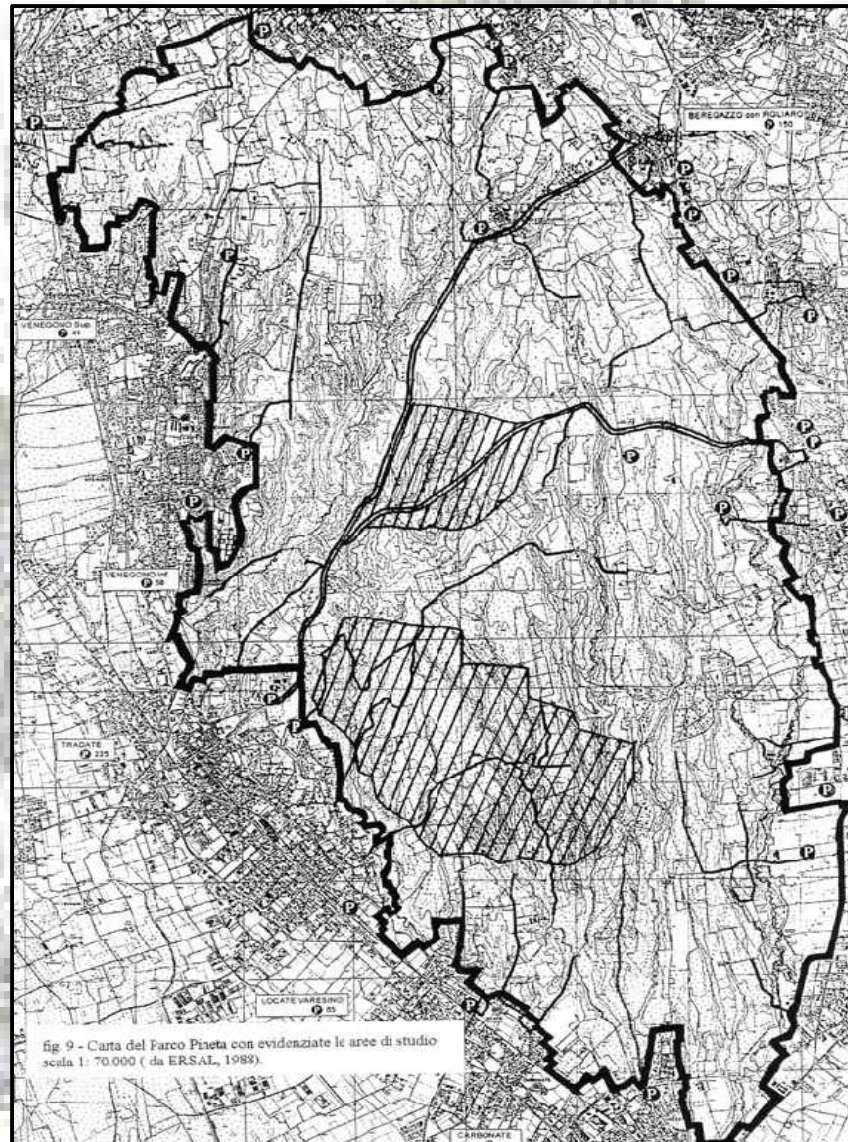
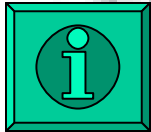
**S. Caterina V.**



# REGIONAL PARK PINETA DI APPIANO GENTILE AND TRADATE

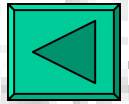


- Upper Po plain. Study area was dominated by Scots pine (*Pinus sylvestris*) with Chestnut (*Castanea sativa*), Oaks (*Quercus robur* and *Q. petraea*), Locust-tree (*Robinia pseudacacia*), Hornbeam (*Carpinus betulus*), Trembling poplar (*Populus tremula*).





# LUINESE



- *Quercus pubescens* stand. Cherry (*Prunus avium*), hazel (*Corylus avellana*) and ash (*Fraxinus excelsior*) are other species in this woods. Large chestnut (*Castanea sativa*) woods grows in the vegetational belt between the lake coast and 700-900 m. Only on arid and warmer slopes
- Beech (*Fagus sylvatica*) woods lies in the middlest vegetation belt, mainly on cold and humid slopes. The coniferous presence is due to reforestation activity in small patches of the area. Poor grassland and abandoned pasture (*Nardetum*) characterized the higher vegetation belt.

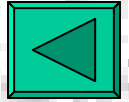
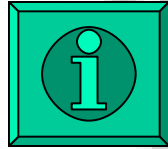
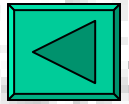


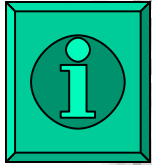
FIGURA 13:  
ITINERARI PERCORSI



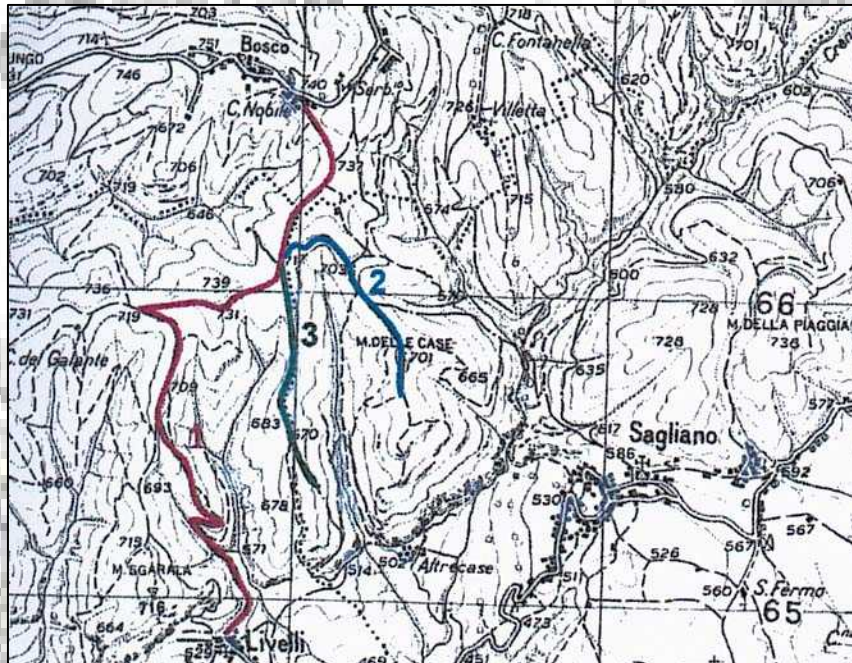
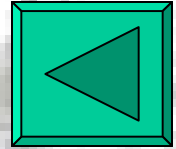
# OLTREPO'



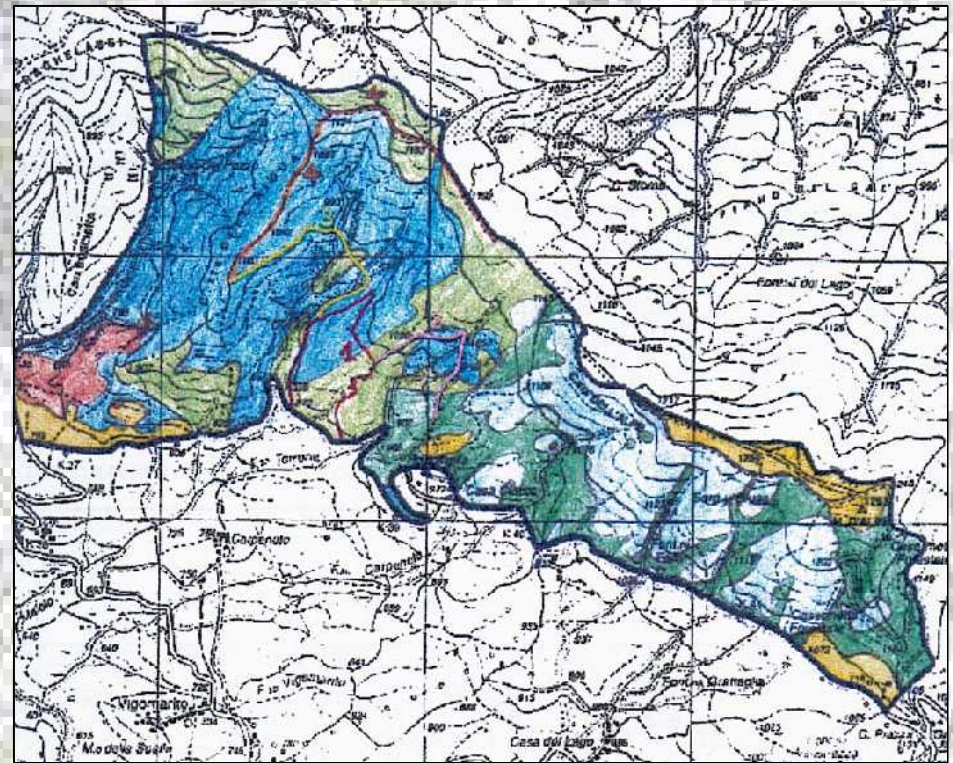
- **Valle Staffora** (600-800 m), with oaks (*Quercus robur*, *Q. petraea*, *Q. pubescens*); hornbeams (*Carpinus betulus*); Chestnuts (*Castanea sativa*) and small patches of conifers.
- Natural Reserve of **Monte Alpe** (1000-1200 m), mixed wood with beech (*Fagus sylvatica*), hop hornbeam (*Ostrya carpinifolia*), Turkey oak (*Q. cerris*) with a large patch of Corsican pine (*Pinus nigra*).



# Oltrepò: transects



**Crenna**



**Monte Alpe**