GENERAL CHARACTERISTICS OF WESTERN HIGH ARAGON
by E. BALCELLS R. (1)


(1) English translation of Mrs. Duffey. I thanks Mr. J. Puigdefábregas the revision of the manuscrit.
1. GENERAL SITUATION

The area to be visited is on the south slope, Mediterranean continental type, of the western central Pyrenees. Administratively it is in the NW part of the Spanish province of Huesca and a small part of the N of Zaragoza and the extreme NE of Navarra (Valle de Roncal), 42° 3' and 42° 15' LN and 1° 30' and 1° 10' LW of Greenwich.

2. RELIEF AND ZONAL STRUCTURE

The frontier ridge (general direction NW), on the southern side, owes its origin to two important tectonic movements:

A) One which affects the granitic soils and primary deposits, forming the axis of the Pyrenees, with the frontier running along its crests. These ancient soils are very denuded by erosion and sometimes are at lower altitudes and more open to the Atlantic influence than the more modern (secondary) soils of later, longitudinal folding.

B) The tertiary orogenic forces gave place successively to longitudinal reliefs, resting on the ancient palaeozoic massif, given the name of Prepyrenees. This region covers a wide area (60 km.), limited on the N by the axil zone (which sometimes becomes lost below the northern Prepyrenean reliefs) and on the south by the Ebro depression, constituting the Somontano and Cinco Villas district. Tectonically, this unit is exceedingly complex, but in addition the distinct hard core of the material and its evolution during the Tertiary has made the relief even more complicated, giving rise to the later variegated landscape mosaic. From a tectonic point of view, the whole is limited to the north by high massifs of hard secondary limestones constituting the Interior Sierras; on the south, immediately before the Somontano, there is another narrow strip of secondary soils, the Exterior Sierras. In the middle are the rugged complexes of a Tertiary tectonic "depression".

More recent syntheses studies (1) distinguish from north to south -therefore in a transverse sense- the following litho-morphological units:

a) Axil zone: Very ancient and complex relief due both to the chaotic disposition of material which has been subjected to all kinds of deformation and also to the significant glacial action of the higher granitic massifs of Panticosa and Balsaibus (>3,000 m.).

b) Interior Sierras: Mountainous alignment formed by cretaceous sandstones and oocene limestones, with very marked and abrupt reliefs (Peña Forca, Bisaurín, Apa, Pico Colíareda, Telera, Tandeñera and Massif of Monte Perdido).

c) Flysch zones: Immediate southern fringe, broad, cut by val-

leys in the general N-S direction. Very homogeneous, with undulating reliefs predominant, except where fairly large and intercalated limestone banks have developed (Foz de Elviés and Sierra de San Miguel).

d) Canal de Berdún - Campo de Jaca - Val Anoia: Extensive depression descending from E to W, made up of a grey marl base, on the north limited by flysch and on the south by oligocene continental deposits. The most notable characteristic is the development here of the quaternary layers in the form of terraces and glaciers, due to the softness of the material and the lithological uniformity. These terraces and glaciers are now dissected by the river network in such a way that small depressions have been formed between them, usually covered by mud.

e) Cuanca del Guarga (E) - Onsella (W): Complex deposits of the continental type, in general moderately folded, so that the relief is determined both by the lithology and by the structure. The strong reliefs are therefore due as much to the greater proportion of coherent material (sandstones and conglomerates) as to the greater dips (Canciás, Peña de Belo and San Juan de la Peña). The material diminishes in size of grain from E to W; therefore it is more clayey to the W of the basin, but because this is the last intensively folded zone, is still very hilly. One should note, nevertheless, certain flattened zones which even today constitute nuclei of exploitation and human colonisation (from W to E can be noted: Valle de Onsella, and depressions of Bailo, Zna, Caldesazas, Zena, Valle del Guarga, Rocito – Used and head of the river Balces).

f) Exterior Sierras: New alignment (general EW) of limestones of the cretaceous and eocene, there being three clayey (or loamy) alignments which alternate with the calcareous formations, that of the Aragui - La Peña being most important, forming a depression. The other two less conspicuous correspond to the Garumense and the Keuper, producing definite clayey and extensive depressions in the direction of the folds. The most important limestone massifs are: Sierras de Guara and Balces to the E and Sierra de Santo Domingo to the W.

g) Somontano - Cinco Villas: Unit composed of materials of continental origin, with clays very predominant on the Somontano (with gentle reliefs to the E of the river Gállego). The plain is covered by extensive glacial (clearly visible from Riglos), now dissected by the river network. Towards the W of the Gállego sandstones are abundant and the reliefs are more steep (paleochannels stand out).

In the northern limit of this zone, next to the Exterior Sierras, there are large masses of conglomerates which form characteristic cliffs: Rodellar, San Cosme, Salto de Rodén, Riglos, Agüero, and in the extreme W, the most important of Biel - Luesia, which reaches 1,300 m. above sea level.

3. RELIEF AND CLIMATE

In mountainous countries, next to relief, the climate is apparently the most important factor in conditioning human colonisation, both qualitatively and quantitatively – a final result of the decisive influence on the ecosystem.
The western High Aragon is part of a wider region where there is conflict between two well-defined climatic types: the Atlantic and the Mediterranean in its continental form. The predominance of one over the other depends on the situation of the anticyclone areas over the Iberian Peninsula; these determine a greater or lesser penetration of the Atlantic storms starting from their general NW - SE path. The cyclones which on occasion form over the Balearics or in the North of Africa have little influence on the region. The circumstances mentioned are such that the transition between the two climatic types is completely gradual. On the other hand, exposure, relief and other topographical conditions have a considerable influence on the local manifestation of one or other characteristic. The question is further complicated by the fact that in the zone of contact there are intermittent periods in which the conditions of one of the two types predominate. Due to all this, the landscape is very varied and in the hidden as well as obvious aspects; sometimes the presence of a localised oakwood is not always the product of the interaction of the same climatic factors, but occasionally different causes can give rise to apparently similar effects.

Summarising, the climate in High Aragon not only provides sharp contrasts from place to place, but is also characterised by extraordinary fluctuations of every kind (daily, monthly, seasonal and also from one year to another). Therefore, depending on whether January is characterised by stable anticyclone conditions (1957) or by fierce storms from the Atlantic (1955), the average rainfall in the different localities would give us the following fluctuations from one year to the other:

<table>
<thead>
<tr>
<th>Zone</th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axil zone</td>
<td>47.3</td>
<td>329.6</td>
<td>185.3</td>
</tr>
<tr>
<td>Pyrenean mountains (Canal de Berdún)</td>
<td>7.2</td>
<td>117.7</td>
<td></td>
</tr>
</tbody>
</table>

In the central part of the Pyrenean Sierras, the depression of Aran (see paragraph above, n°5), there is a great variety in the amount of precipitation from mid - summer in the order of 53.6%; on the other hand the lower extreme of the quadratic deviation (30 mm.) indicates that summer precipitation can frequently reach dangerously low values.

The existing data on the High Aragon climate have not permitted us to study the subject as completely as we would like. We have established a plan, in agreement with the National Meteorological Service, which will permit recording and collection of data for 10 years, coming from sixty stations; but this plan has been in operation for a maximum of only two years. Three studies have been published up to now on the climatic aspects mentioned (2) but they are only based


Other more recent studies have not yet been published. One should also mention the latest studies, carried out but not yet published, by J. CREUS. See also MONTSERRAT, P., 1964.- Ecología del pasto (Ecología de los agroecosistemas pastorales). *Publ. Centr. pir. Biol. exp.,* 1 (2), 1-68, Jaca.
on a short series of sometimes incomplete data and refer to different periods.

The problem relating to the transitional character of the western High Aragon climate has been touched upon by P. MONTSERRAT (1971). According to the conclusions of this work, the region which we are considering comes between the following extremes: the continental submediterranean climate, characterised by maximum precipitation in spring, marked summer and winter drought and marked temperature fluctuations, and the subcanábrico montano in which the summer drought is rather less marked, although high temperatures and insolation do exist, but in general with less contrasts. On the other hand there is an oróphyte Mediterraneo type characterised on the peaks with Schinopsis herdii, in which, although having similar characteristics to the harsher continental mediterranean, there is a certain shortening of the summer, the dry period is very intense, with strong insolation and rapid daily temperature variations in the spring. This can be found 1,000 m. above sea level but it is characteristic of the submediterranean mountains above 1,500 to 2,000 m. above sea level. The Esmberger index would give a lower quotient of dryness at 100 and the mean of the minima in the cold months would be less than -5°C. All this explains the selection of pioneer species in the litho - soils and soils truncated by recent erosion, and on slopes which are the only areas where plants of greater productivity and interest, such as Arctostaphylos uva ursi, Buxus sempervirens, Pinus sylvestris, Aselanchier ovalis, etc. are able to colonise later. (This is visible on Puerto Urolei on the day of the excursion to San Juan de la Peña).

One characteristic throughout the region considered, is the presence of the absolute maximum precipitation in late spring (May - June), while the autumn maximum is secondary; from the first half of October to the end of December the weather is usually dry and sunny, with clear air and good visibility. All this is of utmost importance for the plant, and above all the animal, life. The period of vegetative activity suffers considerable setbacks and this is reinforced by snow falls at higher altitudes in the west of the region - so that the winter snow also remains longer - but in addition the mountain activity suffers a displacement into the autumn if the precipitation at the end of the summer is not heavy and snowy, thus breaking the continuity of the vegetative life (end of August or September). Other consequences of the May - June rainfall are the difficulties of moving hay and the delay in being able to use the high pastures.

One can attempt a climatic description of some of the areas mentioned following the topographical zone classification:

a) Axial zone: General climatic characteristics of high mountain; mean temperature low (7.5 to 5.3°C); minima very pronounced; summer temperatures less marked (mean of the maxima lower than 25°C); Annual fluctuations weak, lower at 280 and 26.3°C; nevertheless the daily contrasts are exceedingly strong. In the ancient glacial basins pronounced phenomena of thermal inversion can be produced. On the passes the wind keeps the temperatures low in summer and produces very cold periods in winter (75 days without frost per year). Precipitation is high (means recorded from 1,162 to 1,809 mm.) and also the winter precipitation, since it exceeds 20% of the total. This aspect is exceedingly important for the establishment of winter sports stations, but its variability is very marked from one year to the next, as has
already been mentioned above (1957: 43.3 compared with 1955: 329.6 mm.), which without doubt causes very serious periods of crisis in the hotel trade (and not only at Christmas, on account of lack of precipitation at the end of the year, but also in the spring when the deficit also continues to January - March). The summer precipitation is relatively abundant and in some years the cattle cannot stay high up until October, since the precipitation in the second half of Au-
gust or September can be snowy (" espantes - veraneantes "), thus cut-
ting short the summer tourist season.

b) Interior Sierras: We have few data on this relatively narrow band of highland, which on the north side it is the cause of the Atlan-
tic increase in humidity. On the south there is definitely an in-
crease in precipitation with altitude and we have data to show that
the southern face of the interior sierras receives abundant rainfall
(Villanúa and BisSeeingas); but the vegetation reflects the drought and illumination characteristic of the orophyte Mediterranean climate on
the high slopes (excursion to Los Lecherines) and other topoclimatic
aspects which will be mentioned later (foher effect).

c) Central depression: (including zone c (flysch) and d (Canal
de Berdún): The western parts, not only of this region but also of
the following, Prepyrenean Sierras, are characterised by relatively
high temperatures: the mean of the minima scarcely drops below zero,
but on the other hand the fluctuations are remarkable, owing to the
intense summer heat (mean of the maxima fluctuating between 29°C and
30°C). The frost - free period is the longest of the region (more
than 160 days per year). These conditions are most extreme in the
bottom of the valleys and depressions.

The eastern regions, on the other hand, reveal characteristics of
greater continentality; the upper excavations in the central depres-
sion reveal a strong thermal inversion (already well studied in the
Val Ancha, Sabiñánigo and the bank of the Gállego), the spring fluc-
tuations being very pronounced (16.8°C), the effect without doubt ob-
vious in the vegetation, and the problem is made more acute by the
decrease in precipitation and its seasonal distribution.

The central depression enjoys abundant precipitation with con-
siderably higher than normal values in the extreme west, but which
decreases towards the east, particularly in the valleys cut into the
flysch in a general N - S direction (Veral, Sobordán and Sasturín ri-
ver beds). The scarcity of rain received by Berdún is curious (sum-
mer average of 50 mm.); one could imagine a "gap" in the convective
summer rainfall, owing to the circumstances of relief, together with
the screening effect of summer displacement of the Cantabrican storms,
inconceivable getting this far. Be that as it may, this situation
disappears at the Yesa reservoir, somewhat further to the W, since
the vegetation of the Sierra del Orba reflects the frequent produc-
tion of convective summer storms.

d) Prepyrenean sierras (including 9, Cuена del Guarga - Onse-
lla and 10, exterior sierras): As regards temperatures and E - W gra-
dient, the reader is referred back to the previous paragraph. The
percentages relative to the annual total of precipitation from Decem-
ber - January are comparatively low in this zone: only 18%. This
appears to indicate that the winds coming from the Cantabricans do
not penetrate so much into these longitudinal valleys and depressions,
as in the axis zone and central depression, and that a more erratic
regime prevails. The territory under consideration therefore remains dry except at its northern border, in the high umbras (north-facing slopes) (Peña Vredo, Guara, etc.) or in western localities well exposed to the NW, which receive somewhat higher amounts of rainfall than normal. The dry period is very pronounced in the whole of this area, greater then in the following belt of Somontano - Cinco Villas, and the precipitation is extraordinarily variable from one year to another, especially in summer, as has been indicated above for the Aragón depression.

e) Somontano - Cinco Villas: As this area is outside the Pyrenean region proper, we have not studied it so much. Nevertheless the excursion to Riglos will enable many climatic aspects reflected in the vegetation to be seen. According to P. MONTSERRAT's work (3), the Somontano can be characterized by the formation of the meso-mediterranean 'carrascal' (evergreen oak) (Quercion rotundifolia complex) which lower down changes to dominance of the "cosejador" (Aragones region steppe (Desmano - Cocciferetum complex) with a marked meso-mediterranean influence (sensu GAUSEN), particularly well developed at Cinco Villas, in the extreme SW of the area being considered. In these somontano parts, the almond and olive seem to be productive crops. This area in fact corresponds with the normal type of habitat of Quercion rotundifolia, which when degraded gives rise to romeraleas (Rosemary associations) of different types, in which, along with Rosmarinus officinalis, appear Pistacia lentiscus, Toy - maloea tinctoria and Pinus halepensis; Qu. coccifera is also abundant on the southern slopes in summer, free from thermal inversion, conserve thermophile plants which will be mentioned later.

The particular slopes of the barrancos (rivers drying out in summer) free from thermal inversion, conserve thermophile plants which will be mentioned later.

The somontano slopes referred to are affected a little by winter mists, characteristic of the Ebro depression and which sometimes cover Huesca and its area.

f) Some topoclimatic aspects related to the vegetation: Towards the west benochoos cover the alxii zone including part of the southern foothills of the interior sierras (Zuriza, Reclusa, head of the Osa, Oza); towards the E they are limited to the slopes exposed to the NW and to the vicinity of the less rugged valleys of the alxii zone (Pormigal de Tena), the remainder being colonised by pines and firs. In more continental situations it appears in the better orientated slopes (Guara, umbras of Fanlo, etc.); but in the foothills

below rocky cliffs, special communities form where beech and fir, within the limit of their area, can play an important role, still more if they are in sheltered valleys, where the plant transpiration gives rise to a definite atmospheric humidity (San Juan de la Peña, Peña Groel, Ordesa, etc.).

Mention has been made above of the probable causes of the Echinospartum horridum formation on orophyte Mediterranean lithosols.

Where an oceanic influence exists, opportunist indicator plants can appear and the winter edaphic leaching enables more acidophile plants to become established, such as Calluna vulgaris, Ilex aquifolium, which can be found in the high plateaux and watersheds such as San Juan de la Peña and in El Boalar de Jaca. San Juan de la Peña curiously provides protection for certain high mountain species such as Vaccinium myrtillus and the heteroptera Eurydemus ovatus; also amongst the birds, Serimus citrinella, overwinters until very late in the spring.

The milder temperatures are indicated by the presence of Quercus rotundifolia and more frequent cultivation of Prunus cerasus and Vitis vinifera. Different types of Quercion rotundifoliae occupy mountain enclaves which are topoclimatically mild and due to the descending effect of warm dry N–S winds (foehn effect), on the solanes of the calcareous interior sierras (Villanúa), regions where the precipitation on the other hand usually exceed 1,000 mm. The variants of this type are diverse: the foehn effect, in lower and xerophyte zones, on stony ground, favours the development of various Juniperus, mentioned above.

Finally, warm and humid environments, for various reasons produce conditions for different kinds of tree cover. On the one hand in the middle mountains there is oak wood (Quercus type pubescens) at the foot of Mount Sayerri, Garcipollera, Sotremonte, etc., in areas of middle altitude in the flysch zone, with temperatures with some what smaller fluctuations than in the remainder of the central depression, and spring cold periods somewhat more persistent, thus reducing the frost - free period, and accompanied by an increase in precipitation with altitude and exposure.

In various places of the association Quercion rotundifoliae, for example on the Somontano and Exterior Sierras, Agüero, and to the south of the Peña dam, the strawberry tree, Arbutus unedo, appears, accompanied by Phyllira media, Ph. angustifolia and Viburnum tinus (4). Arbutus also persists (perhaps for different reasons) in gorges more to the NW of the region being considered, such as that of Esca (visit during the excursion to Larrà before entering the Roncal valley) and Poz de Biniás (excursion to Zuriza). Leaving aside some of P. MONTSERRAT's biogeographical - historical explanations, Arbutus not only denotes warm areas but also a certain acidity due first to the subsoil and then to the subsequent edaphic leaching.

In summary: Based on a continental Mediterranean climate, with all its harsh consequences - with associations of a xerophyte vegetation of deciduous Quercus, Pinus sylvestris and P. nigra as dominant species - there appear diverse altitudinal orophyte types and

(4) Also: Pistacia terebinthus, with abundant Aphidid galls and subsessile Ficus carica.
diverse degrees of intermittent oceanic influence, and with diverse local topoclimatic factors and of exposure, characteristic of all montaneous landscapes, making up a very varied mosaic. These factors cause considerable delays in the onset of vegetative growth, which is all the more paradoxical if one makes comparisons with the green, exuberant, much milder landscape of the northern Pyrenean slope and other sites in western Europe situated at a higher geographical latitude. Such are the harsh environmental conditions that man has found and where he has succeeded in colonising and surviving from remote times - although perhaps not before the Bronze Age - succeeding, during thousands of years and by manual labour, to maintain himself with a policy of difficult survival, without benefits and with scant possibility of bringing outside energy into the ecosystem.

4. THE ENVIRONMENT AND MAN

The principal problem lies in the rugged relief just described and in the harsh climate. The exploitation of the area has had to be based fundamentally on the utilisation of what it produces and on demand, always very much lower than supply, up till very recent times (5).

The poor quality of productivity, of low yield, imposes a new paradox: low population; but the harshness of the environment requires a high population for the manual exploitation of the land, with groupings of settlements able to help each other. The basis of exploitation without doubt the possibility of concentrating the population. This is still a very serious problem today, in the face of the necessity of conserving an abandoned territory, with a long history of exploitation maintained only by the efforts of a high population and without possibilities nor means of investment; investments which are still today uneconomic.

On the other hand, along with this physical paradox, there is another exceedingly important one of the ethnic type; a territory whose fundamental basis of exploitation, had to be dedication to productivity, was colonised by people of Mediterranean origin, whose principal basis had always been serventile activity, of free exchange and barter.

The high altitude thus demanded a latitudinal "rectification", based on secondary production (mentioned later) and which only had a definite tradition in milder and more northern countries. This process of Pyrenean rectification was sufficient to give rise to a people of a characteristic or Basque (to give it a name) hue, and certainly the...
process in Aragon did not take place before the Bronze Age.

The utilization or straightforward harvesting of mountain production had very limited profits, except in isolated parts of the territory which were at once considered to be richer and with a greater capacity for human settlement. Primary production offered timber and grazing. There was no demand for the first up to two hundred years ago, and moreover because of the nature of the terrain export to other areas was not feasible and except for the most "oceanised" territories its quality is exceedingly low. However, the construction of the Aragonese irrigation canals, which produced a demand for timber for the first time (the sea was too far away for timber to be used for the construction of ships, as in the eastern Pyrenees), mountain man responded by making use of the difficult aquatic extraction routes, across the torrents and rivers of the Ebro basin. In a few years this developed into a domestic exploitation activity which enjoyed a great tradition (aladíeros) in the valleys on the west of our territory (Roncal) and which still persisted 25 years ago, little before the construction of the Yesa dam.

Secondary productivity did not offer any other possibilities than hunting and honey and was faced with similar problems of export. Such methods of utilisation could hardly supply anything but an economy of difficult subsistence. However, prehistoric evidence, even if of a late date, exists of large population nuclei, despite the fact that the resources of the subsoil (mining) were also exceedingly scarce or even nil (mines with some silver in Guerriñas).

The humanizing process did not have great resources at its disposal, either. The primary production in the depressions did not offer any other agrarian possibilities than cereals, and that only by great effort by farm workers who exacted cultivation from marginal zones such as steep slopes and small parcels of land with scant soil. Agricultural productivity was maintained by means of shifting cultivation and burning. Without doubt, despite the difficulties of transport, cereal cultivation was the only basis which permitted self-contained reinvestment into an increase in comforts and domestic furnishings, and also in the recovery of family resources after a succession of natural or social catastrophes. Other solutions of incorporating energy into the system take place by means of temporary migration of members of the various families - as much women as men - to work in the lowland, both at home and abroad. During the Reconquest (VIII - XV century), wars also played a role as energy incorporators by means of importing booty and treasures captured from richer enemies, like the Arabs. The Condés - Reyes of Aragon lent themselves repeatedly as "plebeians" to the noble bourgeois of Langue d’Oc, thus obtaining certain imperial concessions and the receipt of taxes and rents; also contraband of all types.

The area therefore did not enjoy the classic trilogy of cultivations characteristic of the Mediterranean countries: wine, olive oil and bread; a trilogy as envied by the Nordic races in the course of the Middle Ages and which provoked so many more or less well justified ideals of conquest. The problems of reproduction and basis of survival had to centre on livestock grazing and its products, which permitted the exploitation of primary productivity and improvement in its quality in situ and at different levels, according to circumstances and seasons. The traditional economic basis of exploitation of mountains territories, therefore like continental landscapes in
general, was grazing.

Grazing in the mountains, owing to the harshness of the climate - irregular distribution of water and its retention, and seasonal thermal fluctuations - cannot be of any permanent form. Transhumance thus demanded constant dedication to the livestock, a daily struggle against the elements (creating a characteristic people full of fight) and an uprooting from home and spirit of independence. Livestock exploitation in mountainous territories therefore requires the grazer to look for and make agreement over an area in which to spend the adverse season on the plain. And so the farmer with his own piece of ground does not traditionally possess any possibilities of protection unless he owns livestock. Livestock exploitation in addition used to enjoy a favoured position in the region as a whole. Almost all the private properties with a regime of cereal cultivation have to put up with or possess "aleras forales", ancient rights of grazing after the harvest has been taken, which also used to benefit the landowner who received, in exchange, a fertilizer from livestock dung.

On the other hand, little by little, another situation was forming: the protective aristocracy, represented by the nobles and monks, charged with being "plebeians" and the administration, which found the peasants an easily controllable and exploitable prey, while the independent shepherds, with a special and more ancient civilisation, continued to dominate (less controllable) in the more closed countryside.

Historical circumstances have thus given to the area three traditional states:

- The feudal, which controlled the peasants or men of the earth. They occupied frontier zones, of scant value (Prepyrenean Sierras), where "the frontier" was situated.

- The grazer, constituting an independent aristocracy of the second class, less specialised, but which also became accustomed to defend itself and did not recognise a master, but knew quickly how to ally with or disassociate from - according to the circumstances - his equal and neighbour.

He lived mainly in the transverse valleys of the exil head and has remained, up to our days, linked to this patriarchal organisation. He boasts a "coat of arms" at the door of his home and until a little while ago was recognised as a category of cadet in the course of military service.

- The serf, residing in the depressions exploited for agriculture.

These states did not always preserve their lineage in the mountains; they migrated and were substituted by others.

In this assembly of people who distributed the land amongst them - selves, "towns", certainly originating in Iberian "castros" (forts) dotted the Pyrenees, not always defensive, but gradually opening up. The secular Church took then as its See. They responded to propaganda and civilisation; a mercantile interchange was organised in them, carriage and commercial roads, help for more specialised artisan crafts. Jaen, at the entrance to the pass of Summus Portus, was a hospitable and free town, it sheltered commercial travellers; it did business with the French and the Moors; it managed to make the agricultural population bring their products to it and spend their savings; it maintained a Jewish quarter and sheltered, in addition to its cathedral and centre of studies, an
important nucleus of "workshops" or spinning and weaving mills. Ber-
dun on the other hand represented a typical defensive Iberian Castro,
the centre of rural life, of less importance for mercantile and ar-
tesan affairs. Jaca was probably always a free city. The first
chiefs of Aragon came from the territory of Gareipollers - situated
more to the N; the lineage of the ancient Condés - Reyes came from
Hecho and they always lived - when they were not occupied with jour-
neys and wartime activities - in the Monastery of San Juan de la Pe-
ña.

Leaving aside the market towns mentioned - one can differentiate
three primitive village types: one dispersed and two concentra-
ted.

a) Dispersed: On properties linked to the lat noble state, they
form border large estates in the Prepyrenean Sierras, with one or few
families, often with their lords living away from them and exploited
by livestock graziers in the intermediate and winter localities, and
by cowmen or guard - administrators who cultivated a small part,
paying taxes to their senior proprietor and claiming as a right the
rental for the temporary exploitation by animals. According to the
richness of the soil, they could constitute more numerous "villages" or
villages, attaining full ownership and serving as a nucleus for
the villages of the following type. The classic properties, on poor
ground, had the name of "pardinis" and served - except in periods of
intense and necessary "artigues" (shifting agriculture) - only as pas-
tures.

In the area under consideration only two "pardinis" are known,
squeezed into the axis territories. That of Tena is today covered
by the waters of the Huelva Reservoir. Its lord, in the XVII century,
had great influence and moral and cultural power in all of the valley.
The other is situated near Villanúa (Aragón). The majority of the
others belong to the Prepyrenean Sierras and very few to the central
depression. Some, close to roads, provide a hotel service for trave-
ellers and are called "ventas".

b) Villages of the depressions: Originally made up of serfs,
farmers and farm workers, later freed by the feudal lords. Their ori-
gin is apparently cereal cultivation, rarely irrigated and generally
"secano" (not irrigated). They own their parcels of land. In the
acquisition of these properties, there were originally complex ques-
tions of common law acquired by ploughing in years of recession.
These ploughings began communally, with each new place, although af-
terwards they were divided into individual parcels per family, thus
forming "patrimonies" of a single property owner, with very dispersed
parcels. The inhabitants are usually very poor and all of them, in
addition to kitchen garden and farmyard poultry, own small flocks of
sheep and goats (occasionally a cow), which graze, traditionally led
by a weak member of the family (boy, woman, or old man), utilizing
margins, wasteland and uncultivated land or stubble fields during the
intermediate seasons and the winter. Dependent on mountain territo-
ry for the summer, the patrimonial flocks usually unite during the
dry season, under a single shepherd, for one or several villages, leas-
ing a "pass" (puerto) high up and paying their owners so much per
head. This type of transhumance is direct. Some municipalities on
the lowland possess communal properties in the highland, the origin
of which is very ancient, but these are the exception; thus: Aragües
del Solano has rights in Tortiellás, Jaca has the Astín territory,
etc. Other high mountain pasture territories were the property - to-
day lost - of monasteries; also some are private, but only one of this type exists.

c) Concentrations of graziers: In the axil areas and the transverse valleys of the flysch terrain there exist nuclei of populations preferably formed by graziers. Ansó, and perhaps Ronces, are the most genuine representatives. Others to the east (Nacho) follow a more mixed regime of exploitation, perhaps because their valleys are more open and with better possibilities for cultivation. The Ansó people despise even the farm worker, up to the point that they never cultivate anything; not kitchen gardens nor meadows for the livestock. Its social structure is very genuine and is based on the communal exploitation of the territory of a permanent type, except some parcels of land amongst those of mixed or agricultural exploitation, of which: the regime of ownership possesses an origin similar to that of the villages of the depressions. Although a valley may have more than one nucleus of population, almost the whole of its territory belongs to one community, being exploited as a whole, as much as the woods and their timbers as the pastures, divided into "passes" with a capacity for a fixed number of animals. These high passes of summer exploitation during 80 or 90 days - controlled like the exploitation of timber by a state service - are leased to the neighbouring graziers in the valley by lottery every year, for a minimal price. The areas left are offered to the highest bidder amongst graziers from outside and for a single season. Three types of passes exist; those at the bottom of the valley which are less healthy, destined for cows and horses, in an indiscriminate regime for all the village. Those of the slope - called "borregaríles" - without doubt healthy and rich, dedicated to the fattening of lambs for slaughter, and the highest and coldest, but less rich, devoted to sheep. Each community usually owns a single pass for cows and in addition supplies services without payment of extra tax, both for domestic economy and, for example, studs for the cows for the whole population, which benefits, or used to benefit (for this service has now been eliminated in some communities) the poorer proprietors.

This regime of exploitation is inverse transhumance. The graziers live in villages at average height. They arrive at the village with the livestock in the spring (during May) and during this season make use of the pastures surrounding the village and its vicinities, which act as "mayence" (low pastures); the sheep wait there for the entry into the high alpine passes which take place on 10 July and they stay there until 29 September, when they return to open the pastures adjoining the village, reserved during the summer. They stay in them - according to meteorological circumstances of the reproductive cycle - until 12 October or the beginning of November, when they start the descent to the lowland. The journey is usually made by foot and utilising the pastures which are offered to them along the road in "pardinas" and stubble fields. In old times, large flocks of more than 1,000 head were very frequent, passing through the central depression, although an "año" (small flock) of lambs for replacement and old sheep for slaughter used to stay in "aborrales" or coarse pastures of the Pyrenean Sierras, while the remainder of the flocks were driven to the 8bro steppes. They spend a week to three weeks on the journey, covering from 15 to 25 km. daily. They remain on the lowland until April of the following year. The majority of the sheep produce lambs in December and these are sold at Restur; another section of the flocks lambs in spring and then goes up with the lambs to the highland where they stay on entering the summer passes. The flock is driven to the borregaríles where the ewes were
milked, making some cheese for their own use, although in the Roncal some is sold. The search for winter pastures has always been the cause for traditional friction between the Aragonese graziers and the peasants of the lowland, sometimes coming to "blows". The rents are extremely high. The Navarran valleys of Roncal and Salazar enjoy an ancient right to winter pastures in the steppe territory of Las Bardenas Reales (royal concession of the XV C). The trek of the shepherds to the plain, far from home, is a hard system of exploitation, for the lodgings which are available there are inhospitable. Sometimes they go down with their families; the possibilities of improving lodgings are difficult, for the acquisition of estates on the lowland compromises his rights of citizenship in the highland, and therefore those of summer utilisation of the highland. The shepherds turn down other winter territories like those of the Prepyrenees, for the xerophyte vegetation is injurious to the production of wool on the sheep. However, meat is the basic transaction, while the wool and afterwards the milk represent complementary benefits. Owing to the installation of irrigation in the Ebro and the market fluctuations, the traditional cycle has undergone changes. Finding pastures in March for the sheep is now a problem, for the irrigated areas begin production at this period; in addition the demand for lamb increases at Christmas and it is necessary to obtain lambing in September, leaving the high mountain pastures unused, for in the highland the conditions are not suitable for rearing.

On the other hand the graziers of cattle follow an inverse transhumance, but closer; it ends in the aborraltes of the Prepyrenean Sierras, shared with the basibos or replacement lambs from the sheepfold. In autumn they don't usually go down until November; in the spring they go up in June and rapidly enter the "bajanotes" passes (Zuriza and Linza) and utilise the high passes ("alpages") during only one month and a half (Agua Jueba), going down again to the "mayence" (Zuriza and Linza).

In the truly grazing villages (Ansó) the cattle is very few and there are less which stay permanently in the village. The same doesn't happen in other valleys (Necho, Iena, Villanúa), in which the nature of the land has permitted traditionally a more agrarian or mixed regime.

Without doubt there are exceptions to these formulae. Also there are peaks in the Prepyrenees which allow grazing exploitation in the summer (Bromion).

The ethnic similarity and friction between the axil populations on both slopes is remarkable. There are numerous examples of exceedingly curious agreements, crossing frontiers with great indifference without government-type diplomacy. For the people of the south slope there has always been a problem of obtaining firewood, which often to the north side have ceded amicably in exchange for the use of the best Spanish pastures once in ever four or five years (Ansó). The "aleras forales" mentioned above are very varied and have been respected by the Pyrenees treaty and its continuation. FAIREN GUILLON, a well-known lawyer, has compiled such customs, which the reader can find published (in part) in Pirineos (92-96) and also see La Aldea foral, Zaragoza, 1951, by the same author. Among the most famous agreements are those of the tax on the three cows, a solution to an ancient and bloody dispute between the valleys
of Roncal and the French one of Larrau, in which the valley of Ansó intervened as arbitrator. Also the auction of the rental in the commune of Jarret (France) is very curious; in which the Panticosa graziers have a special right of competition: it takes place in Saint Savin, near the Argelles du Gacost (France), both sides having right to bid while a lighted candle lasts; in exchange for this right of competition, Panticosa has the obligation to replace the bell rope of Saint Savin.

5. GENERAL CONCLUSION.

This outline I hope will explain the present-day situation and enable it to be understood. Undoubtedly man has over-exploited the territory, but this over-exploitation has responded, giving levels of productivity without precedent, which man has maintained by his own efforts and institutions such as the dedicated heir who preserves the family inheritance until death; the tio (uncle) who, without the right of inheritance, often remained a bachelor in the service of the "home" and the inheritance, saving it from ruin. These customs have not been substituted today, neither by mechanisation nor real forestation activities carried out by the state lands. Neither has the extensive "unloading" of livestock been beneficial, for it has disintegrated the pasture ecosystem of high quality and "improved" it. The large mountain herbivores are not a substitute, and in addition requires methods similar to transhumance which are difficult to regulate. The hydroelectric exploitation and the dams for irrigating the plain have disintegrated the highland communities, for they have flooded the ground of greatest productivity and the communities have made a massive emigration, lacking essential resources. Reafforestation, without foresight and unplanned, has not only eliminated resources but gives low productivity and deficient quality. Tourism does not cover the whole season; the hunting resources are insufficient for its exploitation and have diminished, and there is lack of demand. The problem is without doubt pressing and the depopulation does not augur well for the necessary possibilities for conservation, without opportune support... The general view of the future of the Pyrenees today is pessimistic. The efforts for conservation will, however, be undertaken if the investments exist which are required and the townman takes responsibility for them, in face of the demand for health. This is the task that must be undertaken and which seems to require a previous profound knowledge of its resources and an intelligent approach, cautious and certain about the recovery of the extensive grazing regime - guarantee of productivity and efficient and lasting utilisation of the mountains - based in turn on a later development of the remaining complementary resources.

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