BEAR CONSERVATION IN GREECE: A PLANNER'S PERSPECTIVE

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Abstract: The most important remaining population of bear *(Ursus arctos)* in Greece is found in the Pindus range, in a vast area with extensive human activities and structures. The current condition of the bear's habitat is a result of human history and traditional exploitation, but this situation is changing under the pressure of new development plans and changes in the sectorial economy. Although attitudes of people in the Greek highlands are primarily positive toward the bear, the efficiency of bear protection efforts depends on the integration of conservation measures into the socio-economic setting. On a large scale, objectives such as conservation of bear habitat integrity and diversity can be specified using zoning techniques and may be incorporated into regional planning. Conversely, it is possible to increase space availability and limit disturbance to important sectors for bears by re-adjusting critical human activities or by broadening the scope of EIA studies. All steps of a bear conservation project should be designed properly and adapted to the local environment and economic activities.

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A population of 100–120 brown bears still live in Greece, distributed in four nuclei, in the southern part of a larger Balkan bear range (Fig. 1). The Pindus nucleus, which extends over 4,400 km², is the most important Greek bear population, estimated at 50 individuals (World Wildlife Fund [WWF], Conservation strategy for the brown bear in the northern Pindus, 1992). Because of the size of this population and its key position on the longest Greek mountain range running across the mainland, the preservation of this nucleus is a high priority for the survival of the brown bear in Greece.

The Pindus range has been inhabited by humans since neolithic times, and the environment reflects the impact of this long-term human presence. Traditional human exploitation included extensive livestock raising with significant nomadic flocks moving down to the plains in winter, small scale agriculture on terraces on the mountain slopes, and clearings in the oak *(Quercus* spp.*)* forests. Timber harvesting has not affected the montane forests due to difficulty in transportation, and firewood was gathered from oak forests around the villages. The combination of these activities created a mosaic landscape where areas of moderate human use were interspersed with undisturbed zones.

Presently, roads, cultivations and farms, livestock rearing grounds, intensive logging areas and many villages are found within the bear range. In the northern part of the Pindus range, in the stronghold of the bear population, the total human population exceeds 27,000 inhabitants distributed in 130 villages. The economy of this region, though rapidly changing, is still land based. The primary sector, including agriculture, nomadic livestock rearing, and forestry, occupies 69% of the active population. During recent decades, agriculture and livestock rearing have declined and are giving way to other activities, such as industrial forestry and tourism. Ongoing and planned projects will improve the infrastructure of this region, which is considered underdeveloped (Loukakis et al. 1987). The Common Agricultural Policy of the European Union (EU), through subsidies system, promotes the creation of large areas of wheat fields, which now cover 17,000 ha in the oak zone. This policy accelerates abandonment of the traditional cultivations of orchards, vineyards, and vegetable gardens. EU subsidies also facilitate the concentration of the major part of the 220,000 goats and sheep of the North Pindus in confined areas, which can be served by infrastructure works. These changes are leading to an environment of less diversity and patchiness, fragmented by an axis and areas of intense human activity. In the North Pindus, the aforementioned human activities as well as most of the villages and the majority of roads are found between 700–1300 m elevation (Demathas 1992), where two-thirds of the bear activity occurs (WWF 1992 unpubl. rep.).

The ecology and conservation of the brown bear has been studied in the Pindus since the late 1980s (Matsakis et al. 1981, Minst. of Agric. [MOA] Final report of the first phase of the project "Brown Bear" in Greece 1988, Mertzanis 1991, WWF 1992 unpubl. rep.). The conservation priorities proposed by several authors (MOA 1988, WWF 1992 unpubl. rep.) in respect to the Pindus bear population nucleus are: (1) maintain integrity of habitat, (2) protect key sites and corridor zones, (3) identify and protect critical areas, (4) redress the balance of bear–human conflicts, and (5) educate and sensitize concerned people and providers. Goals and objectives relating to these priorities at the population range scale, such as maintaining integrity of habitat, have been interpreted as implying the establishment of large protected areas (Inst. R. Sci. Nat. Belgique 1992). However, there are only 2 National Parks in the bear population range covering just 70 km², and the establishment of new Parks is unlikely in

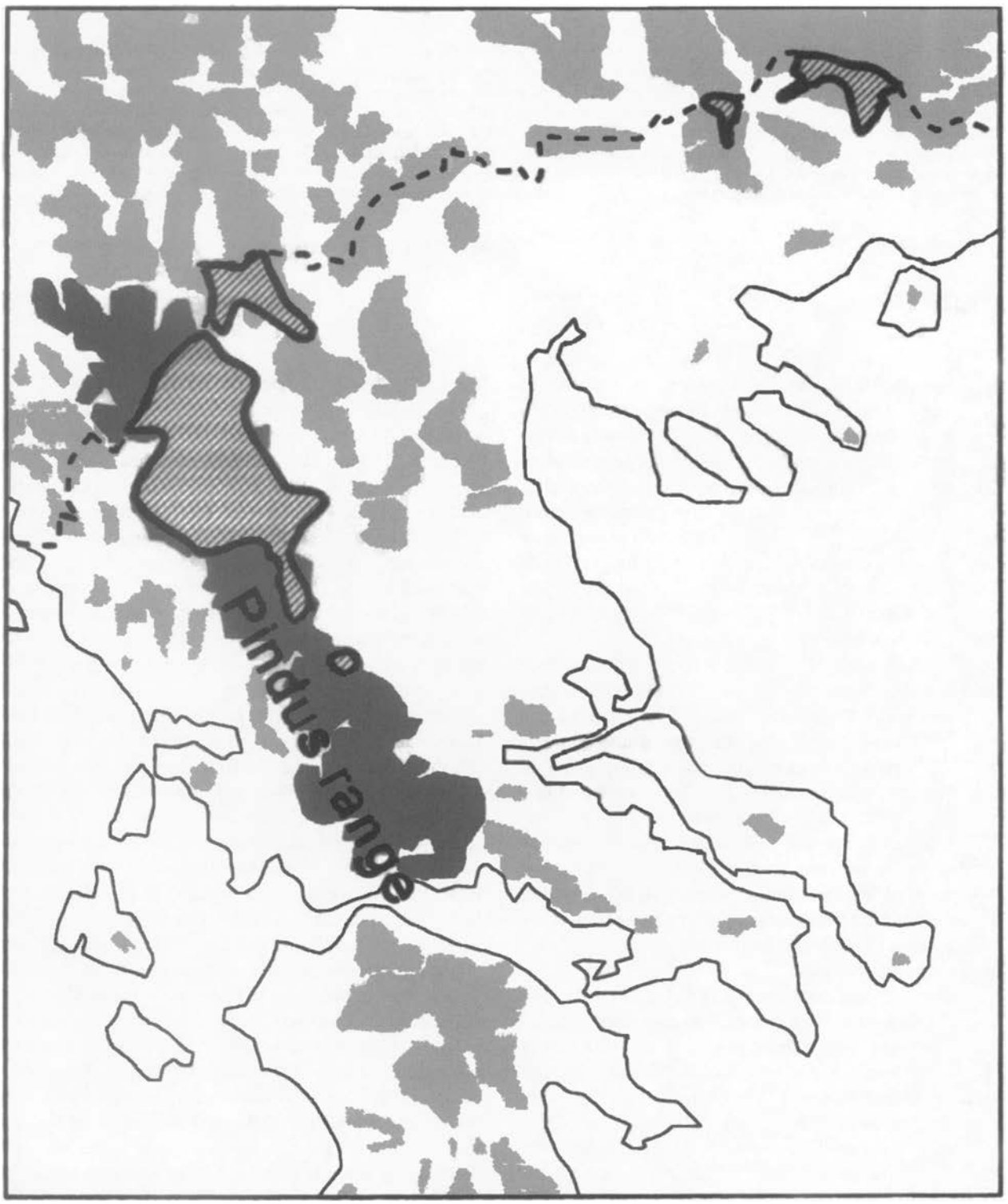

Fig. 1. Brown bear distribution in Greece. Light gray areas are >1,000 m elevation and the 4 bear population nuclei are outlined in bold.

the near future. The realization of these objectives should therefore be sought through comprehensive planning and small scale interventions.

I examine aspects of the priorities listed above within the framework of regional planning and planning techniques. After discussing bear–human conflicts, I explain the bear population range approach and zoning techniques and present alternatives of small scale intervention.

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THE BEAR–HUMAN RELATIONSHIP

Bear–human interactions have changed over time as humans' relationships with wilderness and natural resources have changed. In the past, bear–human conflicts were confined to occasional predation on domestic herds; the bear–human relationship was, therefore, of a competitive nature. Today, society has reconsidered the bear's value and allocates zones of conservation priority in bear country, usually as nature reserves, where exploitation of resources and use of space by humans is limited or prohibited. These limitations may cause economic or operational problems, which trigger conflicts between social groups. The main groups of concern in bear conservation are the nomadic shepherds, the woodcutters, the hunters, and more recently the adventure tourists. These groups are responsible for intense, dispersed, and random disturbance in the bear areas.

Although highlanders have a positive attitude toward the bear, they associate predators with a poor and underdeveloped context of life. Bear conservation is often interpreted as an effort to preserve some old-fashioned components in a rapidly evolving society. Thus, public opinion fluctuates in response to perceived positive or negative consequences of bear conservation and local attitudes reflect mostly the economic impact of measures and activities related to bears. The perceived bear value is much higher in the Abruzzo National Park (NP) (1,000,000 visitors) than in the Pindus NP (<10,000 visitors/year). Also people living in developed regions relying on fuel other than wood for heating are less sensitive to limits set on firewood cutting or other environmental regulations than those living in rural areas. Therefore, the conservation of the bear and its habitat requires a policy that explicitly re-evaluates and incorporates the bear into the local socio-economic system.

THE BEAR POPULATION APPROACH

The foremost step in environmental planning is the delimitation of the study and the wider study area and the identification of units with both managerial and ecological character. The boundaries of study area and management units should consider land-use and infrastructure lines to facilitate the analysis and ensure the operational nature of management recommendations. We should consider the entire bear zone, including core and occasional presence areas, corridors, farmland, and urban areas, as results will be incomplete and vulnerable if some areas are excluded (Walther 1986). During this step, objectives and zoning categories should be clearly defined and criteria should be established in common with users.

The classification of human and bear land use should be based on common geographical references, as for example, a framework using simple analysis elements such as points, lines and areas (Fagence 1990). These elements may correspond to both human (point=village, line=road, area=cultivated zone) and bear (point=den, line=corridor, area=feeding zone) activity references. Such geometrical elements should be used to design human and bear land-use zones and assist the identification of zones of compatible and conflicting use. Also, since each human activity comprises several stages, methods, and levels, (e.g., farming means plowing, seeding, spraying etc. and these works may be mechanized and intensified at various levels), their impact on the environment should be evaluated and classified.

Bear activity and presence should be correlated to an intensity of use value in a more or less defined area according to either an activity index (WWF 1992 unpubl. rep.), a seasonal habitat value (U.S. Dep. Agric. and U.S. Dep. Inter., Cumulative effects analysis process for the Selkirk/Cabinet–Yaak grizzly bear ecosystems, [USDA/USDI] 1988), or a habitat evaluation model. This value is presumed to be lowered by the effect of existing or planned activities and works. After classifying the bear zones to several degrees of priority or sensitivity (e.g., denning, feeding, wintering areas), we superimpose classified bear-and human-presence zones. The resulting map should be subjected to a bargain of compromises between, on one hand, habitat value and size of area needed for the bear population, and, on the other hand, imperatives and socially desirable size and position for each human activity.

The final maps, allocating in space the zones of managerial or institutional intervention, reflect the compromise between environmental and development policy. The resulting limitations should be adapted to the structure of

local economy, existing infrastructure and settlements. Moreover, zoning should consider the diversity and complementarity of activities in the traditional mountain economy and avoid segregating land-uses. It is possible to identify zones of compatible use (e.g., grazing areas for summer in spring bear zones) and multi-use zones (e.g., agriculture and grazing) by taking advantage of the temporal complementarity of the highland economy. Temporal regulations should focus on scheduling activities in respect to the bear's annual or seasonal activity pattern. Temporal dimensions of proposals can be visualized in maps with the aid of simple graphic techniques (Fig. 2). At each step several alternatives can be examined and evaluated in respect to the needs of both bear and humans. If large areas have been identified as important for the bear by field research, it is wise to attribute to these zones a more widely recognized environmental goal or value (e.g., watershed protection, soil preservation, game reserve recreation area), instead of misunderstood conservation terms i.e. sanctuary or biogenetic reserve. The final zoning maps, considering the totality of bear country, could be forwarded to public service agencies at the regional level for consideration during regional planning studies and regional development plans.

Fig. 2. Interpretation of spatial and temporal conflicts with the help of simple computer graphics. Simultaneous bear presence and human activity have been recorded in a spatial unit. Conflicting uses extend from April to June and from August to October. These graphs facilitate the responsible agency to establish and schedule a new program of works and activities compatible to the presence of the bear in the unit.

THE SMALL SCALE INTERVENTION: CRITICAL AREAS AND EIAS

The critical area approach is more flexible than large-scale planning. It is based on re-organizing human activities occurring in a given small area of prime importance for the bear, such as feeding or reproduction sites, with the goal of increasing site availability and limiting disturbance. Proposed measures may range from simple management suggestions to the creation of new nature reserves.

To increase space availability and habitat quality in critical areas and reduce disturbance requires explicit understanding of human impacts on bear habitat. This includes understanding the mechanisms that lower the value of a habitat for bears, and organizing the wide spectrum of activities that occur in the bear zone, such as off-road vehicle tours, timbering, and livestock rearing.

Although conventional field work allows researchers to identify the attributes of preferred habitats, the delineation of critical areas requires a geographically referenced study design and a convenient evaluation protocol. The study area must be temporally and spatially segregated into segments of explicit managerial or administrative character. Among these segments, sectors of high seasonal importance may be identified with simple comparative techniques, for example, on the basis of a seasonal activity index or the density of radiolocations. Using quantitative data on bear space use, we should pay particular attention to important landscape elements such as dispersion bridges and travel corridors, which might be underestimated or even overlooked because bears use them infrequently.

The identification of human activities causing critical disturbances is a complex problem because it requires the systematic recording of all human activities over a larger area than the critical area, and classification of activities into various levels of disturbance. As it is unlikely that a single activity can dramatically lower the value of a zone to bears (Schoen 1990), it is preferable to address moderate regulations on several activities (e.g., limit timbering to fall and control summer outdoor activities in sensitive sectors), versus excessively limiting 1 activity. When formulating the regulations, timing should be thoroughly considered. For instance, because bear activity is lower in winter, some of the disturbing ac-

tivities and work in bear feeding areas could be scheduled between late December and early March. This regulation would also be consistent with seasonal construction (Follmann 1989) or managerial practices. There are already some positive results in the Pyrenees such as the formulation of management rules for timbering (Off. Natl. For. 1990) and in Greece with the design of bear-compatible itineraries for outdoor activities (WWF 1992 unpubl. rep.). The experience acquired from these approaches shows that conservation measures are much more effective when they are specific for each critical area and disturbing activity and are addressed to users through their management bodies or associations. During these case-by-case approaches, measures will be more effective if they are presented on simple maps showing areas and periods of allowed use and if specifications are written in user's language. Complex maps overlying ecological and land-use data do not effectively convey the message.

Expected impact on bear habitat from planned work could be investigated in an EIA study. National legislation requires the EIA for most important development plans; however, in most cases EIA studies only recommend technical regulations (Theophanidis 1992), and are designed to mitigate the project's impact on the vegetation and the landscape rather than re-examine the location, size, and technical features of the project. The EIA should consider disturbance from both the construction and operation phases, habitat degradation and fragmentation, and evaluate the project's indirect impact.

CONCLUSION

Bears are animals of landscape scale (Schoen 1990). An effective approach to bear habitat management requires the use of tools suitable for the landscape scale. Our approach is to exploit the possibilities provided by planning techniques and the peculiarities of mountain activities, to increase space availability, integrity, and diversity of bear habitat.

Reliable and suitable data on bear space use and feeding habits are of prime importance for land-use evaluation. Interference of human activities with bear habitat must be recorded and analyzed in a comprehensible way and data should refer explicitly to management or administrative units. For instance, conclusions on habitat preference such as "the x forest type was used more than expected" are of little use, because use versus availability is a relative statement where the spatial allocation is loosely defined for the user.

Methods and design techniques used in regional planning, such as spatial allocation and zoning, are relevant for environmental control and conservation of large areas. However, spatial allocation of development and zoning may orient economic and social development as well. In other words, limiting activities of the primary sector will stimulate the evolution of extant land use towards another economic and consequently landscape configuration and, therefore may have undesirable boomerang effects.

Finally, we should keep in mind that planning and zoning are, after all, matters of judgement. Computer-aided zoning and cookbook solutions should be submitted to critical examination. The characteristics of local ecosystems should be studied thoroughly, looking for differences and similarities to patterns described in the literature. The historical dimension of human activities and the peculiarities of local society should be used to help understand and analyze the complex socio-economic web of mountain societies. Bear conservation in different regions may be a problem as dissimilar and variable as bear countries, and a different approach and imagination may be required in each case. A different approach might be necessary for each country within the continent, for each region within the country, and for each land-use within the region.

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