Without doubt in the next ten or twenty years the aggregate will be covered by whole forests of these trees.

This is not at all a strange phenomenon considering that plane-trees require very little in the way of nutrients, and the light soil of the aggregate enables their roots to penetrate deep into the ground to find the moisture they need. However, those who made an attempt at reforestation of certain parts of the mine area were apparently quite unaware of this marvel of nature, preferring to plant pines, acacias and other trees totally alien to the area. Such attempts at "rehabilitation" naturally produce poor results, their sole use consisting in an indication of what to avoid.

The area of the mines as a whole could be converted at some future date into a kind of mining park in which visitors could observe the various types of base rock and natural processes at work through the creation of a new and unusual (though by no means impoverished) type of ecosystem.

It does not require much imagination to envisage at Gerorema vast expanses of plane-trees full of birds such as blackbirds and nightingales, with swifts and swallows flying over the small bogs. These marshy areas would also make excellent wintering spots or resting-places for migrating aquatic birds. All of this presupposes that nature is allowed to function without human intervention.

Fauna

Historical account - Human interventions

The study area is typical of Northern Evvia, with its extensive pine forests interspersed at the lower levels with villages and cultivated fields. Long-term human intervention has resulted in the formation of many clearings in the forest --particularly near villages and sheep-folds-- but fortunately this has not led to the forest being broken up into smaller stands of trees and thus losing its character as a biotope, or its economic value.

Man has had a marked effect on the wild fauna of the area: the populations of larger mammals such as deer and wolf (Th. Sophingaris, forest scientist, personal communication), and perhaps also red-deer and wild cat, became isolated from the rest of Greece and disappeared from Evvia many years ago. Other less feral species (fox, ferret, weasel, badger) found the thinning out of the forest and the provision of new sources of food in the fields and human settlements to their advantage; and the absence, so far, of any serious pollution problem in the river has meant the survival of the otter in the area. The higher slopes of Mount Kandili are steep and they constitute the most noteworthy area in N. Evvia for birds of prey. (B. Hallamann, personal communication; and observations of the study team). Protection of this part of the study area is easy, since there is no conflict with the (minimal) existing uses but it is not sufficient to ensure the survival of these species of bird (golden eagle, etc.) which need large open spaces; this could only be assured through the implementation of an integrated protection programme for the whole mountain range and the western slopes of Mount Kandili together.

Methodology

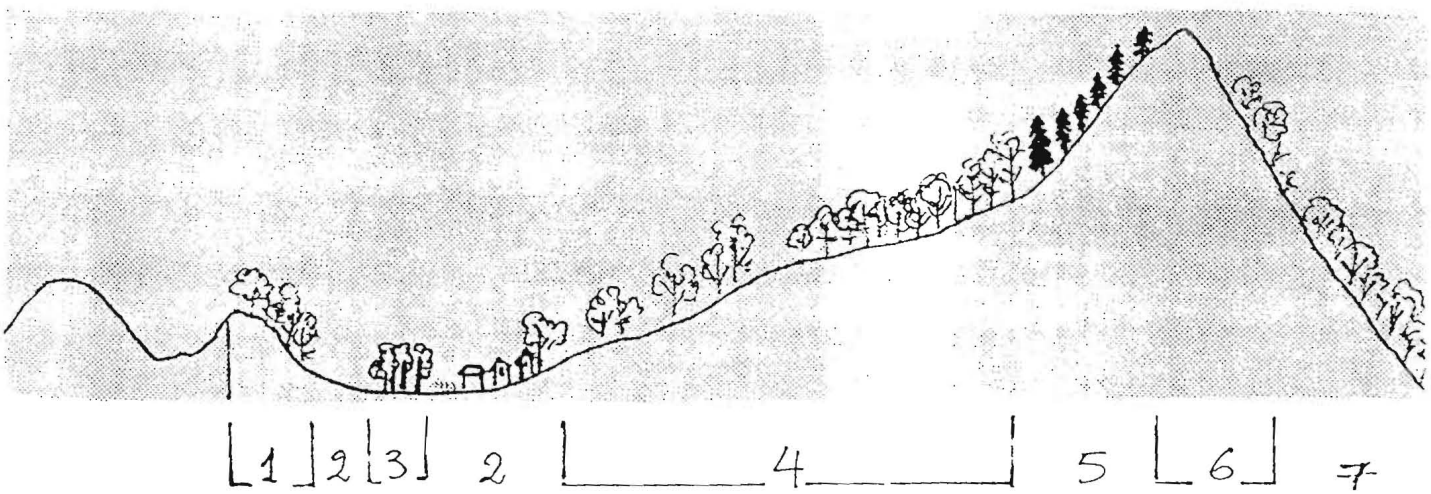
An inventory of the species in the area was made on the basis of field observations and the available literature. The main groups to be observed were mammals, birds, amphibians and reptiles;

it was not possible to extend observations to include other zoological species. Particular attention was paid to identifying those species protected by the Berne Convention, which is upheld by Greek Law 1335/19.3.1983. The identification of species which are given both national and international protection is one of the most prevalent methods used in assessing the national and international importance of the wild life of a particular area.

The following lists of fauna in the area and the distribution of species in the various biotopes is by no means to be considered as definitive or exhaustive, and further study is required. However, they do offer a very clear picture of the ecological value of the estate and of the individual biotopes.

The diagram which follows showing a section of the study area indicates the main zones into which the area is divided in respect of its fauna:

DIAGRAM SHOWING DISTRIBUTION OF BIRDS OF PREY IN RELATION TO THE RELIEF OF THE AREA OF THE ESTATE (Figure 1)



List of Animals found
in the Area of Mount Kandili
and the Kereus Valley

Alongside each species is noted, where possible, the area in which it lives, according to the numbering of the various areas in the diagram. The frequency with which different species occur is noted as follows: (1)

+++	very common
++	common
+	rare
*	protected species

REPTILES & AMPHIBIANS

Bufo bufo	common toad
Bufo viridis	green toad
Rana rudibunda	marsh frog
Testudo graeca	spur-thighed tortoise
Testudo hermannni	Hermann's tortoise
Testudo marginata	marginated tortoise
Emys orbicularis	European pond terrapin
Mayremys caspica	striped-necked terrapin
Lacerta trilineata/viridis	green lizard
Podarcis erchardii	Erchard's lizard
Podarcis muralis	common wall lizard
Ophisaurus apodus	glass lizard
Ablepharus kitaibelii	kitaibel's skink
Salamandra salamandra	fire salamander
Anguis fragilis	slow worm
Chalcides ocellatus	ocellated skink
Typhlops vermicularis	worm snake
Coluber gemonensis	Balkan whip snake
Elaphe quatuorlineata	four-lined snake
Elaphe situla	leopard snake
Natrix tessellata	dice snake
Malpolon monspessulanus	Montpellier snake
Telescopus fallax	dice snake
Vipera ammodytes	nose-horned viper

Birds

Accipiter nisus	sparrow hawk
Buteo buteo	buzzard
Aquila chrysaetos	golden eagle
Falco subbuteo	hobby
Falco tinnunculus	kestrel
Pernis apivorus	koney buzzard
Coturnix coturnix	quail
Alectoris graeca	rock partridge
Rallus aquaticus	water rail
Scolopax rusticola	woodcock
Larus cachinaus	gull
Columba palumbus	wood pigeon
Streptopelia turtur	turtle dove
Streptopelia decaocto	collared dove

Cuculus canorus	cuckoo
Otus scops	scops owl
Athene noctua	little owl
Strix aluco	tawny owl
Caprimulgus europaeus	night jar
Apus pallidus	pallid swift
Apus melba	alpine swift
Alcedo atthis	kingfisher
Upupa epops	hoopoe
Merops apiaster	bee-eater
Jynx torquilla	wryneck
Melanocorypha calandra	calandra lark
Calandrella cinerea	short-toed lark
Galerida cristata	crested lark
Alauda arvensis	skylark
Lullula arborea	woodlark
Hirundo rustica	swallow
Delichon urbica	house martin
Anthus tvivialis	tree pipit
Motacilla alba	pied wagtail
Motacilla cinerea	grey wagtail
Lanius collurio	red-packed shrike
Oriolus oriolus	golden oriole
Sturnus vulgaris	starling
Garrulus glandarius	jay
Pica pica	magpie
Corvus monedula	jackdaw
Corvus corone cornix	hooded crow
Corvus corax	raven
Cinclus cinclus	dipper
Cettia cetti	Cetti's warbler
Hippolais pallida	olivaceous warbler
Hippolais olivetorum	olive-tree warbler
Hippolais icterina	icterine warbler
Sylvia communis	white throat
Sylvia acricapilla	blackcap
Sylvia melanocephala	Sardinian warbler
Syvia cantillans	sub-Alpine warbler
Philloscopus trochilus	willow warbler
Philloscopus collybita	chiffchaff
Regulus ignicapillus	firecrest
Regulus regulus	goldcrest
Muscicapa striata	spotted flycatcher
Ficedula albicollis	collared flycatcher
Oenanthe oenanthe	wheatear
Oenanthe hispanica	black-eared wheatear
Saxicola torquata	stonechat
Monticola solitarius	blue rock thrush
Phoenicurus ochruros	black redstart
Erithacus rubecula	robin
Luscinia megarhynchos	nightingale
Turdus merula	blackbird
Turdus philomelos	song thrush
Turdus viscivorus	mistle thrush
Turdus pilaris	fieldfare
Turdus iliacus	redwing

Parus major	great tit
Parus ater	coal tit
Parus caeruleus	blue tit
Parus lugubris	sombre tit
Aegithalos caudatus	long-tailed tit
Sitta neumayer	rock nuthatch
Certhia brachydactyla	short-toed treecreeper
Passer domesticus	house sparrow
Passer montanus	tree sparrow
Passer hispaniolensis	spanish sparrow
Fringilla coelebs	chaffinch
Coccothraustes coccothraustes	hawfinch
Serinus serinus	serin
Carduelis chloris	greenfinch
Carduelis carduelis	goldfinch
Carduelis cannabina	
Miliaria calandra	
Emberiza cia	rock bunting
Emberiza caesia	Cretzschmar's bunting
Emberiza citrinella	yellowhammer
Emberiza cirlus	cirl bunting
Emberiza melanocephala	black-headed bunting

Mammals

Erinaceus concolor	hedgehog
Talpa caeca	mote
Crocodura suaveolens	shrew
Rhinolophus ferrumequinum	greater horse-shoe bat
Rhinolophus clivosus (Cretschm.)	Cretzschmar's bat
Rhinolophus hippocrepis (Hezm.)	Hezm. bat
Nyctalus noctula	noctule
Pipistrellus kuhli	
Pipistrellus pipistrellus	pipistrelle
Pipistrellus savii	
Myotis emarginatus	marginated bat
Eptesicus (Vesperus) serotinus	serotine
Vespertilio murinus	
Vesperus leucippe Bonar	
Lepus europaeus	nare
Glis glis	fat dormouse
Pitymys duodecimcostatus	
Pitymus savii	savius vole
Microtus nivalis	snow vole
Apodemus sylvaticus	wood vole
Apodemus flavicollis	yellow-necked mouse
Apodemus mystacinus	mouse
Mus musculus	house mouse
Rattus rattus	ship rat
Vulpes vulpes	red fox
Meles meles	badger
Lutra lutra	otter
Martes foina	been marten
Mustela nivalis	weasel

Mammals no longer found in the area
(mentioned by Lindermayer, 1855)

Sciurus vulgaris	red squirrel
Canis lupus	wolf
Canis aureus	jackal
Felis silvestris	wild cat
Felis lynx	lynx
Cervus elaphus	red deer
Dama dama	fallow deer
Capreolus capreolus	roe deer

The main zones and biotopes of the fauna in the area

Since the study area presents markedly different types of relief, vegetation and degree of intensity of human intervention, it may be expedient to divide it into zones which are shown in Figure (1) and which have the following characteristics:

Zone 1.

Description: Slight gradients, with common pines. Parts of the more northerly slopes occupied by mines.

Human Intervention: Several forest roads, timberfelling; grazing of goats; some hunting; northern part of the forest covered by earth excavated from the mine.

Typical Species: (mammals and birds) Ferret, badger, fox, tawny owl, hawk, buzzard, sparrow-hawk.

Evaluation: From an ecological point of view the area is relatively small, and manifold interventions have been responsible for the acute degradationof the area. There is considerable spontaneous regeneration of the vegetation where mining activities have ceased.

Zone 2.

Description: Cultivated zone which also includes Prokopi. Small bog south-east of Prokopi. Cluster of oak-trees to the south of Prokopi.

Human Intervention: This zone has been the most affected by human activities. Mechanisation of agriculture has led to the almost total disappearance of natural hedges between fields. Hunting.

Typical Species: (mammals and birds) Fox, mouse, crow (non-feral species).

Evaluation: The disappearance of hedges which were used as a refuge by many species of animal has reduced the value of the biotope for wild life. However, since the cultivated area is quite small and is surrounded by forests, it serves as a hunting ground for the woodland birds of prey which thus keep a check on the mouse and rat populations. Agricultural exploitation does not leave much room for other uses, but if it continues as it is today, it offers a mixed pine and oak forest, with food for several species of bird which gather in this forest of broadleaved trees, unique in the study area. The restoration of natural hedges, or at least the protection of existing hedges, is to be encouraged.

Zone 3.

Description: Small river with pebbly bed. Continuous flow in winter months; in summer the water flows underneath the pebbles in some places. Stands of very old plane-trees along the river banks.

Human Intervention: The residue from pesticides and organic fertilisers from the surrounding cultivated land reaches the river in the rain water, but only in small quantities as the area under cultivation is not large. Some grazing in the lower vegetation. Pollution from the mines. Litter and nuisance by visitors passing through the area.

Typical Species: (mammals and birds) Otter, ferret. Crows nest in the plane-trees.

Evaluation: Despite various interventions and disturbances (liquid waste, rubbish, timber-felling, removal of sand for construction purposes), the area has not suffered degradation and retains its ecological value. The banks of the river maintain their natural state. However, there is serious danger of degradation in the near future.

Zone 4.

Description: Slopes covered mainly in Aleppo pines. Numerous openings in the forest, paths and woodland tracks. Cluster of black pines at the highest point and expanses of sparse and dense bushes.

Human Intervention: Continuous grazing (flocks of sheep and goats, free-grazing cows) and felling of timber for firewood have kept the openings in the forest and the paths clear. A certain amount of hunting. More intensive intervention around the village. Mine in the northern part of the zone. Several forest tracks.

Typical species (mammals and birds): Ferret, badger, fox, tawny owl, sparrowhawk.

Evaluation: This zone is a typical example of the long co-existence of man and the highland forests. The grazing herds help to maintain openings in the forest, taking over the role of the wild herbivores which have now disappeared from the area and indirectly benefiting many species of animal which are not really native to the forest. Grazing is not carried out so intensively as to result in serious damage to the regeneration of the forest, but there is no doubt that it prevents the biotope from being restored to its natural state. This is the most suitable zone for tourist development since it offers both easy access and an attractive environment.

Zone 5.

Description; Steep gradients of moderate height above sea level, with mainly pine forests and scattered rock outbreaks which go up as far as the hardly accessible rocky peak of Mount Kandili.

Human Intervention: Goat grazing. A little timber-felling on lower ground. Hunting.

Typical Species (mammals and birds): Golden eagle, crow, tawny owl, sparrowhawk, rock partridge, ferret, fox.

Evaluation; The ridge and the steep faces of Mount Kandili constitute the most important area in Northern Evvia for birds of prey, because of the abundance of rocks and the inaccessibility of the area. This zone represents a small but substantial part of the territory of a pair of golden eagles (and probably of other birds of prey). Important features of the area are as follows:

- there is no road to interrupt the continuity of this biotope,
- the forest lies on an extremely steep slope and could be considered as a soil protector, and
- dead goats from the herds are from time to time a source of food for the golden eagles. The basic objective in this zone should be the conservation of this special ecosystem and area of natural beauty. No works should be carried out which would change the appearance of the zone, and the number of public footpaths should be restricted.

Zone 6.

Description: Steep gradients with large talus fans. Scattered bushes and a few trees.

Human Intervention: Grazing by goats. Probably some hunting.

Typical Species (mammals and birds): Golden eagle, crow, rock partridge, ferret, fox, rock mouse.

Evaluation: Main habitat of the partridge, and chief golden eagle shooting area, same as Zone (5). The planned coastal road will make this zone accessible to hunters.

Zone 7.

Description: Wide strip of moderately dense forest of Aleppo pine. Smooth beach with rocks and shingle alternately.

Human Intervention: Possibly some grazing. Area accessible only by boat. Formerly used for collection of resin.

Typical Species: (mammals and birds): Fox, ferret, tawny owl

Evaluation: The natural inaccessibility of this area has protected it from human intervention for many years, and this renders it of particular ecological value. The opening of a coastal road or any other form of tourist development would result in the total destruction of this valuable asset.

Protected Zones

The aim in creating a natural park is to protect and promote the integrated development of the area. In order to achieve this it is essential that certain restrictions be placed on human activities in the area, especially in the most ecologically sensitive zones. The effective enforcement of regulations concerning the protection of the area is a pre-requisite for maintaining the ecosystems in good condition, which in turn represent the most important natural resource as far as tourist development in the area is concerned. The wise exploitation of the most important ecological zones, therefore, is an essential element in the design and maintenance of the natural park. The following main zones of protection have been identified based on observations made (see Diagram 1):

Ridge (Zones 5 and 6): The most important protected zone, it includes the area along the ridge, the surrounding rocky areas, the sparse pine forest extending as far as the mixed forest and the steep western slopes of Mount Kandili. The area contains the nest and a large part of the territory of some golden eagles (one of the most endangered species of birds of prey in Europe). Other important species are the kestrel (Falco tinnunculus) and the raven (Corvus corax). Cretzschmar's bunting (Emberiza caesia) and the rock bunting (Emberiza cia) are also typical examples of the ornithology in the area, and most species of reptile are to be found there, including the common wall lizard (Podarcis muralis), the nose-horned viper (Vipera ammodytes) and the Montpellier snake (Malpolon monspessulanus). This zone also contains many of the rare species of plant to be found in the area.

It is proposed that restrictions should include reduction and control of public access to the area and the

prohibition of hunting, grazing, timber-felling and the picking of wild flowers and plants; it is also recommended that there should be no road construction in the area.

Western slopes (zones 6 and 7): It is recommended that hunting, wild plant collection, grazing and timber-felling should be prohibited, and that no road should be constructed along the coast or anywhere else in the area. Coastal access by boat should be regulated.

Oak forest near Prokopi (Zone 2): This is the only part which remains of the old -predominantly oak- forest in the area, and it is of considerable importance to the wild fauna throughout the year. It is an important habitat for the long-tailed tit (Aegithalos caudatus), the thrush and other passerines. Another characteristic species is the sparrowhawk (Accipiter nisus), and there are numerous examples of skink (Ablephorus kitaibelii) in the area. It is recommended that timber-felling, grazing and hunting be prohibited.

River Kereus and its banks (Zone 3): The area should be protected both because of its beautiful scenery and because it is the habitat of offers (Lutra lutra). The otter is a protected species which is in danger of disappearing from Central and Western Europe. There is no doubt that it is one of the rarest species of mammal in the Prokopi-Dafnoussa estate, and its presence in the River Kereus is an extremely important factor for its survival in the whole of Evvia. Because of its sensitivity to the degradation of the biotope, pollution and human disturbance, the otter may be considered as an indicator (key species) with regard to the ecosystem of the river. Measures taken to conserve a healthy otter population would therefore benefit the river and riverside environment as a whole. The main threats at present and in the immediate future lie in the destruction of the riverside vegetation, pollution from the mines and from litter, and too many visitors.

Measures proposed for this zone are as follows: there should be no felling of plane-trees and no intervention in the riverside vegetation: procedures for treating the waste from the mines should be improved, with the use of settling tanks; ways should be sought of preventing pollution from litter; no permanent installations, such as a campsite, should be permitted near the river, and no overnight camping should be allowed; the numbers of visitors to the area should be restricted and control exerted over their behaviour which may be detrimental to the environment.

There are other areas of considerable ecological value, such as the mixed wood close to and above the Venetian Fort (habitat of many species of passerine); the maquis and the mixed forest near the fire-watch tower and forest ringroad; and the hedgerows between the various cultivations in the valley. Both in these areas and in the study area as a whole, activities which threaten the ability of the biotopes to function, cause degradation of the landscape, etc., should be stopped or kept to a minimum.

Creation of an Arboretum

The creation of an arboretum (a botanic garden of trees and shrubs) would be a major attraction for visitors to the area and a unique sight-seeing feature in Greece. A suitable area for this garden is marked on the map, to the north of the village of Prokopi. Stands of all the species of tree in the area could be planted, each stand consisting of three trees (e.g. pinus halepensis, pinus nigra, abies cephalonica, quercus pubescens, pinus pinea, populus tremula, cercis siliquastrum, etc.), together with examples of all the bushes and shrubs (e.g. arbutus unedo, arbutus adrachne, pistacia lentiscus, pistacia terebintus, etc.) This should all be carried out without affecting the existing mossy vegetation, which is also of considerable interest. The stands of trees should be planted fairly sparsely, bearing in mind their ultimate size when fully-grown.

Possibilities of Reintroduction of Species

Since the reintroduction of carnivorous animals presents different kinds of problems and complications from those of reintroducing herbivores, these two categories will be examined separately. It must be said, however, that the reintroduction of a species is significant only as an experiment or as an intervention for the establishment of organised hunting in the future, as the average visitor hardly ever manages to see the wild animals of an area, even if he stays there for several days.

A) Herbivores

As animals which feed on the primary production of an area (i.e. plants), herbivores can exist in dense populations and do not come into major conflict with indigenous populations, the only possible exception to this being the competition for grazing material with goat and sheep herds. Since, however, herbivore populations are in their natural state checked by natural enemies there would have to be some artificial form of control as a substitute for the actions of carnivorous animals which are non-existent in the area, if over-population by herbivores and the over-grazing of the forest are to be avoided. This control could be exercised through hunting, either by organised groups of hunters or by local poachers. Moreover, the aim of forest management should be to create better conditions for the survival of these animals, and probably also to reduce the number of domesticated animals using the area: this would have repercussions on the area's economy and --most likely-- on the diet of the golden eagles, since the various species of deer do not use expanses which are quite bare.

Some of the rules which should govern the management of the area are presented below:

a) The majority of herbivores --particularly various species of deer-- prefer forests with a varied structure, that is, with alternating densely-wooded and open sections which are suitable for providing both shelter and food: development of the forest should therefore create these conditions.
b) Watering-places should be provided as herbivores need a lot of water to digest their food; it should be near at hand so that in their search for it they do not have to encroach on the territory of other animals.
c) Food, water and shelter should alternate if territories are to be kept small, and consequently the density of the animal population high.
d) During prolonged spells of bad weather, when deep snow prevents the animals from seeking for food, some trees should be cut down near where they are sheltering so that they do not die of starvation. Dropping straw from a helicopter is not effective, as deer have difficulty digesting food that is rich in cellulose but poor in protein. ("If deer are to survive", W. Dasman, 1971). If, however, the presence of some deer is desired for visitors to see, then the easiest and most effective solution is, without doubt, an enclosed area. Some deer could live in the wild within a large enclosed area (e.g. 300 m^2), where they would be fed and where visitors could watch them from a vantage point, such as a high lookout tower. This method would simplify their conservation and solve the problem regarding management of the forest and the artificial control of the population. Deer from the Parnitha reserve, red deer from the reserves on Parnitha and in Northern Evvia, wild boars (there are some examples in Florina Zoo, and elsewhere) and even wild goats (rupicapra rupicapra, from Bulgaria) could be used for this project.

B) *Carnivores*

As animals which live on meat, that is, the secondary production of an area, carnivores populate the area sparsely. Since they are also more cautious than herbivores, it is almost impossible for the average visitor to see them; there is therefore no point in reintroducing them into an area, except for ecological reasons. The reintroduction of the wolf or the lynx into the study area would cause numerous problems for local animal breeders, and create a negative climate with regard to the area to be protected; it is therefore considered to be impracticable. Only the reintroduction of the wild cat, which represents no danger to stock breeding, could be considered, but this, too, would be a costly procedure, and it would have to be determined whether catching a few pairs of cat on mainland Greece or ordering some from abroad is really worthwhile, since the wild cat is not a rare species in Greece, nor does the study area suffer from a lack of carnivorous animals. (There are foxes, ferrets, badgers, stoats and otters in the area.) On the other hand, keeping large carnivores in semi-captivity is relatively easy and of considerable value to the education and enjoyment of the visitors. A pack of wolves could be kept in almost their natural, wild state (with their food provided) in an enclosed area of, for example, 200 X 500 metres, and visitors could observe them from hidden lookouts (B. Hallmann and F.Studer, personal contact). It should be remembered that the wolf has a particular attraction (as ascertained in personal observations at Athens and Thessaloniki Zoos) compared with other European animals, and frequent references to it in Greek mythology and popular traditions show how closely it is associated with the country's civilisation.

(Wolves could be obtained by taking the litters from animals already kept in the National Garden in Athens). The lynx, which prefers to remain hidden much of the time, is an anti-social animal, and as such does not

offer the same behavioural variety of interaction with other members of the species as the more sociable wolf. It can therefore be kept in a much smaller area. Lynxes could be imported from abroad (e.g. Germany) where they have been successfully bred. Bears which have been confiscated by the Ministry of Agriculture from bear-trainers could also be kept in an enclosed area, following the implementation of relevant protection laws. This will help to promote the protection of this large mammal, which is an endagered species, and will at the same time provide a major additional pole of attraction for visitors to the area. The bears showed be allowed to move about freely within the enclosed area, but should be shut up in their cages by turn so as not to create a problem of overcrowding.

One species considered to be highly suitable for introduction into the area is the river crayfish (Astacus fluviatis, or Astacus astacus), which would have no diffuculty surviving in the water of the River Kereus since pollution is negligible.

APPENDIX III: REPORT ON THE QUALITY OF THE RIVER KEREUS

Description of the river

The sources of the river are to be found somewhere in the ravine which lies alongside the main road from Chalkis to the north of Evvia, approximately 9-10 km before Prokopi (Diagrams 1 and 2). There is very little water at the beginning: it starts as a stream, then about 4 km before Prokopi it becomes a small river, meandering alternately to the right and left of the main road until 7 km from Prokopi (42.5 km from Chalkis), from which point on it stays on the right-hand side of the road until it passes beyond the boundaries of the Prokopi-Dafnoussa estate. Observations were made on 5th-6th December 1987 and 7th-8th May 1988. Estimates are based on the first of these visits and are merely approximate indications of the rate of flow.

At a point 47 km from Chalkis (where the river now has a flow of roughly 0.2 -0.25 m^3/sec.), there is a bridge across the river to serve the road leading to the mines at Gerorema, Plakarias and Mouritsa. The bridge has collapsed and is now partially submerged, forcing vehicles crossing it to drive through the water.

A little lower down, the river bed gradually begins to widen, continuing to do so until about 100 -150 metres before the boundary of the Prokopi community. Thereafter it begins to narrow once more, and by the time the river passes the community sports ground (49.9 km from Chalkis), it is between 1- 15 metres wide. As the river widens, the volume of water gradually lessens, probably flowing through the shingle on the bed until it disappears altogether somewhere below the bridge carrying the road to Pili, reappearing near the sports ground and resuming normal flow a few hundred metres further down. Thus there appears to be a break of approximately half a kilometre in the river's course.

Roughly 1.5 km after Prokopi (50.9 km from Chalkis), there is a very picturesque suspension bridge across the river. At this point the flow is estimated at 0.2 m^3/sec. 51.3 km from Chalkis, a small tributary joins the river from the left, with a flow estimated at 0.1 m^3/sec.

Half a kilometre after the confluence of this tributary with the river, there is a sharp drop in the water level of about two metres caused by a two-stage dam approximately 20 metres in width. About 200 metres below the dam (52 km from Chalkis), a tributary from the area of the mines, with a flow of approximately 0.05 m^3/sec, enters the river from the right. The flow of water after this confluence is estimated at 0.6 m^3/sec. Finally, 53.7 km from Chalkis, the water flows (under conditions of no rain) beneath the road to the mines.

The whole water-course is lined with broad-leaved trees, mainly plane-trees; sometimes, in its narrower reaches, it is fast-flowing, while at others, where it opens out, it scarcely moves at all, presenting an idyllic rural picture.

Quality of the water

No activity is carried out within the drainage basin of the river, or at least the nature and extent of those activities that do exist are not considered to be such as to pollute or contaminate the river. The village of Prokopi disposes of its liquid waste into dead wells which are emptied by a local sewage tanker, which in turn discharges the contents of the dead wells outside the drainage basin. Investigations have shown, however, that sometimes the tanker discharges onto the rubbish dump which is 1.5 km from the river, at the side of the road to Pili. Yet neither the rubbish dump itself nor any periodic discharges from the tanker appear to give rise to any potential hazard regarding pollution of the river. Should any possible pollution from the dump reach the river after heavy rain, it would not present any problem as the volume of river water would at the same time be increased.

There are two basic causes for the deterioration of the natural beauty of the river: rubbish, and the run-off from the mines.

Rubbish

Throughout the length of the river as it passes through the estate, and particularly along the section that inclines towards the village of Prokopi, there is litter of every kind (mainly plastic bags) lying around on the banks or hanging from the lower branches of the dense vegetation, causing gross deterioration of the landscape. This litter is left on the banks and in the river itself by the residents of Mandoudi and Prokopi, who are impatient to get rid of it and unwilling to wait for the local rubbish collection service, which by all accounts is an extremely efficient one. The proximity of the road to the river has greatly facilitated the establishment of this habit as a permanent one. The contribution of litter left by tourists and visitors to the area represents only a small part of the problem.

Run-off from the Mines

Two main sources of run-off from the mines into the river were identified. In both cases this consists of drainage from the sedimentation ponds in which the liquid waste from the mines deposits part of the particulate matter which it carries. The first occurs 47 km from Chalkis, beside the ruined bridge with a rate of flow of 50 l/sec., and is probably the main reason for the signs of slight eutrophism in wider reaches of the river. The second source of run-off occurs 52 km. from Chalkis, and comes from the mine at Paraskevorema. While this run-off does not contain any organic pollutant load, it does have high concentrations of suspended inorganic particles which have resulted in sedimentation on the river bed. This sedimentation (orangey-brown in colour) is the cause of the aesthetic deterioration of the river for quite a distance towards its estuary, particularly in stretches between points 47 and 49 km from Chalkis (where the water disappears underground), and from 52 km from Chalkis to beyond the boundaries of the study area.

Table 2 shows the results of the measurements made. When the first visit was made, it was raining and the water temperature was 13^0 C, while the second visit took place on a warm, sunny day and the water temperature was 18^0 C.

TABLE (2) SHOWING RESULTS OF ANALYSES OF WATER FROM RIVER KEREUS

Sampling point	1	2	3	4	5	6	7
Type of Identification							
Estimated rate of flow (m^3/s)							
12.87	0.2	0.1	0.35	0.4	--	0.6	--
5.88	0.2	0.1	0.3	0.4	--	0.5	0.05
Disolved oxygen (mg/l)							
12.87	8.6	10.0	10.5	9.3	--	9.5	--
5.88	7.8	9.5	10.5	9.8	--	9.5	9.6
Conductivity ($\mu S/cm^2$)							
12.87	330	460	370	400	--	420	--
5.88	430	580	480	495	--	510	790
Probable no. of colibacilli (MPN/100ml)							
12.87	49	11	33	8	--	13	--
5.88	350	920	430	110	--	180	240
Probable no. of coliforms (MPN/100ml)							
12.87	49	11	33	8	--	13	--
5.88	38	70	70	49	--	49	14

Sampling Points:

1: A little before the ruined bridge (50.5 km.)
2: In a tributary of the Kereus shortly before it joins the main river (51.3 km.)
3: After the confluence of the tributary and the Kereus (51.3 km.)
4: After a small cataract where the water falls from a height of 2 metres (51.8 km.)
5: Run-off from Paraskevorema mine (52º km.) with rate of flow 0.05 m^3/sec. (no sample taken)
6: Further down from run-off from Paraskevorema mine
7: Run-off from Gerorema mine before it enters River Kereus.

Identification of water quality

In order to determine the quality of the water samples taken at five or six different points were made for dissolved oxygen (both in situ, using a scavenger, and after removal to the laboratory), conductivity (in situ), and colibacilli and coliforms (in the laboratory). The points at which samples were taken were selected so as to provide a representative picture both of the state of the river and of the effect the quality of the water might have on various possible areas of degradation.

It was observed that the flow of water steadily increases to a rate of roughly 0.6 m^3/sec even without the added flow from joining tributaries. This is because there are influxes of water from the subsoil along almost the whole length of the river. With a saturation point of 10 mg/l dissolved oxygen, the measurements of over 8.6 mg/l which were found are considered to be satisfactory. (With less than 5-6 mg/l dissolved oxygen, it could be said that the water begins to suffer degradation.) The conductivity readings were considered to be normal for surface water.

Conclusions and Recommendations

It may be concluded from the above data that the water in the River Kereus is in very good condition. No major differences appear in the quality of the two samples of water taken. The increased number of colibacilli (a sub-category of coliforms) would seem to be normal, considering the second sample was taken in warm, dry weather. The microbic readings taken on the second visit appear to be reliable, although the microbic load of colibacilli in the first sample seems rather high compared with that of coliforms, which is normal. The first sample should therefore not be considered as completely reliable as far as the colibacilli reading is concerned. However, the degree of microbic pollution must be considered fairly good on the whole, and the water of the River Kereus may therefore be used for swimming, as it is, and for drinking-water, after appropriate treatment.

The problem of litter on the river-bed could be partially overcome through appropriate programmes to enlighten the local residents. This would entail a continous and long-term effort which should be extended to include school-children.

The problem of rubbish could also be alleviated by placing suitable receptacles at points where visitors gather, with a regular rubbish collection provided by the community.

The run-off from the mines should be the subject of a special study and be dealt with separately, although it does not appear to be the main cause of the problem.