

Fagotto F. 1985. Larger animals of Somalia in 1984. *Environmental Conservation* 12(3):260-4.

Keywords: 1SO/Acinonyx jubatus/Africa/Caracal caracal/cheetah/distribution/East Africa/Felis silvestris lybica/habitat/hyena/Leopard/Leptailurus serval/lion/Panthera leo/Panthera pardus/ poaching/status

Abstract: The critical situation of the big cats in Somalia is presented. According the author, the cheetah has been almost exterminated in Somalia, although it was once widely distributed in the country. The poaching for the animal skin is cited as a disappearance cause.

L'auteur présente la situation critique des grands félins en Somalie. Selon l'auteur, le guépard a quasiment été exterminé en Somalie, alors qu'il était autrefois largement distribué dans tout le pays. Le braconnage pour la vente des peaux de l'animal est cité comme l'une des causes de disparition.

to influence how things are done, are not luxuries but necessary parts of our well-being. The respondents, as had done others before them, highlighted the importance of having a chance to be involved. They were also aware of the relationship between this satisfaction and conservation behaviour.

*Luxuries, and the independence of satisfaction from them:*—In each study, a satisfaction-from-luxuries dimension was identified that focused on the pleasures gained from having the comforts and conveniences of modern society. This dimension reflects the satisfaction which people experience in being a member of a thriving community—participating in the good life.

In a hasty analysis, one might conclude that satisfaction gained from luxuries is the direct opposite of the other satisfactions. Yet in all three studies all satisfaction-dimensions have had similar mean scores, and the luxuries dimensions have had generally positive and always very low correlations with the other satisfaction-dimensions. This suggests that satisfaction from luxuries is not the antithesis of satisfaction from frugality or participation.

Furthermore, there has been a lack of significant relationships with any of the conservation behaviours studied. This supports the idea that there is no conflict between a life-style of modern convenience and comfort, and behaving in an ecologically responsible manner. Together, these findings suggest that environmentally appropriate activities might be made to appeal to a broad cross-section of North Americans (the well-off and disadvantaged alike) rather than just to people of a Spartan nature.

### Conclusion

One must avoid equating quality of life or sense of well-being with economic standard of living. The North American public is concerned about intangible as well as tangible indicators of well-being. In fact, a shift towards deriving one's well-being from intangible resources would seem an adaptive response to a people-rich but concomitantly resource-poor world.

Despite the common-sense nature of these findings, their application to the plight of the disadvantaged is often overlooked. Clearly, human well-being can be increased in many non-economic ways. Due to the plurality of human satisfaction, people have the potential to improve their quality of life even if they have difficulty in moving rapidly up the economic ladder. For this potential to be realized, however, people must be able to become involved in their environment: they must be able to take actions, to explore, and to experiment, on a daily basis. They must, in short, experience the environment as supportive of their concern to participate and always avoid wastefulness.

Fortunately, the urban environment can be designed and managed in ways that enhance environmental supportiveness (Kaplan, 1983). In fact, creating supportive environments may be vital, in terms of equity and justice, for those of limited resources, as it provides alternate routes to a satisfying existence.

### Acknowledgements

Partial funding for this research was provided by the Horace H. Rackham School of Graduate Studies and the University of Michigan Office of Energy Research (Project No. 65).

### REFERENCES

- ANDREWS, F. & WITHEY, S. (1976). *Social Indicators of Well-being in America*. Plenum Press, New York, NY, USA: xxi + 455 pp., illustr.
- CAMPBELL, A. (1981). *The Sense of Well-being in America: Recent Patterns and Trends*. McGraw-Hill Book Company, New York, NY, USA: xiii + 263 pp.
- CAMPBELL, A., CONVERSE, P.E. & RODGERS, W.L. (1976). *The Quality of American Life: Perceptions, Evaluations, and Satisfaction*. Russel Sage Foundation, New York, NY, USA: xi + 583 pp., illustr.
- CONE, J. & HAYES, S. (1980). *Environmental Problems/Behavioral Solutions*. Brooks/Cole, Monterey, California, USA: xvi + 284 pp., illustr.
- DEYOUNG, R. (1984). *Some Psychological Aspects of Resource Conservation: The Role of Intrinsic Motivation in Recycling*. (Ph.D. dissertation in Urban, Technological and Environmental Planning, University of Michigan, Ann Arbor, Michigan.) University Microfilms International, Ann Arbor, Michigan, USA: ix + 120 pp., maps.
- DEYOUNG, R. & ROBINSON, J. (in press). Some perspectives on managing water demand: Public and expert views. *Canadian Journal of Water Resources*, 9(4).
- GELLER, E.S., WINETT, R.A. & EVERETT, P.B. (1982). *Preserving the Environment: New Strategies for Behavioral Change*. Pergamon Press, New York, NY, USA: xvii + 338 pp., illustr.
- HARRIS, L. (1977). *The Harris Survey*. Louis Harris and Associates, Inc. (Column subscription ISSN 0046-6875, May 23, 1977). [Not available for checking.]
- INGLEHART, R. (1977). *The Silent Revolution*. Princeton University Press, Princeton, NJ, USA: xii + 482 pp., illustr.
- KAPLAN, S. (1983). A model of person-environment compatibility. *Environment and Behavior*, 15(3), pp. 311-32.
- KAPLAN, S. & KAPLAN, R. (1982). *Cognition and Environment: Functioning in an Uncertain World*. Praeger, New York, NY, USA: xiv + 287 pp., illustr.
- SIMMONS, D.A., TALBOT, J.F. & KAPLAN, R. (1984-85). Energy in daily activities: Muddling toward conservation. *Journal of Environmental Systems*, 14(2), pp. 147-55.
- WEIGEL, R.H. (1983). Environmental attitudes and the prediction of behavior. Pp. 257-87 in *Environmental Psychology: Directions and Perspectives* (Eds N.R. FEIMER & E.S. GELLER). Praeger, New York, NY, USA: 356 pp., illustr.
- YANKOLOVICH, D. (1981). *New Rules: Searching for Self-fulfilment in a World Turned Upside Down*. Random House, New York, NY, USA: xxi + 278 pp., illustr.

RAYMOND DEYOUNG, *Research Fellow  
School of Natural Resources  
University of Michigan  
Ann Arbor  
Michigan 48109  
USA.*

## Larger Animals of Somalia in 1984

### Introduction

In 1971, after a three years' stay in Somalia, I wrote my first survey report on the larger fauna of that country (Fagotto, 1971). That was the last year in which hunting was permitted in Somalia; after 31 March very few licences were granted, either for special purposes (scientific re-

searches, dangerous animals, etc.) or limited to particular birds or Warthogs (*Phacochoerus aethiopicus* Pallas).

Now, after spending all of 1984 in Somalia, I wish to sum up the present big-game situation. For this purpose I visited many woodlands, particularly south of Mogadishu (Mogadiscio) cf. Fig. 1, which are familiar to me; for it is in



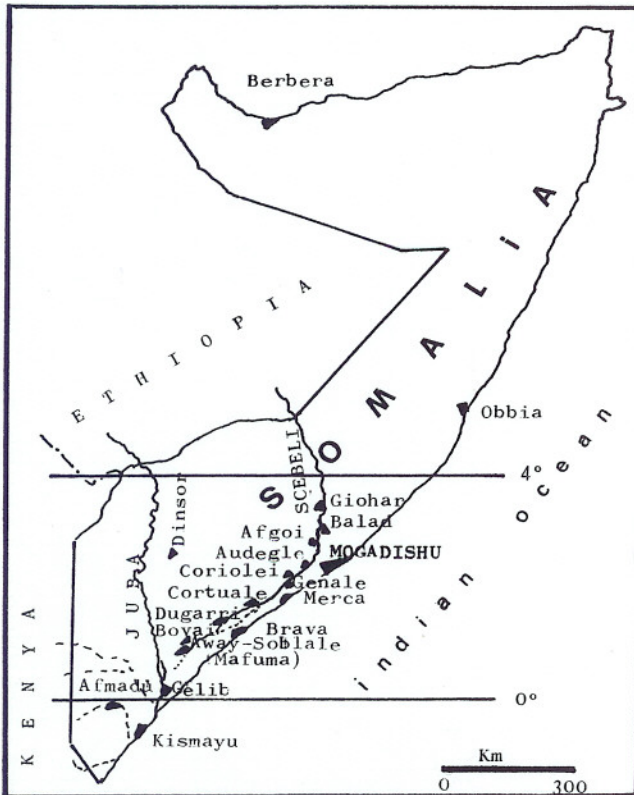


FIG. 1. Sketch-map indicating positions of places mentioned in the text.

the South that most of the big game is concentrated. In addition, I gathered a lot of information from the central and northern regions, and consequently believe I have a brief but reasonably complete picture of the big and medium-sized animals in present-day Somalia.

For some mammals, such as the Elephant and Buffalo\*, whose numbers were calculated in 1974–75 (Fagotto, 1976, 1980), the comparison between the past situation and the present is relatively precise. Even for the other large animals it has been possible to make quantitative estimates that ought not to be far from reality, thanks to the major or minor ease with which they were to be found.

The 'Horn of Africa' is well known to be particularly interesting biologically. The climate is arid to semi-arid, with rainfall normally ranging from 300 to 600 mm per year. The environments become more humid towards the south, where the only two rivers of this region, the Juba (Giuba) and the Scebeli (Shibeli), are situated.

Many different plant communities and types of vegetation are present, including littoral steppe, open xerophilous woodland, dense woodland, riparian forest, hygrophilous savanna, and swamp, often in restricted bands (Marco & Fagotto, 1978). To this great variety of vegetation corresponds a faunistic variety (Drake-Brockman, 1910; Beaux, 1924; Funaioli & Simonetta, 1967; Funaioli, 1971). Unfortunately, some animals have a restricted habitat and others gravitate along the two rivers Juba (Giuba) and Scebeli (Shibeli), which offer the very environments that are among the most-needed for agricultural programmes. Vast expanses of woodlands have been desecrated (near Balad, Merca, Coriolei, Cortuale, Soblale, etc., cf. Fig. 1), while others are subject to heavy cutting or overgrazing.

But the worst harm to the large animals has been done by poaching, which has become increasingly active in recent years in all Somali territory—in spite of the efforts of local authorities to eradicate it.

The scientific nomenclature in this communication is mostly according to Grzimek (1969), though in some cases Dorst & Dandelot (1972) or Scaramella & Scaramella (1975) have been followed.

#### *Elephant, Rhinoceros, and Buffalo*

As has happened in other African countries, the Elephant (*Loxodonta africana africana* Blumenbach) was the wild beast most sought-after by poachers. In 1975, according to my estimate (Fagotto, 1976), some 3,000 Elephants were living on Somali territory, but nowadays I can state that this majestic animal has almost disappeared from Somalia.

There are no more Elephants in the woodlands of Giohar, Balad, Afgoi, Genale, Coriolei, or Cortuale. Even further south, near Dugarri, Soblale, and Away (about 170–200 km from Mogadishu), the Elephant has disappeared or it is extremely rare to meet a single specimen, whereas in all those localities some years ago could be found herds of 10–40.

In the lower Juba, beyond this River and near the Kenya border, the Elephant is now very uncommon, though there was a slight improvement last year. Thus some Elephants have been recorded, in different woodlands, near the Mafuma swamps (lower Scebeli), Gelib (lower Juba), and near the Kenya border, presumably coming from that country. But it seems that at present, in the whole Somali territory, there remain only a few hundred Elephants at the most.

The widespread extermination which has taken place is also testified to by the large quantity of ivory that circulates illegally in Mogadishu. From the examination of this ivory it has been found that baby Elephants had been slaughtered too.

The price of raw legal ivory is about 2,000–3,000 Somali Shillings per kg; carved ivory weighing about 100 g is sold for 500–800 So Sh (November 1984). The price of illegal ivory is reduced by one-third.

The Black Rhinoceros (*Diceros bicornis* L.) is by now to be considered as exterminated in Somalia, at least for the last 20–25 years. I have no direct observations of this animal, but apparently two examples may have been sighted two years ago between Dinsor and the lower Scebeli, in the thick woodlands of the right bank of that River.

The Cape Buffalo (*Synceus caffer caffer* Sparrmann) has still the same distribution which I mapped in 1975 (Fagotto, 1980). This big animal occupies the most inhospitable woodlands and the hygrophilous savannas along the lower courses of the two Somali rivers. The territories are infested by tsetse flies, which prevents competition with domesticated animals (including Camels). The vitality of the Buffalo population is still good in many places of suitable habitat—largely because it offers little interest for poachers and is a rather difficult- and dangerous-to-acquire source of meat.

#### *Hippopotamus, Warthog, and Bushpig*

The Hippopotamus (*Hippopotamus amphibius* L.) is still present in the two main rivers of Somalia, and I have observed groups of 4–6 in the lower Scebeli (Giohar, Genale, etc.). Along the Juba they are more numerous. Nevertheless the reduction in numbers of this unique animal is evident. It is slaughtered by poachers, who gain for its fangs some hundreds of Somali Shillings, as well as by farmers because of the damage it may cause to cultivations.

\* See below for taxonomic determinations.—Ed.





FIG. 2. Warthogs in the littoral steppe.

The Warthog (*Phacochoerus aethiopicus* Pallas) is certainly the most widespread and common large animal in Somalia. Its remarkable abundance is due to the fact that Somali people, being Muslim, disregard this animal. Consequently it is findable in groups of up to 10–15 head in practically all the Somali territory—even in very dry bushlands (Fig. 2). Yet, since ivory became less abundant, large quantities of Warthog tusks have appeared in the shops of Mogadishu.

The Bushpig (*Potamochoerus porcus* L.) is also common in its habitat, which is limited to the strips of dense thicket near the cultivations along the lower Scebeli and Juba Rivers.

#### Zebra, Wild Ass, and Giraffe

Burchell's Zebra (*Equus burchelli bohmi* Matschie), which once was distributed beyond the lower Juba, can be considered totally exterminated for many years, while the same can be said of Grevy's Zebra (*Equus grevyi* Oustalet). Thus I could never see any trace or hear anything about the presence of these two splendid mammals.

The Somali Wild Ass (*Equus asinus somalicus* P.T.Sclater) still lives in the northern regions of Somalia, but in limited numbers. I am unable to judge whether this species has been affected by interbreeding with feral donkeys, as some Authors have suggested (e.g. Dorst & Dandelot, 1972).

The Reticulated Giraffe (*Giraffa camelopardalis reticulata* De Winton), a wonderful spectacle of Nature, has suffered a decline of population and become rather rare. Thus near Away, where a few groups could formerly be found, it has now completely disappeared. However, groups of a few head have been recorded from beyond the Juba River.

#### Antelopes, Duikers, Oribi, Gerenuk, and Dibatag

The Greater Kudu (*Tragelaphus strepsiceros* Pallas) is nowadays extremely rare in Somalia, though a few specimens can still be found in the northern semi-arid regions.

Widely distributed are the Lesser Kudu (*Tragelaphus imberbis* Blyth) (Fig. 3) and the Gerenuk (*Litocranius walleri* Brooke), but both are strongly reduced in number because of intense poaching activity. Whereas it is still not difficult to observe these two elegant antelopes in the open *Acacia* woodlands of the lower Scebeli and Juba, or in the central regions of Somalia, they are no longer findable near Balad, Afgoi, or Audegle, where some years ago they were common.

The Bushbuck (*Tragelaphus scriptus* Pallas), the Grey Duiker (*Sylvicapra grimmia* L.), and the Oribi (*Ourebia ourebi* Zimmermann), are not easily found in their habitat, along the thick woodlands of the lower parts of the two main rivers. However, the Red Duiker (*Cephalophus na-*



FIG. 3. Bushland with two Lesser Kudu.

*talensis* A. Smith) still inhabits the woodlands along the lower Juba.

The Common Waterbuck (*Kobus ellipsiprymnus* Ogilby) and the Topi (*Damaliscus korrigum topi* Blaine), once numerous in the vast hygrophilous savannas near the lower Juba and Scebeli, have both undergone severe reductions in numbers. The same can be said for the Beisa Oryx (*Oryx beisa* Rüppell). Some years ago it was widely distributed in the open dry bushlands, but now this magnificent antelope has disappeared from Giohar, Balad, Afgoi, and Genale, and it is very uncommon and patchily distributed in other dry bushy plains of Somalia.

Nowadays the waterlogged plains near Cortuale, Dugarri, Bovai, and Soblale, are almost devoid of large mammals, as a result of poaching and human settlement.

Hunter's Hartebeest (*Damaliscus hunteri* Sclater), a species which has a very restricted range near the border with Kenya, is on the verge of extinction, so that it becomes more and more difficult to find this animal.

The Dibatag (*Ammodorecas clarkei* Thomas) is still widely diffused north of the Scebeli River, though in the northern regions it has been very substantially reduced. In the central part of Somalia it is still possible to observe groups of 2–4 head, browsing on *Commiphora* sp. bushes, though unfortunately this gracefully-built species, limited to the Horn of Africa, is becoming an illegal object of intense shooting.

#### Dik-dik, Klipspringer, and Beira

Dik-diks have always been abundant in Somalia, represented by various species (*Rhynchotragus kirki* Günther, *R. guentheri* Thomas, *Madoqua swaynei swaynei* Thomas, *M.s. piacentini* Drake & Brockman, and *M. phillipsi* Thomas). Thus it was very common a few years ago to see these small antelopes in the bushlands, dashing away with their characteristic zig-zag leaps, and to hear their shrill whistle. Now, however, as a result of their being captured with nets, it is unusual to encounter them.

From the news I have gathered it seems that the Klipspringer (*Oreotragus oreotragus* Zimmermann) is still findable in the rocky hills of the extreme northern territories of Somalia, but with only a patchy distribution. This depends not only on its particular habitat but also on the active shooting of which it is an object in this region, along with the Beira (*Dorcatragus megalotis* Menges). This latter species, unmistakable for its large ears, inhabits the dry stony barren hills of North Somalia. Being limited to this territory and to the Ethiopian part of the Horn of Africa, the drastic reduction in numbers that this small antelope is undergoing may become extremely serious.

#### Gazelles

Pelzeln's Gazelle (*Gazella pelzelni* Kohl), limited to stony plains and desert lowlands of the extreme North



Somali coastline, is another species for which I am seriously worried. It is much reduced in number in its Somali range, and outside the country is findable only on the borders with the Republic of Jibouti and with Ethiopia.

Grant's Gazelle (*Gazella granti* Brooke) inhabits southern Somalia south of the Juba River as far as the Kenya border. In those woodlands some ten years ago it was very common to meet groups of 10–15 head; but now, greatly reduced in numbers by poachers for its meat, this large Gazelle is quite uncommon.

Soemmering's Gazelle (*Gazella soemmeringi* Cretzchmar) has a wide range north of the Scebeli River, but even this species has suffered a severe diminution in number. Thus whereas the open dry bushlands some ten years ago frequently offered me the spectacle of herds of 15–30, such a spectacle is now rare.

Speke's Gazelle (*Gazella spekei* Blyth) is one of the few species which has suffered from a reduction in number in recent years in only a limited way. It is still common north of Mogadishu, along the coastline, in the bare steppe, in the stabilized dunes (Fig. 4), and in the stony hills of the northern regions.

It was very pleasant for me last year, when going from Mogadishu towards the north, to meet the first group of 18 head at 25 km from that city, in the same area in which I had found this small Gazelle in 1975 (Fagotto, 1979).

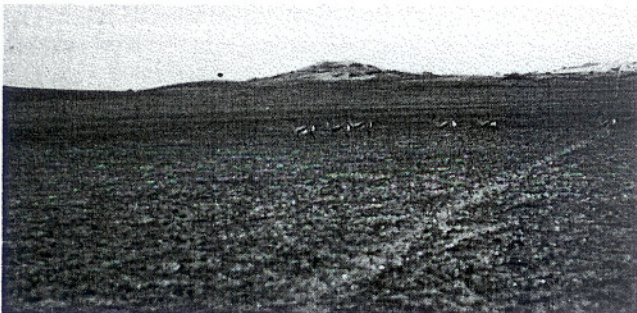


FIG. 4. Stabilized duneland with Speke's Gazelle.

#### Lion, Leopard, Cheetah, and Serval

All the big felines have declined to a great extent over these last few years in Somalia, especially as poaching activity against them has been very intensive. The local Lion (*Panthera leo somaliensis* Hollister) is the one which has suffered least. Although I found this powerful flesh-eater in different woodlands, it is now considerably localized throughout its range, which includes a large part of Somalia. The territory where the Lion is most easily found remains along the lower Juba and the lower Scebeli.

The Leopard (*Panthera pardus* L.) and the Cheetah (*Acinonyx jubata* Schreber) have been almost exterminated in Somalia. To find traces of these animals has become very difficult, though once they were widely distributed in all the Somali territory. The Leopard, in particular, was common along the Scebeli River, which in Somali language means Leopard's River. Subsequently, large numbers of Leopard and Cheetah were slaughtered all over Somalia. Their skins are sold at high prices despite severe prohibitions.

Even the Serval (*Leptailurus serval* Schreber) has been actively poached, and its range is now limited along the two rivers, where it has become uncommon.

#### Other Mammals

Among the carnivores that are still to be found widely are the Spotted (*Crocuta crocuta* Erxleben) and the Striped

(*Hyaena hyaena* L.) Hyaenas. The same can be said of the Common Jackal (*Canis aureus* L.), the Black-backed Jackal (*Canis mesomelas* Schreber), the Aardwolf (*Proteles cristatus* Sparrmann), the Ratel (*Mellivora capensis* Schreber), and the Bat-eared Fox (*Otocyon megalotis* Desmarest). It is not rare to find specimens of these species crushed by a car on an asphalt road. The Wild Dog (*Licaon pictus* Temminck), moreover, seems rarer than it was ten years ago.

The Caracal (*Felis caracal* Schreber), the African Wild Cat (*Felis libyca* Forster), and some other minor carnivores such as various mongooses, genets, and the Civet (*Viverra civetta* Schreber), are still adequately represented in fair numbers.

The Porcupine (*Hystrix cristata* L.) is common everywhere, while the different species of hare (mostly *Lepus* spp.) have become rarer than formerly. Dassies (various Hyracoidea) are not rare in their habitat, while the Aardvark (*Orycteropus afer somalicus* Lydekker) is always findable in the open dry bushlands.

Primates do not seem to have suffered any diminution. The Lesser Galago (*Galago senegalensis* E. Geoffroy) and the Thick-tailed Galago (*G. crassicaudatus* E. Geoffroy) are uncommon but still widely diffused in southern Somalia, while the Hamadryas or Sacred Baboon (*Papio hamadryas* L.) is abundant in the northern regions. The Vervet Monkey (*Cercopithecus aethiops* L.) and the White-throated Guenon (*Cercopithecus mitis albogularis* Sykes) are not uncommon in their range along the two rivers. Baboons (*Papio cynocephalus* L.) are still abundant and often plunder the crops even near the villages (Ballad, Genale, etc.).

The Dugong (*Dugong dugon* P.L.S. Müller), a large aquatic mammal which lives in the calm bays, has become extremely rare.

#### Non-mammalian Animals

Among birds the majestic Ostrich (*Struthio camelus molybdophanes* Reich.) merits special mention, as it runs the risk of being exterminated in Somalia. Its eggs are obstinately searched for by natives, and were still being sold in Mogadishu at 500 Somali Shillings each in December 1984. Some years ago it was easy to see Ostriches in the open bushlands of Afgoi, Balad, Genale, and Cortuale, where now there is no trace of this unique species.

Other birds, apart from the Vulturine Guinea-fowl (*Acryllium vulturinum* Gray) and the Crested Francolin (*Francolinus sephaena grantii* Hrtlaub), which are caught to be sold in Mogadishu, are still very abundant in Somalia.

The Crocodile (*Crocodylus niloticus* Laurenti) has become very uncommon, such that it may take some time to find its traces in the lower courses of the two rivers. However, Monitors (*Varanus niloticus* L.) are relatively abundant, and are probably partly responsible (along with the poachers) for keeping down the number of Crocodiles, because they eat their eggs.

The Python (*Python sebae* Gmelin) is not rare, but the Green Turtle (*Chelonia mydas* L.) is being actively caught with nets along the coasts, so that its number have steadily decreased.

#### Conclusion

Some 'big game' species in Somalia seem to have already disappeared or to be on the verge of extinction. If nothing is done about the situation, other species will soon follow. Some of these are endemics limited to the Horn of Africa, so that their disappearance would be an irreparable scien-



tific loss affecting also the economic value of the faunal heritage of the region. It is necessary and urgent to take the appropriate steps to prevent such desecration.

## REFERENCES

- BEAUX, O. DE (1924). I mammiferi della Somalia Italiana. *Atti Soc. Lig. Sc. Nat. Geogr.*, 3(3), pp. 149–68.
- DORST, J. & DANDELLOT, P. (1972). *A Field Guide to the Larger Mammals of Africa*, 2nd edn. Collins, London, England, UK: 287 pp., illustr.
- DRAKE-BROCKMAN, R.E. (1910). *The Mammals of Somaliland*. Hurst & Jackson, London, England, UK: [not available for checking].
- FAGOTTO, F. (1971). *La Somalia di Oggi: Aspetti Venatori e Fauno-naturalistici*. Riv. Diana, No. 15, Ed. Olimpia, Firenze, Italy: pp. xv + 65–8, illustr.
- FAGOTTO, F. (1976). *L'Elefante Africano in Somalia*. Boll. Acc. Gioenia Sc. Nat., No. 12, Catania, Italy: pp. 1–32, illustr.
- FAGOTTO, F. (1979). *The Speke's Gazelle and its Habitat in Somalia*. Atti Soc. Tosc. Sc. Nat., LXXXVI, Pisa, Italy: pp. 125–31, illustr.
- FAGOTTO, F. (1980). *The Caffer Buffalo and its Habitat in Somalia*. Atti Soc. Tosc. Sc. Nat., LXXXVII, Pisa, Italy: pp. 161–9, illustr.
- FUNAIOLI, U. (1971). *Guida Breve dei Mammiferi della Somalia*. Inst. Agron. per l'Oltrem., Firenze, Italy: 185 pp., illustr.
- FUNAIOLI, U. & SIMONETTA, A.M. (1967). The mammalian fauna of the Somali Republic: Status and conservation problems. *Monit. Zool. It.*, 74, pp. 285–347.
- GRZIMEK, B. (1969). *Vita Degli Animali*. Bramante, Milano, Italy: xiii + 563 pp., illustr.
- MARCO, G. DE & FAGOTTO, F. (1978). *Geobotanical and Ecofaunistic Map of the Lower Scebeli River (Somalia)*. Centro Car. Ecol. Appl. Univ. Roma, Italy: map.
- SCARAMELLA, D. & SCARAMELLA, A.L. (1975). I mammiferi della Somalia (a livello di sottospecie). *Boll. Sc. Nat.*, LXXXIII, pp. 270–331, illustr.

FLAVIO FAGOTTO  
Via Torino 77  
96100 Siracuse  
Italy: formerly Professor of Zoology,  
Somali University of Afgoi, Mogadishu.

## River Jordan—The Survival and Future of a Very Special River

### Introduction

No river in the world can compare with River Jordan. By standards of size it is very small, hardly flowing in the dry summer; but there is no river in the world, small or large, that has such a place in cultural history. No other river has suffered such a long-standing and profound human impact. Yet, most of its biota have survived, hardened by their history, and lately helped by special conservationist care.

For millennia, the Jordan was believed to flow out directly from Paradise. The crossing of River Jordan was the act of creation of the Biblical federation of the Jewish tribes. More than a thousand years later, the River baptized the first Christians. Again, a few centuries later, on the banks of the Jordan the Roman armies were defeated and the Arab world's empire was born.

A mere creek, the amount of the Jordan's waters bears no proportion to the flood of religious and poetic inspiration which it has given to the world. Yet the River has been, all along through history, a source of feuds and wars. The use of its waters and the mastery of its fords are today as disputed as ever they were in its history.

For all these reasons it is very difficult to give a dispassionate presentation of the Jordan environments and ecosystems, their history, and their chances of preservation. The natural procedure would have been a coauthorship of scientists residing on both banks of the Jordan. As, unfortunately, this is not possible, we consider this paper to be an opening for an ecological dialogue. If our presentation might give the impression of oneness, this is due to our lack of information from the Jordanian side and not to any *parti pris*.

### Geographical and Geological Setting

River Jordan is a typical 'endorheic' (i.e. without opening to the sea) river, originating in southern Lebanon and northern Israel, where annual precipitation values are of more than 1,000 mm. It flows due south and ends in a terminal hypersaline lake, the Dead Sea, where annual precipitation is a bare 50 mm. Evaporation increases in



FIG. 1. SKYLAB photograph of the Jordan Rift Valley and Lake Kinneret (by courtesy of NASA). The scale is given by the (prominent dark) Lake Kinneret (Sea of Galilee), which is 21 km long.

inverse proportion, and reaches in the Dead Sea area the impressive value of over 2,500 mm/year. The catchment area of the Jordan, including its main tributary, River Yarmouk (Yarmouk), covers 43,000 square kilometres. The total length of the endorheic catchment area, from the source of River Hazbani (Hebrew name, Nahal Senir) to the En Hayav rise in the South, is 320 km. Annual flow of the Jordan is around 1,250 million cubic metres, part of which is due to winter floods.

The Jordan owes its existence to the geologically young tectonic movements that formed the impressive Syrian-