

storage. This means that Nature gradually becomes clean of such radioactivity. This is not true with regard to some non-radioactive elements, such as barium and arsenic, compounds of which are constantly being used by Man and which accumulate in the human environment, remaining poisonous for ever. Unlike nuclear reactor waste, such chemical poisons are not planned to be buried deep in the bedrock. This is a fact that should not be forgotten

during the current, often deeply emotional, discussion of the dangers of disposal of nuclear-reactor waste.

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'Sea-turtle Faces Extinction in India': Crying 'Wolf' or Saving Sea-turtles?

A recent report in *Environmental Conservation* (Davis *et al.*, 1978)*, with all the best intentions for rational management of marine turtles, made claims that were unsupported, and some of these have been refuted. As Simon (1980) has pointed out, there has been 'An over-supply of false bad news', and it is necessary to set the record straight.

The plight of sea-turtles has been well publicized, with the World Conference on Sea Turtle Conservation (held in Washington, D.C., during 26–30 November 1979), a widely circulated and read *Marine Turtle Newsletter*, and an ever-increasing number of accounts describing the depleted status of hitherto undocumented populations. Altogether the situation is grave: Major populations of the last century exist today as mere vestiges, while turtles that once provided important foods and foreign exchange are now so few that they have little direct value. The decline in Seychelles of *Chelonia mydas* (L.), the Green Turtle, is a prime example (Frazier, 1979). Other situations around the world provide depressing reading, and indicate that, if there is anything which we learn from history, it is that we do not learn from history!

In recent years, major sea-turtle fisheries have developed in several parts of the world, and they seem to be ignoring and repeating past mistakes. The exploitation of *Lepidochelys olivacea* (Eschscholtz), the Olive Ridley, in the East Pacific, is the largest such venture and a classic case: hundreds of thousands of turtles, mainly reproductive females, have been slaughtered yearly in both Ecuador and Mexico, primarily to provide skin for a luxury export market, while hundreds of tons of prime meat have been thrown out to rot on the beaches (Frazier, in press *a*).

There is no debating that the future of sea-turtle populations is insecure, and the need for basic information and rational management practices is therefore urgent. Yet, these needs are poorly served by unsupported and controvertible claims, which reduce the credibility and effectiveness of other, more careful accounts which may present crucial information.

In their 'short communication' entitled 'Sea-turtle Faces Extinction in India', Davis *et al.* (1978) stated that '...in the 1977 nesting season not a single turtle arrived on the picturesque beach' (viz. Gahirmatha, Cuttack District, Orissa). However, a zoologist who studies turtles on that beach reported that there was nesting there in 1977, and the numbers nesting in 1978 and 1979 were each estimated to have been in the hundreds of thousands (Kar, 1980). Apparently Davis *et al.* were only able to spend a few hours on the beach in 1977, and on the basis of their brief observations made inferences for the entire season—a very questionable procedure.

Other comments which they made also seem debat-

able, although less serious: 'Fortunately, under normal circumstances, the predators of these turtles or turtle eggs (dogs and jackals) do little damage...' (Davis *et al.*, 1978), but farther south in Madras, 90% of nests are reportedly lost to human and canine predators (Whitaker, 1977). Quantitative data are essential to support these claims and resolve what appears to be a contradiction.

The statement (Davis *et al.*, 1978) about '...numerous mature turtles weighing about 100 kg each...' is curious, for the species under consideration, *Lepidochelys olivacea*, is not known to weigh much more than 40 kg when full-sized (Márquez *et al.*, 1976). Either Ridley turtles in Orissa are twice the size of those occurring elsewhere, or the animals named by Davis *et al.* were incorrectly identified, or the size estimates were exaggerated by a factor greater than two. The last possibility seems likely.

The export of large numbers of adult turtles by train across India has been going on for years (Kuriyan, 1950, see also L. A. K. Singh *in lit.*, 20 July 1976), despite the implication by Davis *et al.* (1978) that it is a recent development.

This note is not to imply that there was no value in the report by Davis *et al.* (1978), for they drew attention to the possibility of a large-scale fishery specializing on reproducing animals and geared mainly towards export. It is critically important to control these activities if we are to avoid following the usual disastrous course. Intensive exploitation of breeding populations, especially when local peoples are not responsible for most of the consumption, has consistently led to severely depleted populations which have lost economic and nutritional worth; there are already too many examples in the Indian Ocean (Frazier, in press *b*).

However, it is unfortunate that a message as important as that delivered by Davis *et al.* is undermined by refutable statements. Sceptics might simply claim that these conservationists were crying 'wolf' and dismiss other warnings in the future.

Pleas for rational management must themselves be rational!

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REFERENCES

- DAVIS, T. Anthony (1977). Tragedy strikes sea turtles. *Hindustan Times*, Magazine Section, New Delhi, 24 April, 2 figs.
 DAVIS, T. Anthony & BEDI, Rajesh (1978). *Environmental Awareness*, 1(2), pp. 63–6 (reprinted in *Hamadryad*: Newsletter of the Madras Snake Park Trust, 3(3), p. 8, September 1978, and reprinted in *Marine Turtle Newsletter* (Ed. N. Mrosovsky), No. 12, p. 5, September 1979.
 DAVIS, T. Anthony, BEDI, Rajesh & OZA, G. M. (1978). Sea-

*Cf. also Davis (1977) and Davis & Bedi (1978).

- turtle faces extinction in India. *Environmental Conservation*, 5(3), pp. 211–2, 2 figs.
- FRAZIER, John G. (1979). Marine turtle management in Seychelles: A case-study. *Environmental Conservation*, 6(3), pp. 225–30, map.
- FRAZIER, John G. (in press a). Marine turtle fisheries in Ecuador and Mexico: The last of the Pacific Ridley? *Special Scientific Report—Wildlife*, U.S. Fish and Wildlife Service.
- FRAZIER, John G. (in press b). Exploitation of sea turtles in the Indian Ocean. *Human Ecology*.
- KAR, Chandra S. (1980). The Gahirmatha turtle rookery along the coast of Orissa, India. *Marine Turtle Newsletter*, No. 15, May, pp. 2–3.
- KURIYAN, G. K. (1950). Turtle fishing in the sea around Kru-dasai Island. *Journal of the Bombay Natural History Society*, 49(3), pp. 509–12, fig.
- MÁRQUEZ, M. René, VILLANUEVA O. Aristóteles & PEÑAFLORES S., Cuauhtémoc (1976) *Sinopsis de Datos Biológicos Sobre La Tortuga Golfina*, *Lepidochelys olivacea* (Eschscholtz, 1829). Instituto Nacional de Pesca, Sinopsis Sobre la Pesca, No. 2, 61 pp., 12 figs.
- SIMON, Julian L. (1980). Resources, population, environment: An oversupply of false bad news. *Science*, 208, pp. 1431–7, 4 figs.
- WHITAKER, Romulus (1977). A note on sea turtles of Madras. *Indian Forester*, 103(11), pp. 733–4.

1979 World Population Estimates

The world population growth-rate would appear, from our estimates, to be 1.9%. As the growth-rate appeared to be 2% last year, there is always the possibility that a 1.9 figure may be taken as an indication that population growth has slowed. A careful analysis of the individual figures will not support any such conclusion. If we had relied on UN figures, the world's growth-rate would be 2%. However, if we had relied on UN figures, the population of Mexico would be nearer 70 millions than 65 millions. We are here reporting the lower Mexican figures given to us in July 1979 by the US Bureau of the Census.

Is there this much difference between most population figures from the two major sources? No, the figures are usually very close, and in most cases they are the same. A brief examination of the differences, however, is illuminating. Let us take two examples. The latest UN figures for Mexico (1 April 1979) indicate that its mid-1979 population was 69.2 millions, with a growth-rate of 3.5%. The latest information available from the Census Bureau (August 1979) would give Mexico a population of 65.8 millions and a growth-rate of 2.5%.

The US Census figure reflects two recent surveys that are not yet reflected in the UN figures. Accordingly, we think that the Census Bureau is much closer to the correct figure. However, the difference between these two Mexican population estimates, alone, could account for the difference between a world population growth-rate of 1.9 and 2.0. The cause of this difference seems to be the fact that, while both the UN and Census are not permitted to account for illegal migration, they have elected to treat it differently. Essentially, the UN shows people in Mexico who are, perhaps, not there but *would* be there if there had been no emigration.

The US Census Bureau is attempting an accurate count of those who are actually *there*, and is finding that there are millions fewer than there were thought to be—possibly because millions have left Mexico. If those who are being subtracted from Mexico's population were to be added to the population of the United States, no change would be reflected in the world's population, and the world growth figure might still appear to be 2.0. But the US Census Bureau has not done so. This means that perhaps 5 million Mexicans are wholly unaccounted for—hence a smaller world population figure and, apparently, a lower world growth-rate.

The other example is China. Chinese population and vital rates are unknown, even to the Chinese, but apparently a quarter of the entire world's human population lives there. Let us take three different assumptions for China that are quite within the realm of *possibility*, and

see their effect on the world's growth-rate. The first would be that China's growth-rate is somewhat lower than its neighbours', say 3%. Another assumption could be that it is lower than anyone has guessed, say 1%. The third assumption could be that its growth-rate falls directly in between these two.

Using UN estimates for the rest of the world, the result would be:

If China's Growth Rate Were:	The World's Growth Rate Would Be:
1%	1.8%
2%	2.0%
3%	2.2%

But actually we do not *know* which of these rates is closest to reality.

In 1979, thanks to the International Labour Office, we were able to add some columns relative to the size of the labour force in most of the world's countries. In most of the 'under-developed' countries, half of the entire population is teen-age or younger. Accordingly, the growth in the labour force in the next decade-and-a-half will be much more rapid than the growth in population as a whole. From the figures, it would certainly appear that some of the serious problems now confronting these countries are likely to become very much worse.

Because Mexico is our neighbour, let us use it as an example. It currently has a population of perhaps 65 millions, of whom nearly 19 millions are in the labour force, with about 50% of these (9–10 millions) unemployed or seriously underemployed.

By the year 2000, the Mexican labour force will be 45 millions instead of 19 millions. Mexico's new oil industry couldn't possibly employ more than 1% of these. Where are these tens of millions of needed jobs going to come from? Unfortunately for Mexico, lowering the birth-rate will change this situation hardly at all. All of the people who are to be in their labour force in 1990, and most of those in 2000, have already been born.

Because of Mexico's staggering birth-rate during the last decade, this employment problem will be somewhat worse there than in most other 'under-developed' countries, but, to varying degrees, they are all facing the same dismal prospects.

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