the cases stopped by Customs. As an indication of their future intentions, the Zoogei Bukai meeting on February B, 1985, passed four resolutions as follows:

1) "We will try to decrease the amount of imports and refrain from re–-exporting ivory, in order to secure the regular import of ivory.
2) We will co-operate with the African countries in the export quota system which is now under consideration.
3) We will support the establishment of the Ivory Unit at the CITES secretariat.
4) We will co-operate with and exchange information with the CITES Secretariat, TRAFFIC (Japan) and World Wildlife Fund Japan."

TRAFFIC is hopeful that the resolutions above will take positive form and, in doing so, the conservation of African elephants will be greatly advanced.

The address of the Zoogei Bukai is:

Zoogei Bukai
Japan General Merchandise Importers' Association
2-4-1 Hamamatsucho
Sekai Boeki Center Building
Minato-ku
Tokyo 105, Japan.

Tom Milliken, Director,
TRAFFIC (Japan).
February 22, 1985.

Book Review

The Japanese Ivory Industry, by Esmond Bradley Martin (World Wildlife Fund, Japan, 1985)

Most published work on ivory has tended to be either statistics-laden analyses of the effect of the trade on elephants, or adjective-laden descriptions of the work of the great masters. There is a significant gap in our knowledge of what happens to elephant tusks between the packing crate and the collector's shelf.

Esmond Bradley Martin, who has previously done landmark research into the rhino horn trade, is helping to fill that gap. He has already published several articles on the ivory industries of African nations, in **Pachyderm** and **Traffic Bulletin**. The subject of this review is a beautifully-produced booklet describing the Japanese ivory industry.

The book opens with several pages of photographs and drawings of stages in carving, from stacked tusks to a range of finished products including seals, musical instruments, and figurines. The photographs of the figurines are especially attractive, but unfortunately show up the merely average drawings.

The text begins with a description of the history of the ivory industry in Japan. The industry extends back several centuries, but only began to consume really large quantities of ivory in the 1970's. Since then, Japan has become the world's largest ivory importer, and is unique in that almost all the ivory that is imported is consumed internally.

Most of the ivory is made into personal seals, which are used in lieu of signatures. Dr. Martin describes their place and importance in Japanese society, and their techniques of manufacture. He goes on to describe the other products made from ivory, such as jewellery, musical instruments, and artistic carvings. The carvings, done by master craftsmen, receive a deservedly long description in the text, having already provided the high points of the photographs.

Dr. Martin goes on to describe the activities of the ivory dealers and the ivory trade associations. It is interesting that as early as 1980 they were expressing concern over the sustainability of the annual ivory offtake. This concern has recently been expressed in the associations' support for genuine enforcement of CITES regulations by the Japanese government.

The booklet ends with a number of tables containing a great deal of interesting and useful information. These may be the most important part of the book for those actually studying the trade.

All in all, the booklet is useful far beyond its small size, because it fills a large gap in our knowledge. It is unfortunate, in this regard, that it was four years in publication, so the latest information is for 1980. This in no way diminishes the import of the facts it does contain, however, and the book makes a key contribution to our understanding of the forces affecting the ivory trade.

Its strength serves to point out a glaring weakness; the limited information available on the Hong Kong carving industry. Ian Parker, who deserves credit as the first, and still most important, filler of the crate-to-shelf information gap, did valuable research into the Hong Kong industry in the mid-1970's. However, his findings, which are now a bit dated, are available only in his mammoth Ivory Report, which is not published. Perhaps he should be supported to carry out and publish an in-depth follow-up study, to describe in more detail the other major ivory consumer.

Tom Pilgram
WICI, Nairobi

New Procedures for controlling the Ivory Trade

ROWAN MARTIN

In September 1983, at the meeting of the African Forestry Commission of the FAO, the Working Party on Wildlife Management and National Parks recommended that African ivory producing countries set quotas of ivory for export, and this recommendation was reaffirmed at the Seminar on CITES implementation held in Brussels in June1984. Following the Brussels meeting the CITES Secretariat initiated a consuitancy to pursue the proposals with African states, and this consultancy was carried out by Rowan Martin from the Zimbabwe Department of National Parks and Wildlife Management between November 1984 and March 1985. At the same time, John Caldwell and Jonathan Barzdo of the WTMU in Cambridge prepared a report on the world trade in raw ivory in 1983 and 1984.

Sixteen ivory producing countries were visited and the report was divided into 3 sections dealing with elephant population estimates, a method for setting quotas, and the administrative procedures which would be required to make the quota system work.

The population of African elephant was estimated at slightly over one million animals, and a simple model of elephant numbers and the volume of ivory entering the trade confirms that the population is unlikely to lie outside limits of 0.8-1.3 million animals. Models of ivory harvesting suggest that an annual ivory harvest of about 700 tonnes is more than populations can sustain and quotas should be set to reduce this substantially. It would be possible to produce over 750 tonnes of ivory from a million elephants with good management, but not with the present strategy of selectively killing older animals.

The method suggested for setting quotas is based on the utilisation policy of the country concerned, and relies on estimates of animals which die naturally, animals killed as a result of management

programmes, and animals killed illegally. Allowances are made for surplus stocks and confiscations, and the quota is separated into amounts which will enter the international trade, amounts which will be used by domestic carving industries and tusks which will be exported as sporting trophies.

For the system to work, both international and internal administrative procedures need to be put in place. Of these, perhaps the internal issues are the more critical since it is only in this area that illegal hunting can be contained and the internal carving industries controlled.

The recommendations from the report together with proposals from the CITES Secretariat were discussed at the 5th Meeting of the Parties to CITES in Buenos Aires in April 1985. A resolution proposing the introduction of the quota system was adopted by the meeting with no dissenting votes.

The key aspects of the new system are as follows:

1. Ivory producing countries will set a quota of tusks which they expect to export in 1986.
2. All present stocks of ivory held by both producer and non–producer countries will be registered before the end of 1986.
3. An Ivory Unit will be established within the CITES Secretariat which will maintain a data bank of the registration numbers of all tusks in trade, or likely to enter' the trade.
4. A set of referral procedures will be initiated whereby no shipment is cleared by an importing country until the CITES Management Authority in the exporting country has confirmed the authenticity of the export with the corresponding Management Authority in the importing country. Copies of all export documents will be sent to the CITES Ivory Unit to enable them to monitor quotas and assist in the referral procedure.

The new system should result in improvements, certainly in the ivory traffic between Party States. Hopefully the process of quota setting will focus the attention of the wildlife agencies in producer countries on improving the management of elephant populations and critically identifying the sources of ivory entering the international trade. If all Party States co-operate and the CITES Ivory Unit is successful, the possibility exists of having a daily knowledge of the location of all tusks in legal trade – which would be a major development.

Letters to the Editor

Elephants and Woodland –A Reply

It was a novel experience for me to be lectured by Lindsay and Olivier on my philosophical bias against dynamic change in ecosystem structure (are there other kinds of change?) and about the differences between ruminant and non-ruminant feeding strategies. While I admit that the paper by Jachmann and myself could have been better expressed, I would like to argue the following points:

According to Maglio (1973) the modern African elephant, **Loxodonta africana**, is relatively primitive in its browsing dentition, and evidently remained a forest or forest-margin species until the demise of the grazing **Elephas recki** which occupied the East African savannas until about 35 000 years b.p. On the question of whether the elephant is primarily a grazer when circumstances allow, I am aware of Olivier's (1978) work indicating that **Elephas maximus** selects strongly in favour of monocots in an Asian forest environment; nonetheless, grass makes up a small proportion of its diet. Similarly, with **Loxodonta** we have examined the browse-graze ratio by means of carbon isotope ratios in bone, determined by Julie Lee Thorpe at the University of Cape Town. We find that the browse-graze ratio is a function of woodland density and ranges from about 100% browse in closed forests to about 50% browse in open areas such as Tsavo East. We are now looking for samples from primarily grassland habitats, and would be glad of some Amboseli specimens. However nobody appears to argue that elephants perform better on a diet of pure grass than on a diet containing a substantial browse fraction, or disputes that browse is critical as a dry season food reserve. We may therefore eliminate the first branch of the argument, that the reason elephants kill trees is because to do so stimulates grass production (which it does) and thereby enhances elephant food supplies.

We may assume, therefore, that (perhaps excepting permanent marsh conditions) elephants require a diet consisting of at least 50% browse on a year-round basis. Therefore a key factor in determining elephant population performance is the density of available browse, that is, browse about 3m above ground. The question now is: how does use by elephants affect this value?

Tom McShane and I are currently examining the factors that control the probability that a tree will die or coppice as a result of breakage by elephants, at a number of locations in Malawi. The factors we have identified are as follows:

(a) The probability of tree death seems to be higher in certain species irrespective of other factors. Susceptible genera are **Acacia, Commiphora**, and **Adansonia**, among others. **Brachystegia, Julbernardia, Isoberlinia, Colophospermum**, some combretums, terminalias, and a range of other species characteristic of the moist-oligotrophic savannas have a higher probability of coppicing, although under certain conditions, as with **Brachystegia boehmii** in Sengwa and Chizarira, Zimbabwe, they may be killed.

(b) Climate: The probability of tree death seems to be higher in more arid areas, particularly below about 600 mm per annum.

(c) Soil conditions: The probability of tree death seems to be higher in soils of higher fertility and lower infiltration rates. Since those factors are mutually correlated, it is hard to distinguish the primary determinant. Perhaps both are involved: more fertile soils support higher biomasses of elephant, leading to more intense use of the vegetation; higher infiltration rates allow greater moisture availability to tree roots and hence may allow coppicing more readily, as well, perhaps as allowing heavier investment in chemical defence. However, in "overdrained" sands moisture availability is low; this may account for the tree death in Sengwa-Chizarira.

(d) Tree size and shape: The probability of tree death is greater in very small and very large trees, while in trees from 2-20cm in diameter the probability of coppicing is relatively high. Further, a tree that has been coppiced once has a low probability of death due to further elephant use. Weyerhauser (1982) made the same point concerning survivors of ring barking.

(e) As a result of the last factor, stand history becomes important. Young stands or stands that have been subject to cultivation or previous elephant use are more resilient to elephants then protected mature stands.

The effect of coppicing is to increase the density of available food for elephants for the following reasons:

(i) Tree biomass production is stimulated during regrowth;

(ii) Edible biomass is produced within the height range accessible to elephants;

(iii) Regrowth is of higher primary quality, being younger and thinner than mature material; the effect on secondary chemical defences is unknown and subject to dispute;

(iv) The edible biomass is denser in space, leading to larger amounts per trunkful and hence faster intake;

(v) The breakage pattern has the above effects preferentially in preferred species (Jachmann 1984).