A NEW THREAT TO FARM-LEVEL MAIZE STORAGE IN WEST AFRICA: — *Prostephanus truncatus* (Horn) (COLEOPTERA; BOSTRICHIDAE)

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Abstract

Prostephanus truncatus has been discovered in West Africa, with an area of distribution extending about 25 Km from Lome. All maize stores found infested have been fumigated with phosphine and pheromone traps have been tested as a monitoring method to detect the likely further dispersal of the pest.

The impact of *P. truncatus* on the Togolese farm storage system is discussed after an introductory account of farm storage methods, pest problems and control methods. Comparisons are made with the *P. truncatus* problem in East Africa.

Introduction

Maize, in addition to cassava (*manioc*), yams, millets and sorghum, is a significant staple food in Togo. Traditional maize farming stretches up to Sokodé (Figure 1), where it is progressively replaced by various types of millet and sorghum. In recent years maize farming has spread to the north into the Mango region and now occurs, together with millet farming, from Sokodé northwards.

Maize is the major stored product in Southern Togo, whilst in the north mainly millet is stored. Cassava is stored to a small extent in the form of dried chips but most remains fresh in the soil. Yams can be stored fresh for several months. Other stored products include cowpeas, groundnuts, and, according to the region, various other products such as rice, bambara groundnuts (*Voandzeia subterranea*) and fonio (*Digitaria exilis*).

In Southern Togo maize is stored on the ear, with husk intact, in an open type of store (Figure 2). This type of store is adapted to the humid climate but allows attacks by pests. A cylinder of cobs is built on a platform that is a shallow inverted cone touching the ground at its centre. Once the outer wall of cobs is formed the remainder are thrown loose into the centre. Every layer is sprayed with water to stabilize the cobs and a *liana* is tied around the outside of about every fifth layer. A common modification of this type of store in South West Togo is an elevation of the platform on tall stilts. These support the maize at a height of about 1.5 m above the ground. The family's cooking-place is generally located beneath this platform; if not, a special fire is lit here. Occasionally maize is stored inside the farmer's hut, on a low platform above the kitchen fire.

As a result of the humid climate, damage to stored maize is often considerable, especially at the beginning of the storage period since maize is stored with a moisture content of about 25%. Nevertheless, the main losses are due to insect pests, particularly beetles. Maize is also liable to damage by various rodents, for the whole storage period, but such damage, in general, is not extensive.

The most common beetle pests are *Sitophilus* spp., mainly *S. zeamais* Motschulsky but usually with some *S. oryzae* (L), and *Cathartus quadricollis* (Guerin), although the latter causes considerably less damage and rapidly declines in numbers towards the end of the storage period. Other beetles found regularly are, in order of importance: *Palorus subdepressus* (Wollaston), *Tribolium* spp. and *Carpophilus* spp. The latter are very common at the beginning and at the end of the storage period, probably because of the high moisture content of the maize at the start of the storage period and the moisture produced at the end of the storage period by increased infestation. However, the damage caused by this pest is insignificant. Pre-harvest infestation is not particularly high in Togo. On average about 1-2% of all ears are infested with the major pest, *S. zeamais* (Pantenius, personal communication).

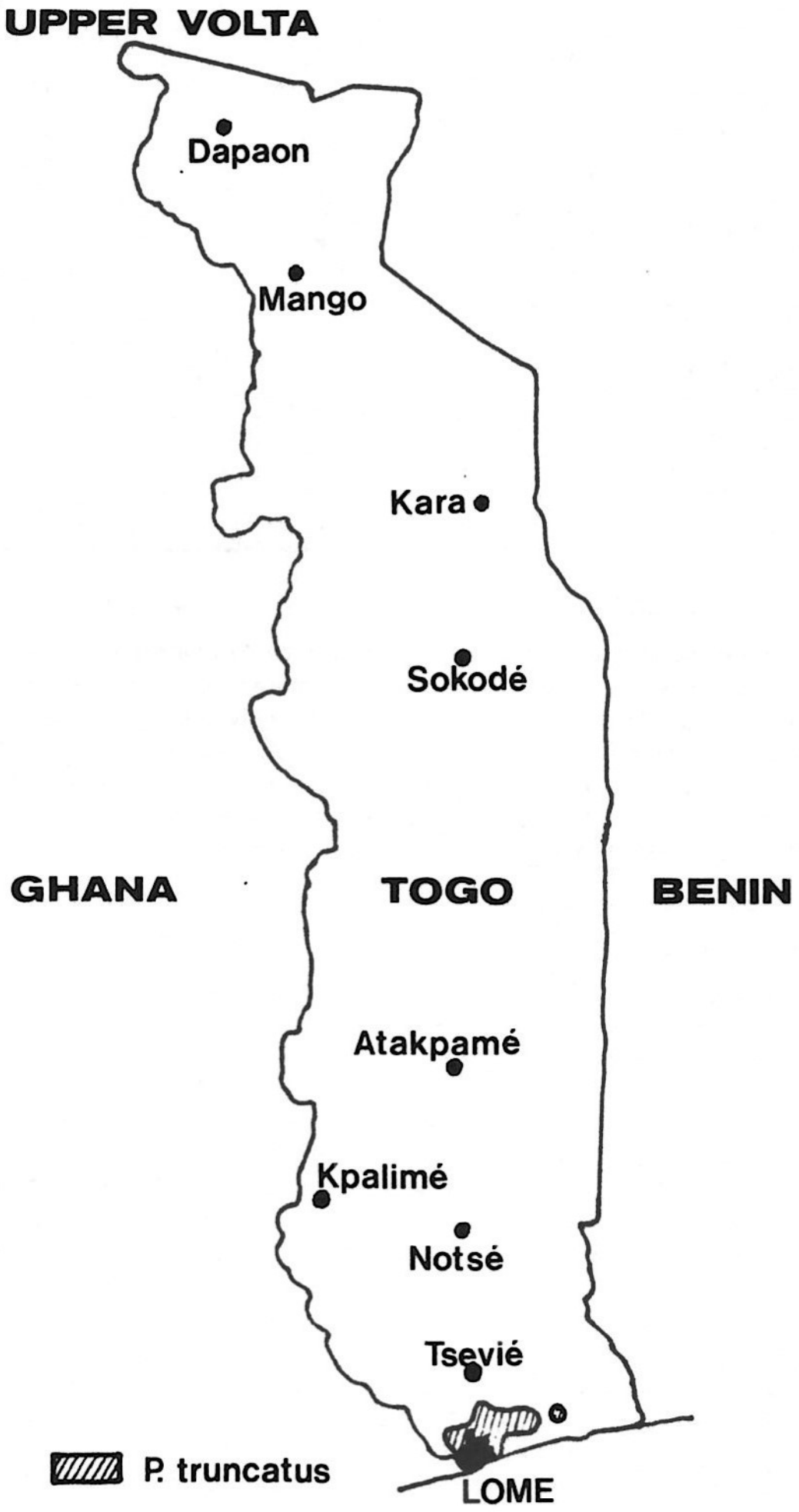

Figure 1 — Map of Togo indicating major towns and the extent of *P. truncatus* infestation within the country

Figure 2 – A traditional maize crib in Southern Togo

For protection against storage insects it is common to dust ash over the maize and this may have some effect. A protective effect, probably as a repellent, is sometimes obtained by the application of the residue of the local production of palm spirits (*sodabi*). Traditional fetishes are also commonly used. Dilute insecticide powders are sometimes used. In the last ten years pirimiphos methyl has largely replaced Lindane and DDT for this purpose. A mixture of an insecticide (Heptachlor) and a fungicide (Thiram) is available for seed treatment. Insecticides are often used where they are available, but the majority of farmers do not treat their crops. For rodent control, the edge of the crib is covered with prickly pear cactus or protected by sheet metal. The use of rodenticides is uncommon.

Occurence of *Prostephanus truncatus*

During January 1984 members of the GTZ-Post-harvest project discovered an infestation of *P. truncatus* in seven traditional maize cribs on a farm in Djagblé, 10 km north-east of Lomé. Not only the stored ears of corn were heavily infested, but also the wood of the crib.

Rigorous surveys ascertained the area of distribution as extending about 25 km from the capital city, Lomé (Figure 3). Most of the farmers stated that this was the first time they had experienced this particular pest or its typical symptoms in their maize. The farmer at Djagblé reported having seen the pest the previous year. A number of farmers in the vicinity of an area with State granaries claimed to have had this pest for 2 or 3 years. This indicates that the pest may have occurred for the first time in 1981, which was the year when the State storage company began to store imported grain. This may therefore have been the origin of *P. truncatus* in this area.

The significance of the present damage caused by *P. truncatus* in Togo can be evaluated in several ways. With regard to the farming area as a whole the danger is, as yet, insignificant because the new pest's area of distribution is still small and, within this area, the damage was heterogenous. Infestation, after 9 months storage, ranged from low to high. In some stores the infestation was very high, so that at the end of the storage period almost 100% of all ears were infested. In other stores, often in the immediate vicinity of those infested with *P. truncatus*, there was only the usual spectrum of pests, with no evidence of the new pest. This heterogeneity is probably due to the recent introduction of *P. truncatus*, since the previously established common grain pests are distributed very homogeneously. Damage to individual ears is significantly higher than from these previously known pests. A number of ears were completely ruined after only 4 months storage (Figure 4). Clearly, *P. truncatus* is a great danger to maize storage in Togo and this is also the opinion of those farmers who have come into contact with this new pest.

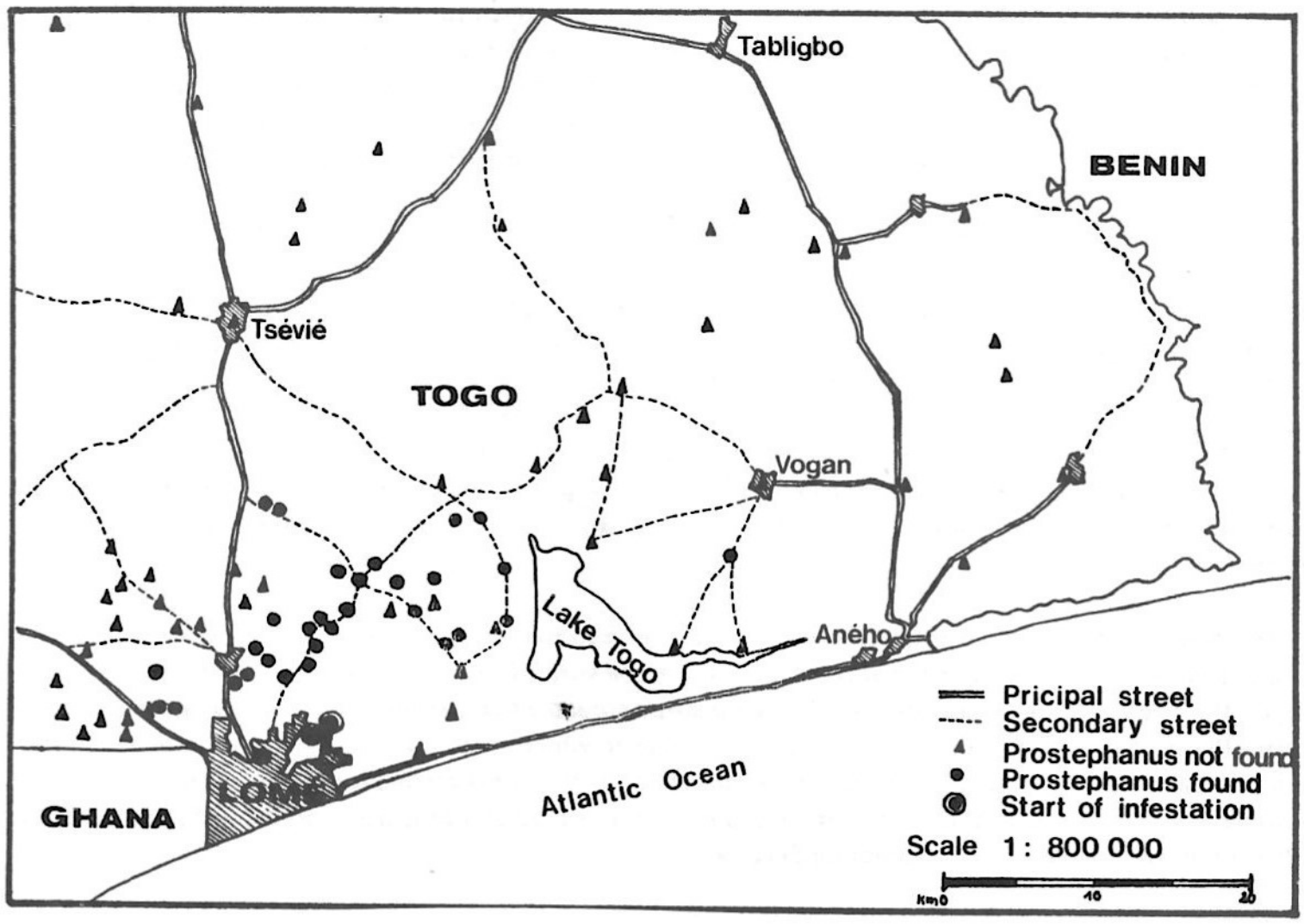

Figure 3 — Locations in Togo surveyed for *P. truncatus*

Figure 4 — A maize cob severely damaged by *P. truncatus*

Population monitoring. Tests were carried out in January 1984, using traps for *P. truncatus* baited with one of two types of synthetic, aggregation pheromone. Twenty-three traps with the pheromone of the bostrichid *Rhyzopertha dominica* ("Dominicalure"), previously used for *P. truncatus,* and 23 traps with "Trunc-call", a specific pheromone for *P. truncatus,* were placed in cribs in the infested area. "Trunc-call" was more than twice as effective as "Dominicalure" and, in the future, should play an important part in the monitoring system in Togo.

Immediate control measures. The infested area was comparatively small. Fumigation, with phosphine, of all stores found to be infested was carried out during May-June at the beginning of the rainy season. Thin (0.04 mm) plastic gas-proof sheets were used (Figure 5) and phosphine was applied at 5 g/m^3. The earthen floors of the stores proved to be sufficiently gas-proof. Concentrations of around 1000 ppm were measured after 52 hours of fumigation. Whole store fumigation can thus be regarded as effective in these circumstances.

A total of 144 stores in 33 villages were fumigated in two weeks and about 100 tonnes of maize ears were so treated. The fumigations were performed at the end of the storage period when a great many stores had already been emptied, partly as a result of the heavy infestation with *P. truncatus.* A further spread of the beetle is therefore expected.

Further control measures. Togo has applied to the Ministry for Economic Co-operation of the FGR to carry out a project "Lutte contre *Prostephanus truncatus*" within the framework of technical co-operation. This project is intended, on the one hand, to reduce the speed of the beetle's spread whilst, at the same time, providing advice and support for affected farms. Discussions are still taking place as to which methods and storage techniques adapted to *P. truncatus* can be propagated in Togo. Effective control of *P. truncatus* carried out by the farmers themselves is not possible in traditional stores. Until a specific project is started, assistance is being provided by the GTZ-Postharvest Project in the Togolese Plant Protection Service.

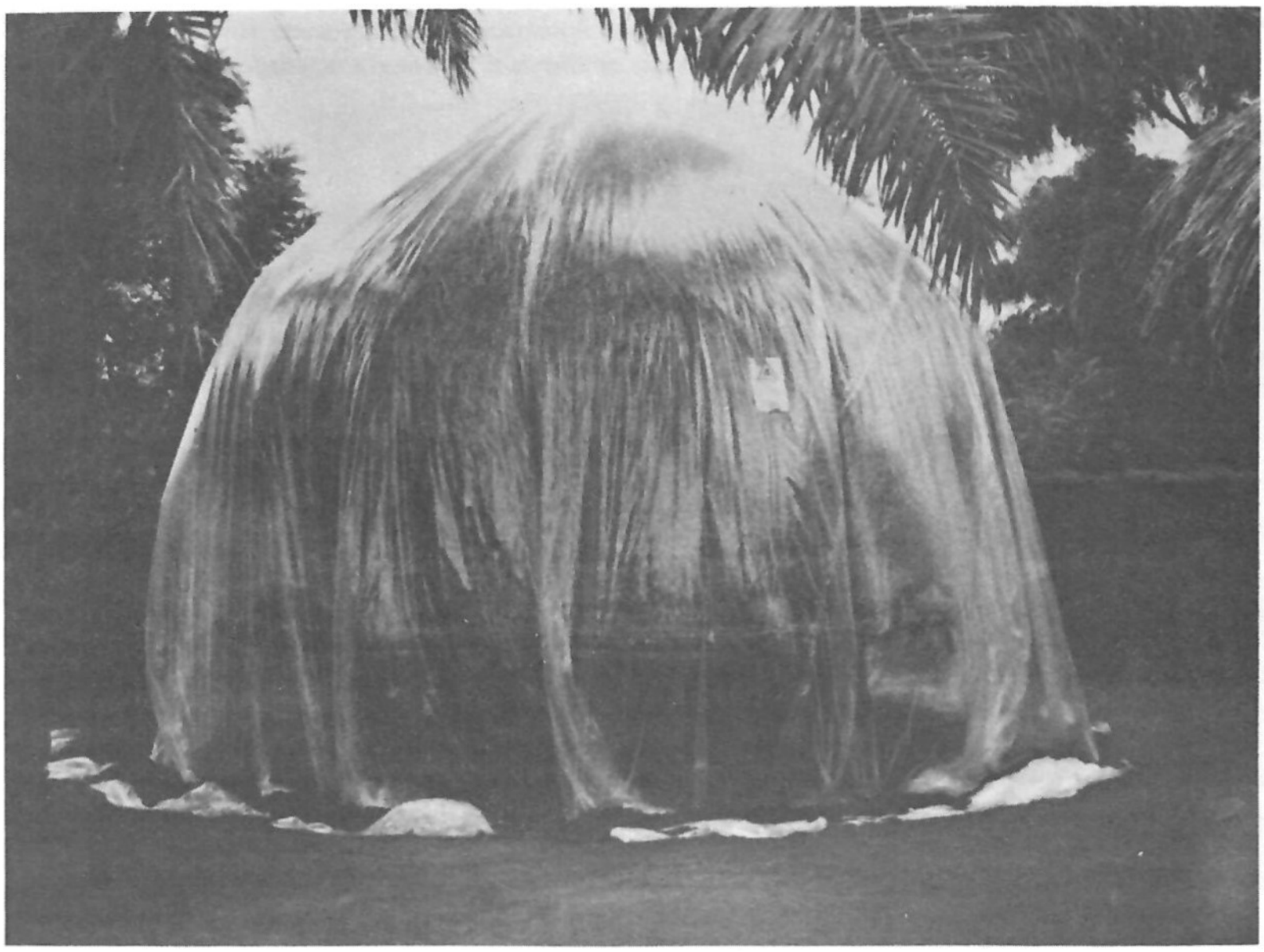

Figure 5 — A traditional maize crib under plastic sheeting for phosphine fumigation

Comparisons with the situation in Tanzania. The situation in Tanzania, where *P. truncatus* was introduced several years ago, shows some differences. In Tanzania, maize is stored in the lofts of the houses. Thus the beetle has areas of retreat (e.g. the wooden roofing) where it is difficult to control. Infestation by other storage insects is comparatively low in the affected areas of Tanzania, whereas in Togo it reaches high levels during the storage season. Increased losses to Tanzanian farmers are thus more evident and it is likely that they will be more willing to alter their present storage techniques. A Togolese farmer may suffer only a moderate increase in grain damage and will be less ready to change from his traditional methods of storage. This will aid the further spread of *P. truncatus* in Togo and the problems of containment and control will require a different approach to that adopted in Tanzania. However, if this insect spreads into drier grain-production areas of West Africa the situation in those areas would be more like that in Tanzania.

This second introduction of *P. truncatus* into Africa demonstrates the potential danger to other countries so far unaffected. All African countries should pay particular attention to imported maize and those countries which border Togo and Tanzania have a special need for prompt measures to prevent the pest from becoming established in their countries.

Acknowledgements

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