The Vegetation of
Shipstern Nature Reserve
(Corozal District, Belize, Central America)

A structural and floristic approach

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1. Introduction

1.1 Shipstern Nature Reserve

Shipstern Nature Reserve is a private nature reserve owned by the International Tropical Conservation Foundation, based in Marin-Neuchâtel, Switzerland. It is located in the northeastern part of the Corozal District, on the southern shore of the Chetumal Bay. The road linking the villages of Chunox and Sarteneja delimits the northern border of the reserve. Created in 1989, the Shipstern Nature Reserve covers approximately 8'000 hectares (20'000 acres). In 1990, a further 13'000 hectares (32'000 acres) on the eastern side of the reserve were declared non-hunting area by the Minister of Natural Resources at the time, the Hon. Florencio Marin. In 1995, the ITCF bought an additional 600 hectares of forest located to the West side of the reserve, including a group of small lakes and marshes called the Xo-Pol ponds. The latter form a very important habitat as they encompass several of the few freshwater bodies of the area (see map, p. 3).

The ITCF was instrumental, with the help of funds provided by the European Community, in setting up the Bacalar Chico National Park and Marine Reserve, covering 13'000 hectares on the northern half of Ambergris Caye and bordering the international boundary of Belize and Mexico. The park includes a variety of habitats such as coral reefs, lagoons, mangroves and forest, some of which are similar to those found in Shipstern Nature Reserve.

The Shipstern Reserve includes part of the Shipstern Lagoon, an intricate system of shallow lagoons bordered by mangroves and other saline wetlands, listed in the Directory of Neotropical Wetlands (IUCN/IWRB, 1986). These lagoons are dotted with small mangrove islands that form important breeding habitats for many bird species: among others the reddish egret (Egretta rufescens), the roseate spoonbill (Platalea ajaja), the white ibis (Eudocimus albus) and the american woodstork (Mycteria americana). The latter is now a rare breeding bird in Belize and rapidly declining in other parts of its range.

The Shipstern Nature Reserve is approximately 7 km away from Sarteneja, a fishermen community of ca. 1500 inhabitants. The area surrounding the village was fairly isolated from the rest of the country until 1980, when the dirt track were improved into an all-weather road. For this reason, it remained particularly rich with regard to its fauna and forest cover. All five cat species occurring in Belize are present in and around the reserve, and tracks of large mammals such as Baird’s Tapir (Tapirus bairdii) are regularly observed.

The pressure on the area has, until recently, remained relatively low. Occasional hunting during the closure of the fishing season has always been carried out by the villagers of Sarteneja. Nowadays, with the increase in population, agriculture is being developed further and milpas (slash & burn cultivation) are expanding rapidly (see fig. 2, below).

The hardest pressure on the area, however, comes from the West, where Mennonites (European settlers of Swiss, Dutch and German origin that came to Belize during the sixties) are expanding their agricultural activities from Little Belize towards Shipstern Lagoon. Villagers from
Fig. 2: Map of Yucatan, Belize, Bacalar Chico National Park and Shipstern Nature Reserve.

1: Reserve Headquarters
2: Botanical Trail
3: Thompson Trail
4: New Trail
5: Main Trail
6: Western Survey Line
7: Xo-Pol Ponds

Shipstern Nature Reserve, Belize, Central America

Bacalar Chico National Park and Marine Reserve
Chunox, a community more traditionally based on agriculture, have also cleared further areas of forest south of the Xo-Pol area. Up to now, only minor conservation problems have occurred within the Shipstern Nature Reserve, such as occasional poaching or theft of trees. The latter concerns mainly species such as Santa Maria (*Calophyllum brasiliense*, Guittiferae), Ciricote (*Cordia dodecandra*, Boraginaceae) and Mahogany (*Swietenia macrophylla*, Meliaceae). The revival of selective logging in the last forested areas of the eastern part of the Corozal District is disquieting: within little more than a decade, vast areas surrounding Shipstern Nature Reserve have been stripped of their valuable hardwood species, sometimes illegally so. As Wright et al. (1959) report, the Mahogany in the forests of eastern Corozal is slow in growing and often stunted, but of excellent quality. Unfortunately, a whole range of species are now harvested, and often undersized trees are indiscriminately taken out. This poses a serious threat to the long-term viability of certain species, foremost Mahogany, and it is to fear that viable populations shall not continue to exist outside protected areas, if effective tree regeneration is impeded. Although forestry regulations are excellent in Belize, their implementation is made difficult by lack of personnel and financial means.

The pressure on Shipstern Nature Reserve will undoubtedly increase as a result of population growth, and the reserve itself will be, at some point in the future, completely surrounded by a mosaic of forest remnants and cultivated areas. It is therefore important to secure more land adjacent to the reserve to ensure its biological viability in the future.

Scientific research in this part of the country has always been relatively poor, a fact probably due to the isolated position of the area. In addition to the vegetation studies to be discussed in the following sub-chapter, various faunal studies have been carried out, in the past 15 years. The University of Leeds carried out preliminary faunal surveys during their expeditions in the mid-eighties. Meerman, former manager of Shipstern Nature Reserve, started, together with Boomsma, a series of annotated checklists of butterflies (Meerman & Boomsma, 1993), dragonflies (Boomsma, 1993), invertebrates (Meerman, 1993b), reptiles & amphibians (Meerman, 1993c), birds (Meerman, 1993d) and mammals (Meerman, 1993e). A preliminary survey of the freshwater fish fauna was carried out by the author (Bijleveld, 1990). A large-scale mammal survey, made possible by a grant of the SDC (Swiss Agency for

Fig. 2: 1988 satellite photograph of northeastern Corozal District, showing extent of forested areas.
Development and Cooperation), was carried out by the Wildlife Conservation Society (Miller, Miller & Quigley, 1995). A team of the University of Neuchâtel collected pedological data during their field course of 1993, some of which are presented here. BÄRTSCHI, of the University of Neuchâtel, carried out an extensive survey on bats during the first half of 1997.

1.2 Earlier vegetation studies in the area

Unlike research in other fields of biology, vegetation studies carried out in the north-eastern part of the Corozal District are scarce. Botanical surveys have been limited to nearby areas such as Freshwater Creek Forest Reserve and Honey Camp (Orange Walk District) south-east of the Shipstern Reserve, and to some areas in the northern part of the Corozal District - according to collecting localities cited in Bartlett (1935), Standley and Record (1936), Lundell (1940), Spellman et al. (1975) and Dwyer and Spellman (1981). The Honey Camp area, together with other areas in the Orange Walk district, have been botanically explored by LUNDELL, MEYER & KARLING in the 1930s. LUNDELL also collected in the adjacent state of Campeche (Mexico), and thus was able to identify the first links between the two floras. GENTLE, a local collector, provided BARTLETT and LUNDELL with numerous plant specimens from the Corozal District. As far as can be concluded from the available sources, plant collecting never took place in the immediate vicinity of Shipstern Nature Reserve, a fact which, again, is very likely linked to the geographical position and remoteness of the area.

During the 1950s, much work was done by WRIGHT et al. (1959) to provide a map and analysis of the vegetation patterns in Belize, based on the Holdridge Life Zone System (1947). The terminology used has changed since then, but the maps are still of particular interest, since the delimited vegetation patterns have not changed much (except for the areas that have been heavily disturbed - unfortunately most of the north-western part of the country). In 1984, HARTSHORN et al. published the Country Environmental Profile of Belize, wherein a corrected version of the life zone map of Belize can be found. Unfortunately, the description excludes minor life zones and transitional areas, rendering its use inadequate as a basis for more detailed vegetation analysis (see also next sub-chapter). More recently, BROKAW et al. (1990) did a study of the vegetation of the Rio Bravo Conservation Area which they regularly update (Brokaw et al., 1995 & Anonymous, 1996). IREMONGER & BROKAW (1994) produced a new Vegetation Classification for Belize, wherein the vegetation zones of Wright et al. (1959) have been corrected: according to WRIGHT himself, the species lists were sometimes short and inadequate, some distinctive vegetation patterns had been omitted and in a few cases vegetation types were shown where they do not exist.

REIMANNKÓVA et al. (1996) did extensive research on the wetland plant communities of northern Belize, whereas KING et al. (1992) provided a Land Resource Assessment of Northern Belize together with maps of current and past land use based on aerial photographs and satellite imagery. ZISMAN (1992) analysed the distribution of mangroves throughout Belize using GIS methods.
In neighbouring Mexico, a typology of vegetation zones and patterns was established by Miranda & Hernandez (1963), and completed by Rzedowski (1978). The vegetation of the Biosphere Reserve of Sian Ka'an, in the province of Quintana Roo, has been studied in many aspects: Olmsted & Duran (1986) brought to light differences in plant communities of low inundated forests, whereas Espejel (1986) classified the vegetation of littoral sand dunes. Duran (1986) did some extensive research on low semi-deciduous forests occurring in the area. Sanchez (1987) studied the composition and structure of the semi-evergreen forest of the CIQRO Botanical Garden at Puerto Morelos, Quintana Roo, whereas Escalante (1986) studied the overall flora of the same garden. Sousa Sanchez et al. (1983) gives a summary of information about forest associations in Quintana Roo, Mexico.

Within the immediate surroundings of Shipstern Reserve, vegetation studies include only two references: Waldren (1985), a member of the University of Leeds expedition, did a preliminary survey of transition patterns in the vegetation bordering Shipstern Lagoon, whereas Meerman (1993a) provided an annotated plant list for Shipstern Nature Reserve, the only published study documenting the flora of Shipstern Nature Reserve.

1.3 Climate

Belize lies in the outer tropics, i.e. in the subtropical belt, between 15 - 19° N latitude. The type of climate of this area mainly differs from the one occurring in tropical regions by its higher extreme temperatures. Mean monthly minima temperatures range from 16-17°C in winter to 24-25°C in summer, while mean monthly maxima range from 28°C in winter to 32-33°C in summer. Some maxima measured in the past exceed 40°C (Walker, 1973). Data from Santa Cruz (Corozal District) show an annual average temperature of 26°C (King et al., 1992). From November to February, arctic air masses sometimes penetrate far to the south. These cold, wet masses enter the country from the North-East and affect temperatures severely. It is not unusual that temperatures drop as low as 10°C. Normally, coastal areas in Belize are exposed to southeast tradewinds.

Rainfall in Belize increases on a North-South gradient. For example, the village of Libertad, Corozal District, has an annual rainfall average of 1347 mm, whereas Barranco in the Toledo District receives an average of 4526 mm.

Fig. 3: Rainfall in Belize (from Hartshorn et al.)
Rainfall at Shipstern Nature Reserve was measured over a period of 4 years (Meerman & Boomsma, 1993). Results showed that the area receives only 1260 mm a year, with a minimum of 1029mm/year and a maximum of 1610mm. From the available data can be concluded that Shipstern Nature Reserve and its immediate surroundings are the driest areas in Belize.

The dry season usually starts in mid-January and ends in May, February and March being the driest months. The end of April generally sees the first showers, and rain falls more regularly as from May onwards. August, again, is a somewhat drier month. On average, the highest rainfall occurs during the month of September.

These climatic data permit some conclusions as to the exact place of Shipstern Nature Reserve in the Holdridge (1947, 1967) classification of life zones. Unfortunately, the average temperature for the area is unknown which prevents a precise positioning in the system. The Shipstern Nature Reserve area is probably a transition between the subtropical moist forest, the subtropical dry forest and the tropical dry forest life zones. Santa Cruz (Corozal District), of which the mean average temperature is known, falls into the subtropical dry forest life zone, although it is more probably also transitional.

September and November occasionally see a climatic phenomenon with sometimes dramatic consequences: hurricanes. These are, depending on their wind speed and duration, classified as tropical depressions, tropical storms or hurricanes. Hurricanes are the most powerful of all cyclone types and may have, when they do reach coastal areas, devastating effects. It is astonishing to see that between 1886 and 1978, only 5% of the recorded hurricanes that developed in the tropical part of the Atlantic Ocean ever reached Belize. It is even more astonishing to note the extent of the damage caused by the very few that did. The hurricane that hit the country in 1931 nearly destroyed all of Belize City. The same town, among other areas, was struck again in 1961 by hurricane Hattie. This made the British government decide to move its administration to a more sheltered inland area that was to become the capital Belmopan in 1971.

Hurricane Janet hit Belize in 1955, and greatly affected the northern part of the country: it destroyed Sarteneja, then passed over the area that now encompasses Shipstern Nature Reserve, spared - to a certain degree - the village of Chunox, before finally hitting and destroying Corozal Town. The extent of the damage was not only horrendous with regard to habitations and people, but equally the vegetation: the forest in the area was completely flattened, and subsequently suffered from severe fires (J. Verde, pers. comm.). The extent of the area hit by the hurricane is, nowadays, difficult to assess. According to J. VERDE, "an area