The Burseraceae (*Boswellia*, *Commiphora*) of Central Somalia

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INTRODUCTION

Frankincense and myrrh are the best-known products of the family Burseraceae. Resin-producing species of *Commiphora* and *Boswellia* in the Horn of Africa and SW Arabia were important articles of trade between this part of the world and the Mediterranean empires two to three millennia ago. (The Pharaohs sent an expedition to Somalia, then called Punt, to get myrrh which they valued for embalming mummies (c1000 BC) – JGB; also cf. Baumann 1960).

A bibliography of Somalia's range and forestry by Bowen & Bird (1988) notes: "The importance of the gums and resins trade, particularly in earlier times, is clearly reflected in the number of references on this topic. Of these, the majority refer to the gum frankincense and the trees of the genus *Boswellia* which produce it. It is thus surprising to find so few papers on the cultivation of these important species." This is particularly unfortunate since incense products in Africa, notably frankincense and myrrh, "often seem to reach consumers by circuitous routes with middlemen making a high profit." This is contrasted with the marketing of gums, notably gum Arabic, where the producer gets a much better share of the profit. Improvement of production would be "highly facilitated by the ease with which the species involved are propagated vegetatively." (Poulsen 1982)

Even today aromatic resins are an article of commerce in Somalia, but their value is far overshadowed by the rangeland significance of Burseraceae. Trees and shrubs of many *Commiphora* and a few *Boswellia* species form a dominant component of the semi-arid rangelands which cover most of the country as well as adjoining areas of Kenya and Ethiopia. In many areas commiphoras are second only to acacia (*Senegalia* & *Vachellia*) in cover, biomass and browse value for livestock, and over sizeable areas the genus forms the dominant plant layer. For reasons of its great diversification, abundance and wealth of characters, not least of which are its gum-resins and palatability for camel and goat, *Commiphora* is a worthy subject of biological and ecological scrutiny.

Despite their ubiquity, the commiphoras remain one of the most poorly understood and documented plant groups in Somalia or for that matter all of Africa. Intrinsic features of their developmental morphology and form, as well as the relative inaccessibility of the habitats combined with the generally low level of understanding of the flora (Kuchar 1986a, Thulin 1999), have for a long time curtailed any real flow of information on the group.

Collecting activity and vegetation studies by the turn of this century have helped elucidate the status of most of the Chiovendan and Englerian taxa and have amplified their characterization and distribution information. An important paper by Vollesen (1985) described 13 new species of *Commiphora* of which at least half are common in the Central Rangelands (CR) (Fig. 1). A paper by Thulin (2000) described 10 more Somalia species. Since then, some further taxa await formal description, pending fuller material.

Although taxonomic puzzles remain and although new species will still turn up, this report should help clarify the status and diagnostic features of most of the CR species viz. C Somalia (Fig.1), and it is hoped that the genus will attract the multidisciplinary attention it deserves. The CR include Mudug, Galguduud and Hiraan Regions. C Somalia per FS2 (Thulin 1999) has Mudug and Galguduud in C1 and Hiraan in C2, but C2 includes Bakool Region west of Hiraan (Fig. 1). Currently Hiraan is combined

with Middle Shabelle Region as Hirshabelle State while Galguduud and Mudug are combined as Galmudug State (Wikipedia 2025b), but those new names are not used in this report.

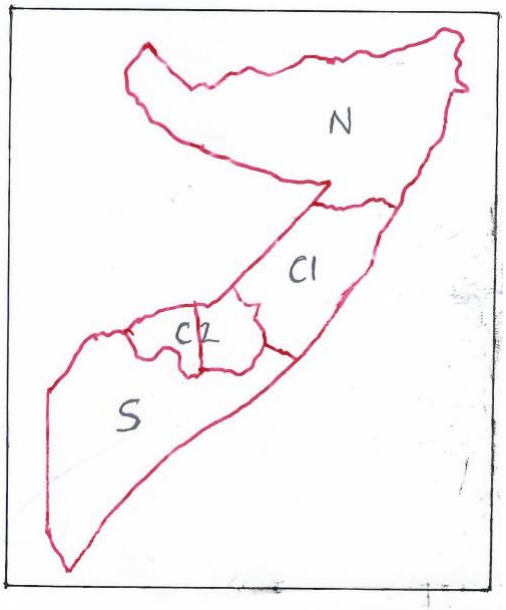

Figure 1. Somalia floristic regions. C Somalia (aka CR) includes C1 (Galguduud & Mudug Regions) and the right portion of C2 which is Hiraan Region. The left portion, Bakool Region which belongs to S Somalia, was placed in FS (Thulin 1999) as part of floristic region C2. Hiraan has 3 districts, Beledweyne, Buulo Burte and Jalalaqsi, from N to S respectively.

All Burseraceae found in Somalia are featured in this report. However, only those in CR are emphasized and a vegetative key has been developed for them. The remaining species found in Somalia are each briefly dealt with. Vegetative characters especially, leaf and bark, have been used in constructing the key, with occasional supplementation of flowers or fruit. Commiphoras do not synchronize flowering and leafing out, flowers and fruit are far scarcer than leaves or other features such as size and bark. Most vegetative features are accessible to the naked eye.

Fortunately, some taxonomists have an enlightened attitude toward plant identification. For example, in an Asian monograph of the Burseraceae, Leenhouts et al. (1956) recommend using vegetative keys as far as possible, the justification being that most species are dioecious, and female trees very rarely bear flowers and fruit simultaneously. Note that this applies equally to *Commiphora*. In his study of miombo woodland, Malaisse (1978) noted that a major gap in knowledge was species identification. “A key based on leaves and seedlings would be most valuable.” In a key to the shrubs of Ontario (Canada), Soper & Heimburger (1982) plainly state: “The keys are based mainly on vegetative characters as this is the condition most frequently encountered in the field.” A more in-depth look at vegetative keys can be found in Kuchar (1995).

PUBLICATION HIGHLIGHTS FOR AFRICAN BURSERACEAE

A very useful summary of the historical rise of taxonomic knowledge of Trop Afr Burseraceae, focusing on those of ENE Trop Afr, was prepared by Teshome (2003), and some details from his treatment have been used in the following synopsis.

Descriptive accounts of *Commiphora* began in 1797, and Teshome cites 49 publications. Engler (1883) divided 35 species into 2 groups and 18 subgroups. In 1896 Engler recognized 63 species, and in 1912(1913) 129 species of African Burseraceae in 43 Artengruppen ('sections'). In earlier 20th century Chiovenda focused on the Burseraceae of Somalia. In 1916 he characterized 3 *Boswellia* and 17 *Commiphora* species including 7 new species described. In his Flora Somala (1929,1932) he cited 3 *Boswellia* and 64 *Commiphora* species including 29 new commiphoras described. By 1935, Sprague (1927) and Chiovenda had listed 160 species for Somalia and other areas. Burtt (1935) covered the Tanzanian species, but his paper had good practical information and caveats on collecting, also economics and vegetation.

In 1941 Hutchinson & Bruce supplied information on commiphoras of the Horn, including ample descriptions, in fact some being redescriptions of some Chiovenda species. A major revision and classification by Wild (1959) distinguished 185 species in 2 subgenera, Opobalsamum and Commiphora, the latter divided into 5 sections and 11 subsections. In 1963, Wild published the Burseraceae for Flora Zambesiaca (southern Afr.) region. S. African work by de Winter (1968) culminated in van der Walt's (1973,1974,1975 a, b) detailed descriptions of *Commiphora* species and distributions in S. and SW Africa.

Table 1. Progressive number of *Commiphora* species known.

Berg 1862	13
Engler 1883	35
Engler 1896	63
Engler 1913	129
Wild 1959	185
Vollesen 1989	150-200
Gillett 1991	190

While the wealth of *Commiphora* species was being uncovered in the Horn of Africa drylands, its sister genus *Bursera* was found to have proliferated in the Neotropics, particularly tropical deciduous forest. Frequent local endemism e.g. in Mexico suggested that the genus had undergone considerable adaptive radiation associated with ecological and geographical factors. (McVaugh & Rzedowski 1966). The evolutionary similarity to *Commiphora* is obvious. Physical similarities are also inescapable, e.g. leaves predominantly pinnate, often a winged rachis, many species with papery peeling bark, resinous aromatic sap commercially important in some species, sexually dioecious or polygamodioecious, important for live fencing, and bark and leaf characters valuable for identification.

"For many years the South American genus *Bursera* and the African genus *Commiphora* have been viewed as closely related despite their obvious geographic isolation. In fact, some species of

Commiphora are so similar to those of *Bursera* that Bullock (1936, 1937, 1938, 1939) commented that if they had been found in Mexico as opposed to Tanzania they would indeed have been classified as the same genus. This observation became a catalyst for the work of Gillett (1980) who reexamined the morphological characters used to separate the genera and evaluated affinities. Gillett (1980) showed that there was indeed some blurring of generic boundaries and transferred *Bursera leptophloeos* Mart. from *Bursera* to *Commiphora*. Additional support for this hypothesis comes from recent palynological studies (Harley & Clarkson 1999) in which the pollen of a few species of *Commiphora* have been shown to have aperture characteristics more typical of *Bursera* pollen, whereas the pollen of one or two species of *Bursera* have aperture characteristics more typical of *Commiphora* pollen." (Clarkson et al. 2002) Rzedowski & R Palacios-Chávez (1985) transferred two C American species of *Bursera* to *Commiphora*. According to Gillett (pers com), "I do not wish to express an opinion as to whether these two species really are Commiphora. The fact that they come from Central America is surprising."

The basic modern framework of *Commiphora* sections, used in FTEA (Gillett 1991), FE (Vollesen 1989) and FS (Thulin 1999), originates in Vollesen (1985). Vollesen (1985,1986,1989) proposed 12 sections for NE Trop African species. Teshome comments on conflicting ideas between Vollesen and Gillett in systematics of Ethiopian and Kenyan commiphoras, respectively. However, I would call the differences relatively trivial. Gillett used Vollesen's 11 sections but split sec. Commiphora into 2 sections and kept Hemprichia distinct from Arillopsidium vs. Vollesen's Spondioideae. (He also created 2 new sections Pedunculatae and Ugogenses, each with 1 species, in E Africa only in Tanzania.)

Vollesen used 11 characters in his designation of groups: spines, leaf type, bark, exudates, infl type, flower color, disk, pericarp valves, pseudaril shape and arms, endocarp surface. But Teshome said that leaf type, bark peeling nature, resin types and infl types are variable within species, precluding their use for sectional delimitation. He used 40 characters. Some of them: shrub vs. tree, ht < or >3 m, bark peeling, thorns, petiole < or >1.5 cm, leaflet < or >3.5 cm, leaflet width < or >1.6 cm, petiole & leaflet trichomes, multicelled glandular hairs, various fl characters, drupe > or <10.5 mm, stone > or <7 mm, pseudaril arms & extent. Most dubbed primitive vs. advanced characters.

Based on cladistic analysis (looks like cluster analysis), Teshome recognized 7 sections in a selection of 74 species in ENE Trop Afr. The arrangement deviates markedly from the more natural arrangement used in the 3 major floras. Why have a new section name, Schimperianae, when Africanae is perfectly serviceable? Why redefine Coriaceae, originally having only *C. myrrha*, to include most of the species in former sec. Commiphora? Why place most sec. Africanae species in former sec. Hildebrandtianae when the latter are thornless? Sec. Hemprichia has become a jumble, with most (but not all) former Arillopsidium whose members are distinctly different from other sections but also thrown in some sec. Hemprichia and even *C. campestris* from spiny sec. Campestres (which disappears). New sec. Cupulares is also a jumble.

It bears noting that most (if not all) members of sec. Arillopsidum are poisonous (though the fruit of *C. edulis, C. paolii* and possibly others is edible), and vegetative parts were used to make hyena poisons as well as arrow poisons by the Somalis. The potential of plant poisons, some from *Commiphora*, for predator control was investigated by Kuchar et al. (1995). The southern African *C. glandulosa* Schinz (*C. lugardae* N.E.Br., *C. seineri* Engl.) (sec. Commiphora) is the only other species regarded as toxic: "Said to be a poisonous tree." (Pole-Evans in Brenan 1953).

Teshome then prepared a thorough systematic description of *Commiphora* and its new sections, and a key to sections. I am pleased that he has un-synonymized Thulin's (1999) merging of *albiflora*, *velutina* and *ancistrophora* under *gileadensis*. He also considers Thulin's merging of various species under *kua* to be unwarranted, also my opinion. Ditto for *ogadensis* vs. *hildebrandtii*.

BURSERACEAE IN NE TROPICAL AFRICA

The Burseraceae are a moderate-sized family of woody dicots, with 18 genera and some 560 species, widespread through the tropics of both hemispheres and just reaching the subtropics in the Middle East, S. Africa (as far as 33ºS in the eastern Cape) and Mexico; but few in Australia (Gillett 1985). The Australian Burseraceae are clearly recent immigrants from the north. The poverty of Burseraceae on that continent, much of which would seem to be ecologically well suited to such plants as *Commiphora*, *Boswellia* and *Bursera* may be because in comparatively recent geological times it lay much further from the equator than it is today and was thus too cold for Buseraceae.

North-eastern Africa has 3 genera of Burseraceae, of which *Boswellia* and *Commiphora* occur in Somalia. These are shrubs and small trees rarely exceeding 10 m tall, and often with markedly contorted limbs forming a gnarled stunted-looking crown.

Virtually all *Commiphora* species are dioecious viz. separate male and female plants; Gillett (1991) calls it imperfectly dioecious, rarely monoecious. Regionally, the only monoecious species is *C. monoica* found in a small area of S Ethiopia. Taxonomic descriptions treat the sexes as isomorphic except for the inflorescences, but there may be anatomical and structural as well as ecological differences. A rare comment on the subject notes that the female plant of *C. rostrata* is less spiny and the stems tend to be thin and flexuous (Gillett & Hemming in EA). Gender could help explain some odd hedging data from the CR, where certain species, especially *C. truncata*, exhibit unusually wide differences in browse impact in ecologically equivalent stands. The significance of gender in gum production and browsing ecology (e.g. gender recognition by browsers) is wide open for investigation.

Darwin 1877 was among the first to recognize that reproductive differentiation in dioecious plants could place specific and perhaps different resource demands on each gender – which could lead to specializations between the sexes at the morphological, physiological and ecological levels. Studies especially in 1980s have studied such sex-specific spatial or niche partitioning. (Dawson & Bliss 1989)

Sexual dimorphism may be obvious in some plants, e.g. the female cannabis plant is usually taller and stockier, and a fuller aspect due to more leaves near the flowers (Tippo & Stern 1977). And it can be induced to change sex simply through day-length treatments (Heslop-Harrison 1957 cited by van Wyk & Claasen 1981). Nonetheless, in the absence of flowers or fruit it is often impossible to separate the sexes of many dioecious plants.

Studies in the ecology of dioecy have produced varying outcomes. For example, Freeman et al. (1976) studied the ecology of 5 dioecious species in the western U.S. For *Distichlis spicata*, low-salinity sites had proportionately more females. For *Thalictrum fendleri*, males were more abundant on dry sites, females concentrated on moister sites. For *Acer negunda*, proportionately more females along streambanks than on adjacent hillsides. For *Atriplex confertifolia*, males most abundant on ridges while

females better represented on moister alluvial fans; also more males in more xeric vegetation and more females in more mesic vegetation. For *Ephedra viridis*, males more abundant on steep slopes while females more common on better-watered sites at slope base. Females require more resources for reproduction, thus are more successful on better-watered and more fertile sites. They cited a study of 6 dioecious species that found males consistently less sensitive to water stress.

"In dioecious plants, females and males frequently differ in their resource demands for reproduction and in the phenology of these demands" – several references cited by Kohorn (1994). It is commonly noted in the literature that males show greater herbivore damage than females (Elmqvist et al. 1991) – with some exceptions. However, the existence and degree of gender bias in populations of dioecious species, and the possible action of browsers in modifying the sex ratio, is not intuitively predictable. For example, male *Atriplex canescens* is preferred by herbivores but female *A. vesicaria* is preferred (Maywald et al. 1998). Another study (Cibils et al. 1997) reported bias for female *A. canescens* by browsing cattle.

Many species of *Salix* at N latitudes, especially in areas with abundant bark-feeding rodents, have female-biased sex ratios. These rodents generally prefer male willows, and the lopsided sex ratio is likely at least partly the result of differential consumption (Elmqvist et al. 1991). Female arctic willows are common in mesic to wet, more nutrient-rich habitats and here are much more prolific than males (Dawson & Bliss 1989). Voles may prefer male willow bark, hence a female-biased ratio. They could favor male bark if female bark has far greater tannin content. (Danell et al. 1985)

A caveat on field studies of *Salix lasiolepis* by Boecklen et al. (1990) is that sex differences in herbivory may be confounded with sex differences in microhabitat. Consider *Commiphora* in the Horn of Africa. The innate sex differences in plant size, microhabit preferences, phenology etc. are moderated by camel browsing which likely has gender preferences. The authors suggest that herbivory may play an important role in maintaining dimorphic patterns of resource allocation in dioecious species. Consideration of the literature by Hjältén (1992) finds that herbivores can have an important impact on the sex structure of dioecious plant populations. However, it has also been suggested that a biased sex ratio is inherently determined (Ueno et al. 2007).

More than half of bryophytes are dioecious. This enhances variability through outbreeding but poses serious reproductive problems if both sexes aren't close together, i.e. a few cm (Schofield 1985). The spatial distribution of dioecious vascular plants is less problematic though very low seed set in commiphoras has been observed and attributed to low attraction of pollinating insects to female flowers. In a study of *Commiphora guillauminii*, the dominant forest tree in a W Madagascar study, Farwig et al. (2004) found insects (potential pollinators) visiting male flower far more frequently than female flowers, and fruit set was extremely low. A S. African study of *C. harveyi* by Voigt et al. (2005) also found remarkably low fruit set. Male trees had more and larger flowers per inflorescence than female trees.

I have no information on population sex ratios of commiphoras in CR plant communities. It is possible that male and female trees are not equally palatable to camel, therefore differential browsing impact could further skew sex rations. Such a juxtaposition of dioecious food plants and their utilizers is rare on such a scale, of thousands of km^2 (though note Arctic *Salix*). If camels have indeed modified commiphora sex ratios, this is a further impact on top of the initial impact they must have had on commiphora populations of the CR when they first entered the acacia-commiphora bushlands 1500-2000

years ago (Ehret 1995, Kusow 1995).

Commiphora and *Boswellia* species have some plainly evident characters valuable in separating them from other genera and in species identification. Look for papery bark, resinous-aromatic sap, a gnarled dwarf tree form, spines, short-shoots, leaves often 3-foliolate, and a small drupaceous fruit. Combinations of characters will be diagnostic – e.g. not all species have spines or 3-foliolate leaves.

More than a third of the Somalia species are armed with differentiated single spines and/or spine-tipped twigs. Coincidentally, 39% of the commiphora complement in each of N, C and S Somalia is armed. Some of the commiphoras of the Zambesian miombo zone have unarmed branches but bear large spines on the trunk, a condition not found in Somalia. The presence or absence of true spines is a character of the greatest importance in the classification of *Commiphora* but has been little used in the past because the careless collector can all too easily secure and prepare spineless specimens (Gillett 1987).

Although no commiphoras are true vines, i.e. tendrillate or twining, a few are scramblers at least when young. Somalia representatives include *C. alaticaulis*, *C. rostrata* var. *reflexa* and *C.* sp.=Kuchar 17300, and maybe sometimes *C. velutina*. A few such species are to be found in other floristic zones (e.g. *C. pteleifolia* in coastal E. Africa does scramble). Markedly fluted trunks are another uncommon character.

In the field, members of the Burseraceae are infrequently mistaken for other taxa. Nonetheless, *Commiphora tomentosa*, described from Kenya by Engler, is actually *Lannea rivae*. A few Burseraceae were first described as Anacardiaceae, e.g. *Boswellia socotrana* Balf.f. as *Odina* (*Lannea*) *asplenifolia*, and *Commiphora ornifolia* as *Odina ornifolia* Balf.f. (Kokwaro & Gillett 1980). A synonym of *Sclerocarya birrea* is *Commiphora subglauca* Engl. Most of the confusion seems to be with *Lannea* especially species such as *L. alata* that have a winged rachis. Rarely, the sap of *Lannea* will be described as having an odor, e.g. "Strong smell" for *L. schweinfurthii* (EA). However, this is not a character typical of *Lannea*, and the lack of papery peeling bark is also notable. But a simple test is that whereas *Boswellia* and *Commiphora* twigs are brittle and snap when bent, the flexible and elastic bast-covered twigs of *Lannea* will bend. The bark of *Lannea*, furthermore, is stringy, a condition unknown in *Commiphora* (Burtt 1935, Brokensha & Riley 1975). *Commiphora* bark flakes or chips. Stellate foliar hairs, characteristic in *Lannea*, are unknown in *Commiphora* with the exception of the C Somalia endemic *C. stellatopubescens*.

Lannea alata is easily confused with *Boswellia hildebrandtii* (Kokwaro 1986). *Kirkia* (Simaroubaceae) could be mistaken for *Boswellia* but has a winged fruit and bark corrugate (vertically fissured) rather than smooth or papery. *Platycelyphium voense* (Papilionaceae) was originally described (by Engler) as a *Commiphora* (Thulin 1983) but its large somewhat glutinous leaflets are not easily confused. *Rhigozum somalense* (Bignoniaceae) resembles an unarmed 3-fol. *Commiphora*. The E-C African *Ekebergia benguelensis* (Meliaceae) has been mistaken for a *Commiphora*. *Citropsis* sp.=Hemming SRS 520/1 (Rutaceae) from S Somalia has 3 leaflets, a winged petiole, and is armed. *Erythrophysa septentrionalis* (Sapindaceae) in SE Ethiopia has pinnate leaves with winged rachis just as in some commiphoras. In SE Asia one might mistake *Spondias* (Anacardiaceae) for *Canarium* (Burseraceae) (Corner 1952).

Both *Boswellia* and *Commiphora* produce resins and fragrant sap whose abundance, color and other physical properties may well be species-specific, though many more observations are needed to quantify this area. Already, sections and groups of species can be classified by the nature of their resin. Odor alone - its type and intensity - is a very helpful diagnostic feature. For example, *C. sphaerophylla* is easily recognized by its sweet odor, unusual among *Commiphora* resins, and *C. rostrata* by a musty odor. Sap odor ranges from nil and very faint to acrid-pungent and ammoniacal and has been described as 'turpentiny' and `dieselly.` The slash of the extralimital *C. eminii* is said to smell of green mangos (EA).

Most species show either milky white or watery exudates. Some are intermediate e.g. *C. erlangeriana, C. spathulata*. Some produce scanty sap e.g. *C. lindensis, C. glandulosa*. Various aromas and intensities. Exudate amount and scent may be a function of season, e.g. field observation of the same shrub of *C. gurreh* showed highly aromatic in dry season and at most faintly scented in wet season; this could be due to concentration dilution in wet season (Teshome 2003). This may be the answer to the varying sap amount and scent attributed to some species.

Most exudates are "*terpenoid* in nature, being derived from mevalonic acid through a five carbon (5C) precursor to give compounds that vary considerably in size and structure but contain a carbon skeleton made up of multiples of five carbon atoms. Three basic types of terpenoid compound are recognised as being important in resins; *monoterpenes* (10C) and *sesquiterpenes* (15C) which are both volatile and are responsible for the pungent smell produced by many exudates; *diterpenes* (20C) and *triterpenes* (30C), the latter often present as acids, which are generally nonvolatile and form the true resinous exudates; and *polyterpenes* (>100C), which are milky, free-flowing, liquids known collectively under the heading of *latex*. A contrasting category of exudates are those known as *gums* and *mucilages*. These are polysaccharide in nature, being made up of very large molecules formed by the polymerisation of simple hexose and pentose sugars, notably glucose, galactose, arabinose and rhamnose. Unlike the terpenoid resins the gums and mucilages are generally at least partly water soluble. Unfortunately, subdivision of exudates into these groups is not straightforward as it is usual for them to contain more than one type of component. For example, some of the resins produced by *Commiphora* species must be defined as *oleo-gum-resins* because they contain volatile mono- and sesquiterpenes, polysaccharide gums and triterpene resin acids." (Waterman 1986)

Resin quality and quantity can be related not only taxonomically, but also appear to vary with site and season, and there is even tree-to-tree variability. Different forms of exudate can be produced by the same species. For example, Waterman (1986) recognized three exudate types from *C. africana* related at least in part to tree health. Resin collecting is usually enhanced by injuries to the tree, which stimulates exudate flow, but spontaneous `bleeding' can appear on apparently perfectly healthy bark.

Resins are a typical chemical feature of xerophytic floras (Dell & McComb 1978 cited by Waterman 1986). The leading hypotheses on resin function link them to water conservation - the sealing of transpiration points - and protection against herbivores and pathogens. When leafless, few of the Burseraceae appear to offer anything by way of food for livestock, and the resins may dissuade wood-eating insects especially termites. Debarking damage is low for both elephant and livestock. (Waterman 1986)

Acacias (*Senegalia* and *Vachellia*), the main competitor of *Commiphora* in NE Trop. Africa, support many more insect species in the canopy (West 1986). Whereas acacia canopies have many species of Coleoptera and Lepidoptera, *Commiphora* trees are richest in Hemiptera. These are sap feeders while the first two are chewing insects, suggesting that the resins in *Commiphora* play a role in limiting the variety of leaf eaters. West (1986) notes that when leaves are cut or punctured,, they exude resinous material which may interfere directly with feeding, and by hardening on exposure may deter further feeding. This helps explain why the phytophagous insect fauna of *Commiphora* is dominated by sap-feeding Hemiptera which circumvent the problem of resin release, though they have had to become specialists in their ability to ingest resinous material.

A few species (Tab. 4) – all are in the CR – have the remarkable feature of spraying sap when a twig is bent slightly. Comments on some herbarium labels:

> "When branches pierced a spray of resin spurts out as though under pressure" (Powys in EA).
> "Bark spits when pinched" (Wieland in EA).
> "Bark spurts aromatic oil on cracking."
> "Sap...can be thin & run from cut twig, or even spray in a brief thin jet from bent twigs."

Doubtless an antiherbivore device, this property has to our knowledge not been reported in other members of the NE African flora, though the southern African *C. cervifolia* squirts sap when branches damaged (Swanepoel 2011). However, in Mexico the phenomenon has been described in the related genus *Bursera* (Becerra 1994). *Bursera* is notable for its terpenoid secretions and exudates arising from resin canals. Damage causes an immediate release of fluids from the site of injury. However, in some species the resins are under considerable pressure and when a leaf is damaged, they may be released in a syringe-like squirt. In some species this squirt may travel up to 2 m and last a few seconds. About 1/3 of the 80 Mexican species can squirt resins when injured, 1/3 release moderate amounts of fluid that may partially bathe the leaf blade, and 1/3 release little or no fluids. [Contrast this with *Commiphora* which has a much lower proportion of squirters.] *Blepharida* beetles feed on *Bursera* and some other genera. They cut the leaf resin canals before feeding. The squirt defense can hinder or deter these beetles, even kill them. Highly squirting *Bursera* species tend to have highly volatile mixtures of terpenes. (Becerra et al. 2001)

It is interesting that the *Bursera* first investigated (Becerra & Venable 1990) has simple succulent leaves. It manifests an undeniable parallel with a common *Commiphora* in Somalia, *C. rostrata*, unusual in the genus in having simple fleshy leaves and a squirt response. When *C. rostrata* is browsed by camel this is said to prevent camel flies (Hippoboscidae) from collecting on the beast. Sap of *C. ancistrophora* kills camel flies if sprayed on them. Somali pastoralists point out that spraying *Commiphora* sap will not cause blindness, but a person will feel severe pain. These volatile resins have not yet been characterized chemically due to the difficulty in collecting material for lab analysis – it probably needs to be distilled at site (cf. Waterman 1986).

Another feature, not exclusive to this family but seen in the majority of *Boswellia* and *Commiphora* species, is the tendency of the bark to peel in scrolls, strips or sheets, revealing a darker under-bark. This contains chlorophyll so that photosynthesis can be maintained when the trees are leafless, which can be up to 9 months of the year. Examining some neotropical trees, Scrivner & Black (1983) found some correlation between duration of leafless period and bark chlorophyll concentration. The variability in

color and degree of peeling is another useful diagnostic character. The color of peels is mostly white, pale yellow or pale orange, while the trunk (or under-bark) is green, blue-green or black. The scrolling or peeling bark does not accumulate at the tree base as in, for example, some Australian Myrtaceae (Corner 1952) (e.g. eucalyptus).

Peeling bark also in *Delonix baccal* (Caesalpiniaceae), *Platycelyphium voense* (Papilionaceae), *Steganotaenia araliacea* (Umbelliferae), *Cordia goetzei* (Boraginaceae), *Jatropha dichtar* (Euphorbiaceae), *Cyphostemma betiforme* (Vitaceae) and some acacias, e.g. *A. ankokib*, *A. asak*, *A. circummarginata*. The Ethiopian *Euphorbia reghinii* was long regarded as a *Commiphora* probably because of its whitish papery peeling bark. Bark of *E. cuneata* has been described as peeling like *Commiphora* (Gillett *in* Carter 1989). The bark of the mangrove *Xylocarpus* (*Carapa*) *granatum* peels in scroll-like flakes (Corner 1952) or irregular patches (Hassan & Cheek 1999).

Slash characters (by cutting into the trunk) are important in diagnosis of tropical forest trees, where crowns are not readily accessible. However, they are generally not used in bushland floras. *Boswellia* and *Commiphora* possess enough other characters; besides, slash causes more mutilation than the snipping of a twig. (Kuchar 1995)

Most if not all Somali species of *Boswellia* and *Commiphora* produce two types of shoots. Long-shoots are `normal' elongate undifferentiated shoots on which leaves are alternately placed. These are not always present, being naturally sparse on the plant or having been browsed off. Short shoots, on the other hand, will always be found. This shoot type ranges from 1 mm to as long as 10 cm in extreme cases, but the normal range is c2-20 mm. Short-shoots are usually densely leaf-scarred and are in the growing season surmounted by a group of leaves. The length, diameter, color and texture of short shoots have diagnostic value but a lot more collecting is needed to quantify the normal range of variation for each species. Long-shoots and short-shoots have also been called extension shoots and spur shoots, respectively (Cheek 1991).

The leaves of Burseraceae are spirally arranged but appear alternate or fascicled on leaf-scarred spurs. A few species have simple leaves, but most have 3-foliolate or odd-pinnate leaves. Leaf or leaflet shape ranges from narrowly lanceolate to orbicular but is most commonly obovate and oblong-obovate. The margin is entire or toothed, and the leaf is never lobed. The Malagasy *C. pervilleana*, a small tree of dry forest, is unusual in having a drip-tip. Leaflet size is normally in the range 1-4 cm, but up to 10 cm in some members of sec. Arillopsidium. Leaves of S-C African woodland and thicket commiphoras are generally more robust than those of Somalia bushlands.

Flowers are arranged in panicles, corymbs, racemes, cymes, fascicles or solitary; they are rather small, regular, and usually imperfectly unisexual and dioecious. It is common to find a few fruits on male trees and on isolated female trees (Gillett 1987). The calyx is capsular or saucer-shaped with 3-5(6) usually valvate lobes. Petals (0)3-5(6), valvate or imbricate, usually free. Stamens are outside of or on the margin of a disc, (3-5)6, 8 or 10(12), usually twice as many as the petals and in 2 whorls. Ovary superior, 2-5 locular with 2 ovules pendulous. The fruit is a drupe or pseudocapsule.

For taxonomists the most valuable diagnostic feature of African Burseraceae is the fruit, and the 15-odd Sections in *Commiphora* are arranged primarily on fruit morphology. In *Boswellia* the fruit is a (2)3(5)

valved pseudocapsule; this is a dry dehiscent fruit which on opening releases, not seeds but 1-seeded nutlets. *Commiphora* fruit is a dehiscent drupe, the fleshy pericarp splitting into 2 or 4 valves disclosing a 2 or 3 celled 1-2 seeded putamen (stone) which is usually surrounded or subtended by a red psedaril. The configuration of this pseudaril is a critical feature of *Commiphora* taxonomy.

In identifying commiphoras one is not limited to pseudaril diagnostics; in fact, this rather technical exercise may be frustrating for the novice and has been totally excluded from the Key to Species. *Commiphora* is blessed with more than its share of valuable diagnostic features, especially plant form, bark type, sap odor, color and abundance, leaf form and size, and flower type. Combinations of characters should lead one to a correct diagnosis. However, countering these advantages is a peculiar phenology of brief leafing-out, often non-synchronous production of reproductive parts, and dioecy, which has made *Commiphora* one of the most difficult and poorly understood of African genera.

Commiphora is, as Dale & Greenway (1961) put it, "A genus of frustrating trees and shrubs, mostly appearing to be leafless for nine months of the year... The flowers and fruits are seldom produced with the leaves and are therefore difficult to identify." Identification is challenging due to dioecy, flowering nonsynchronous with leaves, and the deciduous habit (Vollesen 1986). Thulin (2000) mentions the difficulty of getting complete material from plants leafless most of the year, and usually flowering or fruiting when leafless or with young foliage. Commiphoras are notorious for being, or at least seeming to be, leafless all the time. They are quick to respond to rain, but among the first plants to lose their leaves at the end of the season. This seems to hold true as far away as S. Africa. In coastal Natal, Ward (1980) noted that of all deciduous species *C. harveyi* generally went the longest period without leaves and was also usually the first to drop leaves.

Commiphoras are not favorites among collectors: they are rarely in leaf or reproductive condition, many are spiny, and the strongly 3-dimensional twig and spine architecture makes them awkward to collect and press. All major stages in securing and preparing acceptable herbarium sheets of *Commiphora* take extra effort, and the average commiphora specimen will take several times longer to process than other plants. Burtt (1935) and van der Walt (1973) have commented on the generally poor quality of herbarium specimens of species which are poorly represented in herbaria to begin with. The main reasons for this are (1) inadequate attention and care in collection and preservation and, related to this, (2) the poor availability of good material. The poor state of collections has led to far too many species being described from inadequate material, and Wild (1959) considers this one of the principal reasons for the apparently difficult taxonomy of the genus. He cites some wild guesses by none other than A. Engler.

The difficulties in naming commiphoras have been compounded by the taxonomic legacy, particularly of E. Chiovenda. This prolific student of plants from the Horn of Africa seems to have been in a great hurry to describe anything that looked new. This meant descriptions from poor, even sterile material, redescriptions of the same species, and even redescriptions of the same collected material. Vollesen (1989) in FE3 describes one such fiasco: In 1915 Chiovenda described *C. dancaliensis* based on Pappi 36. By 1932 he'd forgotten about this and redescribed Pappi 36 as *C. assaortensis*. He also totally misinterpreted the material, indicating that it was close to *C. rostrata* whereas the two names are now synonyms for *C. habessinica*. An even worse gaffe: the type of Chiovenda's *C. reghinii* is a specimen of *Euphorbia*!

As striking examples of how recently our knowledge of the CR commiphoras has grown, consider the status of two locally abundant taxa, *C. chiovendana* and *C. stellatopubescens*. They were only described in 2000. Both are abundant and locally codominant in the tree layer of Buulo Burte Dist. bushlands. *C. stellatopubescens* is particularly notable as a leading dominant of limestone hills and plateaux in the upper Shabelle Valley of C Somalia.

See Appendix 2 for guidelines on collecting commiphoras.

BIOGEOGRAPHY AND ECOLOGY

Boswellia and *Commiphora* are characteristic genera of the Somalia-Masai floristic zone (sensu White 1983), and *Commiphora* is the most important genus after *Acacia* [*Senegalia* + *Vachellia*] in the Afro-Oriental domain (Ibrahim 1978). Although neither genus is restricted to this region, species richness and vegetational importance climaxes in the arid bushlands of Somalia and E Kenya. Diversity in *Boswellia* peaks in the Gulf of Aden area, while *Commiphora* is most richly represented in C Somalia which has about 70 species plus a couple dozen undescribed. Endemicity in Somalia may be as high as 40% and approaching 60% when neighboring SE Ethiopia (Ogaden) is included.

Commiphora is a `gregarious' genus, in that where one species is found several others are likely to occur (Gillett 1987). In the deciduous bushlands of E. Africa, vegetation stands frequently support 3 or 4 *Commiphora* species, but in C Somalia this communality is developed to an astonishing degree. Bushlands on sands as well as gypseous silts can have 10-15 commiphora species within 0.5-ha plots (Kuchar unpublished., R. Wieland pers. com.). Stands often have 5-10 species. Contrast this with a quantitative study by Adefires et al. (2012) in Borana, S Ethiopia. *Commiphora* was dominant in the tree layer of acacia-commiphora woodland, contributing 44% of stems. Together with *Boswellia*, the Burseraceae contributed 56% of density (compared to 36% for acacias). This was the leading family by (*in terms of?)* no. species with 10 commiphoras and 2 boswellias. *Boswellia neglecta* codominant or subdominant, also abundant regeneration. *Commiphora africana, C. confusa* and *Senegalia (Acacia) senegal* codominant or subdominant. It is notable that the total number of *Commiphora* species was 10, vs. many more locally and regionally in the CR of Somalia.

Commiphora species richness is also high in the more arid parts of Ethiopia, Kenya and Tanzania (Tab. 2). It is moderate in semi-arid southern Africa (18 in S Africa) and Madagascar (25-40 species). A distinctive suite of tree-sized, relatively large-leaved species inhabits the miombo zone of S-C Africa. The genus is represented in Arabia and the Indian subcontinent by 8 species (van der Walt 1973) and extends westward in a Sahelian-Sudanian band to Senegal (Fig. 4) though in attenuated species richness. Often *C. africana* is the only commiphora to be seen.

Table 2. Number of *Commiphora* species in various countries and regions.

E. Africa (FTEA)	66
Ethiopia (FE3)	52
Somalia (FS2)	97 (includes possible new species)
Most W. Afr. countries (FWTA)	2-4 (total 5)

Central Afr. countries	2-4 with 7 in Congo and Sudan
South trop African countries (FZ)	8-15 (total 21)
S. Africa (Van der Walt 1973)	18
Madagascar (Internet)	up to 44
Socotra	6
W trop Asia	1-5
Brazil, C. America	3

At least one species of *Commiphora* is known from the Neotropics (NE Brazil). Because the Burseraceae were probably differentiating into genera some 60-80 million years ago at a time when S America and Africa were almost touching, it is not surprising to find yet another biological connection between the two continents (Gillett 1980). Rzedowski & Palacios-Chavez (1985) transferred to *Commiphora* two C. American species of *Bursera*.

Commiphoras form an important part of the vegetation in hot, dry areas of Africa (Wild et al. 1972). *Commiphora* is one of a handful of characteristic genera of the S Saharan sand-pebble plains with shrubby grasslands (Petrov 1976). Unlike some of the other leading genera of African bushlands, commiphoras are generally not considered deleterious to range except in the Borana region of S Ethiopia where cattle herding in grasslands is impeded by encroaching (invasive) commiphora especially *C. africana* (Coppock 1994 Tab.B8, Gemedo-Dalle & Isselstein 2006, GRM 1989). In Botswana rangelands *C. pyracathoides* is considered troublesome and undesirable, rapidly forming extensive impenetrable thickets (van Rensburg 1971). In Somalia, Burseraceae tend to be decimated and eliminated rather than stimulated by intensive pastoral activities. This applies particularly to the palatable species, though a few unpalatable &/or heavily armed commiphoras such as *C. incisa* and *C. hodai* may increase under heavy range use.

Sound estimates of *Commiphora* cover in Somalia are not yet available, but it is instructive to examine vegetational information from E and N Kenya with landforms, climates and vegetation comparable to S Somalia and parts of the CR. There the significance of *Commiphora* can be assessed from ecological surveys and descriptive vegetation studies (Dale 1939, Edwards 1951, Bax & Sheldrick 1963, Glover & Trump 1970, FAO 1970,1971,1973, Barkham & Rainy 1976, van Wijngaarden 1985, Herlocker 1979, Sato 1980, Kuchar et al. 1981, Agnew et al. 1986).

Where annual rainfall is less than c650 mm, *Commiphora* may be expected to dominate outright or co-dominate with *Acacia [Senegalia, Vachellia]*. *Commiphora* trees and shrubs represent the dominant life-form over vast areas of deciduous bushland amounting to perhaps 25% of Kenya's land area, and either codominant with *Acacia* or one of the leading dominants of at least another 30%. In other words, *Commiphora* is top-ranked or among the leading genera in plant communities covering more than half of Kenya's land area. The figures for Somalia would not be much different, with the central and southern parts of the country supporting most of the commiphora bushland. A vegetation survey in Hiraan Region, CR (Kuchar 1989), found *Commiphora* the leading contributor of bushland cover (Tab. 3). Its contribution to tree canopy cover is much higher, since much of the other woody vegetation except acacias consists of dwarf shrubs, shrubs and climbers.

Table 3. The top woody plants in Hiraan Region rangelands. Based on abundance (cover)

index of 100% = all woody plants of all 685 plots.

GENUS	%	FAMILY	%
Acacia	21	Mimosaceae	22
Commiphora	15	**Burseraceae**	17
Indigofera	6	Papilionaceae	10
Grewia	4	Tiliaceae	6
Euphorbia	3	Acanthaceae	6
Cordia	3	Caesalpiniaceae	6
Terminalia	3	Euphorbiaceae	4
Dalbergia	2	Boraginaceae	4

NOTE: Acacia includes Senegalia + Vachellia.

Optimally developed *Commiphora*-dominated communities have a characteristic "orchard bushland" appearance of gnarled little trees forming an open upper layer at 3-6 m over a variable but typically rather open shrub layer and variable herb layer. Where this woodland-bushland is open, allowing a productive layer of many palatable grasses, it is especially valued for grazing, but it can form a dense (though never impenetrable) layer shading out most grasses. In such stands most of the feed comes from browse, including the commiphoras most of which are palatable, though availability may be severely limited for stock classes other than camel. Since the trees are shallow rooted, they can be pushed over by elephant. In Kenya a well-publicized consequence of this activity was the transformation of commiphora woodlands into grassland during the 1970's drought in the Tsavo area of E Kenya (van Wijngaarden 1985). Of course, this is not an issue in the CR where elephants no longer exist.

Commiphoras thrive in all landform types except some seasonally flooded clays and salt pans which tend to be dominated by specialized grasses, acacias and succulents. They are also sparsely represented in riverine forest and riparian habitats, including the Jubba and Shabelle basins. Various investigators have tried to sort out the habitat requirements of commiphoras vs. acacias, but although local trends and tendencies can be quantified the regional picture is confusing.

Commiphora thickets in Kenya clothe the bases of the arid-zone mountains and some species ascend drier midslopes. However, species richness, cover and general prominence on the landscape are much reduced in the more mesic climatic zones beginning with the *Combretum-Terminalia* woodland zone and carrying on up to mid-elevation evergreen scrub. *Commiphora* has not successfully invaded true forest (except *C. zimmermannii* in Kenya and Tanzania, inhabiting drier forest, and rather marginally) and two species just reach 2000 m altitude as subordinate components of bushland on shallow stony soils.

Considering now the lower-elevation zones, commiphoras make up an estimated half of total tree cover in the subcoastal bushlands of E Kenya and are co-dominants in the dense secondary thickets on coastal coral rag. However, they are sparse or totally absent from true evergreen bushland (Kuchar & Mwendwa 1982) and can be expected to be very minor components of the subcoastal strip of Zanzibar-Inhambane floristic region (sensu White 1983) woodland and evergreen bushland reaching the SW corner of Somalia. They are also curiously scarce in the coastal band of *Vachellia (Acacia) tortilis* woodland and wooded grassland from Mogadishu to the S border and into NE Kenya. M. Madany (in litt.) notes, "In

all my travels between Muqdisho and Jilib in the past 3 years, I've never once seen a *Commiphora* in this high-biomass (but low diversity) woodland community."

The Zambezian floristic zone of C Africa (Wild 1963, White 1983) has a suite of distinctive tree-sized commiphoras with relatively large leaves and not infrequently spines on the trunk. They are virtually absent from some areas of miombo woodland but in others can be a significant component. *C. ugogensis* can be the dominant or most abundant tree in some woodland stands, but overall commiphoras are much less prominent here than in the semi-arid regions.

The most arid parts of Kenya seem inimical to *Commiphora* and are dominated by dwarf shrub especially *Indigofera* and *Duosperma*. One exception is the Didagalgalla lava subdesert N of Marsabit where *C. sennii* is the sole woody plant over large areas (Gillett 1987). Turkana Dist. in NW Kenya, an area almost wholly influenced by recent vulcanism, is particularly poor in commiphoras (see Olang 1983). Commiphoras are abundant in parts of SE and S Ethiopia, e.g. the Borana study by Adefires et al. (2012), but not in the local or regional diversity manifested in CR of Somalia. Citing literature from Uganda, Kenya and N. Somalia, Herlocker (1979) indicated that commiphora bushland is generally considered a more moisture-demanding vegetation than acacia bushland. If this is so, it points up a fundamental difference in the plant ecology of CR vs. other semi-arid and arid parts of eastern Africa. Whereas commiphoras drop out at about 250 mm in E Africa, in C and N. Somalia only plant stature diminishes and the commiphoras may maintain their importance and include some dwarf species. Only on the coastal grasslands are they scarce, not exceeding 1% cover (Herlocker et al. 1987).

Somalia shows a N-S gradient of increasing rainfall (Fig. 2). The eastern half of N Somalia gets mostly 50-150 mm. The northern part (Mudug) of the CR gets 150-200 m, Galguduud gets 200-250 m which reaches NE Hiraan. The 300 mm isohyet cuts across Hiraan Region with 250-300 mm in the northern half to two-thirds, and 300-350 mm in the southern portion. Notable for S Somalia (Fig. 2) is significantly higher rainfall, 450 mm or more, and it has some commiphoras not found in the rest of Somalia. As for Hiraan Region, it appears to be ideally located climate-wise, with peaking *Commiphora* richness and a unique suite of shrubs and trees including the endemic *Cordeauxia*, several endemic acacias, and many other endemics and sub endemics. A frequent dominant in the drier N part of the Region is *Commiphora horrida*. With its tight flat-topped dwarf-tree habit and stout spike-like twigs, it is morphologically the most unusual of the large number of endemics in the diverse section *Opobalsameae*. *Commiphora* species richness is high even into Hobyo District with rainfall 150-200 mm. Including some unnamed but likely new commiphoras, the CR have c75 species. N Somalia has 51 and S Somalia 64 species.

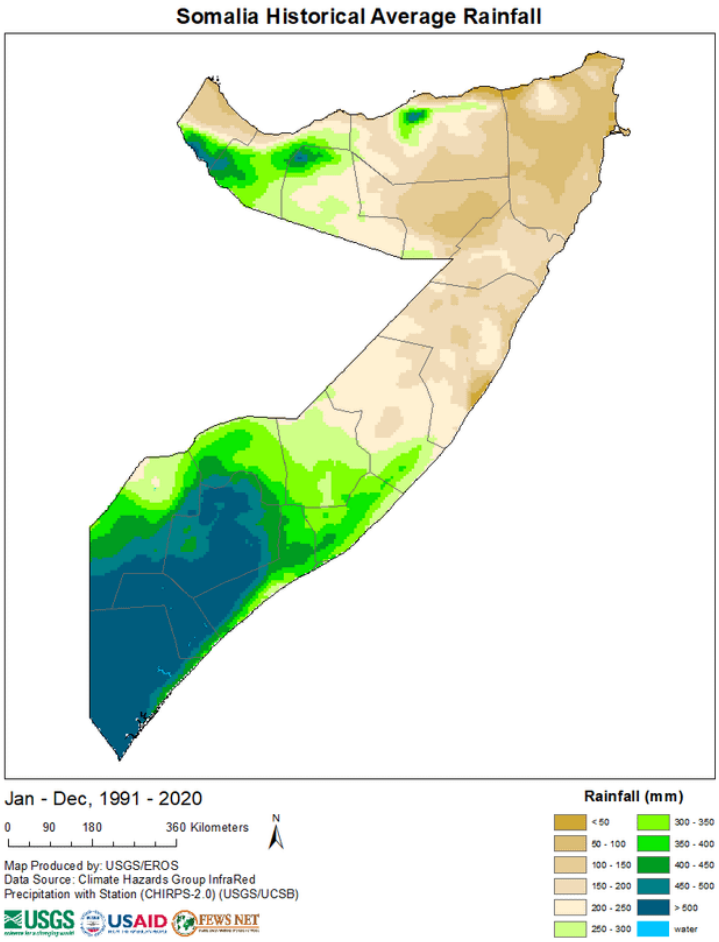

Fig. 2. Somalia rainfall (USGS/EROS 2026).

An FAO rainfall map of Somalia (Muchiri 2007) shows higher rainfall, 300-400 mm in the northern two-thirds of Hiraan and >400 mm in the S third. The discrepancy is not worth worrying about. The trend is the same, rainfall declining northward.

A variety of substrate types combined with long-term (i.e. geological) stability are probably keys to the richness and uniqueness of the Burseraceae flora in C Somalia. Each major surface type - sands, limestone hills, limestone plains, alluvial silts - has its characteristic commiphora guild. Gypsums are an unusual yet widespread surface type in the CR which (likely) have their own suite of species.

Though not nearly as diverse nor ubiquitous, members of the genus *Boswellia* are locally significant landscape elements. Northern Somalia has 8 species vs. 3 in each of C and S Somalia. In parts of Somalia and E Kenya *B. neglecta* and *B. microphylla* are co-dominants or prominent emergents of zonal bushlands. In W Africa *Boswellia dalzielii* is abundant locally, sometimes in dominant pure stands, in savanna forests (Dalziel 1937). In parts of W Sudan and NW Ethiopia *B. papyrifera* forms pure stands on hillcrests and scree (Radwanski & Wickens 1967, TAMS), and the dominant of dry deciduous forest in N and NW Ethiopia (Kindeya 2003, Lemenih et al. 2007).

ECONOMICS

Gum-resins

The Burseraceae in the Horn of Africa have great historical significance as the source of myrrh and frankincense. *Commiphora myrrha* yields the true myrrh resin, and *Boswellia sacra* the true frankincense; both were important in the ancient world of Asia Minor and N Africa (Anderson 1956). The significance of the burseraceous gum-resins in ancient commerce is discussed by Groom (1981). This is the 'classic' study and some of its suggestions have been superseded by research. In a review Chittick (1981) states, "The ancient references to frankincense, myrrh, bdellium and such gum-resins are often difficult to interpret; indeed, even the modern taxonomy is muddling and unsatisfactory. The matter is not rendered any easier by the fact that at least four languages are involved in the discussion - Arabic, Somali, Latin and English." An excellent little tour of the land and history concerning the frankincense trade can be found in Abercrombie (1985). In ancient times, myrrh commanded 3 times the price of frankincense, but there was 5 times greater demand for the latter. From Arabia Felix – Happy Arabia "rose the river of incense that in ancient times flowed north on caravan camels…to distant Greece and Rome. Along the route a succession of kingdoms prospered for nearly two millennia: Fabled names like Main, Hadramawt, Sheba, Qataban, Nabataea." The frankincense trade began to decline after Christianity won over the Romans who banned pagan practices in the 4th century. After A.D. 622 it was further reduced after the rise of Islam, whose rituals seldom require incense.

In ancient times myrrh from *C. myrrha* and olibanum from *C. kataf* was used as a perfume, medicine and embalming substance (Moldenke & Moldenke 1952). Olibanum, a term sometimes used for frankincense, is properly applied to the product of *C. kataf* and related species in sec. *Hemprichia*. The ancient Egyptians prized myrrh highly for embalming, perfumes, ointments and unguents (Baumann 1960). Nowadays myrrh still has widespread application in indigenous medicine, and Watt & Breyer-Brandwijk (1962) note that the incense is a well-known mosquito repellent in the tropics. One other interesting use of myrrh, well-known among Somalis, is as a depresser of libido. It is taken particularly by sheiks wishing to do some serious meditating. The antidote is said to be a cupful of fat from the tail of the fat-tailed sheep.

Balsamodendron, an old name for *Commiphora*, is an evocative synonym. Most commiphoras produce aromatic resins (Wild 1963) but outside of Somalia (and Yemen) the species don't seem to be significant producers of myrrh-like substances (e.g. Greenway 1941).

C. africana yields a commercial gum-resin, the bdellium of Old-Testament times, today's African bdellum (Moldenke & Moldenke 1952). Dalziel (1937) described a method of obtaining and preparing the gum-resin of *C. africana*. Incisions are made in the trunk to the depth of the bark. The resin is scanty and takes 6-7 days to exude an amount as large as a hazelnut. It soon solidifies, but after pounding it is softened in the heat of the sun, kneaded into balls allowed to harden, becoming a blackish mass containing bark fragments, etc. In Europe it was used like bdellium, in medicinal plasters and varnishes. Some other species, e.g. *C. habessinica*, produce exudates resembling myrrh or African bdellium. The Indian *C. mukul* is the source of guggul, a resin used medicinally and commanding attention because of its pronounced anti-inflammatory activity and ability to reduce blood cholesterol levels (Anand & Nityanand 1984).

Frankincense, a gum-resin which has been the world's most important incense material (Greenway 1941, Baumann 1960), is obtained from *B. sacra* of Arabia- N Somalia. Although recognized an an important incense tree, it is second-best after the Somalia endemic *B. frereana* which however is a much less common tree. Its resin is not bitter like that of *B. sacra* and is much appreciated for chewing particularly among Arabs; also, the incense fragrance is less 'heavy' (Thulin & Warfa 1987).

In Somalia frankincense and myrrh still form the basis for a modest industry, and in some parts of the north "resin-collecting is the chief occupation of the sparse local population" (MOG). *Boswellia frereana* and *B. sacra* have both been extensively exploited. "The trees are protected from harm and are never cut as firewood and are left untapped until they attain considerable size. No attempt, however, is made to increase the number of trees." (Collenette 1931) A sizeable report by Farah (1994) details the collecting, grading and marketing of frankincense by Somali families in the rugged terrain of N Somalia. “The frankincense trade…stimulates nostalgic feelings among Somalis, particularly the inhabitants of the geographical frankincense region. Somalis boast of an early mercantile culture, and they’re “interested in accounts of the pharaonic Queen Hateshepsut’s fabulous expedition to the Horn of Africa in the 15th century B.C.”

The frankincense produced by other *Boswellia* species is much inferior in quality. Other frankincense producers are *B. papyrifera* and *B. thurifera* (Moldenke & Moldenke 1952). The W African *B. dalzielii* has been known as the frankincense tree (Irvine 1961), as also the C-W African *B. papyrifera* (Andrews 1952) tapped for its frankincense-like resin. Aside from their incense value, these resins also have a variety of medicinal applications in the form of salves, plasters and powders.

Frankincense and myrrh are chemically interesting compounds: they are mixtures containing a water-soluble polysaccharide and a water-insoluble resin (Anderson et al. 1965). Unfortunately, there is insufficient industrial interest in these materials to stimulate studies of their composition, structure, or uses (Anderson 1985). This points up the main problem with the whole international resin industry, the decreasing demand for natural gums and resins through the 1970's and early 1980's.

Anderson (1985) has given a sobering overview of the current world situation in the gum and resin trade. "Not so long ago, the sale of the gum collected by nomads and villagers in Africa constituted their major single source of annual income; gum trees were treasured possessions and fights to the death to retain ownership were not infrequent." But with nationalized policies of fixed prices for agricultural products, gum-farmers have found that they can derive a greater income and reward for their labors by producing other crops. At the same time, the imposition of relatively large export taxes makes for gum export at prices that are not cost-effective for a significant number of the potential industrial uses for gums. Lastly, natural gums and resins are subject to the economic fluctuations well-known in all natural commodity trading.

Unreliability of supply due to climatological factors, political instability, etc. causes industry in consuming countries to seek ways of establishing more reliable, alternative sources of supply. The Sahelian droughts, which reduced the availability of gum Arabic, adversely affected the market for gum Arabic: many former major industrial gum users devised or switched to alternative products. The rapid development of the fermentation technology industries has evolved(?) products of reliable and reproducible quality, which include novel polysaccharides that can substitute for natural gums such as

karaya and tragacanth. Viable substitutes for frankincense and myrrh have not yet appeared, but this does not mean they won't.

Another cloud in the economic future of Burseraceae resins is low demand. Whereas the international gum trade measures in the thousands of tons, the market for water-insoluble gums i.e. resins is smaller, it has decreased due to increased use of petroleum-based products and synthesized chemicals, and for frankincense and myrrh resins measures in only a few tons. Anderson (1985) notes that resins such as these, which are used for religious purposes or in folk medicine, tend to be used largely within the countries of origin. Though there may be a lot of internal marketing and trading activity, the international market is small and has no significant economic potential. "There seems little prospect of market demand increasing, particularly for resins exuded by Burseraceae, which occur widely throughout arid zones; supply exceeds demand."

The demand for myrrh has expanded in the last 20 years owing to its use in traditional Asiatic medicine, both Indian and far eastern. This has come about through a combination of rising incomes and a nationalism that includes criticism of orthodox European medicine, hence a reversion to traditional, innocuous (possibly useless) medicinal substances such as myrrh.

One unexplored avenue of research into *Commiphora* products might be pharmaceuticals. Some species, notably in section Arillopsidium, have been reported as toxic and were used to make arrow poisons by the Somalis before firearms became common. Poisons sometimes are linked to important drugs. So far no biochemical nor pharmaceutical investigation of these poisonous *Commiphora* species has been undertaken as far as I know and may prove a fruitful line of research.

Feed for livestock

The Horn of Africa has the world's highest camel populations (Mukasa-Mugerwa 1981) as well as exceptionally high numbers of goats on a per capita basis. The importance of both of these browsers, camel in particular, cannot be overstated. They are the foundation of pastoral life here. And it is the excellent cover of palatable browse, a large proportion of it supplied by Burseraceae, that supports the large livestock populations in C and S Somalia.

Whereas the market for traditional natural products from Burseraceae - the resin in particular - has probably seen its heyday decades and centuries ago, its species indirectly support an export commodity of considerable value to Somalia, and that is livestock. The bulk of the livestock in the CR consists of camels and goats. They are primarily browsers, and both thrive on the naturally occurring shrubs and small trees which populate the landscape. Since the majority of Somalia's Burseraceae - including most of the widespread and dominant species - are palatable, their contribution to the livestock economy, both internal as well as export-oriented, is considerable. Unfortunately, this relationship between livestock and feed is as yet unquantified, though attempts are being made within CRDP to estimate browse production.

The literature on animal food habits is a disappointing information source on *Commiphora*. Aside from the widely distributed *C. africana* and *C. schimperi*, much of the information on browse refers only to genus and not individual species. The livestock data in Table 6 are based largely on palatability

information gathered in the CR (Herlocker & Kuchar 1988). Although as yet underestimating the total numbers of species utilized, it underlines the value of *Commiphora* in camel and goat diet.

Virtually all Burseraceae are palatable to livestock especially camel and shoats, and the fallen leaves of some species are eaten by all stock classes. Even the sap-spraying species appear to be good browse. The only category for which there is some doubt is section Arillopsidium whose members have poisonous gum-resins. With their stumpy gnarled stems, these species often have a hedged look but it is unlikely they are much browsed though some pastoralists have indicated good feed value in the leaves. Work in Kenya (Waterman 1986) suggests that members of this section exude less resin than other sections. The only commiphoras definitely known to be unpalatable - and they are not in that section - are *C. hodai* and *C. sennii*; the latter can be an indicator of overgrazing on alluvium.

Livestock diet and palatability studies in East Africa have recognized the importance of commiphoras in camel and goat diet (Maxwell Darling 1938, Codd 1951, Nge'the & Box 1976, Field 1978, Kuchar 1984, Herlocker & Kuchar 1988). Most species are palatable to camel and goat and are readily or widely browsed. Consistent with the overall pattern of vegetation utilization by livestock, these are the two important stock classes in Burseraceae browse utilization, with sheep a distant third and cattle rarely mentioned. The foliage of many species is out of reach to these two classes, though cattle have been reported to avidly browse *C. africana* and to eat fallen leaves of several species. Some Burseraceae are lopped for stock, especially for young goats and for sheep. Those recorded are *Boswellia microphylla*, *Commiphora edulis*, *C. sphaerocarpa*, *C. sphaerophylla*.

With the data so far available, no strong patterns of utilization are apparent among *Commiphora* sections. As expected, some of the armed species, e.g. *C. ellenbeckii*, *C. incisa*, *C. oddurensis* and *C. horrida* are lightly if at all hedged, though the leaves can be highly palatable. On the other hand, others such as *C. gurreh*, *C. africana* and *C.* sp. aff. *oddurensis* exhibit moderate to moderately heavy hedging despite their spines. The unarmed groups likewise show great variability in hedging. Some, e.g. *C. stellatopubescens*, show little or no browse impact despite being rated good feeds, but the majority do show hedging whose intensity is roughly proportional to degree of stocking and range condition.

The species that seem to be browsed most are in sections Hildebrandtianae and Hemprichia. These are unarmed species generally with sweet-scented or odorless sparse sap. By far the most heavily hedged commiphora is *C. alaticaulis* (sec. Hildebrandtianae). Another obviously hedged species in this section is *C. truncata*. It is an outstanding browse, the no.1 camel food plant according to some pastoralists, and it is also lopped for goat. *C. sphaerophylla* (sec. Hemprichia) with its strikingly sweet-smelling sap is almost its equal and these two, due to their ubiquity and high palatability, are among the handful of top browse producers in the regional flora. Many members of sec. Opobalsameae are highly rated but exhibit little or no browse impact. Outstanding among these is *C. horrida*, and in areas of the *hawd* (waterless bushland on sand plains) where it is the leading shrubland dominant its leaves, attached or fallen, may be the top contributors to wet- and dry-season feed for camel, cattle and smallstock.

Among the boswellias, *B. microphylla* and *B. neglecta* are outstanding feed sources for camel and goat. Both are relatively large trees, common and locally dominant, and both are rated excellent in palatability. *B. microphylla* is frequently lopped for goat, particularly for kids.

Browse quality

Nutrient analyses have been published for a few of the African Burseraceae. They are summarized in this section. *Commiphora* browse has 11-18% Crude Protein (CP) and very low ash at 7-9% (Dougall et al. 1964, Pellew 1980).

Here are proximate analyses for *C. africana*. Young leaves have moisture content 8.3%, CP 14.2%, digestible CP 9.7%, Ca 0.98%, P 0.18%, Mg 0.48%, K 2.47%; fruit has moisture content 14.2%, CP 8.4%, digestible CP 3.9%, Ca 0.88%, P 0.16%, Mg 0.39%, K 1.45% (SOGREAH 1982). Leaf N 2.4-2.6%, P 0.14-0.22%, IVDDM 44-48%, NDF 23-25%, lignin 5-6%, ash 0.4-1.3% (Coppock et al. 1987). Leaf CP 15%, NDF 31%, ADF 22%, condensed tannin 4% (Katjiua & Ward 2006). Fallen leaf CP 4.1-5.7%, Crude Fibre (CF) 9.2-19.0% (Scholte 1992). Camel browse has CP 21.9%, CF 13.6%, lipid 1.1%, ash 7.1%, NFE 56%, Ca 1.17%, Mg 0.44%, P 0.29%, K 1.41%, Na 0.007% (Höller et al. 1989). Contains significant quantities of HCN (Shone & Drummond 1965). Leaf forage value fair (FAO 197l). Medium palatability for browsing stock (Abule et al. 2007). Medium dry-season palatability for goat, low for sheep (de Leeuw & Chara 1985).

A study of camel browse in N-C Kenya (Höller et al. 1989) found that *C. africana* had browse analyses comparable to other wet-season plants in CP, lipid, Mg, K, inorganic P. Exceptions: CF relatively low (14%, though even lower in Capparaceae), lipid low (1% vs. 2% or higher), ash somewhat low (7 vs. 8-10%), NFE notably higher than all other important browses (56 vs. 38-48%), Na somewhat low, K somewhat low, Ca low (1.2 vs. 1.4-3.4%).

C. edulis: Based on 6 samples, leaf CP 16-31%, CF 23-34%, fat 3.5-10% (Said et al. 1985). Leaf N 2.57%, P 0.15%, IVDDM 39%, NDF 27%, lignin 7%, ash 1.8% (Coppock et al. 1987).

C. schimperi: Browse CP 16-19%, ash 6.8-7.2%, NDF 31-45%, ADF 11-37%, lignin 4-17%, cellulose 7-20%, hemicellulose 8-20%, IVD 63-83%, soluble phenolics 19-24%, Mn high at 160 ppm, Cu 25 ppm, Mb <0.5 ppm, Se 0.07 ppm, Co 4 ppm (Olsson & Welin-Berger 1989). Leaf NDF 37%, fairly low soluble phenolics (18%), high insoluble proanthocyanidins (condensed tannins) (Reed 1986). Leaf N 2.65%, P 0.19%, IVDDM 51%, NDF 41%, lignin 7%, ash 0.6% (Coppock et al. 1987).

Seed analysis of species in 114 families of vascular plants placed Burseraceae at the very bottom in terms of mean protein content (5.5%). Mean seed protein content was in the range 15-25% in most families sampled. Burseraceae were within the lowest quartile for mean seed oil content, averaging about 10% though ranging to 20%. (Barclay & Earle 1974)

Feed for game

Burseraceae especially commiphoras provide food for the whole gamut of wild herbivores from elephant to hyrax. Although foliage is the usual portion used, bark is frequently mentioned in connection with elephant, roots can be important in warthog, bushpig and porcupine diet (van der Schijff 1959, Anon. 1960, Pooley 1978), and fruit by baboon. In C and W Africa the fruit of a couple of genera of Burseraceae notably *Dacryodes*, also some *Santiria*, is eaten by monkeys (Gautier-Hion et al. 1980) and the great apes (e.g. Kano & Mulavwa 1984, Williamson et al. 1990). *Commiphora* and *Boswellia* do not

figure prominently in primate diets in Africa, though a study in Madagascar found *C. pervilleana* a very important food plant of the sifaka (A.Richard cited by Petter et al. 1977-78). The fruit is attractive to birds (Burtt 1935), and the bright red pseudaril plays a role in dispersal. Birds will remove the pericarp (fleshy cover) and swallow the seed (stone) with pseudaril, the latter is digested and seed regurgitated. Apparently, the pericarp is not eaten, it may be full of secondary compounds; it is the lipid-rich pseudaril that is sought (Böhning-Gaese et al. 1995). I have observed starlings open the pericarp and remove and swallow the arillate seed.

The scientific literature is a poor information source on Commiphora and *Boswellia* utilization by wild herbivores, only a few of the many species are treated. The Table 6 summary grossly underrepresents the diversity of commiphoras utilized by game. Little is known of the role of commiphoras in the lives of the medium-sized and small antelopes, especially gerenuk, dibatag and dikdik all of which are characteristic faunal components of the Somalia-Masai floristic region. Studies in Kenya by Leuthold (1970,1979) and Raeder (1981) have found commiphoras important in gerenuk and lesser kudu diet, but have not sorted out species contribution. In these as in most diet studies, the difficulty in naming species has usually caused them to be lumped as *Commiphora* spp. Interviews with pastoralists and local hunters in C Somalia (Kuchar et al., unpub.) indicate that the domestic camel is a far more avid *Commiphora* browser than any of these game animals.

Somewhat more has been learned about commiphora in big-game diet. Studies in eastern and southern Africa have shown commiphora to be important for elephant (van der Schijff 1959, Anon. 1960, Bax & Sheldrick 1963, Dougall et al. 1964, Jarman 1971), black rhinoceros (Schenkel & Schenkel-Hulliger 1969, Goddard 1970, Mukinya 1977), giraffe (Harrison 1936, Stephens 1975, Pellew 1980), eland (Harrison 1936, Posselt 1963, Nge'the & Box 1976), and impala (Harrison 1936, Jarman 1971). In a Tanzania study the roots of two *Commiphora* species were among the 5 plant species noted as the warthog's favorite (and likely dominant) food (Harrison 1936). In Tarangire GR (Tanz.) lesser kudu habitat appears associated with occurrence of *Commiphora* (Lamprey 1963b).

Due to their resinous compounds, Burseraceae may not be as palatable as many of the other plants of bushland and woodland, and often their utilization seems more a matter of necessity than choice. For example, in Jarman's (1971) study of impala *Commiphora* was important in late dry-season diet since it came into leaf first. In a Serengeti study of giraffe, Pellew (1980) found that during the flushing period young leaves and shoots are much sought after, and diet at this time may be almost entirely of these plants, but as the foliage ages, commiphora becomes avoided relative to its availability.

Various studies give the impression that elephants will push over commiphora trees "because they are there" - they are not an avidly sought part of the diet. A Rwanda study (Monfort & Monfort 1979) found *C. africana* one of the few species not sought by elephant. Studying black rhinoceros, Goddard (1968) found that commiphoras were often left untouched by this pure browser (whereas acacias are avidly browsed and may be important in diet – e.g. Joubert & Eloff 1971, Mukinya 1977). Taylor & Walker (1978) state that in mopane savanna of southern Africa, commiphoras are avoided by game.

Large herbivores can have significant impact on commiphora population structure and health. In a SW Kenya study involving *C. africana* and *C. schimperi*, Glover & Trump (1970) counted 307 trees and found 71% damaged by elephant and giraffe. Twigs had been chewed on 23% of the trees, branches

broken on 12%, bark damaged in 15%, and 8% had been uprooted or the trunk broken; 20% of the trees were judged fatally damaged.

The most clearly documented case of the antagonistic behavior of elephant to commiphoras is the saga of Tsavo East National Park in Kenya. Elephant overpopulation brought on the systematic destruction of commiphora woodlands over hundreds of km^2, transforming the landscape to a grassland or bushed grassland (though with strong regeneration potential back to commiphora woodland). Curiously, many of the uprooted trees were not fed upon. (Bax & Sheldrick 1963, Agnew 1968, Leuthold 1977, van Wijngaarden 1985)

In summary, it is certain that Burseraceae play a primary role in the energetics of livestock and game, but we know little about the ecology of *Commiphora* and *Boswellia* in relation to herbivory, particularly for Somalia. Although the smaller antelopes, dik-dik in particular, are the commonest form of wildlife here, virtually nothing has yet been published on their food habits here, though some data have been compiled from discussions with hunters and pastoralists (Kuchar unpub.). The role of smaller antelopes in commiphora population dynamics must be considerable, and any research in this area would help fill a gap in our knowledge of deciduous bushland ecology.

Fencing

Next to their renown as special resin producers, the African Burseraceae, especially *Commiphora*, are best known for their use in fencing particularly live fencing. Most can be grown from truncheons which are often planted as fencing poles (Wild et al. 1972, van der Walt 1973). "The remarkable manner in which all *Commiphora* poles take root when planted in the ground has made them invaluable to the native cattle owner for the construction of live-pole fences for cattle-kraals" (Burtt 1935). A peculiarity of this reproduction is that the planting must be done in the dry season: wet-season plantings generally will not succeed.

Some species are used a lot more than others, but the reasons for this are not entirely clear. It is easy to see why *C. incisa*, which forms an absolutely impenetrable mass, may be favored, but some commonly used species are unarmed, e.g. the S-C African *C. harveyi*, *C. mollis* and *C. woodii*. Among the top favorites in C Somalia are *C. hodai* and *C. sennii*, two very sparingly armed species with a not particularly dense crown. Perhaps availability and development success have a lot to do with choice. Low palatability may also be an important feature, and it is notable that both *C. hodai* and *C. sennii* are unpalatable (a rare condition in *Commiphora*) hence can be sacrificed for fencing.

Other notable fencing species include the following. *Commiphora incisa* and *C. swynnertonii* are said to make a fence particularly effective in keeping hyenas out, hence the Somali name *warabreb* (*waraabe* = hyena). *C. africana* has been recommended for live fencing and is widely used in semi-arid regions of Africa. Cuttings of the Kenyan *C. eminii* are often used by the Kikuyu to mark boundaries or subdivisions and also planted as a shade tree (Leakey 1977). *C. kerstingii* makes a very common live fence in N Nigerian towns, where some of the vernacular names suggest it has significance in preventing fires (Dalziel 1937). With its spiny branches and stolon reproduction, the Tanzanian *C. stolonifera* is useful as a live fence and can form an intensely spiny and impenetrable thicket impervious to all larger game except elephant and rhino (Burtt 1935). *C. berryi* is cultivated for hedging throughout S India

(Bennett 1972). The W African *Boswellia dalzielii* is planted as a live fence and as such is said to bring prosperity or prevent bad luck (Dalziel 1937).

The rooting ability of commiphora truncheons also makes them useful in dune stabilization. Ongoing reclamation work in the CR is making use mainly of *C. incisa* and *C. sennii*, which have demonstrable success in stabilizing active dunes.

Burseraceae, mainly the armed types, are also used for temporary fencing. In a N Kenyan survey, *Commiphora* was used for stock fencing but only when acacias were unavailable (Kruuk 1980). In C Somalia, however, commiphoras notably *C. horrida* appear to be the top favorite material for temporary enclosures. The choice may be a matter of convenience rather than quality. Commiphoras do not make durable dry fencing, and several genera of leguminous shrubs as well as other plants are favored, but commiphoras are the most readily available in many parts of Somalia.

Other uses

Pastoralists have evolved many other uses for *Commiphora* and *Boswellia*, and these can be categorized under wood products, edible products, medicines, and miscellaneous (Tab. 6).

The wood of most commiphoras is soft and perishable and often snaps easily when dry, so it is by and large unfit for constructional purposes or fuel. Wild et al. (1972) note that one common name is `corkwood'. According to Brokensha & Riley (1975) the timber of C Kenya species is, despite these deficiencies, used for rafters and small construction, beds, and granary doors. *C. eminii* reportedly yields a light useful timber (Burtt 1935); the poles are used in granary construction (Leakey 1977). Although commiphora wood has been used for fuel, the usual comment is that it is not used as such. In a Beledweyne (N Hiraan) study, Castro (1983) found *Commiphora* one of the least preferred firewood species though it could see significant use. In such cases usage is purely by availability and not quality.

Because it is soft and readily available, commiphora wood figures prominently in all kinds of carving, notably for household utensils. It is especially popular for water and milk containers, stools, dishes, and beehives though the last might not be an important use in Somalia. Quran (Koran) boards are also often made of commiphora wood. The data in Tab. 6 underestimate the extent to which the wood is actually used in nomadic households.

Edible products have not been identified in most commiphoras but could this be a matter of poor information? *Commiphora* gum-chewing is not a common practice as it is with acacias. The gum of a few species is chewed, but indiscriminate such use could be dangerous as the gum of some species is highly toxic. These same species in section Arillopsidium may have edible fruit but further investigation is needed as the literature has contradictions. *C. kraeuseliana* is the only S. African species whose seed is reported eaten (van der Walt 1974). The fruit of most commiphoras is probably inedible. That of the southern African *C. pyracanthoides* is "said to produce a stinging sensation in the mouth, followed after some days by swelling and burning of the lips. This is thought to arise from the local effects of a gum-resin." (Watt & Breyer-Brandwijk 1962)

The bark of a few species makes a good bush tea, and twigs of a few other species are used as chewsticks. The unusual leaf of *C. rostrata* - it is simple and fleshy - can be chewed as a refreshing thirst-quencher (incl. pers. obs.). According to Williamson (1975) the leaf of *C. africana* can be used as a potherb.

The best-documented food use of commiphora is of the roots. Young roots of various E and S-C African species are reportedly chewed for the juice, especially during famine (Newman 1970, Scudder 1971, Wild et al. 1972, van der Walt 1973, Brokensha & Riley 1975). The root of *C. pyracanthoides* is a significant year-round food of the Kalahari bushman (Silberbauer 1981). It is fairly juicy and a water source but troublesome to dig out for the meager return (Story 1964). In an E-C Kenya vegetation study, Agnew et al. (1986) noted that despite drought conditions the roots of *C. africana* had 52-65% water, and all major roots were at only 1-3 dm depth. The wood of some species tastes sweet, and chips are sometimes chewed to allay thirst (Pardy 1956). *C. rostrata* and *C. schimperi* are the only Somali species for which the root is known to be chewed: that of the former is reportedly tasty, with a sugarcane flavor.

Burseraceae figure prominently in indigenous medicinal practice throughout Africa. Bark, resin, sap, root and wood are the parts used, in that order of frequency. The commonest application is for wounds and sores. There are also many references of use of *Boswellia* and *Commiphora* for tumors and cancers (Hartwell 1967-71). A leaf extract of the Namibian *C. saxicola* was reported by a research lab to contain the most promising antitumor properties of all S African plants (van der Walt 1974). Various species have also been mentioned in connection with labor pain and postpartum applications. All parts of *C. africana* have been used for snakebite. A couple of Kenyan species have been mentioned in connection with jigger deterrent and wound dressing to deter flies. In a related context, when *C. rostrata* is browsed by camel this is said to prevent camel flies from collecting on the beast (Sato 1980). Sap of *C. ancistrophora* kills camel flies if sprayed on them. It may be significant that these are two of the `spraying' commiphoras.

Under miscellaneous, one of the commonest uses is of the resin as an adhesive especially to fix arrowheads and vanes to the shaft. Bark of some species is used for coloring or cleaning calabashes. The resin of some species is mixed with charcoal to make ink. Some of the E African species are good nectar trees in honey production (Brokensha et al. 1972). Branches of *C. mollis* produce a heavy smoke used in smoking beehives (Newman 1970). The holes of some Tanzanian species are often used as nesting places for a small `sweat bee' whose honey is much sought (Burtt 1935). An insect known to Somalis as *dunyale*, perhaps related to this sweat bee, produces or uses holes in the trunk of *Bourreria* (Boraginaceae), but no informants have ever mentioned a commiphora harboring it. The ash of *C. samharensis* gives a blue color. The bark of *Boswellia carteri* yields a skin dye, and that of *B. microphylla* yields a red dye for coloring calabashes.

On the negative side, commiphoras have been singled out as bush encroachment problem particularly in S Ethiopia (see in Biogeography and Ecology). In the dense tangle of deciduous acacia-commiphora thicket in N-C Tanzania, Newman (1970) found only a very sparse undergrowth of grasses as well as hindrance to stock movement. Newman considered the major limitation to stock production in that part of Tanzania to be the lack of grasses.

Summary

Boswellia and *Commiphora* are renowned for their aromatic resins and esteemed in medicinal applications and perfumery, but the value of Burseraceae as stock feed far outweighs this and all other uses combined. Many of the Somali species are highly palatable and are invaluable primary producers in the livestock economy of Somalia.

Burseraceae are not nearly so highly rated for livestock elsewhere in Africa. We suggest four reasons for their disproportionate value in Somalia.

(1) Somalia has about half of Africa's commiphoras, so it is not surprising that among the hundred-odd species some should have excellent feed characteristics. The top three in the CR, *C. horrida*, *C. sphaerophylla* and *C. truncata*, are endemic or near endemic, and the top-rated *Boswellia microphylla* is also virtually confined to Somalia.

(2) Commiphoras are a much more important vegetational component here than in most other parts of Africa. Sheer availability is an important aspect of diet in general, hence the value of Burseraceae in the Somali livestock economy.

(3) The bimodal rainfall regime of NE tropical Africa doubtless plays a positive role in utilization. Commiphoras are notorious for early leaf-fall, and the period of browse availability in areas with just one wet season (viz. most of the rest of Africa) severely limits their usefulness. A bimodal system theoretically doubles the availability of commiphora browse.

(4) Somalia has 5 million camels (Elmi 1983). Camels are the most valuable stock class and probably the single most important resource of Somalis. This browser, well-known for its catholic tastes, includes many Burseraceae in its diet. It eats more *Commiphora* species and browses them to a greater degree than any other stock class or any other mammal.

The rich Burseraceae flora in Somalia, combined with our incomplete knowledge of it as witnessed by various only recently described species and a few as yet undescribed, suggests a great, untapped vein of information. The Somali commiphoras must certainly have many unrecorded uses and potential in medicine, land management, livestock husbandry and a diversity of secondary uses. The exudates they synthesize are doubtless a key to the survival and dominance of Burseraceae in the arid bushlands. The resins probably assist in water conservation and deter insect and mammalian herbivory, yet the chemistry of most species is unknown.

Consider the diversity of recorded uses for *C. africana*. The fact that it is the commonest and most widespread species in Africa must have a lot to do with its economic prominence. There is no *a priori* reason why this species should be superior in browse characteristics or secondary metabolites to many lesser-known species. In Somalia the many commiphoras represent a rich lode of information which we have only begun to mine. We must temper our optimism with the realization that most of the uses will not find a commercial outlet, at least not internationally. However, knowledge of distribution, ecology and properties of the indigenous species will greatly enhance our ability to properly manage the range resource, and will significantly enrich the potentialities of resource management in the world's arid zones.

KEY TO THE SPECIES OF BURSERACEAE (*BOSWELLIA* AND *COMMIPHORA*) IN CENTRAL SOMALIA (with sections in brackets)

Notwithstanding some taxonomists' love for natural keys and fixation on floral characters, my aim is a vegetative key which doesn't take an expert to follow, and which eschews as much as possible flowers and fruit. I don't wince, the way I imagine taxonomists may, when I think of artificial keys. Or impossible keys, such as the Fl. Zambesiaca (Wild 1963) Commiphora key constructed of flower and fruit characters.

KEY TO GROUPS

1. Plant armed with spines &/or spine-tipped twigs.

2. Leaves simple, or 3-foliolate but with minute laterals generally less than ¼ the size of terminal leaflet. **GROUP I** (p.28)

2. Leaves 3-foliolate (3-7 in *campestris*), leaflets subequal, most or all laterals usually at least 1/3 size. **GROUP II** (p.30)

1. Plant unarmed though twig ends may fray to a fairly sharp point. (Some unarmed spp may appear sparingly armed viz. *kataf, pseudopaolii*)

3. Leaves strictly 3-foliolate (rarely some 5-fol e.g. *kataf* ssp. *turkanensis*). **GROUP III** (p.32)

3. Leaves some or all with >3 leaflets. **GROUP IV** (p.35)

GROUP I

1. Young shoot hairy & usually felty; leaf hairy rarely subglabrous.

2. Plant a prostrate shrub forming large mats; leaf underside with reddish veins contrasting with the pale hair surface. **C. horrida var. 'unifoliolata' (Q)**

2. Plant an erect shrub or tree.

3. Blade bristly-puberulent; fr bristly or fluffy-looking. **C. chaetocarpa (B)**

3. Blade puberulent; fr glabrous. **C. gowlello (B)**

1. Young shoot glabrous; leaf glabrous or subglabrous.

4. Blade margin usually with >8 prs teeth or crenations.

5. Leaf stiff & crinkly; milky sap usually copious.

6. Usually a dwarf tree with a broad symmetric unhedged crown; trunk flanged or ropy looking; on limestone. **C. oddurensis (B)**

6. Usually a shrub or shrubby tree with a distorted hedged crown; base not ropy looking; on sands & sandstone. **C. n.sp. aff. oddurensis (B)**

5. Leaf not particularly stiff or crinkly; sap sparser; plant generally absent from CR though may occur in extreme SW portion.

7. Blade with a few long hairs at base; short shoot lvs simple; fr c10-12 mm long. **C. habessinica (B)**

7. Blade glabrous; short-shoot lvs some or all 3-foliolate; fr c6 mm long. **C. lindensis (B)**

4. Blade margin with 0-7 prs teeth, rarely more.

8. Spines some or all characteristically short (0.5-2 cm), often sparse.

9. A broadly, deeply, symmetrically crowned tree; spines very few, all short (rarely to 2 cm); fr ovate-elliptic, 10-15 mm long, beaked. **C. hodai (B)**

9. A shrub or small tree with irregular crown; spines usually moderately numerous, usually some longer spines present; fr oval-elliptic to sub globose, 5-10(12?) mm long, apiculate.

10. Short-shoot lvs strictly 1-foliolate, oblanceolate or

narrowly oblong; sap milky. **C. bruceae (B)**

10. Short-shoot lvs some or all 3-foliolate, obovate-orbicular or elliptic-obovate; sap clear or clouded. **C. obovata (D)**

8. Spines some or all long (>3 cm) &/or numerous.

11. Leaf slightly to rather fleshy; spines stout; petiole 1-12 mm; fr 10-18 mm, markedly beaked.

12. Lvs always simple; leaf margin entire; sap with musty (resinous) odor, abundant & flows or even sprays from bent twig. **C. rostrata (A)**

12. Lvs (1)3-foliolate; leaf margin usually toothed; sap lightly resin-scented or odorless, sparse. **C. myrrha (B*)**

11. Leaf not at all fleshy; spines stout or slender; petiole <1 mm; fr 4-8 mm, apiculate.

13. Leaf margin entire or with low teeth or crenations.

14. Margin with crenations or low blunt teeth in distal half; fr 5-8 mm long; petiole 0-0.5 mm. **C. gracilispina (B)**

14. Margin entire or with (mostly) 1-3(6) prs low teeth; fr 4-5 mm long; (extreme base of leaf is truncate though cuneate in broad outline); petiole 0-1(1.5) mm long. Dense globose or dome-shaped crown; blade may be shiny. **C. ellenbeckii (B)**

13. Leaf margin mostly with distinctive & sometimes large teeth. (Blade obovate or oblong-spatulate)

15. Leaf incised with (1)2-4 prs big oblong teeth; fr 5-6 mm long. **C. incisa aff. = Kuchar 17185 (B)**

15. Leaf margin with (1)3-5(8) prs triangular teeth.

16. Spines usually in a distinctive 3-D arrangement of closely (1-2 cm) spaced spine-twigs rather uniformly 5-10 cm long, arranged evenly around the branches; usually a dense impenetrable sprawling shrubby mass; sap clouded rarely milky, fr 4-6 mm long. **C. incisa (B)**

16. Spines short & long, not arranged evenly around the branches; sap milky or creamy yellow; fr 5-7(8) mm.

17. Bark intensely peeling, giving a strikingly shaggy & banded look. **C. sp. aff. kua = Kuchar 17189 (B)**

17. Bark not intensely peeling. **C. kua (B)**

GROUP II

1. Lvs hairy.

2. Leaflets strongly discolorous, very pale (white) below, veins often red or orange; compact dwarf shrub or shrub to 2(4) m with long interlaced spine-tipped twigs.

3. Margin of terminal leaflet with 1-5 prs big teeth. **C. lobatospathulata, armed form (Q)**

3. Margin of terminal leaflet with 5-15 prs teeth. **C. horrida (Q)**

2. Leaflets concolorous or slightly discolorous, generally not red-veined below; dwarf shrubs, shrubs & trees.

4. Lvs finely (?felty-) puberulent; cut twig with clear sap that may run; short-shoots to 13x2-3 mm.
C. sp. aff. africana = Kuchar 17089 (D)

4. Lvs hairy or rough-puberulent; cut twig with white or clear sap, odorless or mild; short shoots to 7x2 mm.

5. Terminal leaflet 0.2-1.5(2) cm, to 2(4)x laterals, can be shorter than petiole, mostly rough-puberulent. **C. tubuk (D)**

5. Terminal leaflet 1-5+ cm, 2-5x laterals, felty-puberulent at least below.
C. africana (D)

1. Lvs glabrous (except *C. schimperi* sometimes with a few long hairs at petiole apex).

6. Sap mostly milky, sometimes clear, with mild odor or none, merely oozes from cut twig;

7. Short-shoots 3-10+ mm, leaflet margin with 5-10(15) prs low teeth or crenations.
C. campestris ssp. glabrata (C)

7. Short-shoots 1-4 mm, leaflet margin with 0-4 prs (large) teeth.

8. Spines stout, long; lvs slightly sub succulent; lateral leaflets usually small, rarely to half size of terminal leaflet. **C. myrrha (B*)**

8. Spines slender, long & short; lvs not subaccount; lateral leaflets rarely much less than half size.

9. Spines very sparse; petiole 0.5-2.5(5) cm; bark mostly pale gray green; fr 9-12(15) mm long. **C. sennii (C)**

9. Spines numerous; petiole 0.3-0.5(1) cm; bark (dark) gray often with purple tinge; fr 6-9 mm long. **C. gurreh (C)**

6. Sap clear, with mostly strong resinous odor, often flows from bent or cut twig; petiole often longer than terminal leaflet.

10. True spines absent but plant markedly pseudo spinose with sharp twig tips; stems with big white peels; some lvs 5-foliolate; fr 6-8 mm long. **C. pseudopaolii (N)**

10. True spines present; stems lacking big white peels; fr 7-15 mm.

11. Leaflet margin with (0)2-4 prs teeth or crenations; petiole 0.3-3 cm; short-shoots 1-6(9) mm long.

12. Petiole 0.3-1.5 cm long; terminal leaflet 0.3-1(1.5) cm long, obovate to subreniform, margin with crenations or teeth; sap may flow; fr asymmetric, 8-10 mm long.
C. sp. aff. tenuis = Kuchar 16915 (C)

12. Petiole (0.5)1-3 cm long; terminal leaflet 1-3 cm long, oblong or rhomboidal to obtriangular, margin with large teeth; sap not flowing; fr 10-15 mm long. **C. schimperi (D)**

11. Leaflet margin with 3-8(12) prs teeth or crenations, or subentire; petiole 1-4 cm long; short-shoots 3-12(25) mm long; sap flows & may spray. Twigs typically dark purple.
C. samharensis (D)

GROUP III

1. Leaflet margin entire (may be slightly irregular in *C. erosa*, rarely1-2 prs shallow subterminal crenations in *C. ancistrophora* & *C. foliacea*; at least lateral leaflets may be entire in *C. kataf* ssp. *turkanensis*; may look subentire in *C. boranensis*); sap clear.

2. Lvs glabrous [may be sl puberulent in C. gileadensis].

3. Bark strikingly pale, usually white & peeling in large white or pale-yellow sheets to reveal a dusty-looking pale blue or greenish blue underbark. Leaflet margin subentire.

4. Petiolule of terminal leaflet 2-10 mm long; short-shoots 1-1.5(2) mm diam; leaflets with 1-4 prs lateral veins & a few secondaries but no network; sap odor often ± unpleasantly musty; fr 7-10 mm long. **C. foliacea (N)**

4. Petiolule of terminal leaflet 1-4 mm long; short-shoots 1.5-2.5 cm diam; leaflet with 3-4(6) prs lateral veins; sap odor may be sweet, not musty or sour.

5. Lvs 1-2.5 cm long; petiole 0.5-1.5 cm long; leaflets <1.5 cm long; fr 9-10 mm, on slender stalk 1-3 cm. (leaflet margin subentire) **C. aff. kataf = Kuchar 17290 (N)**

5. Lvs 2-5.5(7) cm long; petiole 1-4 cm long; leaflets 1-3.5 cm long; fr 9-16 mm, on stout stalk 1-1.5 cm long. **C. lughensis (E)**

3. Bark may have some white patches but not strikingly pale & not with pale blue underbark. (Also C. sp.aff. sphaerocarpa = Kuchar 17277)

6. Bark dark, with black-&-bronzy peels; lvs 1-2.5 cm long; leaflets to 1(2) cm long; sap with resinous odor. **C. gileadensis (Q)**

6. Bark gray with white patches, or dark gray or brownish gray; lvs 2-9(12) cm long; leaflets 1-4.5(8) cm long, apex (very) shortly bluntly acuminate (or not); sap often with musty odor. **C. erosa (E)**

2. Lvs with at least some hairs on petiole (sometimes *C. gileadensis*, *C. cyclophylla*). [also here *C.* ? n.sp. = K(R120)]

7. Sap thin & clear, flows & can even spray from bent twig, has a strong acrid-resinous odor, occasionally does not flow & has a carroty-resinous odor or possibly even a mild sweet odor; bark uniform dark gray or purplish, or mottled.

8. Lvs sparsely to moderately hairy but not felty (sometimes *C. ancistrophora*); fr 4-7 mm long, on stalk 1-4 mm long.

9. Petiole with erect hooked hairs.

10. Trunk & main limbs may be knobby & slightly flanged, but twigs not markedly striate. **C. setulifera (Q)**

10. Trunk & main limbs vertically furrowed or fissured, twigs striate. **C. ancistrophora (Q)**

9. Petiole hairs not hooked; twigs zigzag & markedly striate.

C. 'sulcatostriata' (Q)

8. Lvs mostly felty-hairy; fr 9-15 mm long, on stalk (5?)10-25 mm long.

11. Trunk mottled gray, yellowish-green, &/or buff, usually bearing some papery peels &/or flakes, rarely smooth gray; trunk & main limbs usually lumpy & somewhat flanged. (trunk plane-tree-like) **C. cyclophylla (E)**

11. Trunk uniform dark gray to black, may be steely gray to dark purplish-gray, peels rare or small; not noticeably flanged(?).

12. Short-shoots 0.5-2 cm long; young twigs & at least petiole glandular & with some long erect ciliate hairs. **C. ciliata (P)**

12. Short-shoots 1.5-6(10) cm long; not glandular; trunk steely dark gray to dark purplish gray. **C. sp. aff. cyclophylla (E)**

7. Sap none or thick, merely oozes from cut twig, odor none, mild resinous or musty, rarely strong; bark white- (or yellow-)peeling or mottled gray.

13. Bark strikingly pale, usually white & peeling in large pale yellow or white sheets to reveal a dusty looking pale blue or greenish blue underbark. **C. lughensis (E)**

13. Bark smooth gray, mottled gray green, may have small peels or chips; limbs can be slightly lumpy or flanged. Lvs fairly thick, margin appears sl recurved when dry. **C. sphaerocarpa (E)** (also here **C. sp = Kuchar R120**)

1. Leaflet margin crenate-serrate [or at least vaguely crenate-wavy] with at least 2 prs crenations or teeth; sap clear or milky.

14. Leaflets glabrous, hairs if any confined to midrib, never on intervein areas; sap clear. (Also here *C.* sp.1 [ST 602]: unarmed, glabrous, strong odor; short-shoots 1.5-2.5 mm diam? lvs 3-fol, terminal leaflet 2-5x laterals, 5-9 prs blunt teeth especially along truncate apex. Call it **aff samharensis**.)

15. Petiole hairs (when present) erect & hooked; sap usually sprays from bent twig; bark gray (or purple?); short-shoots 2-3 mm diam; leaflets with 3-6 prs lateral veins & a fine dark green network below; fr (5)6-7 mm long. **C. setulifera (Q)**

15. Petiole hairs not hooked; sap does not spray; bark various; short-shoots 1.5-2 mm diam. [also here *C. 'erosa'* which is that 'elong'-lvd thing. Stems very pale gray, lvs to 3 cm, terminal leaflet 1.5-2x laterals, ovate, apex bluntly acuminate, small blunt mucro, usually a couple prs low crenations]

16. Bark with pale yellow, tan or whitish papery peels revealing pale blue underbark; lvs 3(-5) fol, 1-6 cm long; fr 8-11 mm long. **C. kataf ssp. turkanensis (N)**

16. Bark pale gray to blackish, may have tiny peels or scrolls but no blue underbark; lvs 3-5 fol, mostly 1-2.5 cm long; fr 7 mm long. **C. boranensis (Q)**

14. Leaflets hairy, often felty; sap clear or milky.

17. Terminal leaflet 0.4-1.2 cm long, if longer, then petiole only to 7 mm long;

short-shoots 1-2 mm diam.

18. Lateral leaflets mostly <1/4 size of terminal leaflet; leaflet margin with (3)4-8 prs teeth; petiole 1-3(7) mm long; fr 7-8(9) mm long. **C. truncata (M)**

18. Lateral leaflets not minute compared with terminal leaflet; leaflet margin with 1-3(+?) prs teeth.

19. Bark (±) gray, not white peeling nor revealing blue underbark. Branches markedly striate; long-shoots dull orange; lvs puberulent, leaflet margin with low subterminal crenations; fr 5 mm long. **C. sp. aff. 'sulcatostriata' = Wieland 4477 (Q)**

19. Bark with white patches & with pale yellow or creamy papery peels revealing green or pale blue underbark; sap clear, with strong resinous odor. **C. sp. = Kuchar 17326 (E?)**

17. Terminal leaflet usually much exceeding 1 cm; short-shoots (1)2-3(5) mm diam.

20. Short-shoots predominantly black & thick, (2)2.5-4(5) mm diam.

21. Older stems with 5 corky flanges, younger stems sharply 5-angled; fr 10-11 mm long. **C. alaticaulis (M)**

21. Older stems smooth, lacking flanges.

22. Leaf hairs branched. **C. stellatopubescens (M)**

22. Leaf hairs simple. **C. ogadensis (M)**

20. Short-shoots (1.5)2-3 mm diam.

23. Bark strikingly pale, usually white & peeling in large pale-yellow sheets to reveal a dusty-looking pale blue underbark; terminal leaflet 1.3-1.5(2)x laterals; fr stalked, 8-11 mm long.

24. The short hairs stand out on leaflets, esp. veins of leaflet underside. **C. holtziana (N)**

24. Leaf hairs not stiffly erect. **C. kataf (N)**

23. Bark may be pale but not chalk-white nor revealing pale blue underbark; terminal leaflet length often >2x laterals [?except C. sp. aff. hildebrandtii = K17798].

25. Leaflets usually bullate, strikingly discolorous, white-cottony below with contrasting orange main veins**.** **C. lobatospathulata unarmed form (Q)**

25. Leaflets not strikingly discolorous, not white-cottony below nor with contrasting orange veins**.**

26. Terminal leaflet 1-5 cm long, obovate-oblong or elliptic-oblong, margin with (4)6-12 prs teeth or crenations; trunk dark gray or mottled. **C. hildebrandtii (M)**

26. Terminal leaflet 1-2.5 cm long, obovate, margin with 3-7 prs crenations; trunk &

lower limbs dark (black). **C. arenaria (M)**

GROUP IV

1. Rachis winged.

2. Leaflets 0.4-4.5 cm long but at least some leaflets 1 cm or longer; finely puberulent & mostly felty, rarely (sub)glabrous.

3. Leaflet margin with 3-12+ prs teeth or crenations; short-shoots seem <3 mm long (maybe not C. corrugata).

4. Leaflets bullate, may be sublobed or otherwise non-uniform in shape, margin with 6-12 (20) prs teeth or crenations; (3) 4-7 prs lateral veins. **C. corrugata (M)**

4. Leaflets not bullate, uniform, margin with 2-7 prs teeth or crenations (to subentire); 2-5 prs lateral veins.

5. Leaves 5-7 fol, ± densely hairy, petiole 5-12 mm, leaflets 0.5-1.5 cm. (maybe only S Som) **C. alata (M)**

5. Leaves 3-5 fol, (sub)glabrous or sparsely puberulent at least on midrib, petiole 5-30 mm, leaflets 1-2.5 cm. **C. boranensis (Q)**

3. Leaflet margin entire or with up to 3 prs low crenations; short-shoots 1-25 mm long.

6. Plant vine-like, sap milky & odorless, lvs rough-puberulent & look white-dotted above, leaflet margin recurved. **C. sp. = Kuchar 17300 (sec. unkn.)**

6. Plant erect, sap clear & with strong resinous odor, lvs not rough, leaflet margin not recurved.

7. Trunk black & vertically corrugate toward base, branches strongly banded, twigs zigzag.

8. Petiole (0.3)0.5-1.5(2) cm long, leaflets 0.4-1(1.5) cm long, main lateral veins (0)2-3(4) prs, short-shoots 1-4(6) mm long, terminal leaflet attenuate at base, only seeming petiolulate. **C. velutina (Q)**

8. Petiole (0.5)1-2.5(3) cm long, leaflets 0.5-2.5 cm long, main lateral veins 3-5(6) prs, short-shoots 2-12 mm long, terminal leaflet seems or is petiolulate. **C. albiflora (Q)**

7. Trunk and twigs gray. Petiole may seem narrowly winged, rachis minutely puberulent with curved hairs & extending up the midrib. **C. ? nsp = Kuchar 16503 (M?)**

2. Leaflets 0.1-1.0(1.2) cm long but most leaflets shorter than 1 cm; glabrous, or puberulent with erect sometimes hooked hairs.

9. Leaflets (3)5-9; fr 4-6 mm long.

10. Petiole & rachis with sparse line of hooked hairs; leaflets 1.5-4(6) mm long; bark vertically fissured toward base; fr <4 mm long, subsessile. **C. kucharii (Q)**

10. Petiole & rachis sparsely puberulent, the hairs some or all not hooked; leaflets 2-10 mm long; fr stalked.

11. Petiole hairs straight; leaflet margin with 1-3 prs teeth or crenations. **C. enneaphylla (Q)**

11. At least some petiole hairs curved (not hooked); leaflet margin entire or a vague tooth at apex which may be notched. **C. aff. enneaphylla = Wieland 4287**

9. Leaflets (5)7-17, usually at least some with 11-13 leaflets; fr (5)6-9 mm, shallowly 4-angled. **C. chiovendana (Q)**

1. Rachis unwinged.

12. Fr sharply 3- or 4-angled; bark smooth gray, not bearing papery peels (except *Boswellia rivae*); usually relatively large trees with sparse clear weakly scented sap.

13. Lvs 3-7(11)-foliolate.

14. Fr 4-winged; twigs tending to be at right angles; bark vertically corrugate. **Kirkia tenuifolia** (Superficially like *Boswellia* but in the related family Simaroubaceae.)

14. Fr 3-winged; branching ?not obviously at right angles; bark (mostly) smooth.

15. Leaflets 2-4 cm long; short-shoots stout; (expected to occur in Beledweyne Dist.) **Boswellia ogadensis**

15. Leaflets 0.2-1.5 cm long; short-shoots 2-2.5 mm diam. **Boswellia microphylla**

13. Lvs (7)9-31-foliolate.

16. Leaflet margin entire. **Boswellia neglecta**

16. Leaflet margin mostly toothed. **Boswellia rivae**

12. Fr round or slightly angular in cross-section; bark usually bearing some papery peels; sap clear or milky, odor none to strongly resinous.

17. All stems smooth gray, sap clear, short-shoots 4-20x3-5 mm, lvs glabrous except rachis and midrib with curved hairs, leaflet with 0-3 prs very low crenations subapically, 5-9 prs reddish lateral veins. **C. ?nsp = Kuchar 16503 (M?)**

17. Lacking preceding combination of features.

18. Leaflet margin crenate-serrate.

19. Short-shoots stout, 3-7 mm diam; lvs mostly felty-hairy (except some *C. paolii*).

20. Leaflets 3-5(7). (also C. sp. = Wieland 4163).

21. Leaflets bullate, terminal leaflet 1.5-3x laterals; twig sap clear with resinous odor.
C. corrugata (M)

21. Leaflets not bullate, terminal leaflet 1-1.5x laterals; twig sap milky with faint or no odor.
C. ogadensis (M)

20. Leaflets (3)5-11(13); fr 15-23 mm long, long-stalked.

22. Lvs to 20 cm, 5-9 fol. felty-puberulent; petiole (1.5)2-7 cm long, hairy; leaflets 2-8 cm.
C. edulis (G)

22. Lvs to 13 cm, 5-13 fol. glabrous or sparsely rough-bristly; petiole 0.5-3(4) cm long, bearing a few cilia; leaflets 1-3.5 cm. **C. paolii (G)**

19. Short-shoots slender, (1)1.5-3 mm diam; lvs glabrous to felty (felty only in *C. sphaerophylla* & some *C. holtziana* & *C. kataf*).

23. Bark strikingly pale with large white or cream papery peels revealing dusty looking pale blue or greenish blue underbark; sap with light resinous odor that is often sweet; lvs hairy to felty; short-shoots 0.2-1.5(2.5) cm.

24. Lvs (3)5-7 fol. **C. sphaerophylla (N)**

24. Lvs 3(5) fol.

25. The short hairs stand out on veins of leaflet underside. **C. holtziana (N)**

25. Not as above. **C. kataf (N)**

23. Bark various but never white; sap with weak or strong resinous odor but never sweet-smelling; short-shoots 0.1-0.5 cm long; terminal leaflet rarely exceeding 1 cm long, mostly with a distinct petiolule.

26. Plant glabrous; twigs sharp-tipped; stems gray with big peels. **C. pseudopaolii (N)**

26. Plant with at least a few hairs on petiole or midrib; twigs mostly blunt.

27. Leaflets 5-9, bearing bristly hooked hairs below or at least along margin; sap (thickly) milky; bark mottled greenish-yellow & with some small papery peels & chips. **C. `petiolulata' (N)**

27. Leaflets 3-5(7); sap clear; bark smooth gray to dark & may have black scales.
C. boranensis (Q)

18. Leaflet margin entire. (?also *C.* ? n.sp = Wieland 4163)

28. Plant a very low-growing dwarf shrub, lvs c19-35 foliolate. **C. murraywatsonii (Q)**

28. Plant a shrub or tree usually >1 m high, lvs 3-11 foliolate.

29. Limbs markedly banded; short-shoots 1-3(4) mm diam; sap clear with strong resinous odor; fr 5-7 mm.

30. Lvs 3-5(7) fol, sparsely to densely hairy with erect hooked hairs on rachis & petiole, sometimes also on leaflet underside. **C. ancistrophora (Q)**

30. Lvs 5-7 fol, felty-hairy, hairs erect (may be curved but not (or rarely if ever?) hooked). **C. albiflora (Q)**

29. Limbs gray, smooth, may bear some papery peels, not banded; short-shoots 3-12 mm diam; sap milky, odor none or faint; fr 9-25 mm. (sec. Arillopsidium) (*Platycelyphium voense* (Papilionaceae) could be mistaken for a *Commiphora* in this sec.)

31. Short-shoots 3-6 mm diam; lvs 1-9 cm long, usually felty-hairy; bark very pale gray, smooth or peeling toward base.

32. Lvs 3-5 foliolate; leaflets reniform, sometimes orbicular or obovate; petiolule of terminal leaflet 2-15 mm long. **C. sulcata (G)**

32. Lvs 5-7 foliolate; leaflets ovate or oblong-ovate; petiolule ?shorter. **C. staphyleifolia (G)**

31. Short-shoots 5-12 mm diam (rarely less in *C. erlangeriana*); lvs 5-25 cm long, subglabrous to felty-hairy; bark various.

33. Short-shoots black & rough-prickly, c1-5 cm; leaflets (1)3-5(7), elliptic or obovate to orbicular, (4)5-13 cm long, 6-12 prs lateral veins; fr 10-14 mm long. **C. guidottii (G)**

33. Short-shoots ?generally not black & rough-prickly; leaflets 5-11, elliptic or ovate-elliptic, 1.5-7(9) cm long; fr 9-25 mm long.

34. Leaflets felty-hairy & tending silky when immature; short-shoots 1-2(6) cm; 5-10 prs lateral veins; (sap milky). **C. staphyleifolia (G)**

34. Leaflets subglabrous or hairy but not felty; short-shoots 1-14 cm.

35. Plant a shrub or tree; bark dark gray to black (yellowish?), rarely peeling; (sap milky?); petiole 2-4(8) cm long; leaflets with 3-7 prs lateral veins; upper surface often with many small blisters; fr 13-17(20) mm diam. **C. erlangeriana (G)**

35. Plant a sparingly branched or single stem shrub or straggly tree; bark pale & pale-yellow peeling; (sap clear?); petiole 4-10 cm long; leaflets with 6-10(13) prs lateral veins; fr (15)20-25 mm diam. **C. unilobata (Q)**

ARRANGEMENT OF SPECIFIC INFORMATION ON BURSERACEAE OF SOMALIA

The Somali species of *Boswellia* and *Commiphora* are treated in the next two sections, following a short generic summary for each. A key to *Commiphora* sections is provided, and they are arranged alphabetically within their respective sections. These are as defined by Vollesen (1985) except that sec. *Hemprichia* is separated from sec. *Arillopsidium*, and sec. *Commiphora* is basically what Gillett in FTEA calls sec. *Abyssinicae*.

The order of data presentation under each species is:

(1) Currently accepted species name; names proposed but not yet published are in quotation marks. Along with the name and publication date and pages for description and drawings. Besides those listed, significant information on Burseraceae is provided in Cufodontis 1956, p.375-398, and of course the 3 floras – FTEA, FE, FS.

(2) Synonymy.

(3) Somali names, taken from the following sources:

B	Bay Region plant names (HTS 1983)
C	Cufodontis 1956
CAS	Castro 1983
CH	Chiovenda 1932 [incomplete; need to get all his names G & C used]
DB	Drake-Brockman 1912
EA	East African Herbarium, Nairobi (labels)
FS2	Flora of Somalia v.2 (Thulin 1999)
G	Glover 1947
Ga	Gachathi et al. 1987
HD	JESS (Jubba Valley collections 1986/7 by C.Hemming &/or I.Deshmukh
K	Kew Herbarium, London (labels)
KH	Kuchar & Herlocker 1986 (& later additions)
KTS	Kenya Trees & Shrubs (Dale & Greenway 1961)
L	Elmi 1983
M	Madany 1986
MAC	MacDonald 1985
MIS	J.Miskell unpub. data from Beledweyne, 1986
MOG	Somali National Herbarium, Mogadishu (labels)
V	Vollesen 1985
W	R.Wieland colls (mostly in MOG)
Z	Kazmi 1985a

Many of these names come from outside the C Som study area. All KH names are from C Somalia. See next section for information on Somali names of commiphoras.

(4) Distribution in Somalia, and general distribution elsewhere. N Som. is the area N of 8ºN; C Som. is N of 3ºN and E of 45ºE; S Som. is the remainder (Fig.1).

(5) Description. This is not detailed for reproductive structures and much abbreviated for non-CR species. NOTE: sap refers to exudate from twig break or cross-section. Trunk sap may have different characteristics.

(6) In brackets, number of specimens examined, for CR species only. Unless noted otherwise, the description is based on specimens collected in Somalia and E Kenya. There is a certain amount of duplication of MOG and EA specimens, so the total number of different collections is slightly lower than that given, perhaps by 10-15%.

(7) Habitat and ecology.

(8) Economics, in this order: fencing, gum-resins and medicinal uses, edible products, timber, browse for livestock, browse for game from largest to smallest. Where sources are not cited, the information comes from EA and MOG labels, and field informants' responses compiled by Herlocker & Kuchar (1988).

SOMALI PLANT NAMES

"We aim at using Somali spellings in Flora of Somalia, but this is certainly not a straight-forward thing." (Mats Thulin in litt.). Most of the plant collectors visiting Somalia have been foreigners, and "they tried to reproduce the local plant names in their own spellings. Thus for example *Cordeauxia edulis*, correctly known as yicib in Somali, is spelled more than fifteen ways in the literature, and none of these faithfully reproduce the sound understandable to a Somali." (Kazmi 1985b) The official writing script in Somalia was disseminated through a nationwide rural literacy campaign in 1972 (Wikipedia 2025a). Hence it brought its own set of rules on spelling. Before that, names of plants and places were basically guesses, with notable differences between e.g. English-speaking and Italian-speaking researchers. “Italian is a particularly poor medium for spelling Somali, since it lacks an “*h*” (Somali has two: a normal “*h*”, plus the aspirated “*x*”) and “*w*” (these are some of the commonest sounds in Somali). In addition, both Italian and English do not have the sounds represented by the following letters in Somali: *c*, *dh*, *kh*, & *q*…” (Madany 1990)

The only real oddities in the recently formalized Somali orthography are the **c** and **x**. The letter c represents a guttural, obscure and hardly audible except to Somalis and Arabs. Transliterated Arabic represents it by **'** as in 'Iraq and 'Ali, which in Somali is written Cali. The x represents a rough kind of h, the h in transliterated Arabic.

Names may be prefixed by GEED, meaning 'tree' or 'bush'. This has been omitted except where deemed an integral part of the name.

An attempt has been made to tidy up the spelling of plant names in line with modern Somali orthography, with the kind help of M.H. Madany, but some names (mainly those marked ‘[?]’ and those not in bold) need a second look. A question mark will alert the reader to possible or probable misapplied names. For example, DHIDDIN (and variants) is correctly applied only to *C. myrrha*, a species well-known for its commercial importance. However, Somalis with but slight knowledge of the true names of commiphoras will apply it to almost any similar species, i.e. spiny trees with 1-3 leaflets, which is why it turns up under *C. africana*, *C. ellenbeckii*, *C. habessinica*, *C. samharensis*, *C. tubuk.*

Similarly, XAGAR is broadly applied to non-spiny, white-barked species without a strong resinous smell and with slender ultimate twigs – all of sec. *Hemprichia* and similar species in sec. *Hildebrandtianae*. It is certainly not correct for *C. ellenbeckii*, *C. kua*, *C. myrrha*, *C. africana*, *C. campestris*, *C. bruceae*, *C. velutina*. Somalis in any given locality may differentiate the darker and whiter kinds of XAGAR as XAGAR-MADOW and XAGAR-CAD. In another locality a different pair of species might be involved.

Some other misattributions: GOWLELO is perhaps not correctly applied to *C. myrrha*. JINOW is not really a name for true *C. campestris* which does not have a strong smell. It could be a name for *C. samharensis* which has a strong smell and has been confused with *C. campestris*. Most of the vernacular names cited for *C. africana* seem wrong or very doubtful.

beeyo	aromatic gum
cad	white
dhunkaal	may refer to a poison (?)
luubaan	general term for incense gum
madow	black
quwaax	a general term for plants with sweet sap, incl. many commiphoras

Bracketed i.e. ( ) names are alternatives or anglicized equivalents of the recommended spellings. All names from all available sources, within and outside of the CR, have been compiled (but not FS2). No indication is given of the preeminence of any particular name, though we would tend to favor `KH' names because they are known to originate in the CR. `KH' citations are accompanied by the number of informants in the CR who supplied that name, and as such may be an index of the name's aptness. If '?' precedes the name, this suggests that the name may be wrong or inappropriate.

Names in a wrong genus are rare. QARARRO (GARAHO), attributed to a *Commiphora*, is the well-known name for *Sterculia*. YUCUB, for *C. stellatopubescens*, is better known for *Gyrocarpus* (Hernandiaceae). FULAAY, for *C. lobatospathulata*, is used for yellow-barked acacias such as *Vachellia* (*Acacia) zanzibarica*.

THE SPECIES OF *BOSWELLIA* IN SOMALIA

Unarmed large shrubs or small to medium-sized trees; outer bark usually peeling in papery flakes and rolls; mildly aromatic exudate from cuts hardens to a resin. Leaves mostly clustered on branch tips, imparipinnate. Leaflets crenate, serrate or entire, rather small in the CR species. Inflorescence a panicle or raceme (or thyrse), produced with or before the leaves. Flowers bisexual (dioecious in *B. madagascariensis*). Calyx 5-lobed, persistent. Petals 5, free. Stamens inserted outside a conspicuous circular disk, 10 in 2 whorls, the outer usually with broader filaments. Ovary (2)3(4) locular [3-6(8) acc to FS2] (4-5 locular in *B. popoviana*), style simple, stigma capitate [or truncate]. Fruit a (2)3(4-5) locular obtetrahedroid pseudocapsule, the outer walls breaking away to disclose a (2)3(4-5) winged axis with a single 1-seeded nutlet (stone) in each compartment.

22 species, extending from Ivory Coast to India and south to Tanzania and N Madagascar; most numerous near Gulf of Aden.

BOSWELLIA BRICCHETTII (Chiov.) Chiov. (1941) 132
Commiphora bricchettii Chiov. (1932) 58 & fig.21
Not a form of *B. microphylla*: see Vollesen (1985) 40 & fig.2

N of 10ºN & E of 47ºE.

Unarmed shrub or bushy little tree. [Young stems finely puberulent, can be felty. Short-shoots small. Lvs 0.5-4(5) cm, 5-9 fol.; rachis, leaflet margin & main veins puberulent. Leaflets subsessile, oval to obliquely elliptic, 3-12 mm, apex rounded rarely (sub)acute; 2-4 prs lateral veins. Fr club-shaped or globose, (?3-) angled, 2 cm.]

BOSWELLIA FREREANA Birdwood (1870) Trans Lin Soc 27:144

Tree:
yagcar (OR **jagcar**) (yagar, iegar, yegaar, yegar, yehar, gehar, gegar, gekar) (M,C)
moxor-cad (mohor-ad) (M,C)
moxor (mohor) (EA)

Gum-resin:
mayddi (maidi, meyti, meydi, meithi) (M,C,MOG, Thulin & Warfa 1987)
xanjo-beeyo (hanji-beyo) (C)
luubaan (luban, uban) (C)
luubaan-mayddi (loban-maidi, louban-maitee, luban-maitee, luban-mati, luban-matti, luban-meiti, luban-meyti) (C)

N of 9º30'N & E of 47ºE.

Small unarmed tree, trunk swollen to 1 m diam. at base.

The aromatic sap is collected as frankincense or olibanum (Watt & Breyer-Brandwijk 1962, MOG); it is burnt and the fragrant smoke used by women for perfuming clothes and hair, also used medicinally (Kazmi 1985a). In some areas lopped for fodder and apparently not tapped for the resin (MOG).

BOSWELLIA GLOBOSA Thulin (2006)
Thulin 4309

muqlo (FS3)

N (FS3).

Small unarmed tree, c2.5-4 m, on limestone slopes with various trees especially *Commiphora*, 150-250 m. Bark dark and smooth; leaflets (5)11-21. (Thulin 2007)

BOSWELLIA MICROPHYLLA Chiov. (1915) 404; (1986) 41, t.5A; (1929) 123; (1932) 51; KTS 75
B. bricchettii sensu Chiov. (1941) 132 in part, as to Gillett 4211, non (Chiov.) Chiov.
Synonym for *B. neglecta* S. Moore sensu FS2 non Chiov.

muqle, muqlo (muqlay, muqley, mukulay[?], mokolay[?], mogole, mogoleh, moguli, mogla, muglo) (KH17,KTS,MOG,C,L,W)
merafur, mirafur (L)
bay-bay (bei-bei, bebeh) (C,KTS)
jawdheer (chouwadere) (EA)
geed fogr [?] (ged fogr) (G) [not *B. bricchettii* as stated in G]
qaroon (qaron) (W)

N, CR, S, also E Kenya, Eth.

Unarmed emergent tree to 12 m, crown diam. recorded to 14 m; sometimes bushy tree, often vase-shaped because lower limbs often lopped & because heavily browsed to 3 m high. Sap sparse, clear (rarely clouded), sticky, usually a pleasant parsnip odor, sometimes plainly lightly resin scented. Trunk bark mostly a smooth gray or pale brownish gray (?purple gray, ?mottled), sometimes flanging (also branches); branches pale too (& slightly rough with linear bands). Short-shoots 1-4(15) x 2-2.5 mm. Lvs (1)1.5-4.5(6.5) cm, 3-7(9) fol., appearing glabrous but rachis & midrib usually puberulent. Petiole to 12 mm; petiolule of lateral leaflets 0-1 mm, can be red, 1-5(+?) mm in terminal leaflet. Leaflets narrowly oval or oblong-oblanceolate to suborbicular, (0.25)0.5-1.5 cm, terminal leaflet to 1.5x laterals; 1 or 3 main veins from base & 1-3 prs lateral veins. Fr (elongate) club-shaped & 3-angled, brown or black, 1.5-2 cm. **(41)**

Common in parts of the CR and a codominant on some stable sands. In some *Commiphora horrida-Cordeauxia* shrublands it is a conspicuous emergent generally 7-10 m tall & can form a distinct if open (to 20% cover) tree stratum. In yicib (*Cordeauxia*) sand-plain bushland often a conspicuous and usually sole 'emergent', dotted over the bushlands and distinctive even at large distances. Also found on shallow silts over limestone though less frequent than on sands. Wide ecological amplitude in a Luuq area, S Somalia study (Wieland & Werger 1985).

Gum chewed or eaten, but no commerce. Bark used for tanning, and as the source of a red dye used for coloring calabashes (KTS, EA, Castro 1983). Some use by nomads for temporary stock enclosures (Kuchar 1986b), and in domestic fencing (Castro 1983). Wood not used according to one informant. Used for sterilizing milk containers, the smoke imparting a good smell.

A valuable tree for its palatable browse, and a favorite for lopping to make branches accessible particularly to goat kids. Lopped for camel and goat in wet season, or prior to the rains when the leaves are produced. One of the most heavily browsed Burseraceae, and twigs of considerable diameter are often taken. On being shown a sample of this plant, one pastoralist sang a little song in its praise. According to Ceel Dheer pastoralists it has low palatability for camel and shoats but rated good to excellent in Buulo Burte. Sometimes indicated as sheep browse but virtually never cattle.

Inexplicably, trees in some localities especially broad slight depressions seem untouched by browsers. Possibly there is a varietal difference. Fallen leaves are eaten by sheep and cattle.

In Hiraan Region, *B. microphylla* is usually taller and with a more symmetric crown than *B. neglecta*. The crown depth of *B. microphylla* ranges from slightly less to slightly greater than width, whereas the crown of *B. neglecta* is typically broader than high. Where both *B. microphylla* and *B. neglecta* are found in the same stand, *B. microphylla* shows much greater hedging (browsing) impact.

BOSWELLIA NEGLECTA S. Moore (1877) 67, t.85; Drake-Brockman (1912) 322 & fig.
B. hildebrandtii Engl. (1893) 98
B. multifoliolata Engl. (1898) 16

B. elegans Engl. (1904) 314 & fig 3d-f; (1915) 786 & fig 370D-F; (1931) 423, fig 199D-F[?]
B. microphylla sensu FS2

moxor (M)
moxor-cad (mohr add) (G)
bay-bay (bii bii, be bei, ba beey, birbi, bye-bye) (B,MOG,EA)
jagcar (gekar) (G)
gurre [a form of **gunre**] (C)
murjaan (murgian) (C,MOG), murchen (FS2)
muqlo (moqulo, mugoloh, murlo) (EA,G)
muqlo-jareer, muqlo-jereer (KH4)
muqlo sawir (KH1)
mirafur, marafur (merafur, murafur, magafur) (KH4, KTS, Ga)
mirafur-madoobe (murafur-madobe) (KTS)

N, CR, S, also Kenya, Tanz., Uganda.

A broad full-crowned tree to 6(9) m, sometimes shrublike, forming a broad spreading mass of thick twigs. Cut twig with clear sap, mild sometimes slightly sweet resinous odor. Bark smooth uniform less often mottled gray; (may be a bit purplish or doubtful), (limbs may be charcoal or doubtful). Crown with large conspicuous pseudospinose (sub)perpendicular twigs (1)2-10 cm. Short-shoots 0-15 mm, stout. Lvs 1.5-7 cm, 7-31 fol., hairy or glabrous. Leaflets subsessile or sessile, oval or obliquely elliptic-oval (or oblong-elliptic), 2-5(7) mm; 0-3 prs lateral veins including 1 pr sometimes from base, sometimes a dark network below. Fr globose in outline, 3-angled, 1-1.5 x 1-2 cm. **(17)**

Widespread through Somalia, though only locally more abundant (at least in Buulo Burte Dist.) than *B. microphylla*. The characteristic habitat is somewhat heavier soils or silty sands of shallow depressions and seasonally wet spots, where it can form an open layer of very broad-crowned trees or shrublike masses to 6 m high. A common and widespread tree, locally dominant, in E Kenya and probably S Somalia. In the Ogaden one of the dominants on red sands, also on limestones and suballuvial sites.

Bark and root have a few medicinal uses (Kokwaro 1976, EA). Stem yields a merchantable edible gum which may also be used as incense (KTS, Morgan 1980, MOG). This gum is frequently eaten according to MOG, but not chewed according to CR informants, merely used as incense, or not used at all. As a vermifuge the gum is burnt or twigs are boiled and used. Bark recorded used for tanning. (MOG) The wood is not strong but can make stools (Morgan 1980). Only firewood according to some informants.

Bark CP 4.0%, ash 7.5%, Ca 1.4%, K 0.9%, CF remarkably low at 19.5% (Dougall et al. 1964). Not nearly as heavily browsed as *B. microphylla* and often appearing untouched. However, pastoralists are virtually unanimous in rating it an excellent browse for camel and goat. It is said to aid in production and fragrance of camel milk (Sato 1980). Sometimes cited in sheep diet and fallen leaves eaten.

Bark stripped by elephant (Waterman 1986). Unusually sensitive to elephant impact. In the 1960's [and 1970's] when the commiphora woodlands of Tsavo Park in E Kenya were destroyed by elephant, only the structure changed substantially. The floristic composition of the habitats remained virtually the same, so that with protection from elephant the same sort of vegetation would reestablish. *Boswellia* was a rare exception: it soon virtually disappeared. (van Wijngaarden 1985)

One of the chief food plants of rock hyrax at Lake Turkana in N Kenya (Hemming 1972).

BOSWELLIA OCCULTA Thulin, DeCarlo & SP Johnson

mohor madow

N (Thulin et al. 2019)

Unarmed simple-leaved tree to 5 m. In a small area in N Som, locally common and dominant on arid limestone cliffs and boulders at 400-500 m. where locally of considerable socioeconomic importance for frankincense harvesting. (Thulin et al. 2019)

BOSWELLIA OGADENSIS Vollesen (1985) 39 & fig.1

Shabelle River just N of Somalia thus expected CR.

Unarmed tree. Sap probably clear. Older stems yellowish-brown. Short-shoots stout, densely roughly leaf-scarred. Lvs c4-9 cm, 7-fol., sparsely puberulent. Petiole c1-2 cm, petiolule of terminal leaflet to 2(13) mm, laterals subsessile. Leaflets broadly elliptic to suborbicular, 2-4 cm; c3-5 prs lateral veins. (Description from Vollesen 1985)

BOSWELLIA RIVAE Engl. (1897) 16; KTS p.76 & fig 16c-e
B. boranensis Engl. (1904) 316 & fig 3A-B; (1915) 787 & fig 370A-B
B. ruspoliana Engl.

beeyo (KH), (beh-yab) (EA), beyo (FS2)
beeyo-cad (beiyo-cad) (MOG)
mirafur, merafur (merahfur, myrafur, medhafur, mathafur, madatur) (G,C,CAS,W)
merafur-cad (murafur-ad) (EA,KTS)
muqlo-jareer (KH1)
muqle (mugoloh) (EA), muqlay (FS2)
muurjen (EA), murchen (FS2)
uunsi (onsigonzi) (C,CAS)

N, CR, S; also Eth., NE Kenya.

Sprawly tree to 5(6) m, may be shrublike. Cut twig with clear sap, somewhat sweet carroty-resinous (or strong carroty) odor like *Steganotaenia*, or merely resinous odor. Bark gray, usually bearing a few or abundant pale-yellow papery peels revealing some green or yellowish-green underbark; may have a few black chips. Wood hard. Young shoot & lvs hairy & usually felty. Short shoots? Lvs (2)3-8 cm, c(7)9-25 fol. Petiolule 0 (1) mm. Leaflets oval to elliptic(-oblong), (2)4-17(22) mm, margin with c3-7 prs teeth (predominantly entire in Wieland 4668 which may be a var of microphylla); 2-4 prs lateral veins, a network may be seen below. Fr club-shaped, 3-angled, ?1.5 cm. **(30)**

Very rare in Hiraan Region in contrast to *B. microphylla* and *B. neglecta*.

Yields copious edible white gum, an article of commerce in NE Kenya.

Highly palatable for camel and goat, not used by cattle or sheep.

BOSWELLIA SACRA Flückiger (1867) 31
B. bhau-dajiana Birdwood (1870) 144, t.81
B. carteri Birdwood (1870) 143, t.79

Tree:
moxor (mohor, mogon) (MOG,C) [not the resin as suggested in C(?)]
moxor-madow (mohr-meddhu, mohr-meddu, mohor-medu, mohr-madow, mohr-meddau, mohr-meddu, mohr-medduc, mohor madow) (M,C,MOG)
moxor lab (mohor-lub) (M,C,MOG)
madow (medau, medi) (C)
moxor-cad (mohor add, mohr-add) (C,MOG)
moxor-lo' (mogor lo') (MOG)
beeyo (beio, bejo) (C,CAS)
lufod (MOG)

Gum-resin:
beeyo (beyo, beio) (Thulin & Warfa 1987) sometimes also used for tree (FS2)
xanjo-beeyo, xaajo-beeyo (haaji-beyo) (C)
luubaan-bedowi (luban-bedoni, luban-bedovi, luban-bedowi) (C)
sheheri (C)
luubaan-sheheri (laban-sheheri, luban-sceeri) (C)

N of 10ºN & E of 42º45'E; also S Arabia.

Small unarmed tree, trunk may be swollen at base.

This species, also *C. frereana*, seem to grow mostly on limestone cliff faces (Hunt 1951).

Has been the chief source of frankincense (Baumann 1960). The resin, more properly a gum-resin or oleo-gum-resin, is one of the sources of true frankincense, and called African olibanum and African frankincense. The tree also yields a `turpentine' oil. The resin is used as an incense, a diuretic, and for bilharzia, stomachache and syphilis, and in India for rheumatism and nervous disorders. (Watt & Breyer-Brandwijk 1962) Frankincense is used chiefly in incense, plasters and fumigating pastilles (Greenway 1941). Salve, plaster or powder often used for tumors, cancers (Hartwell 1967-71).

A dye plant: bark is cut off, cut up, powdered and mixed with water; this is rubbed on the skin each half hour for most of 24 h (E. F. Peck in EA).

Browsed by camel and shoats.

THE SPECIES OF *COMMIPHORA* IN SOMALIA

Shrubs or small to medium-sized trees, rarely scrambling shrubs, dwarf shrubs or prostrate mats. Unarmed or armed with differentiated spines and/or spine-tipped shoots, rarely pseudospinose. Outer bark often peeling in papery flakes or rolls revealing a green or blue underbark; some species with smooth bark lacking peels. Usually an exudate oozes or flows from cuts, may spray from bent twig; light or strong resinous-aromatic odor, sometimes none, usually drying to make a gum-resin. Leaves fascicled

on short-shoots and alternate on long-shoots; imparipinnate, 1-3-foliolate, occasionally simple. Dioecious rarely monoecious. Flowers unisexual rarely bisexual, perigynous or hypogynous, male fls usually larger than female, appearing before, with or occasionally after the leaves; in axillary simple or compound dichasial cymes, paniculate cymes, or singly in clusters. Calyx campanulate [from van der Walt 1973] lobes 4(5), petals 4-5, free, red in most sections in our area but white in sec. Opobalsameae, greenish purple in *C. myrrha*, yellow in sec. Hildebrandtianae and some of sec. Arillopsidium. Stamens 8 in 2 whorls of 4, rarely 4. Staminodes present in female flowers. Ovary ovoid, 2-locular with 2 epitropous ovules per loculus; style usually relatively short; stigma capitate, obscurely 2-4 lobed [van der Walt]. Rudimentary ovary sometimes present in male flowers (FS2). Fruit an ovoid, ellipsoid or (sub)globose dehiscent drupe 4-25 mm diam., the fleshy pericarp splitting into 2(3-4) valves disclosing a 2(3) celled 1-2 seeded putamen (stone) which is usually surrounded at least at the base by a ± fleshy, variously lobed rarely ± entire, bright red or orange pseudaril. This pseudaril is probably conspicuous and attractive to birds and undoubtedly plays the same role in seed dissemination as a true aril (van der Walt 1975, Gillett 1985). The stone usually has a fertile 1-seeded cell and a sterile cell, but sometimes both cells fertile.

Commiphora has about 200 species, ranging from the Indian subcontinent to Sahelian-Sudanian W Africa, and S through tropical Africa avoiding the Congo basin. At least one species also occurs in semi-arid NE Brazil. The genus is absent from wet tropical forest and land above 2000 m, and is most richly diversified in stable arid bushlands and to a lesser extent savanna woodland. Somalia has nearly half the world's species.

Extracts from the longhand ms by JB Gillett (dated 1987) as contribution to Beentje 1994 (KTS2). It is more detailed (the rest is in the book). Note that it is apropos of Kenya commiphoras.

Small or medium-sized trees or shrubs, often spiny, normally producing a gummy or fluid exudate which may be aromatic. Outer bark usually translucent and peeling off from the underbark which contains chlorophyll so that photosynthesis can take place when the plant is leafless. Ultimate branches usually either ‘short shoots’ on which the leaves are densely clustered or very short internodes on which the spirally arranged leaves are well spaced out. In some species long-shoot leaves are apt to have more leaflets than short-shoot leaves. Leaves often shed at the start of the dry season, simple, 1-foliolate, hetero 3-foliolate (with greatly reduced lateral leaflets), 3-foliolate or imparipinnate, the lateral leaflets (in Kenya) always opposite and in fewer than 7 pairs [note can be more in Som]. Flowers usually imperfectly dioecious, the females occasionally with a few functional anthers, the males occasionally with a functional ovary. Receptacle saucer-cup- or beaker-shaped. Calyx united at the base, with 4 valvate lobes. Petals 4, free, valvate. Stamens usually 8 in two whorls of 4, in a few species 4 only. Ovary usually 2-celled, one cell being sterile; in a few species both cells may sometimes, or perhaps always, be fertile; rarely abnormal 3-celled ovaries have been found. Fruit a drupe with a fleshy pericarp which, at maturity, splits into 2 or, less often, 4 valves disclosing the stone (putamen) which is usually 1-seeded and covered, at least at the base, by a bright red, orange or yellow fleshy pseudaril; this is edible and nutritious and attracts birds (especially hornbills) which disperse the stone. Cotyledons (where known) entire and as broad as long.

The flowers of *Commiphora* are presumably insect-pollinated, probably by some night-flying insects, but no records of this have been found.

While cross pollination seems always to be more effective than self-pollination the latter can sometimes take place. Branches of *C. samharensis* ssp. *terebinthina* which were fruiting profusely on a tree near a male tree were transplanted to a spot several kilometers from any other tree of this species where they continued to produce a few fruits every rainy season for 5 or 6 years. On the other hand a male and a female plant of *C. eminii* ssp. *zimmermannii* planted c 70 m apart in a spot isolated from other trees of this species produced no fruit until male inflorescences were brought and brushed against female inflorescence.

(From litt 1987:) The fruit stalk is usually partly peduncle and partly pedicel, it is tiresome to distinguish between them and inaccurate to use either word alone. Thus 'fruit stalk' neatly means the combined organ which is easy to observe. Where 2 or more fruits are on a peduncle we have to distinguish.

It is always useful to give Drake-Brockman [1912] references because of his interesting notes and useful little figures.

Key to sections (as represented in Central Somalia) [and no. species here]

1. Fruit not marked with 4 longitudinal whitish lines, usually green or reddish when ripe, often more than 8 mm long & 5 mm wide; pericarp 2-valved or if 4-valved then the plant with differentiated spines; calyx in the fruiting stage not appearing almost square; mature pseudaril often red; sterile cell of putamen almost or quite as wide as the fertile cell.

2. Spines present; leaves of short-shoots 1-3-foliolate.

3. Some or all of the short-shoot leaves simple or 1-foliolate or if lateral leaflets present these are minute, less than 1/5 the size of the terminal leaflet.

4. Fruit more than twice as long as wide on a stalk as long as, or longer than itself; leaves all simple, glabrous, entire; sap very fluid, copious, with a strong peculiar musty odor; pseudaril completely but loosely enclosing the putamen. Section A **Rostratae** [1]

4. Fruit less than twice as long as wide, sessile or on a stalk shorter than itself; sap clear or milky, usually thick and sparse, odorless or with a resinous scent.

5. Pseudaril 4-armed; sterile cell of putamen often humped; thickness of fruit at right angles to the septum almost as great or greater than its width in the plane of the septum; leaves thin. Section B **Commiphora** [15]

5. Pseudaril with broadly triangular or ovate facial lobes and vestigial sutural lobes; fruit ovoid, pointed, flattened (much wider than thick); sterile cell of putamen flat; leaves slightly succulent. Section B* **Coriaceae** [1]

3. All leaves 3-foliolate (to 7-fol. in *C. paolii*); lateral leaflet usually at least half as large as the terminal leaflet.

6. Pseudaril 4-armed; putamen rather smooth. Section C **Campestres** [8]

6. Pseudaril almost completely covering the rugose putamen to which it is closely attached. Section D **Africanae** [6]

2. Spines absent; leaves of short-shoots (1)3-9-foliolate.

7. Fruit stalked.

8. Pseudaril 4-armed; leaves (in Somalia) 3-foliolate.
Section E **Latifoliolatae** [7]

8. Pseudaril various but not 4-armed.

9. Pericarp, when fresh, unusually thick (2 mm or more); twigs stout (diam. 2 mm or more); pseudaril usually subcupular with broad shallow lobes but in *C. unilobata* greatly enlarged on one side only; leaflets (1)3-9.
Section G **Arillopsidium** [9]

9. Pericarp and twigs of normal thickness (under 2 mm); pseudaril with large broad facial lobes and greatly reduced sutural lobes.

10. Outer bark of trunk white or pale-yellow peeling off in large sheets or flakes, underbark blue green or blue; petals yellow; stamens 8 inserted on the rim of the receptacle cup; leaflets 3-9. Section N **Hemprichia** [10]

10. Bark of trunk gray, not peeling in large flakes; petals red; stamens 4 inserted at base of receptacle cup; leaflets 3. Section P **Ciliatae** [1]

7. Fruit sessile or almost so; calyx and usually the petals ± sericeous; leaflets 3-9. Section M **Hildebrandtianae** [10]

1. Fruit with 4 longitudinal whitish lines, usually grown not more than 8 mm long and 5 mm wide; pericarp 4-valved; calyx in the fruiting stage almost square; mature pseudaril yellow or orange; sterile cell of putamen usually much narrower than the fertile cell; leaflets 1-27. Section Q **Opobalsameae** [29]

Table 4. *Commiphora* species with strong-scented resinous sap. (+ = sometimes)

SPECIES	ARMED	STRONG	FLOWS	SPRAYS
rostrata	x	x	X	x
tenuis aff = K16915	x	x	X	
africana aff = K17089	x	x	X	
Samharensis	x	x	X	x
Campestris	x	+		
cyclophylla aff (‘cornii’)	3 leaflets	x (musty	x	+
cyclophylla	3	+	x	+
Erosa	3	x musty		+
sp = K17326	3	x musty		
Foliacea	3	x (musty		

Ciliata	3	+	x	x
Albiflora	3-9	x		
ancistrophora	3-5+	x	x	+
Kucharii	5-9	x	x	
lobatospathulata	3	x		
setulifera	3(5?)	x	x	x
sulcatostriata	3	+		x
Velutina	5-9	x		

Table 5. *Commiphora* species with white or pale bark.

SPECIES	SAP	HAIRS	OTHER
lughensis	sap may be f strong	glabrous to felty	
foliacea	strong musty smell	glabrous	
holtziana	light odor	may be felty	3(5)-fol.
kataf	odor none to strong	may be felty	3(5)-fol.
kua aff = K17189			armed; shaggy, banded
kua			armed; pale gray w/ orange or yellow peels, may be banded
pseudopaolii	clear sap	glabrous	gray(white), peeling, maybe pseudospinose; 2-5(7)-fol.
sphaerophylla	pleasant resinous smell	felty	5-7-fol.
sulcatostriata	sweet or strong smell, may spray	hairy	(gray)
sp = Kuchar 17326	carroty-musty smell		

A Sec. **ROSTRATAE**

Monotypic section. Armed; leaves simple. Male inflorescence a pedunculate cyme, female flowers 1-2 together. Fruit 2-valved or partly 4-valved; pseudaril completely but loosely enveloping endocarp, not fused to it.

COMMIPHORA ROSTRATA Engl. (1897), Chiov. (1932) 61 & fig.24-26
C. robecchii Engl. (1897)

caliboy (aliboye, ali-oi-e, aliboje, alibojeh) (M,G)
libow (libo, libu) (M,G)
jinaw, jinow (jenaw, jenow, janow, jenou, jinau, jillaw, jenno, jenau, chinau, chinow, cillau, cinau, cinow, cinaw) (KH7,P[?],M,KTS,G,MOG,C,L,W) [some of these refs are wrong]
jinow sheere (KH)
orah (MOG)
danu (EA,KTS)
dano-sagaaro (danu-sagar, dano sagarr) (EA,KTS)
gabrar (gobran) (G)

geed danaan (W)

CR, N, S; also Eth., Kenya, Tanz.

Armed shrub or more often small tree 0.5-2.5(4) m; glabrous. Sap clear, usually flows & may spray from bent twig, moderately resinous to often strong distinctive musty un-Commiphora-like odor (very rarely odorless). “Sap peculiarly sweet but unpleasant smelling” (UPS). Trunk (stems) smooth gray (rarely black, may become mottled), white transverse lenticels have been seen; younger twigs may be striate & purplish gray. Spines all lengths, (often 2-5 cm), stout, can be somewhat sparse. Short-shoots 0.5-2(7) x 1-1.8 mm. Lvs simple. Petiole 2-9 mm. Blade fleshy, obovate or elliptic to reniform with apex notched to broadly pointed, (0.5)1-2.5(4?) cm; 2-5 prs lateral veins & usually a network seen below. Fr on stalk 8-12 mm, glaucous, elliptic-lanceolate, 12-18(24) mm, long-beaked. **(42)**

Male plants less spiny and stems tend to be thin and flexible (UPS). Virtually unarmed in ST712; note also the unusually long narrow short shoots to 10 mm and similarly narrow (c1.5 mm diam) continuations as twigs 10-50 mm long.

A common commiphora though never dominant and with its nondescript gray color and smallish size easily overlooked. Widespread however, and a frequent constituent of bushlands on sands. A similar pattern of distribution was found in an E-C Kenya study (Waterman 1986).

var. **REFLEXA** (Chiov.) Gillett
Gillett & Hemming 24707,24743, Friis et al. 4834 (Baidoa)
C. reflexa Chiov. (1932) 88 & fig.52

(N, CR,) S; also Ogaden, N Kenya.

Differs from var. *rostrata* in its semi-prostrate or scrambling habit, slenderer, somewhat flexuous or zigzag branches, and in having some spines reflexed enabling them to act as hooks in climbing. Although extreme forms seem almost specifically distinct no differences have been detected in leaves, flowers or fruit and the two taxa coexist in the same areas and intergrade.

Bark and sap (of var. *rostrata*) have medicinal applications, and the bark can be used as a tea substitute. Twigs can be used as tooth sticks. (Morgan 1980, EA) The root is reportedly tasty, with a sugarcane flavor, and the root of young trees is eaten for malaria.

The fleshy leaves are well-known to be edible; they have a pleasantly sour flavor. Chewing a few leaves can be very refreshing and an excellent short-term thirst-quencher. They are said to contain salt and are locally eaten or chewed by children. The fruit, on the other hand, is strongly resinous and inedible. Leaves can be eaten together with *Leucas abyssinica*. According to one informant the leaves of certain trees (a variety or habitat form?) are salty and are not eaten. According to another, leaves are eaten especially by women and especially when thirsty and pregnant. For a plant I identified as *rostrata* at ST764 in NW Buulo Burte, the leaf tasted of turpentine or paint!

The sap is like acid if it gets in the eye (e.g. by spraying); it will not cause blindness, but the person feels a big pain.

Reportedly used for fencing. When browsed by camel, said to prevent camel flies from collecting on the beast (Sato 1980).

Varying opinions on palatability but more often than not cited as a good browse for camel and goat, infrequently cited for sheep.

B Sec. **COMMIPHORA**

Armed; leaves on short-shoots 1-foliolate or subtrifoliolate, on long-shoots 1-3-foliolate. Bark peels off in horizontal strips. Fruit sessile or almost so, not flattened; pseudaril in most species is divided to the base into 4 narrow arms.

Two or more of the numerous and easily confused species of this section are to be found in almost every part of C Somalia. It is likely that exceptionally knowledgeable Somalis have a different name for each, but these names may be misapplied, and any one name may be used for one species in one area and a similar species in another area.

COMMIPHORA BRUCEAE Chiov. (Hutchinson & Bruce 1941) 133; KTS 85
Drake-Brockman (1912) 316 & fig.

quwaax (goah) (M,G)
geed quwaax (M)
ilka-cadeey, ilka-caddays (ilkacadeeye, ilka adeis, ilka adeye, ilka adayai) (M,G,MOG,Drake-Brockman 1912)
caanamacays, caano-maceys, caanammaceeya (KH3)
qarboqarbo (KH1)
xoday (hodai, hodei) (EA)
cadeey (adayei) (JBGillett)
jawdheer (W)

CR, N, S; also Eth., Kenya, Tanzania.

Armed shrub or shrubby tree 0.5-4(5) m; glabrous. Sap milky (or ring of milky sap), no scent or usually with a slight or marked basically unpleasant fishy odor. Bark silvery or pale greenish gray, peeling usually in big papery scrolls revealing green underbark; (trunk & limbs also recorded as gray with ± rough black lenticels, & branches banded); bark yellowish and with papery peels, but generally whitish especially on the branches (Drake-Brockman 1912). Spines may be sparse, usually very pale, all sizes but typically short spines at regular (c1-3 cm) intervals. Short-shoots 0.5-2(4) x 2 mm. Lvs 1(3) fol., laterals none or minute. Petiole 0-15 mm. Blade (usually?) shiny both sides, often pustulate above, oblanceolate or narrowly oblong-oblanceolate, 1.5-8 cm (to 13 cm in shade forms), margin entire rarely with 1-6(9) prs low ascending teeth; (2)4-6 prs lateral veins & network, dull to subopaque in transmitted light. Fr mostly oval, 5-8 mm, apiculate. **(18)**

Usually a stunted-looking irregular shrub, fairly common but never abundant on alluvial plains and riverbanks (Kuchar 16331 on sandplain). When luxuriant the large elliptic-lanceolate subentire leaves are very distinctive but when small and stunted, confusion with other species is more likely.

Included here is a small-leaved form (Wieland 4536(sterile),4566, ?Kuchar 16108); the first is noted as having branches very flexible & spines weak, breaking easily.

Shows little or no hedging but leaves are eaten by stock and reportedly browsed down according to a MOG label. Only 2 of 6 CR informants thought it was browsed by camel, but 3 considered it utilized by goat and sheep. Has been cited highly palatable for camel and moderately for goat. All stock eat fallen leaves in dry season.

COMMIPHORA CHAETOCARPA Gillett (1991)
Gillett et al. 21943,22325, Wieland 4613

CR; also NE Kenya acc to Gillett (1991) but the specimen believed to be *C. kua* (FS).

Armed dwarf shrub (or small tree). Sap milky, resin-scented or not, odor slight; bark with fresh evergreen smell. Stems (dark) gray, bark tan, bearing large tan papery peels. Long-shoots felty-puberulent. Spines all lengths. Short-shoots 0.5-3 x 1.5-2 mm. Lvs simple, sub-3 fol. on long-shoots, (bristly-) puberulent. Petiole 0-1(2) mm. Blade obovate or spatulate-obovate (to oblanceolate), (0.5)1-3.5 cm, apex rounded, margin with 3-6(8) prs irregular teeth or broad crenations; 3-4(5) prs lateral veins. Fr a fluffy-looking ball 6-7 mm diam including the long pale yellow (red-tinged) hairs. **(4)**

Easily recognized by the puberulent leaves and young stems and the densely bristly fruit, but in the field easily mixed among other species in the bushlands. May be rare, on gypsum in C1.

Likely browsed by camel and goat.

COMMIPHORA ELLENBECKII Engl. (1904), Chiov. (1932) p.73 & fig.39
C. ellenbeckii aff. Also included here is a taxon (e.g. Kuchar 17313) with many pale gray stems, pale gray twigs, & a moderately hedged crown.

dhirindhir (derinder, derender, derindi) (KH3,M,G,L,W,MOG)
dhirindhir xaws (KH1)
xagar (hagar, agar) (M,G,CAS) (Likely wrong)
caanamacays (caano-maceys) (KH1)
waraabe-reeb (warabreb, uaraba reb) (KTS,G)
gowlallo, gawlallo (gowlello, gaulelu, golelu) (MOG; also Gillett 4143,4145,4160 which were wrongly named *playfairii* in KB 1941 p.136 and repeated by G)
tibbuk, tubuk (MOG)
surut (MOG)
iyeen (MOG)
raxan-reeb (reexan-reeb) (KH2)

xudi (KH1)
xuble xuubley (KH1)
taraantar (KH1)
holbe (W)
midqooli [or another member of sec. *Commiphora*] (W)
[not **malmal** (melmel) nor **dhiddin** (diddin); errors in G,KTS; referable to *C. myrrha*, there was certainly gross confusion between it and *ellenbeckii* in KTS.]

CR, N, S; also Eth., Kenya.

Armed single- or multi-stemmed shrub & tree to 4.5 m but averaging 2.5-3 m; dense globose or dome-shaped symmetric crown; glabrous. Sap milky or creamy yellow (creamy greenish-yellow recorded) (or clouded), may be thick and creamy, rarely scarce, odor none or light resinous, lightly scented. Trunk & main limbs various shades of gray & usually bearing (many) small pale orange-yellow or buff-yellow papery peels revealing some green [rarely blue green] underbark, may have many black lenticels; trunk & limbs may look banded. Twigs may be black, many or most (slender &) spine-tipped, also with short (c1 cm) spines. Short-shoots 0.5-2(5) x 1.5(2) mm. Lvs 1-fol. rarely 3-fol. with minute laterals. Petiole 0-1(1.5) mm. Blade can be shiny both sides, oblanceolate or elliptic less often oblong or obovate, 0.5-1.5(2.5) cm, margin with 0-3(6) prs teeth or crenations; 2-3(5) prs lateral veins generally dark green below along with a sparse (outer) network; some dull (subopaque) network in transmitted light. Fl pale reddish (Teshome 2003). Fr oval-elliptic, asymmetric, 4-5 mm, (sharply) apiculate. **(58)**

C. ellenbeckii 1 (K16759,17313) **caano-macays** (KH) A multiple, gray-stemmed, big shrub. Cut twig with milky (or creamy yellow) sap, no odor (or faint). Stems banded. Spines can be fairly sparse, short (1-2 cm). Lvs fascicled on leaf scarred short-shoots (1)2-6 x 2 mm; simple, glabrous. Petiole c1/2-1 mm. Blade looks discolorous, oblanceolate, (1)1 1.2-2 cm, margin entire, c3 prs lateral veins & coarse outer network. (Fls light green) Recorded highly palatable for camel and shoats.

C. ellenbeckii 2 (K16907,16908,17230) **dhigtar, dhintaar** (KH2) Trunk pale smooth gray to yellow, with (many) small (pale yellow) papery peels, and may have many buff or dark lenticels. Cut twig with milky sap, or clear turning clouded or milky, and with strong resinous (pungent) odor. Dharyo. (K16907,16908,17230) Recorded unpalatable for stock.

C. ellenbeckii is very common in at least parts of CR, especially on shallow silts over limestone. May be difficult to positively identify without the distinctive pedicellate male inflorescence; most easily confused with *C. kua* (and *C. gracilispina*). Very close to *C. gowlello* (JB Gillett in litt 1988) but easily separable on basis of hairiness. Abundant in *C. corrugata* bushland on limestone uplands and common on outwash plains and basalt in a Luuq area, S Somalia study (Wieland & Werger 1985).

Sap helps heal cuts quickly (EA). Small spoons or (commonly) stirring sticks. Just below the dark green inner bark is a dark blood-red layer, used to paint calabashes: bark is stripped, crushed to a powder, boiled, water is placed in calabash and swirled until color is absorbed, then the outside painted with the liquid. (Wieland in EA) One of the least preferred firewood species, nevertheless, can see significant use (Castro 1983). Cut and used for fencing; commonly used for nomads' stock enclosures.

Goat/camel fodder. Moderately palatable for camel and goat, rarely indicated as highly palatable; fair rating or not eaten by sheep, not used by cattle. Appears highly resistant to hedging.

COMMIPHORA GOWLELLO Sprague (1927) t.3109
C. atramentaria Chiov. (1932) 76 & fig.43, Drake-Brockman (1912) 317
C. kua (J.F.Royle) Vollesen var. *gowlello* (Sprague) Gillett in FTEA
Kuchar 15988,15996,16005,16038,16045,16095,17617

gowlallo, gawlallo (gowlelo, gowlalo, gaulello, gowlello, golilu, gaulallo, gawlelou, goulelu) (M,MOG,G,EA,C,W,KH,Drake-Brockman 1912)
afbuq (KH1)
jawdheer (KH1)
quwaax-tibbuk (goal-tibbuk, goah-tubuk, goah-tibbuk) (MOG,G,C)
tibbuk, tubuk (MOG)
gaargey (KH1)
waraabe-reeb (warabreb) (EA)
xuubley (hubole,xuboole) (KH2)
quwaax (goal, goar) (MOG)

Resin: **xabag-gowlallo** (habbak-gowlelo) (C)

CR, N, S; also Eth., Kenya.

Armed shrub & tree (0.5)2-4(5) m (also maybe as dome-shaped mound 3x4 m); only 1-1.5 m in N Som (Drake-Brockman 1912). Sap milky, may be somewhat more copious than in other armed commiphoras, odor none, sometimes faint or mild resinous. Trunk & larger limbs various shades of gray or gray-green, or darkish-gray (with blue tinge), usually with many pale yellow or bronzy papery peels, may reveal some gray blue underbark. Twigs gray, long-shoots a contrasting dull orange & (±) felty-puberulent. Well (rarely sparingly) armed with short spines 0.5-1.5 cm as well as spine-tipped twigs. Short-shoots 0.5-4(10) x (1.2)1.5-2.2 mm. Lvs simple, sometimes 3-fol. with minute laterals. Petiole 0(1) mm. Blade somewhat discolorous (shiny especially below), puberulent, oblanceolate to obovate rarely suborbicular, 0.5-2(3.5?) cm, margin with (0)3-10(15) prs crenations or teeth; 2-4(6?) prs lateral veins & (coarse) dark green network below, main veins quite dull to ± opaque in transmitted light especially the network. Flower only 2-3 mm (Drake-Brockman 1912). Fr oval (subglobose), somewhat flattened, asymmetric, (4.5)5-7(9?) mm, with distinct 1-1.5 mm apiculus. **(53)**

Easily confused at a distance with other members of the section, but the puberulent leaves and long-shoots are a unique (aside from the rare *C. chaetocarpa*) diagnostic feature. Common in some bushlands mostly on sands (e.g. E Hiraan Region), rare on shallow limestones and alluvial flats. Possibly different (gowlello aff.) is a small tree, cut branch with ring of milky sap (K15868,15897).

Used for live fencing, containers, stools. Mostly rated unpalatable for browsing stock and some pastoralists consider it useless for stock. Fallen leaves sometimes eaten in dry season.

COMMIPHORA GRACILISPINA Gillett (1991)
Drake-Brockman (1912) p.316
Gillett 13356,(22340,22388,24584), Wieland 4125A, Kuchar 16156(?),
16229,~~17091~~,(16052,16086),16156,(16291),17658,17095

dhirindhir (KH1,W)
dhirindhir xaws (KH1)
raxanreeb (KH2)
malo waxarod (malo wa harod, wa haro malod) (Drake-Brockman 1912)

CR, N, S; also Kenya.

Armed shrub or usually (multi-stemmed) small tree to 5 m; glabrous; wood quite soft. Sap creamy yellow, clouded or clear, light resinous odor. Trunk ± gray (also raggedy black noted), usually with pale orange or buff (or black) papery peels revealing pale green underbark. Branches black or gray, usually banded. Spines 0.5-1.5 cm, also (numerous) spine-tipped twigs. Short-shoots 0.5-2(4) x 1-1.5(2?) mm. Lvs simple [sometimes 3-fol. on long-shoots], petiole 0-0.5 mm, blade obovate, spatulate, or broadly oblong-obovate, 0.4-1.5 cm, margin with 2-4 prs crenations or blunt teeth in distal half or quarter, rarely entire; 2-3 prs lateral veins & some secondaries dark green below. Fl dark red (Teshome 2003). Fr pinkish-purple, glaucous, oval to (sub)globose, 5-8 mm. **(10)**
(K16052 trunk & limbs slightly flanged, mottled gray bark, ± no odor. Doesn't fit well; more like gurreh.)

Easily confused with *C. ellenbeckii* and apparently much rarer. Scattered, rarely abundant, on limestone hills and shallow limestones/silts, occasional on valley sands.

Good for live fencing. Gum solution put on goat teats for weaning. High to moderate browse rating for camel, sometimes goat, not cattle or sheep. All stock eat fallen leaves.

COMMIPHORA HABESSINICA (O.Berg) Engl. ssp. **HABESSINICA**
C. `*abyssinica*' per errore, auct. mult.
C. dancaliensis Chiov. (1915)
C. assaortensis Chiov. (1932) 64 & fig.34
C. madagascariensis sensu Wild (1959,1963) non Jacq.

gowlallo, gawlallo (gawlello, gaulelo, gawlalo, gowlelo) (M,G)
dhiddin, dheddin (didin) (MOG) (Properly for *C. myrrha*)
wedu (MOG)
waraabe-reeb (warabreb) (KTS)

N, S; also Kenya, Tanz., Uganda, Eth., Sudan, Arabia.

Armed tree 4-6 m (reported to 12 m), also spindly shrub; subglabrous. Cut twig with scentless sap, yellow sap at ST941. Bark papery-peeling revealing (lemon-)green; (shiny, peeling). Short-shoots 1-3(+?) x 2-2.5 mm. Lvs 1(3)-fol., laterals small or absent. Petiole mostly 0-2 mm but recorded to 12 mm.

Leaflets glabrous except for a few long (inconspicuous) yellow(ish) hairs at base of blade; hairy in area of leaf base (ST941). Terminal leaflet oblong to lanceolate(obovate?), 1-5 cm, margin nearly always crenate-serrate with 6-14 prs teeth. Fr ovoid or oblong-elliptic, c10-12 mm including a 1-2 mm beak. **(4)** (descr. partly from Gillett 1987, KTS)

Sterile material can be confused with *C. kua* and possibly other members of the section (but *kua* is glabrous).

Not known in CR but perhaps expected in the areas of highest rainfall; known from Afgooye. Throughout its range a commiphora of more mesic sites than normal, which explains its N-S distribution in Somalia. Very common in parts of its range, e.g. on rocky hills in NE Uganda and NW Tanzania.

In parts of C Kenya the sap is a common remedy for wounds and cuts (Brokensha & Riley 1975, Kuchar 1984). Root is also used medicinally, and the fruit is chewed as a cure or possibly as a food. According to Watt & Breyer-Brandwijk (1962) the gum-resin seems to resemble myrrh and is a source of African bdellium.

Wood soft and light (Eggeling & Dale 1951; - not *C. lindensis*). The wood is much used in NW Kenya for making vessels. Also used for beehive manufacture and as firewood. Sap for gumming arrow strings. Cuttings are used for live fencing.

Seems readily if not avidly browsed by stock especially goat and can be heavily browsed. Leaves also eaten by cattle. Also known to be utilized by game in E Africa, including elephant, rhino and giraffe.

COMMIPHORA HODAI Sprague (1927) t.3111, Drake-Brockman (1912) 250,310 & fig.

xoday (hoddai, hodei, hodai, hodeh, odai) (M,KH?5[?],G,C,EA)
xudi [hodi,xudey] (KH1)

Resin: **xabag-xoday** (habbak-hodai) (C)

CR, N, S, also Eth.

Sparingly armed tree to 7 m with open but full symmetric crown; glabrous. Sap milky, odor none to moderately strong resinous. Trunk may be somewhat fluted, pale marbled gray green, bearing some dark chips & usually some small pale yellowish papery peels that may reveal dark green underbark. Spines 0.5-1.5(2.5) cm, very sparse & the plant could be mistaken for unarmed. Short-shoots 0.5-2(6) x 2 mm. Lvs 1- or 3-fol., laterals much smaller. Petiole to 1.5(2) mm. Terminal leaflet elliptic to obovate-oblong, 0.7-2.5 cm, margin with c3-7 prs coarse crenations or teeth; 2-4 prs lateral veins, dark network below. Fr ovate-elliptic, 10-15 mm, beaked. **(24)**

Sprague's description notwithstanding, this species always appears to be armed though spines are unusually sparse, and some twigs may actually be spineless. Somewhat aberrant in this section for its large size, large fruit, and unpalatable foliage.

Common and widespread in CR, ecological amplitude almost the equal of *C. gurreh*, but unpalatable. It is hardly ever touched despite its abundance in certain habitats especially limestone plateaux. Rarely indicated for shoats. Fallen leaves may be eaten by shoats.

Gum used as a medical dressing (Watt & Breyer-Brandwijk 1962). The gum is ground up, getting milky, and is mixed with charcoal and used as ink for writing on Quran boards. Wood is used for all carving, e.g. all utensils, benches, but not for building. Sticks for threshing sorghum. A very good - perhaps the best - of the CR commiphoras for vegetative reproduction, for making live fences.

COMMIPHORA INCISA Chiov. (1916) (1932) 76 & fig.42
C. candidula Sprague (1927) t.3106**,** Drake-Brockman (1912) 317 & fig**.**

raxan-reeb (rexan-reeb, rahanreb, rahan rub, raxan-reb) (M,KH7,MOG,L)
naxan-reeb (KH3)
waraabe (KH1)
waraabe-reeb (KH8)
quwaax (go-ah, go'ah, goah) (M,G,C)
geed quwaax (M)
xoday (KH) (doubtful)
karen karbo (karankarbo) (EA,W)
gowlallo (gheolello) (C)
dhiintaar (KH2)
dhirindhir (KH)
dilindiqo (W)
dhiti (KH)
hobla-loho (MOG)

Resin:
xabag-raxanreeb (habbak-rahanreb) (C)
dhammajo (damacho, damaja, damaitcho) (C,CAS,MOG,Ga)

CR, N, S; also Eth., Kenya.

Armed shrub or shrubby tree to 4.5 m, with a dense usually sprawling crown forming impenetrable masses to 8 m diam; also shrublike full-crowned tree; glabrous (in CR). Sap clouded, occasionally clear but clouding, or milky, odor none rarely mild resinous. Bark some shade of gray, can be shiny, bearing small (tiny) buff or pale yellow-orange papery peels (over pale green). Fearsomely armed in a unique manner, as long (4-9(11) cm) stout close-set spines ± evenly arranged around the branches. Short-shoots 0.5-2(5) x 2 mm. Lvs 1-fol, rarely 3-fol with minute laterals; (sub)sessile, obovate-obtriangular, 0.5-1.5(2) cm, margin with 1-3(5) prs usually large triangular teeth in distal half; 1-3(4) prs lateral veins, may be a coarse dark (raised?) network below. Fls greenish or greenish yellow. Fr oval-oblong to subglobose, asymmetric, 4-6 mm (5-8 mm in FE3, 7 mm in FTEA), apiculate. **(53)**

Similar to *C. kua* but has shorter broader leaves with fewer larger teeth. Similar to *C. gracilispina* but has stouter spines and fls greenish yellow vs. red (but red listed in FE3). *C. gowlello* has been seen (K16435) with similar growth form.

The characteristic growth form of heavily armed, absolutely impenetrable clumps is probably the main reason for its abundance in areas otherwise devastated by stock. It is usually the commonest commiphora on silts or silty sands within a few km of waterpoints, though hardly ever exceeding 3-4% cover. It is an indicator of overgrazing. Also fairly frequent far from water, particularly in low shrublands where it may enjoy the status of a mini-emergent to 4 m. A very common commiphora in Hiraan Region, 2nd only to *C. gurreh*; frequent on most of the landforms viz. sand plains, valley sands, shallow sand over limestone, shallow limestone/silt mosaics, alluvial plains, basaltic clay plains. Also seen on sand dunes, saline plain. Only on limestone hills and plateaux is it quite scarce.

In Ceeldheer Dist, widespread on sand over limestone, stabilized dunes and stabilized sand foot slopes. Locally a major invader of land cleared of woody cover but not farmed, also an invader on abandoned farms. (Herlocker et al. 1987)

Very wide ecological amplitude in a Luuq area, S Somalia study. Particularly common on alluvial plains, also on gypsum and basalt. Often with *Vachellia (Acacia) horrida*. (Wieland & Werger 1985)

Gum and bark have medicinal use particularly to disinfect and clean wounds of man and beast. The sap is also placed on thorn wounds and the thorn then lifted out. (R. Wieland in EA)

Wood is used for stools and containers, and some use as fencing material, e.g. for nomads' temporary stock enclosures. *Naxan-reeb* means `hard to pass' in reference to thorn enclosures made from this plant, which hyenas cannot get through.

Absolutely unhedged in appearance in most sites, even those subject to high stock use. Only under exceptionally high stocking rates will it sometimes show slight hedging. A Kenya study (Waterman 1986) found that the stems contained more resin than any other commiphora examined, suggesting a chemical repellent action. The stout and abundant spines surely must have some effect too.

Despite its untouched look, pastoralists (at least in Hiraan Region) rate it moderately to highly palatable for camel and sometimes goat. Camels will eat young shoots and shoats the leaves. Unpalatable or virtually so for sheep and cattle. Significant in goat but not sheep diet in a N Kenya study (Sato 1980). Young leaves eaten by gerenuk (Raeder 1981).

[*C. incisa* 'A': maybe hedged; clear sap; short-shoots 2-2.5 mm diam, rough-bristly. Only ST906.]

COMMIPHORA INCISA aff. = Kuchar 17185
Kuchar 17185, Wieland 4155a, maybe 4503, (maybe Gillett & Watson 23731)
C. kua per Thulin (UPS).

xuub-cade (KH)
dhirindhir (W)

CR: Buulo Burte, Hobyo.

Armed dwarf tree or shrub to at least 3.5 m; glabrous. Sap milky, slight resinous odor. Bark very pale gray, some small pale yellow papery peels revealing green underbark. Spines all lengths including short spines 1-3 cm; twigs may approach *C. incisa* in the 3-D spine arrangement. Short-shoots 1-2 x 1.5-3 mm. Lvs simple (?sometimes 3-fol. with minute laterals), sessile, obovate or oblong, 0.5-0.7(+?) cm (but immature at least in K17185), incised with (1)2-4 prs big oblong teeth; main veins & dark network below. Fr ovoid, oblique, 5-6 mm including the abrupt apiculus. **(4)**

Lvs differ markedly in shape from C. incisa [not necessarily] and teeth different from C. oddurensis (JB Gillett in litt. 1987). Wieland 4503 seems close to *C. incisa*.

Scarce but may be locally common, on gypseous silts and limestone/silt mosaic in W Buulo Burte Dist.

Palatable for camel and goat.

COMMIPHORA KUA (J.F.Royle) Vollesen (1984)
C. crenulata (A.Terracc.) Chiov. (1932) 75 & fig.41
C. flaviflora Engl. (1904) 306 & fig.1; Chiov. (1932) 70 & fig.37
C. habessinica (Berg) Engl. var. *crenulata* A.Terracc.
incl. Kuchar 16908,17174,17252….
Thulin in FS took a broad view and included these as synonyms: atramentaria (syn of gowlello), **bruceae**, candidula (syn of incisa), **ellenbeckii**, **gowlello**, **gracilispina**, **habessinica**, **incisa**, **lindensis**. Some of these may have entered into my description of kua which I take s.str.
JB Gillett (in litt 1984) states that "delimitation of species is very difficult in this complex."
The following vernacular names may include segregates.

raxan-reeb (rahanreb) (M,MOG)
beeyo (KH1)
xagar (KH1)
gowlallo (gheolello, gowlello, golile, golila) (M,CH,G,KTS,W)
waraabe-reeb (warab-reb) (KTS)
waxar-waalis (wahara wallis) (MOG)
mala waxarod[?] (mala wa hored, mala-wa-harod, wa-haro-malod) (G,C)
xabuboole (prob. incl. howabloho (G)) (KH1)
gadon[?] (ghadon) (MOG)
dalat (CH,G)
xoday (hodhe, xodey) (KTS,CAS), hodai (FS2)
dhammaaji (dhamaji) (KH2)
dililiqo (W)
dhirindhir (W)
midqooli (W)
holbe, hulbey (W)
didin (FS2)
goah (FS2)

ilka adeyi, ilko cadays, ilka deis (FS2)
kukar (FS2)
wedu (FS2)

Resin: **xabag-malawaxarod** (habbak-malo-wa-harod) (C)

CR, N, S; also Kenya, Eth., Arabia.

Armed shrub or tree to 3(4.5?) m (seen 2x4 m with branches arching down & some touching ground); glabrous (incl. FE3, FTEA). Sap milky or pale yellow, usually no odor, sometimes light resinous. Spines (0.5)1-2(3) cm, (sub)perpendicular, also spine-tipped long-shoots. Bark pale gray (or shiny pale gray-green or cream-colored), bearing many (or some) pale orange-yellow or buff papery peels that may reveal green underbark; may be dotted with lenticels [or is this ellenbeckii?]; peeling in horizontal strips acc to FTEA. Branches off-white to dark gray or purplish gray, can be banded. Short-shoots 0.5-3(5) x 1.5-3(4) mm. Lvs 1-fol., or 3-fol. with minute laterals. Petiole 0 or 0-1 mm. Blade obovate to oblanceolate-oblong, 0.5-3.5 cm, (apex truncate to acute per FTEA,) margin with 2-5(8) prs usually fairly large & fairly sharp teeth; 2-3(5) prs lateral veins & sometimes a few (outer) secondaries. Fl y-green or pale red (Teshome 2003). Fr broadly oval to globose, 5-7(8) mm, markedly apiculate. **(48)**

A variable species; it is doubtful whether *C. flaviflora* is truly conspecific. The fruit usually has 2 fertile cells, especially in the northern part of its range, but this character is not always reliable.

In coastal region NE of Mogadishu seen in several places in the wooded dune belt behind the coast where it is the only commiphora (Gillett & Hemming in UPS). In W Hiraan Region scattered on shallow limestone/silt mosaics, very rare on other landforms such as sands, alluvium, limestone hills.

Gum used in washing sheep or goat skins used for water containers, so that the skin won't foul the water nor leak. Gum used in making ink.

Good to very good browse for camel, not used by other stock or also palatable for goat, doubtfully sheep. Food of camel and significant in diet of goat but not sheep in a N Kenya study (Sato 1980). Not browsed according to W Buulo Burte informants, or only by camel for which it is a good browse.

COMMIPHORA sp. aff. **KUA** = Kuchar 17189
Kuchar 17102,17189,17193,17234,17240,17315,17785; 17091
(originally det by Gillett as ellenbeckii or kua, 17104 as gurreh)

roos (KH1)
dhintaar (KH2)
xuuble (KH1)

C2

Armed tree 2-4.5 m; glabrous. Striking shaggy look due to intensely peeling pale yellow, grayish-yellow, dark olive or occasionally pale buff papery bark, & giving a horizontal banded effect. Sap milky

(or clear turning clouded) or creamy yellow, light resinous odor or ± odorless. Spines all lengths, often mostly short (0.5-1.5 cm) (& thin?). Short-shoots 1-6(8) x 2-3 mm. Lvs simple (or sub-3-fol?). Petiole to 1 mm. Blade obovate or oblanceolate, 0.5-1.5(2) cm, margin with 2-4(5) prs large blunt teeth, may be practically incised (rarely entire); c2-3 prs lateral veins & a coarse dark network below. Fr globose, oblique, c5 mm, with an abrupt mucro. **(5)**

Here and there in fair amounts in bushland on limestone/silt mosaic in W Hiraan Region, also recorded on limestone hill, basalt soil, and in NE Hiraan Region on sand plains.

Wood for utensils. Very good browse for camel, good for goat or not used by shoats & cattle.

COMMIPHORA LINDENSIS Engl. (1904)
C. abyssinica var. *simplicifolia* sensu Chiov. (1932) 66 & fig.35
incl. Kuchar 16017,16018,16024,16132 (or obovata?),17697

CR, S; also Kenya, Tanz.

Armed shrub or tree to 3(5) m, may be subscandent; glabrous. Sap milky, ± odorless (may be slightly scented - Gillett 1987); or clear with mild resinous odor. Bark smooth pale gray(-green), may be papery-peeling. Spines all lengths, may be stout. Short-shoots low. Lvs all 3-fol. but laterals small to minute, mostly <3 mm; or lvs apparently simple. Petiole 0.5-3(5+) mm. Terminal leaflet elliptic-oblanceolate (to obovate), 1-3(4) cm, apex rounded or acute, margin with (4)6-12 prs low teeth; c3-4 prs lateral veins. Fl greenish yellow (Teshome 2003). Fr subglobose, c6 mm. **(4+)**

Confusable with *C. obovata* – see under that species.

Mainly in coastal bushlands of E Africa and in places can form the dominant cover of shore thickets. Definitely reaches southern Somalia but the only CR specimen is Gillett & Beckett 23287 from 3º54'N 46º12'E though abnormal. May well reach Jalalaqsi as it is part of the *C. campestris* ssp. *glabrata* dune community S of Mogadishu.

Commonly browsed by stock (van Rensburg 1948) and may be heavily used.

COMMIPHORA ODDURENSIS Chiov. (1932) 71 & fig.38
C. sp. = Friis et al. 3160 in FE3 (but see sp. aff. oddurensis)
incl. Kuchar 16131,16155,17085,17270,17282,17762(nr?)

xoday (KH1)
reymol, rimoole, riimoole (KH3)
dufenud (EA)
afgub[or is it angub!] (angup, angub) (EA,MOG)
tibbuk (tobok, toboc) (G,C)
dharendhar (KH)
jawdeer (FS2)

CR, S, N; also Eth., extreme NE Kenya.

Armed tree (1)2-4 m, rarely shrub; glabrous; crown dense globose symmetric. Sap milky & usually copious, odor none to slightly resinous. Trunk & at least sometimes main limbs flanged or uniquely ropy as if composed of 3 or 4 fused stems; gray-green or olive-gray, usually with a marbled look, usually bearing minute pale tan or orange yellow (or charcoal-colored) papery flakes, rolls or peels. Spines 1-3 cm grading into spine-tipped twigs, all tips may be armed. Short-shoots 1-4(8) x 1.5 mm. Lvs simple. Petiole 0(1) mm. Blade oblanceolate or elliptic-lanceolate, (0.4)1-2(3) cm, apex acute, margin wavy & with 6-13 prs sharp teeth, rarely entire; (3)4-7 prs lateral veins & a dark network below. Fr (sessile,) globose or asymmetric-oval, (4)5-7 mm, 4-angled & ± stripy. **(40)**

The stiff crinkled leaves with numerous sharp, almost spiny teeth are characteristic. Some commiphoras have flanging - i.e. laterally compressed - main stems, but the ropy trunk of this small tree is unique. May be widespread in C Somalia, though at least in Buulo Burte Dist. restricted to limestone substrates particularly rocky hills where it is almost certain to be found though never exceeding 2% cover. A collection from N Mudug (Kasmi et al. 5570) has very small lvs (<1 cm long).

Highly palatable for camel, also maybe goat but hardly ever showing a trace of hedging.

COMMIPHORA sp. aff. **ODDURENSIS** = Gillett et al. 22654
Gillett & Hemming 24309, 24342[A], Kuchar 16345,16557,16633,16786,16926, prob.16566, prob.16738, possibly Wieland 4745,4290(sterile)
I equated it with *C.* sp. = Friis et al. 3160 (*Commiphora* aff. *glandulosa* Schinz, no.42 in FE3), but that taxon is only to 0.5 m high. Teshome (2003) described a new species *C. suffruticosa* from S Ethiopia that may fit but is listed as 4-valved.

afgub (angub) (KH4,W,MOG)
dhirindhir (KH)
raxanreeb (KH)

CR, S, also Eth.

Armed shrub or shrublike tree to 4(6) m; glabrous; crown compact, dense, often irregular through hedging, but in tall plants may be a ‘spray’ of limbs. Sap milky, fairly to quite copious, odor faint or none. Main stems gray, brown, or dull (grayish-)green, bearing many small pale (vertical) yellow-brown or buff-orange papery peels/scrolls, may reveal (gray-)green underbark; may also bear dark chips; ['not peeling' in Friis et al. 4711 from Luuq]. Spines all sizes, may be fairly sparse. Short-shoots 2-10 x (1)1.5(2) mm. Lvs simple, occasionally 3-fol. with small laterals. Petiole (0.5)1 mm. Blade (±) shiny, oblanceolate, oblong-obovate or elliptic, (1)1.5-4(6) cm, margin with (6)8-12(20) prs sharp teeth; c4-8 prs lateral veins, dark green network below, fairly clear in transmitted light. (Fl red or reddish-purple in *C. suffruticosa*) Fr sessile, elliptic-ovate, asymmetric, 5-9 mm, apiculate. **(17)**

Resembles *C. oddurensis* but with somewhat broader leaves; also usually of irregular shrubby form whereas *C. oddurensis* is a symmetrically crowned little tree with a peculiarly ‘ropy’ trunk. Whereas *C.*

oddurensis is common on limestone, this species grows on sands and sandstone escarpment, where it is uncommon.

Tentatively placed here is Wieland 4290, a shrub on sands in Hobyo Dist.; it has numerous thin short (0.7-1.2 cm) spines as well as spine-tipped twigs.

Gum inedible but an ingredient of ink for Quran board. Wood for milk containers, cups. No firewood use.

Usually (but not always) rather heavily hedged despite being well armed (whereas *C. oddurensis* ± never obviously hedged though browsed by camel). Good forage for goats, not used by cattle, sheep or camel (R. Wieland). Good to very good rating for camel and goat, also sheep, not cattle. Fallen leaves eaten by cattle and shoats.

COMMIPHORA PLAYFAIRII (Oliv.) Engl. (1896)
Balsamodendron playfairii Oliv. in F.T.A. 1:326 (1868); Hemsley in Hook. Ic. Ser. 4 VII-2524

hodei, hotai, the gum [i.e. resin] (FS2); **hodai** is the tree and **habbak hodai** the resin according to Drake-Brockman (1912).

N. Confined to coast of Gulf of Aden E of 49º30'E.

Armed twisted dwarf tree & shrub. [2 m; bark papery pale-yellow peeling; lvs glabrous, 3-fol., leaflets small, obovate-oblong, laterals half size, margin entire or with low teeth. (2)]

Used for making ink for the Quran schools (MOG).

B* Sec. **CORIACEAE**

Monotypic section. Armed; leaves 1-foliolate or subtrifoliolate. Flowers in 1(2)-flowered subsessile cymes. Pseudaril a basal cup with 2 broad triangular facial lobes & 2 narrower commissural lobes.

COMMIPHORA MYRRHA (Nees) Engl. (1883)
Chiovenda (1932) fig.47:5,6 illustrates this plant but fig.47:1-4 is *C. sennii*.
Balsamodendron myrrha Nees (1828) fig.127
C. rivae Engl. (1897)
C. coriacea Engl. (1899)
C. molmol (Engl.) Engl.
C. playfairii (Hook.f.) Engl. var. *benadirensis* Chiov. (1932) 70 & fig.36
C. habessinica var. *grossedentata* Chiov. (1941)
C. cuspidata Chiov. (1941)

dhiddin, dheddin (diddin, didin, dithin, didthin, dedin, dhedin, dhadin) (M,CH,G,C,KTS,MOG) (the proper name for *C. myrrha*)
gowlallo (golelu) (G)
xagar (haggar) (M,KTS) (Certainly wrong)
xoday (hotai, hodei, odei, otai) (M,G,C)
surut (G)
mira (mirra) (G)
ilka-cadeey (ilka'adeye) (EA)
afgub (KH)
rona (CH)
karbi (CH)

Resin:
malmal, molmol (malmol, melmel) (KH3,G,M,C,W,MOG,KTS[not C. ellenbeckii])
yobuun-malmal (guban-malmal) (C)
ogo-malmal (C)

CR, N, S; also Eth., Kenya, Arabia.

Armed (sometimes dense-crowned) shrub mostly 1.5-3 m, also bushy tree to 6x8 m with a spare but deep crown, sometimes almost to ground; glabrous. Sap clear or milky, odor none or faintly (lightly) resin scented. Bark smooth gray (with small black protrusions), greenish, or finely mottled gray & yellow, usually bearing pale orange-yellow, gray or tan papery peels (revealing green). Spines & spine-tipped twigs, ± all ends sharp; can resemble *C. incisa* in 3-D spine arrangement but spines are stout & less numerous, & some plants appear unarmed. Short-shoots 0.5-2(4) x 1.5-2 mm. Lvs 0.7-2(4.5) cm (to 10 cm acc. to Chiov.), 3-fol. but laterals usually minute very rarely to half-size; may have a slightly fleshy or rubbery feel. Petiole 1-12 mm (to 4.5 cm acc. to Chiov.), lateral leaflets sessile. Leaflets (maybe) slightly subsucculent, elliptic, sometimes obovate oval to orbicular, 0.5-3(4) cm, margin with 0-4(10?) prs teeth mostly in distal half; 2-4(6) prs lateral veins. Petals dull purple acc to FE3. Fr on stalk 2-4 mm; oval-elliptic, flattened, 9-13(15) mm, markedly beaked. **(53)**

In CR seems restricted to (or predominantly on) soils with some gypsum. Very scarce in Hiraan Region. In Jalalaqsi Dist. forms a characteristic fringe around acacia copses on *Limonium-Suaeda* saltbush plains.(I may be confusing it with *C.incisa*) Very wide ecological amplitude in a Luuq area, S Somalia study; particularly common on alluvial plains, also on gypsum and basalt (Wieland & Werger 1985).

This is the chief commiphora producing economically valuable myrrh. It is rather variable and occurs in most parts of C Somalia, especially gypseous sites, and only seeming to avoid pure sands such as the *hawd*.

Besides the resin myrrh it yields herabol myrrh, a gum-resin used in medicine (Greenway 1941). Medicinal applications include uses as an abortifacient and emmenagogue (Farnsworth et al. 1975), for tumors, cancer, liver and spleen problems (Hartwell 1967-71), and for wounds, cuts, head injuries. A major ingredient of medicinal applications for infibulation wound (Abdalla 1982). Eaten by men, especially sheiks in Somalia, to depress libido. The antidote is said to be a cupful of fat from the tail of the fat-tailed sheep.

The gum is sold commercially in some areas. For example, in Mandera (NE Kenya), "Yields the best gum in this area which is an article of commerce when the price is high. The smoke of the gum is said to keep snakes out of the house." (J.B.Gillett in EA)

Wood for calabashes but reportedly not a good firewood. Makes pen for writing Quran (MOG).

Leaves eaten by camel and goat and reportedly very much liked by the former; moderate to high palatability rating for both. May show moderate hedging (Jalalaqsi Dist). Recorded for cattle and sheep.

C Sec. CAMPESTRES

Armed; leaves 3-foliolate rarely 5-7-foliolate. Flowers solitary or in subsessile or pedunculate cymes. Fruit rarely partly 4-valved; pseudaril of 4 parallel-sided angular arms from a basal cup, the commissural usually longest.

COMMIPHORA CAMPESTRIS Engl. (1893)

ssp. **GLABRATA** (Engl.) Gillett
C. glabrata Engl. (1910)
C. 'sabulosa' ined.
Gillett & Hemming 24629, Gillett et al. 24933, Kuchar 16650,17426,17430,17435,17669,17678, Thulin & Warfa 5285 (campestris per FS). Somalia material deviates in having glabrous young branchlets, distinctly crenulate leaflets and subsessile fruit (FS).
The plants described as *campestris* by Chiov. in 1916 and 1932, fig. 74, without spines, are certainly not *campestris* and are probably *C. cyclophylla*.

kukey (FS2)
quraar (kuru, kura, kuro) (EA, Ga, KH1)
quraar cad (KH1)
gunre (gunr) (EA) **(**probably misidentified material)
jinaw, jinow (jenau, j'nau) (KTS) (probably misidentified material)
hunbaawe (HD)
kulmo doon (KH1)

S,C (FS2); also Eth., Kenya, Tanzania.

Armed tree to 9 m; bark usually peeling; sap with faint odor or strong turpentine smell; (slash red, not resin-scented); species as a whole glabrous or hairy but ssp. *glabrata* has felty-puberulent young shoots (not acc to FS: glabrous). Lvs glabrous, 3-5(7)-fol., petiole 1-4 cm, sometimes longer than leaflets which are 1.5-6 cm, margin entire rarely shallowly crenate. Fr stalked, (sub)globose, flattened, 7-12 mm. (Gillett 1987, FS2)

Armed shrubby tree 2-5 m with broad full crown to 9 m diam & sometimes reaching the ground; may be multi stemmed; glabrous. Sap clear (clouded or milky in Mogadishu coast collection), resinous odor or ± odorless. Bark gray or gray-brown or black, smooth or rough, breaking into small plates, may bear small buff peels/rolls; younger stems & spines gray. Spines short (0.5-1.5 cm) as well as some spine-tipped twigs. Short-shoots 3-10(20) x 2 mm. Lvs 2.5-7 cm, 3(5?)-fol. Petiole 1-4 cm, petiolule of terminal leaflet seems to 4 mm, of laterals 0-1 mm. Terminal leaflet 1.3-2.5x laterals, basal 1-3 mm narrowed but not petiolulate, somewhat discolorous, shiny at least above, may dry unusually dark brown, broadly elliptic to obovate-suborbicular, (1)1.5-3.5 cm, [apex may be shortly abruptly acute], margin with c5-10(15) prs low teeth or (prominent) crenations, may seem entire; [main veins may be scarcely raised above], midrib pale above, pale (white) & raised below; 3-5 prs lateral veins & dark green network below, slightly dull or ± clear in transmitted light. Fr subsessile, globose or ovoid, blunt, 8-9 mm. **(9)**

A taxon apparently confined to stable sand dunes from SE Buulo Burte Dist. down to Mogadishu and coastally down to Kismaayo. A codominant in some bushlands down the coast from Mogadishu.

Apparently not common in Somalia but widespread in Acacia-Commiphora bushlands throughout S and E Kenya, and dominant in some stands.

Fruit edible according to 1 EA label. Root, bark and sap used medicinally. Cut branches will not dry out for a long time and can be planted (Kuchar 1984). Used for live fencing; sometimes also for dry fencing but not good. Has a bit of useless gum. Fencing, fuel. Sap for attaching feathers to arrows (Morgan 1980).

Despite its spines, one of the more heavily hedged commiphoras, and on the coastal dune bushlands S of Mogadishu can be readily picked out by its misshapen appearance, a consequence of browsing. Very good rating for camel and goat, recorded for cattle and sheep, and browsed by all antelopes (oryx, the kudus, gerenuk, dibatag) except dik-dik. Varying opinions by Kitui (E-C Kenya) informants on browse value: some considered it avidly browsed by goat while others believed it was browsed in small or moderate amounts and not used by cattle (Kuchar 1984).

COMMIPHORA GURREH Engl. (1896), Drake-Brockman (1912) 319 & fig.
C. trothae sensu Chiov. (1932) fig.46, non-Engl., and most material cited (FS)
C. tenuis Vollesen (1985)

gunre, gurre (gunrey, gunray, gunre, gunr, gunroh, gunri, gumray, gurey, gurhe, gurreh, guru, gurrey, gorrey, geed, gorey, gonrey, gunrec, gunreh) (MOG,G,C,L,W,EA,KH4[gunre], KH6[gurre])
gunre-cadde (KH1)
gunre-madow, gurre-madow (KH2)
dhuusundhuus (gusungus) (MOG) [doubtful]
gunto (FS2)
gusungus (FS2)
rosi (FS2)
enjir (MOG) (doubtful)
hangool[?] (hungul) (V)

Resin: **xabag-gunre** (habbak-gunri) (C)

CR, N, S, Eth, NE Kenya.

Armed tree 2-6(7) m; glabrous. One seen as a dome-shaped canopy 3x7 m, to ground. Sap milky, odor none or slightly resin-scented (v rarely spicy or strong). Trunk & main limbs irregularly slightly flanged or lumpy, various shades of gray (blue gray) but usually with a slight purple tinge, bark may be mottled due to brown spots where black chips have flaked off; occasionally (rarely) bearing small papery peels; (some branches reddish or red brown). Well-armed with spines & spine-tipped twigs. Short-shoots (0.5)1-3(5) x 1.2-1.6 mm, abundant & give twigs a rough, bumpy appearance. Lvs (0.3)0.5-2(3) cm, 3-fol. Petiole (1)2-6(10+) mm, petiolule of terminal leaflet 1-3 mm. Leaflets glaucous below & often with bluish tinge, terminal leaflet 1.3-2x laterals which are occasionally minute; obovate or oval to subreniform, (2)3-13(15) mm, margin with 1-2(3) prs typically large often subapical teeth, or leaflet shallowly 3-lobed, rarely subentire/entire; usually 2-3 prs lateral veins & coarse dark network below. Fr (sub)globose, may be asymmetric, occasionally scarcely bilobed, (5)6-9 mm, apiculate. **(49)**

The fruit in material from the northern areas is consistently larger than that from farther south and possibly 2 taxa should be recognized.

C. gurreh is the commonest commiphora in the CR (at least in Hiraan Region), thriving in bushlands on a wide range of substrates including rocky hills, sands, silts and shallow limestone soils; may even encroach onto gypsum. Furthermore, it is often among the handful of leading woody dominants of the plant community.

Chewing gum, and smoke has a good smell. Gum used as adhesive/ separator in sorghum-winnowing apparatus. Wood for milking utensils, large water containers, plates.

Commonly used for nomads' temporary stock enclosures.

Moderately to highly palatable for camel and goat, much less so for sheep, recorded for cattle; fallen leaves eaten in dry season. Shows a wide range of hedging, from none to rather heavy, and this, combined with its extreme ecological amplitude and virtual ubiquity, makes it a convenient gauge of stock densities.

COMMIPHORA GURREH aff. = Kuchar 17278 (ST1025),17295 (ST1028)
I had called it C. gurreh var.

A very small-leaved form (leaflets as small as 2-3 mm & often with only 1 pr low crenations) inhabits stable dune fields in E Jalalaqsi Dist (e.g. ST1046); has a pale gray trunk & noted by pastoralist as **gunre cadde** (the white **gunre**). I had equated or confused it with *C. pseudopaolii* which however seems to be unarmed though pseudospinose. Sap clear, ± odorless. Fr small.

COMMIPHORA PALMATIFOLIOLATA Chiov. (1932) 121 & fig.81
Type: Senni 802 from Lugh
Gillett (in litt 1988) suggests it may = *C. tubuk*.
Syn. of *C. africana* in FS2.

afgub (EA,W)
dabacuncun (daba'un'un) (EA,W)

S.

[Armed shrubby tree, resembling (*C. gurreh* &) *C. tubuk* but the pseudaril is 4-armed. Glabrous; 3-fol, terminal leaflet 2(3)x laterals, margin crenate to incised.]

Fodder, fencing, firewood.

COMMIPHORA sp. aff. **PAOLII** Chiov.
(Thulin & Warfa SMP143), Friis et al. 4550,4626

S: c47 km SW of Afgooye (1°47'N 44°45'E), c57 km SW of Afgooye (1°48'N 44°48'E).

Small armed tree.

COMMIPHORA SENNII Chiov. (1932) 74 & fig.40
C. virgata Chiov. (1916) 47 & fig.C, non Engl. (1894)
C. rivae sensu Chiov. (1932) (Rivae) 83 & fig.47 non Engl.
C. sp. 'P' in EA
non *C sennii* Chiov. 1932 which is very different from the original description

Chiovenda (1932) fig.40 is very misleading: the leaves are always 3-fol. in this species but detached leaflets have been drawn as though they were simple leaves. Foliage may have a characteristic yellowish-green color. When leafless, not reliably separable from *C. hodai* which has the same form and sparse spines. The two can grow together on alluvium, though *C. sennii* is virtually restricted to this habitat where it can be a characteristic species of highly degraded post-cultivation sequences. (Though much of its abundance a consequence of planting for plot borders or live fences.)

xoday (hodai, odai, hodhe) (KH3,C,EA)
xudi, ?**xodi** (hothi) (KH2,W)
ombada[?] (C)
malmal-jinaw (malmal-jinau) (EA)
humbawe (humbao) (EA)

CR, S; also Kenya.

Very sparingly armed tree to 6 m, occasionally shrublike [J.B.Gillett suggests it is much more often a shrub than tree, but this does not hold for CR populations; maybe the difference of opinion is in the definition of shrub]; glabrous. Sap milky, sparse, odorless or mild resinous, celery scented. Bark whitish or pale gray-green or gray, mottled & may bear chips or small pale yellow papery peels. Spines 0.5-1.5(3.5) cm, sparse, rarely also spine-tipped twigs. Short-shoots mostly 1-2 x 2.5-3 mm but can be to 11 mm long. Lvs 1.5-6(11) cm, 3-fol. Petiole (0.3)0.5-2.5(5) cm, petiolule seems long in terminal leaflet, laterals subsessile. Terminal leaflet 1.3-3x laterals, elliptic-oblong or obovate to suborbicular, (0.5)1-3.5(6) cm, margin entire or (usually?) irregularly crenate or with 2-3 prs large teeth; 2-4 prs lateral veins, may be some dark secondary veins below. Fr on stalk 2-6 mm, oval-ovate to suborbicular, 9-15 mm, bluntly apiculate-acute, may be beaked. **(35)**

In Hiraan Region, common and locally abundant on alluvial plain and basaltic clay plain, very uncommon on sands. Its presence may have been enhanced by planting of fence poles for crop plots.

In N Kenya, "Often the last woody plant as the open scrub gives way to desert grass - desert shrublet communities." (J.B. Gillett *in* EA).

Gum for ink. Wood carved into utensils and makes water containers.

Unpalatable to stock, never or hardly ever touched, even under high stock densities.

COMMIPHORA SERRULATA Engl. (1892)
C. anglosomaliae Chiov. (Hutchinson & Bruce 1941)
C. serrulata var. *tenuipes* Engl.

xagar-madow (hagar medu) (G,MOG), hagar madow (FS2)

N; C Som acc. to Gillett ms. 1986; also Eth.

Armed shrub or tree to 5(8) m, spines often very sparse. Glabrous or puberulous. Sap milky, can be unusually copious. Bark pale yellowish white to brownish with banding, peeling, may have warty lenticels. Spines all sizes but short ones (0.5-1.5 cm) characteristic. Short-shoots to 4 mm. Lvs 1.5-6.5+ cm, 3-fol. Petiole 0.5-2(5) cm. Terminal leaflet 1.5-2.5x laterals, oval or obovate to suborbicular, 1-5(7) cm, margin crenate or serrate, 3-4 prs lateral veins. The male inflorescence is sessile (whereas that of *C. campestris* is pedunculate). Fruit 7-11 mm. **(5+)**

COMMIPHORA sp. aff. **TENUIS** = Kuchar 16915
Kuchar 16407.16415,16524,16915,16916,~~16919~~,17130,17213,17233,17239
(maybe G&H 24264, W 1697)

dhuusundhuus (gusungus) (MOG)
gunrey gaduud (KH)
lugtool (KH)
roos (KH)

yucub (KH)

(may be named C. gurreh e.g. by UPS)

CR, S**.**

Armed tree to 4.5 m, or shrub to 1½-2 m, may have a densely branched deep globose symmetric crown; glabrous. Sap clear, may flow from bent twig, strong pungent-resinous or ± unpleasant slightly stifling ammoniacal odor, an unpleasant musty odor usually persists in dried material. Trunk irregular or lumpy (can it be flanged?), older trunk developing a slightly shiny white (or pale gray?) or dark grayish-purple smooth surface. Bark motley or scaly greenish or gray green (or dusty green or marbled?) (or dark gray), smooth or may bear (small) pale orange or yellow flakes or peels. Spines all sizes, only some twigs armed, the majority not spine-tipped (& are some spines 'lateral' - i.e. extension-like?). Short-shoots (1)2-5(9) x 1-1.5 mm. Lvs 0.7-2.5 cm, 3-fol. Petiole 0.3-1.5 cm, may exceed leaflets. Leaflets shiny below, terminal leaflet c1.5x laterals, obovate to subreniform, 0.3-1(1.5) cm, margin with 2-4 prs crenations or teeth; 2-3 prs lateral veins & a very few outer veins dark green below, clear in transmitted light. Fr purple, glaucous, oval-flattened, 8-10 mm, asymmetric, apiculate. **(7)**

Silt or silt-clay plain with low bushland or with acacias in W Buulo Burte (B/B). Commiphora-acacia bushland on brown clay loam in W B/B. *Caesalpinia* shrubland at B/B-Jalalaqsi border. Clay loam S of B/B with acacia bushland. Stony limestone soil with emergent *Vachellia (Acacia) tortilis* SSW of B/B.

Highly palatable for camel and goat, not browsed by cattle or sheep.

D Sec. **AFRICANAE**

Armed; leaves 3-foliolate. Flowers solitary or in 1-9-flowered contracted cymes. seudaril usually (almost) completely covering the rugose putamen & fused with it.

COMMIPHORA AFRICANA (A.Rich.) Engl. var. **AFRICANA**
C. pilosa (Engl.) Engl. (1883)
C. benadirensis Mattei (1908)
C. tubuk sensu FTEA and FS2 non-Sprague

dhiddin, dheddin, dhadin (didin) (M,G) (likely wrong)
dabacuncun (dabba'un'un, daba un-un) (KTS,EA)
wongass (EA)
dabar-cad[?] (dabar ad) (EA)
waraabe-reeb (warabareb, waraba reeb, wa rabared, wara-wareb) (EA,B,KH1)
caanamacays (ana-ma-ess, ana-ana-ess, anamaess) (G,C)
quwaax (ghet gua) (G)
disin-kakabi[?] (disingabe) (G,C)
xagar (agag) (C) (likely wrong)
xagar-cad (agar-at) (C) (likely wrong)

xagar-madow (hagar medu) (EA,MOG) (likely wrong)
orldo? (C)
yaaq (HD)
hammes-sagara (Ga)

N, S incl Mogadishu, doubtfully CR; widespread in Africa

Small armed tree, recorded to 10 m (KTS, FS). Sap quite variable in amount and odor intensity (Waterman 1986), normally milky and with slight odor (Gillett 1987), may be odorless, also recorded as clear and with resinous odor. Bark greenish to dark gray, may bear papery peels revealing green underbark. Young stems puberulent. Spines & spine-tipped twigs all lengths, mostly rather long & stout. (Short-shoots 0.5-3 x 1.5-2 mm) Lvs 1.5-5+ cm, 3-fol. Petiole 0.2-2 cm, petiolule to 1 cm in terminal leaflet, <1 mm in laterals. Leaflets may be bullate, felty-hairy at least below, rarely hairy only on main veins; terminal leaflet 2-5x laterals, broadly elliptic or obovate to suborbicular, 1-4(10?) cm, margin with 3-10 prs teeth (>7 acc. to Gillett 1987); 2-3(6) prs lateral veins, sometimes dark green network evident below. Fr obovate or broadly elliptic to subglabrous, 6-11 mm, ± 4-ridged & apiculate. **(26)**

Aptly named for it is by far the most widely distributed of all commiphoras, and the only one in large parts of W Africa. Ranges across the drier parts of the continent and down to S Africa. Has a great ecological amplitude, from subdesert scrub to evergreen montane bushland (to 2000 m in Kenya). In Somalia known from the N and S but not reliably recorded from the CR which are probably too dry.

MOST OF THE FOLLOWING DOESN'T PERTAIN TO SOMALIA.
In Kenya, a leading dominant of bushlands and bushed grasslands in some of the drier range e.g. 600 mm rainfall (Braun 1977). The commonest commiphora at mid-elevations, occasionally a codominant in bushed grassland and bushland on stony or gravelly basal slopes. A relatively fragile species in Africa's Sahelian Zone, can be completely eliminated by the combination of browsing and cutting; might be a useful indicator of degradation (Bradley 1977). Following woodland destruction by elephant in Tsavo E NP, this commiphora is regenerating fastest though *C. campestris* would probably eventually dominate (van Wijngaarden 1985).

Widespread in mid-lower elevations in Tanzania, right to coast. Often the dominant in NE bushlands. In Uganda, very common in Karamoja. Reaches 1800 m in Ethiopia, into the *Combretum-Juniperus* transition zone. In Kenya, a close second to *C. schimperi* in maximal elevations attained by the genus.

A detailed study was made of its standing crop and net primary production at a Senegal site. It was found to be relatively fast-growing, e.g. its biomass was more than 3 times that of *Acacia senegal* after 30 yrs. (Poupon 1977)

Considered undesirable in some areas where bush control is required (Ivens & Pratt 1975). Very short-lived, often falling and blocking roads (T. Adamson in EA).

People say it has seven lives because it is cut but not killed, has therefore been recommended and planted to form a hedge in arid regions. Said to be venerated by the Tuareg, who regard it as a symbol of immortality and place it on graves, etc. (Dalziel 1937) Easily grown from pole cuttings and widely used

in some arid regions as a live fence or hedge (Irvine 1961, Wild et al. 1972, Palgrave 1977). Fencing. Plant used as hedge. Sticks cut and put in ground because they grow.

Due to its great geographic range and the better familiarity that local peoples as well as collectors have with it, *C. africana* has the largest recorded number of uses of all commiphoras. Further enhancing its status is the gum-resin it exudes. African bdellium, composed of 70% resin and 29% gum resembling gum Arabic, was at one time exported from W Africa. It is used as a plaster for sealing up and disinfecting wounds, also as a febrifuge and antispasmodic; mixed with fat and used as a perfumed body lotion. Considered a good insecticide especially against termites; fumigant for clothes and sometimes put on fires to perfume huts; used in varnishes; formerly in the resin trade, also an adulterant of gum Arabic. (Holland 1922, Dalziel 1937, Githens 1949, Irvine 1961, Watt & Breyer-Brandwijk 1962, Kokwaro 1976, Palgrave 1977) Sap heals wounds; used for treating wounds against flies (EA). The aromatic resin, a balsam resembling myrrh, is used especially as a perfume in parts of Sudan, also aphrodisiac (Sweeney 1973). Wood is burnt by women to fumigate clothes (Holland 1922).

Root for swollen testicles, stomach troubles (Kokwaro 1976, ?Palgrave 1977), stomachache (Lee-Smith & Obel 1980), chest problem, stomach medicine; `For stomach pains roots used for stopping loose stools.' Great medicine according to Mozambique locals: outer part of root is boiled and used as medicine for stomach and heat. (EA) Bark chewed with soda and applied to scorpion sting. Leaf stomachic. (Dalziel 1937) For tumors, cancer (Hartwell 1967-71). Bark for diarrhea (Fratkin 1975), bark and root in steam bath for fevers and colds. Fruit for typhoid, (Kokwaro 1976, Palgrave 1977), stomach ailments (Watt & Breyer-Brandwijk 1962), chewed for toothache; veterinary medicine; chewed by mother and put on lips - for children. (EA) Bark, leaf, root and exudate for snakebite. Plant has been used as a stomachic and eye remedy. (Watt & Breyer-Brandwijk 1962)

Leaf edible, pounded and cooked with the help of potash (Williamson 1975). Root chewed to quench thirst (Glover et al. 1966). Root edible; roots of saplings eaten by children (EA). Tuber probably of this species can be chewed raw (Scudder 1971). Fruit edible (Watt & Breyer-Brandwijk 1962, EA), not edible (EA), eaten by birds but not people (Kuchar 1984).

Bark gum or resin edible (x3), eaten by children, collected by locals (EA). Stem used as chewstick (Dalziel 1937). Toothbrush (EA).

Red-brown bark decoction used for dyeing cloth (Watt & Breyer-Brandwijk 1962). Bark said to be useful for tanning. Sap used as soap. Seed for beads. (EA)

The soft sappy wood and clean straight stems are much sought in making gun-traps and drop-traps for leopard and lion (Burtt 1935). The larva of the beetle *Diamphidia*, from which bushmen make their arrow poison, feeds exclusively on this tree (Palgrave 1977). Firewood (Lee-Smith & Obel 1980). Wood makes stools, milk and water vessels, spoons, ear plugs, etc. (Morgan 1980), fishnet floats (Wild et al. 1972), prayer beads (Dalziel 1937), toys, bicycles, wooden spoons, stools, containers, headrest. Makes the horizontal piece of the fire stick of Pokot. Sticks for making bomas. Firewood. (EA)

Contains significant quantities of hydrocyanic acid (Shone & Drummond 1965). Leaf forage value fair (FAO 197l). Food for all animals. Can be severely browsed and in Turkana(-Pokot) (Kenya) frequent in an over-browsed shrub form. Frequently and sometimes heavily browsed by camel (6x) and goat (6x),

young leaves eaten by camel. (EA) Can be an important camel browse (Maxwell Darling 1938). Can be rather heavily hedged by camel (KH). Considered a good though perhaps not a favorite goat browse; avidly browsed by cattle (Kuchar 1984). Leaf eaten by goat (Nge'the & Box 1976).

Bark, twigs, etc. eaten by elephant; heavily browsed (EA). Prone to damage by elephant (Lamprey et al. 1967), often uprooted by elephant in Kruger NP, S Africa (van Wyk & Fairall 1969) but not recorded eaten (Jarman 197l). One of the few species not sought by elephant in a Rwanda study (Monfort & Monfort 1979).

A significant food of rhino in a SW Kenya study (Mukinya 1977). Insignificant in rhino and buffalo diet (Jarman 197l).

Leaf and terminal bud were fairly significant items of giraffe diet in a Zimbabwe study in the wet season, i.e. when available (Stephens 1975). Eaten by giraffe (Hirst 1975).

Leaf fairly important in wet-season diet of eland (Nge'the & Box 1976).

Eaten by greater kudu, may be a seasonally or locally important food item (Conybeare 1975); greater kudu food plant (Hirst 1975), fruit eaten (Conybeare 1975); insignificant in diet (Jarman 1971). Recorded browsed by gerenuk (Raeder 1981).

In a Zimbabwe study, browsed more by impala than by other game and significant in its diet; browsed most in late dry season, less in wet season and not at all in dry season; conspicuous in late dry-season diet since it comes into leaf first, and continues to be used into early wet season (Jarman 1971). Impala record by Hirst (1975).

Fairly commonly eaten by hyrax (Sale 1965). Immature leaves eaten by baboon. Inner bark recorded chewed. (Popp 1978)

COMMIPHORA sp. aff. **AFRICANA** = Kuchar 17089
Kuchar 17089
C. africana acc. to UPS, but short-shoots much longer and resinous sap may flow.

gondod (KH1)

CR: Mukayle, 3º57'N 45º11'E.

Armed stunted-looking single stem shrub to 2 m; wood soft. Cut twig with clear sap that may flow, (strong) resinous odor. Bark powdery-looking light green, bearing pale yellow papery peels revealing green underbark; branches can be very pale. Spines all sizes, (stout). Long-shoots finely puberulent. Short-shoots 3-13(20?) x 2-3 mm. Lvs somewhat discolorous, to 4.5 cm, 3-fol., finely puberulent & perhaps felty. Petiole to 1.2 cm. Leaflets subequal, laterals sessile, terminal leaflet shortly petiolulate or seeming so, broadly oblong-ovate to suborbicular, to 2.5(+) cm, margin with 3-5 prs teeth or crenations; 2-4 prs lateral veins & a coarse network. Fr deep pink, oval, somewhat flattened, 8 mm, apiculate or abrupt-beaked. **(1)**

Recorded on limestone/silt mosaic and basaltic soil in W Hiraan Region.

Palatability high for camel, moderate for goat.

COMMIPHORA OBOVATA Chiov. (Hutchinson & Bruce 1941)
In UPS: Kuchar 16132,16502;16535,16539,17129

shan maalees(?) (shan mal ais, shan maleiss) (G)
gondood (KH)

CR, N; also Eth., Kenya.

Armed shrub or tree to 4 m; glabrous. Sap clear (rarely clouded), mild to strong resinous odor, rarely none or faint. Trunk flanged in K16918. All stems gray, or mottled/marbled gray-green or yellow-green or pale greenish-yellow & may bear small gray chips or pale-yellow papery peels revealing green underbark. Spines characteristically sparse & at least some only (0.5)1-1.5 cm; some twigs spine-tipped. (May have some long, to 2 dm ± zigzagging slender twigs.) Short-shoots 1-3(5[10?] x 1.3-2 mm. Lvs 1-fol. or 3-fol. but laterals small. Petiole 1-4(7) mm. Leaflets shiny above, glaucous/glossy below, terminal leaflet 2-4(10) x laterals, broadly obovate-orbicular or elliptic-obovate, (0.5)1-3 cm; margin with 0-7 prs low teeth or crenations (mostly subapically); (2)3-6 prs lateral veins, dark green usually coarse network below, clear in transmitted light. Fr (on stalk c1 mm,) (asymmetric-) subglobose to elliptic, 6-10 mm (9-12 mm acc. to Gillett 1987), apiculate, 2-lined. **(21)**

The leaves with their greatly reduced lateral leaflets resemble those of *C. lindensis* and the 2 species have been much confused. The teeth in *C. lindensis* extend almost to the base and the lateral leaflets are narrow, while the teeth are confined to the leaflet apex in *C. obovata* and the lateral leaflets are suborbicular. A sterile specimen (Kuchar 16265) seems intermediate.

Not uncommon in Buulo Burte Dist. but has not been found elsewhere in CR.

Browsed by camel and goat.

COMMIPHORA SAMHARENSIS Schweinf. (1894), Chiov. (1932) 63 & fig.31,
Drake-Brockman (1912) 318 & fig.
C. crassispina Sprague (1927) t.3107
C. campestris sensu KTS in part
C. danduensis Gillett (1991)
C. pteleifolia sensu KTS in part, non-Engl.
C. terebinthina Vollesen (1985)

qaroon (KH2)
quraar (KH2,EA)
quraar madoobe (KH1)

salmadoobe (KH1)
wacanri (KH1) ?
dhiddin, dheddin (didin) (M,G) (likely wrong)
dhuusodhuuso madoobe (KH1)
domod (demod) (G,MOG)
caliboy (alioye, alioe, aliboy, aliboye) (MOG,G,C), liboh (FS2)
shan maalees[?] (shan mal ais) (G)
subagle (suba gole) (EA), sowagli (FS2)
gumbo weyne (KH1)
horgooy (horgoi) (V)
quwaax (W)
oonjir (KH1)
xagagare (KH1)
xagar (hagar) (FS2)
rosi (FS2)

Resin: **xabag-caliboy** (habbak-aliboy) (C)

CR, N, S; also Eth., Kenya, N Tanz., E Uganda.

Armed shrub or tree to 6+ m; glabrous; wood soft. Sap clear, flows & may spray from bent twig, strong resinous odor, sometimes parsnipy or carroty or ammoniacal, may be (slightly) unpleasant. Trunk may be lumpy & irregularly flanged, bark various shades of gray, or creamy yellow to off-white, bearing small pale orange, yellow or yellow-buff papery peels revealing (blue-)green (pale dusty green); may bear patches of black chips. Twigs dark gray to purplish black. Spines all lengths, stout, may be fairly sparse, some may appear axillary. Short-shoots (2)4-12(25) x 1.5-2.5 mm. Lvs may be somewhat spare, (1.5)2-7 cm, 3-fol. Petiole 1-4 cm, can much exceed leaflet; petiolule of terminal leaflet seems 3-8(11) mm, of laterals (1)2-3 mm. Terminal leaflet to 2[4?]x laterals, reniform to orbicular [or elliptic?], 0.7-3 cm (2-12 cm acc. to Gillett 1987), (may be glaucous below at least in Kenya), margin entire or (usually) with 3-8(12) prs low crenations or slight undulations mostly in distal half; 2-4 prs lateral veins & some dark network below. Fr on stalk 2-5 (rarely 10) mm, glaucous, broadly oblong-oval, (club-shaped), asymmetric, 7-10 mm, apiculate. **(29)**

Friis et al. 4743 NW of Luuq seems related to C. samharensis but the (sterile) col has smaller lvs though with the same distinctive angularity. Another col is a small armed tree (too).

In Hiraan Region fairly uncommon and hardly ever attaining 1% cover where it grows. On sand plains and valley sands, less likely to be seen on shallow limestone/silt mosaics and basaltic clay plains, rare on alluvial plains. Recorded on limestone hills.

Bark and root have medicinal uses and bark makes a tea-like drink. Fruit edible according to Cufodontis (1956). Miscellaneous uses: tooth stick - fairly well liked, firestick, ash gives blue color, wood for milk utensils. The gum seems commonly used (in at least parts of its range) for attaching feathers to arrows.

Highly palatable to camel and goat and avidly browsed, sometimes eaten by sheep.

COMMIPHORA SCHIMPERI (O.Berg) Engl. (1883)

C. resiniflua Mart. (1886)
C. trothae Engl. (1899)
C. arussensis Engl. (1904)
C. neumannii Engl. (1904)
C. flabellulifera Chiov. (1916) Taxonomic identity uncertain (JB Gillett in litt 1984, FTEA).

xoday (hodai, hode, odai) (M,G,C,MOG)
afgub (afgut) (G)
anka (C)
tibbuk (tubbuk) (C)
wano (EA)
horgooy (horgoi, hargoi) (KTS,EA)
xagar (agar, agarg, hagarg) (C) (normally for unarmed spp)
xagar-madow (agar-medu) (C) (normally for unarmed spp)
hadi (M)

N, CR, S; also Eth. & Arabia, & south to S Afr.

Armed shrub or tree to 5 m with spare open crown; glabrous (except often for a few long hairs at top of petiole - Gillett 1987). Sap clear, may turn or include a milky ring, odor slight to strongly unpleasantly (musty-)resinous (?lemon scent, or lemon-pine - EA). Bark pale (dusty-looking) green, grayish green or greenish-yellow or even ± white, bearing pale yellow papery peels revealing green, or bearing (a few) black bark chips. (Wood soft.) Twigs spine-tipped, also a few scattered short spines. Short-shoots 1-8(x1-1.5(2?)) mm. Lvs 3-fol. Petiole 0.5-3 cm, may exceed leaflet in short-shoot lvs, laterals sessile or petiolule to 1 mm. Terminal leaflet 1.5-2(3?)x laterals, oblong, rhomboid or obtriangular, 0.5-3 cm, (apex rounded or acute,) margin with (0)2-4 prs large teeth (or shallow crenations); 2-3 prs lateral veins & some outer secondaries dark below (dry). Fr (on stalk 1 mm,) ovoid, 8-15 mm (7-8 mm acc. to Chiovenda 1932), usually strongly apiculate or beaked; solid bright red pseudaril. **(7)**

Has been collected for the first time in CR (Kuchar 17106, 4º37'N 45º04'E), also K17140, but unlike most members of the genus in Somalia is clearly not a commiphora of arid bushlands. Over much of its range but especially in E Africa it is a characteristic occupant of mid-elevation rocky slopes and ridges. In Narok Dist., Kenya, reaches 2050 m, the highest recorded elevation of all commiphoras. Also in semi-arid bushlands.

As with *C. africana*, many uses have been recorded simply because it has been widely encountered. One of the myrrh-producing commiphoras (Baumann 1960). The resin is used for its odor and medicinally (Cufodontis 1956). Bark used as tea and medicinally. Sap is reportedly drunk. Root chewed as a gum (Glover et al. 1966) and that of seedling is reportedly edible. In Tanzania, "Akie eat the red fruit" (A.S. Vincent in EA) [The Akie or Dorobo live in Simanjiro Dist. The red fruit likely refers to the pseudaril.]

Wood fairly weak, used for buckets, milk and water containers (Morgan 1980, EA); readily attacked by termites (Kemp 1951); used for construction of game traps in Tanzania (Burtt 1935). Cuttings root freely, thus used for live fencing; much used thusly in Karamoja, Uganda (EA).

Doubtless browsed by camel and goat.

Browsed by game especially when coming into leaf (Brooks 1961). Fairly commonly browsed by elephant and giraffe (Lamprey 1963a) and pushed over by elephant to expose the roots (Croze 1974). A significant rhino food plant in a SW Kenya study (Mukinya 1977). Leaf and young twig eaten by Thomson's gazelle (Brooks 1961).

Eaten by rock and tree hyrax (Sale 1965, Turner & Watson 1965). Young leaf and fruit eaten by baboon (Lamprey 1967, D. Costich *in* Popp 1978).

COMMIPHORA TUBUK Sprague (1927) t.3108, Drake-Brockman (1912) 320 & fig.
Treated as such in FE3 but as a var. *tubuk* of *C. africana* in Gillett 1987 & FTEA, and syn in FS2.

tibbuk, tibuk (tobuk, tubuk) (G,C,EA,Drake-Brockman 1912)
ilan (KH1)
dhirindhir (KH2)
dhiddin, dheddin (diddin, didin) (M,G,C) (likely wrong)
afgub (afgreb) (G)
afqub (W)
quwaax (coa, coha) (G,C)
gurre-cadde(?)(guroade) (EA)
jawdheer (KH2,W)

Resin: **xabag-tibbuk, xabag-tubuk** (abbac-tubuc, habbak-tubuk) (C)

CR, N, S; also Eth., Kenya.

Armed shrub to 4 m. Sap clear, odorless (2 rec.). All stems pale gray to purplish-brown, young stems may be felty-puberulent. Spines all lengths, (generally stout). Short-shoots 1-6 x 1.5(2) mm. Lvs 0.5-1(2.5) cm, 3-fol., (rough- or felty-)puberulent. Petiole 1-5(?-12) mm (often equal or longer than terminal leaflet acc. to Gillett 1987). Terminal leaflet 1.5-2(4)x laterals, suborbicular to broadly ovate (or reniform), 2-15 mm, margin with (0?)2-4(6) prs (large) teeth; 2-3 prs lateral veins. Fr (sub)orbicular (or broadly oval), 4.5-7 mm (to 10 mm acc. to Chiovenda 1932), asymmetric. **(15)**

Resembles the very widespread *C. africana* but smaller in all its parts; might better be treated as an extreme form. The only specimens from CR are Herlocker S268 from near Ceel Dheer, and S129. Common in S Somalia.

Gillett et al. 24914 (2º11'N 45º19'E) on coastal dunes may belong here. Spines all sizes, ± white, felty-hairy. Lvs 3-fol, (drying dark), felty with white hairs, leaflets mostly obovate & mostly with 3-4 prs teeth. Fr 9 mm.

Low in palatability for camel and goat, not used by cattle or sheep.

E Sec. **LATIFOLIOLATAE**

Unarmed; leaves 3-foliolate (very rarely if ever 5-fol. in Somalia, often >3-fol. in E Afr). Flowers in pedunculate cymes. Pseudaril of 4 parallel-sided narrow arms, no basal cup.

COMMIPHORA CORNII Chiov. (1932) 96 & figs.56,57
Type loc. near Oddur [Hoddur]

Recommended placed with *C. cyclophylla* Chiov. The type of *C. cornii* is a male plant with striking large bracts on the pedicels, but leaf and stem seem indistinguishable from those of *C. cyclophylla* whose male flowers are unknown.

ogir (CH,G,C) (prob. incl. ojir (B))
subagle (subacle) (CH,G)

C2, prob. S.

COMMIPHORA sp. aff. **CYCLOPHYLLA** ('CORNII') ['stick-ins.']
Kuchar 16668 (sterile), Gillett et al. 22058 (sterile), K15901,16046,16933,
C. sp.'K' in EA

hablo subke (hablo subko) (KH5)
libow (libu) (C)
meisimbac? (C)
caliboy (aliboye) (EA)
quraar[?]**, qoral**[?] (ura, uraa) (EA,MOG)
qaroon (KH)
balalo (EA)
hagar karon (EA)
eey-naad (KH)
oonjir (KH)

C, prob. S.

Unarmed sprawly shrub or shrubby tree to 6 m, usually much broader (2-4x) than high. (Wood rather soft.) Sap clear, occasionally sprays but usually runs from cut twig, strong perhaps unpleasant resinous-carroty & slightly musty odor; 'plentiful and evil smelling' (CF Hemming in EA). Trunk & limbs smooth dark purplish-gray, steely dark gray with purple tinge, perhaps gray-brown, or deep purple; spine-warts have been noted on limbs (but rare?). Short-shoots (5)10-40(100?) x 2-3(3.5) mm, often transit smoothly from long spur-like branches. Lvs 2.5-6.5 cm, 3-fol., puberulent & can be felty. Petiole

1-3.5 cm, petiolule 0-3 mm. Leaflets orbicular or obovate, terminal leaflet (1)1.5-2x laterals, 1.5-3.5 cm; (4)5-7 prs lateral veins, fine dark network, (very) fine network clear in transmitted light (may have dotlike look?). Fr with peduncle ?1.5-2 cm, (oval, 9 mm). **(11)**

D. Herlocker El Buur Pal. #9 Bad smell. Robust dark purple twigs. Leaflets finely puberulent, not felty, apex distinctly (broadly) notched & may have a vague pr apical crenations.

Locally common in western Hiraan Region, not infrequently in overgrazed areas. Common in bushlands on limestone/silt mosaics, common in basaltic clay plains, occasional in limestone hills, merely recorded on alluvial plain. Locally dominant in Jeriban Dist (MOG).

Highly palatable for camel and goat, sometimes also cited for sheep.

COMMIPHORA CYCLOPHYLLA Chiov. (1932) 88 & fig.53
Poss. incl. *C. cornii* Chiov. (1932) 96 & figs.56,57 Nope, they're quite different!
Poss. *C. campestris* sensu Chiov. (1916) 43; (1932) 115 & fig.74; non-Engl.
Incl. *C. lughensis* Chiov. acc to FS2 and FE3.
Incl. Kuchar 16015,16097,16382;16562,16661,16672,16909,16947,17024,(17078,17079),17100,17253

quraar (gural) (KH1,G)
ilka-cadde (KH1)
ur gir (FS2)

N, CR, S; also Eth., Kenya.

Unarmed tree to 7 m (has been seen with very few limbs & very spare open crown), sometimes subprostrate dwarf shrub. Sap clear, usually runs & may even spray from bent twig, sharp ammoniacal, turpentiny-carroty or sometimes somewhat sweet-resinous odor. Bark mottled olive-buff-gray or grayish-green or yellowish-green, scaly-mottled with black flakes, may be much like plane-tree bark, & usually bearing some pale yellowish or green papery peels & a few black chips, rarely smooth gray acc. to Gillett 1987 (& I've seen such e.g. K16706). Trunk & main limbs usually lumpy & somewhat flanged or fluted; some branches arched (& may arch down or droop a little); smaller branches & twigs rather narrow, the twigs & short-shoots, often perpendicular & only 1.5-2.5 mm diam. Short-shoots 3-12(30) x 1.5-2.5(3) mm. Lvs 1.5-5.5 cm, 3-fol, (?may be ± folded). Petiole (0.5)1-2(2.5) cm, mostly puberulent; petiolule 0-1 mm. Leaflets often shiny above, densely hairy & usually felty at least below, rarely (sub)glabrous, terminal leaflet 1-1.5(2)x laterals, obovate to obreniform (to suborbicular), 1-3.5 cm, margin entire; (2)3-7 prs lateral veins, may be some secondaries (fine network in some, e.g. Kuchar 17253), fairly fine network clear in transmitted light. Fr on stalk 1-2.5 cm (FTEA), oval (ovoid), glaucous, 11-15 mm, (with 2 white lines). **(21)**

Infrequent through W Hiraan Region in bushlands on various limestone-influenced substrates e.g. limestone/silt mosaic, silt pockets, arced silts, gypseous silts, limestone hills. Occasional on alluvial plains. Occasional on basaltic clay plain. In E Hiraan, common on shallow sands over limestone but rare on deep sands. Common on sandstone escarpment.

The smooth or mottled trunk and copious resin-scented sap distinguish this species from *C. lughensis* with which it has been confused. Widespread in CR and fairly abundant, where found

Twig used as tooth stick. Moderate to very good browse rating for camel and goat, rarely sheep.

COMMIPHORA EROSA Vollesen (1985) 60 & fig.9, s.str. (Includes the type but not several other of his specimens which are *C. sphaerocarpa*)

The only Kew records from Som. are K15642,~~15870~~,16666,16990,16991,17245,17371,17510, 17511[FS2],17777(prob), Wieland 1753(7?), & some earlier ones, also 16678,17274. Also, the N plants attributed to *erosa* are *sphaerocarpa*] [Isn't this the one w/ bluntly acum leaflet?]

dhunkaal (duncal) (EA,KH) [or C. sphaerocarpa?]
dhunkaal-madow (dunkal medou) (EA) [or C. sphaerocarpa?]
qaroon (KH2)
bacaroor (ba-aror, baarar, ba-arorh) (EA,MOG)
quraar madow (KH1)
jawle (KH1)

CR, S; also Eth., E Kenya.

Unarmed shrub or tree 1.5-5 m, often rather spindly & spare-crowned, occasionally slightly scandent; glabrous. Sap clear (or creamy but clear in older stems), odorless or aromatic, usually with (uncommiphora-like) strong or slightly musty odor, or aromatic or kerosene-like; rarely recorded as spraying. Bark smooth (finely marbled) pale gray often with white patches, or brown-&-gray, or dark gray to black, or reddish-brown with white patches (where most exposed to sun), (or greenish brown); maybe basally platy. Trunk & main limbs scarcely to often markedly flanged; in K16678 seen to 15 cm deep and only 3-4 cm wide in outer half; wood soft; twigs snap clean, (strongly) striate i.e. angular, can be purple. Short shoots scarce, normally extensions of twigs, 3-40 x 1-1.5(2.5) mm. Lvs 2-9(12) cm, 3-fol. Petiole 1-6 cm, terminal petiolule seems to 7 mm but actually narrowing and subsessile acc to lit. Leaflets somewhat discolorous, (may be) shiny above & glaucous below, terminal leaflet 1.3-2.5x laterals, broadly elliptic (to suborbicular), 1-4.5(8) cm, apex very shortly (bluntly) acuminate or rounded, margin entire but portions slightly irregular; midrib strongly raised below, 4-7(9) prs lateral veins & a few outer secondaries raised, (outer) network (dark) green; main veins & network slightly dull to clear in transmitted light, (fine dense very dull network). Fr on stalk to 20 mm acc to FS (4-6 mm in FTEA), purple, oval or globose (oblong-ellipsoid, asymmetric - FTEA), 8-10 mm [10-15 mm acc. to Vollesen 1985 but that erroneously refers to *C. sphaerocarpa*], apiculate. **(11)**[excludes EA]

The material from ST1057: sap light clear, bark green with yellow peels to green, trunk somewhat irregular, short-shoots (1½)2 mm wide. Fr broadly elliptic, 9-10x6-8 mm, apiculus, stone 7(8) mm, 4 pseudaril arms.

Not uncommon in S Somalia but inconspicuous. (Seems confined to alluvium of the major rivers - JBG.) Similar to *C. sphaerocarpa* but not as stout. May be confused with *C. sphaerocarpa* and *C. cyclophylla*.

Fruit reportedly edible. Sap used for wounds and sores.

The soft wood makes carved utensils, troughs. Cross-poles for pack camel. Sometimes fired branches used for cleaning milk & water containers. Live fencing. Not used for building or firewood. Gum not used, has been indicated as poisonous. Very good browse rating for camel and goat. Fallen leaves eaten by sheep & cattle. Browsed by antelopes.

COMMIPHORA LUGHENSIS Chiov. (1932) 105 & figs.65-67
Syn. of *C. cyclophylla* Chiov. in FS2, FE3 but not FTEA

xagar (agar, agr) (G,C,L)
xagar-cad (M,G)
lalagar [**xagar**?] (lolager) (G,C)
qoral (OR **qaral**) (qural, goral) (EA,W)
kuka (EA)
eleucadide[?] (G)

CR, S, N; also Eth.

Unarmed tree 2-10 m. Sap clouded (or clear), faint or moderately strong, sometimes sweet resinous odor. Bark white or pale yellow, bearing large pale papery sheets revealing pale powdery-looking blue or gray (or green?) underbark. Long-shoots striate. Short-shoots (2)5-15(20) x 1.5-2.5 mm. Lvs (1.5)2-5.5(7) cm, 3-fol. Petiole 1-4 cm may exceed leaflets; petiolule seems to 4 mm in terminal leaflet. Leaflets glabrous to felty-puberulent, terminal leaflet (1)1.3-2x laterals, elliptic-oblanceolate to subreniform, 1-3.5 cm, margin entire or wavy, 3-4(6) prs lateral veins, may be a fine dark network below (or none). Fr on stout peduncle 1-1.5 cm, ellipsoid to globose, 9-16 mm. **(14)**

The white peeling bark is reminiscent of trees in sec. **Hemprichia** but the pseudaril is 4-armed.

Makes Quran boards, plates; not a good firewood; camel and goat fodder (R.Wieland in EA).

COMMIPHORA SPHAEROCARPA Chiov. (1916) 48 & fig.1; (1932) 56 & fig.20
C. cerasiformis Chiov. (1932) 104 & fig.64
C. hirtella Chiov. (1932) 110 & fig.69. Chiovenda shows a male inflorescence which he failed to associate with the fruits described under *C. sphaerocarpa* and *C. cerasiformis*.
C. erosa Vollesen (1985) in part (the fruit, not type)

K15956 Sandy silt in Shabelle Valley. No odor. Is this sphaerocarpa aff = Kuchar 17277?
16189 silt plain. No odor, clear. Shrub.
16683 silt plain. Shrub. No odor.
16687 silt plain Shab.V. No odor, clear.
17005 silt plain in W
17142 silt & limestone in W. ± no odor. Shrub 2x3 m.

17143 silt & limestone in W. No odor, trace of clear.
17159 silt & limestone in W. No odor.

bacaroor (ba-aror, baaror, ba-arorh, ba'aror) (M,G,MOG,EA)
dhunkaal (FS2)
dhunkaal cad (KH1)
geed subagle (ghet subak) (G), geed subagleh (FS2)
gino-sagaaro[?] (gino sagar) (CH,G)
gehai (EA)
jawle (KH1)
quraar (KH2)

CR, N, S; also Eth.

Unarmed tree 1.5-4.5 m (to 9 m acc. to E.F.Peck in EA), may sprawl, sometimes shrubby tree or shrub, (broader than sphaerocarpa aff = K 17277). Sap sparse & clear, or (more often) none, odorless, rarely mild resinous odor. Trunk can be slightly flanged or knobbed, it & main limbs a ± smooth gray-green with a dull yellow & pink mottle, or grayish-yellow or green with some yellow marbled, less often plain smooth pale or medium gray, sometimes bearing some pale-yellow papery peels. (Frequent spur-like short-shoots & twigs perpendicular to branches may be diagnostic.) Long-shoots (mostly) striate, puberulent. Short-shoots (3)5-20(50) x (2)2.5-4(5?) mm. Lvs (fairly thick), (1)2-13 cm, 3-fol, glabrous (doubtful) or puberulent, (?may be half-folded). Petiole (0.7)1.5-7 cm, usually >leaflets, it & at least main veins finely puberulent, rarely only puberulent toward base of petiole; petiolule to 5 mm. Leaflets ± shiny above, terminal leaflet c(1.3)1.5(2)x laterals, broadly (ob)ovate or suborbicular less often (elliptic-)lanceolate, 1.5-6(9) cm, (apex may be very shortly acuminate); 3-7 prs lateral veins & dark green network below, clear (or main veins dull) in transmitted light. Fls red(?). Fr on stout stalk 5-12(25) mm, globose or broadly oval, 8-14 mm, (apiculate?). **(22)**

Wieland 1764 from Luuq area: Tree 3 m, bark gray, not peeling, sap clear, very mildly aromatic. Lvs 3-fol, 9-15 cm, petiole 3-6 cm, leaflets 5-7.5 cm, elliptic, terminal 1-1.5x laterals, sessile but attenuate at base, puberulent, 5-7 prs lateral veins & network. Fr subglobose, 12 mm.

Silt plain (or sandy silt) in Shabelle Valley, silt with limestone outcrops in W Hiraan Region, not on sands in E Hiraan Region in contrast to C. sp.aff. sphaerocarpa.

Trunk is cut and hollowed out to make water vessels (EA). Wood very soft, makes troughs, carved utensils. Not used for firewood.

Browsed by all stock and cut for them (E.F.Peck in EA). Good to excellent browse for camel and goat.

COMMIPHORA sp.aff. **SPHAEROCARPA** = Kuchar 17277
C. sphaerocarpa small form per JB Gillett in litt (1986), FS2.
K17222,17317,17385 (FS), 17277 (JB Gillett), others (not seen for leaflet descr).

16438 sand in E Hiraan. No odor. Tree 1½ m, heavily browsed. Smooth gray, older mottled.
16716 sand in E. No odor, milky. Shrubby tree to 3½ m. Smooth gray. Heavily browsed.

16927 sand plain in E. No odor. Smooth gray w/ ± white patches. Fairly heavily hedged.
17222 (?FS mistake for 17277?) silt (clay?) in Shab V.
17277 sand in E. No odor, bit of milk. Narrow shrub to 2 m, heavily hedged. Smooth gray.
17317 sand in E. Pale stems. Compact shrub to 2½ m, heavily hedged.
17385 sand in E. No odor. Shrub 4 m. Pale gray. Twigs brittle.
17797a sand in NE. No info.
ST567 sand in E. Milky, no odor. Shrub to 2 m. Gray. Heavily hedged.

qarjawle (KH1)
gondad jilac (KH2)
dhunkaal (KH2)
dhunkaal cade (KH1)
bacaroor (KH1)

Compact or narrow shrub 1-4 m or shrubby tree, often heavily hedged (browsed). Glabrous. Sap milky and sparse, or more often none; odorless. Bark smooth, medium to pale gray, may have ± white patches, rarely older mottled. Narrow leaflets to 2x1.2 cm (FS).

Sand plains and sand hills in E Hiraan Region.

Wood can be surprisingly hard for a commiphora.

Good to excellent for camel and goat, not used by cattle and sheep.

COMMIPHORA [?sec. **Latifoliolatae**] sp. **= Kuchar 17326**

ilka cadeys (KH2)

CR: Dharyo, 3º37'N 44º54'E. Also ST1139.

Unarmed tree 3-4 m. Sap clear, with strong distinctly carroty-resinous or somewhat musty odor. Bark pale shiny, white in places, & bearing some pale-yellow papery peels/rolls revealing green underbark; twigs mostly dark. Short-shoots 2-8 x 1.5-2 mm. Lvs 3-fol, <1 cm, sparsely puberulent (may seem glabrous but are apparently very inconspicuously puberulent below). Leaflets (noticeably) discolorous, oblong-ovate, to 7 mm, may have a shallow 3-lobed look, margin with 2-6 prs crenations, midrib raised below, thin sparse network.

Very good rating for camel and goat.

G Sec. **ARILLOPSIDIUM** (**Spondioideae**)

Unarmed; twigs unusually stout; leaves pinnate or 3-foliolate (rarely 1-foliolate). Flowers in pedunculate inflorescences. Fruit large and pericarp unusually thick; pseudaril a basal cup usually with 4 broad very shallow lobes but with a single very large lobe in *C. unilobata*.

Some members of this section have been reported as poisonous and formerly used for arrow poison. The Somali names *bacaroor* and *dhunkaal* refer primarily (if not exclusively) to members of this section, and *dhunkaal* may refer specifically to the poison or toxic gum-resin.

COMMIPHORA DRAKEBROCKMANII Sprague (1927) t.3112
Drake-Brockman (1912) 311

dhunkaal (dunkal) (M,G)
bacaroor (ba-aroor, baror) (K,EA)

Resin: **xabag-dhunkaal** (habbak-dunkal) (C)

N of 10º15'N, 45º-49º30'E.

Small unarmed shrub. [Thick basal trunk. Twigs pale gray, some shoots strongly ridged. Short-shoots to 10x4 mm. Lvs fascicled, simple [1-fol.], densely puberulent & can be felty. Petiole 4-15 mm. Blade broadly oblong or obovate, 1.5-2.5 cm, apex rounded, base can be ?subcordate, 3-5 prs lateral veins. Fr with stalk 0.5 cm, oblong, 11 mm. **(3)**]

Reportedly poisonous.

COMMIPHORA EDULIS (Klotzsch) Engl. ssp. **BOIVINIANA** (Engl.) Gillett
C. boiviniana Engl.
C. savoiae Chiov.

dab-biriq (dabiriq, dab berek, babberek, dab birik, dabbrich, dabbirek, dabbirec, dabbiric, dabbirich, dabbirick, dabbric, dibirrek, debirak, tabirik, dabirrik, dabirig, dembero, dibiriq, dibirkh) (M,MOG,G,C,Z,EA,B,HD,Ga)
geed-xabaaleed, geed-hawaaleed (M)
borah (B,MOG)
itin (M,C)
dhunkaal-itin (duncal itin) (G)
xiltir (hiltir) (EA)
kana (KTS)
dhunkaal (duncal) (M,C,KH)

S, possibly reaches C2; also Kenya, Tanz., Uganda, Eth.

Softly woody unarmed (deep-crowned) shrub or tree 3-4(10) m (recorded to 18 m in Tanzania). Sap milky (or none seen), virtually odorless [not aromatic (few records)]. Bark gray (or brownish?), usually flaking or peeling at least a little. Branches gray, at least the lower ones arching; long-shoots striate, may be felty-hairy. Short-shoots stout 5-60(+) x (5)6(7) mm. Lvs (2)4-20 cm, (3)5-9 fol. Petiole (1.5)2-6 cm, petiolule 0-3 mm. Leaflets felty & slightly (somewhat) rough above, [may be] felty below, hairs may be

pale orange at least when young, terminal leaflet 1.5(2)x laterals, suborbicular to broadly elliptic-oblong, 2-6 cm, margin usually with c5-15 prs teeth or crenations; 4-8 prs lateral veins, dark network below. Fr (on stalk 0.5-2 cm,) oval, 15-23 mm. **(20)**

In moister bushlands of S Somalia, and through coastal and less xeric deciduous bushlands of E Kenya; a local codominant of tree layer in E-C Kenya. The only certain CR (or near) record is Kuchar 17514 [in Jowhar Dist.] just S of Jalalaqsi Dist.

Fruit, leaf, stem, bark and particularly root have medicinal uses (Kokwaro 1976, EA).

Conflicting data on fruit: edible according to several EA labels, and although bitter is reportedly eaten by children and chewed by them to prevent dental cavities; eaten by children according to C Kenya informants (Kuchar 1984); and Cufodontis (1956) notes that it is said to be edible. But Watt & Breyer-Brandwijk (1962) report that the fruit juice is poisonous and has been used as a fish and arrow poison. This is possibly due to confusion with related species as there seems to be no clear evidence that this species is poisonous (JB Gillett in litt 1986). Nevertheless, Jalalaqsi informants note that a gum solution is used as a dip against ticks and flies.

According to Cufodontis (1956) the resin is considered very toxic and used for poison arrowheads, but EA labels and CR informants indicate that the plant has an intimate connection with food: the wood makes spoons, milk pots, ladles, bowls, honey containers, possibly stirrers. Rated a very good wood by the Turkana for containers especially milk (Morgan 1980). Other uses: sap for gluing vanes on arrow shafts; wood for stools, beehives, knife handles, tinder and firesticks. Reportedly a good firewood. Knife handles (M.H.Madany pers. com.). The name *geed-xabaaleed* means `tree of the grave': in parts of S Somalia it is commonly planted as a grave marker, and also extensively used for live fencing in leprosy colonies (M.H.Madany pers. com.). Often found around homesteads in dry parts of Meru Dist., Kenya (EA).

Camel and goat feed, usually avidly browsed, also used by cattle, and lopped for livestock (Edwards 1948, Kuchar 1984, EA). Very good rating for camel and goat; they also eat the fruit. Fallen leaves eaten by sheep and cattle. Untouched by game.

COMMIPHORA ERLANGERIANA Engl. (1904) non sensu Chiov. (1932) [which is *C. unilobata*]
C. retifolia Chiov. (1932) 54 & fig.19

bacaroor (ba-arorh, bar-arorh, ba-aror, ba-eron, bararorth, paror, parhor) (MOG,G,B,C)
bacaroor-grue? (baror-grue) (C)
goborosc (CH,G)
dhunkaal (duncal, loncal) (MOG,CH,G,C,B)
hithi (W)

CR, N, S; also Eth.

Unarmed tree or shrub 1-3(6) m. Sap milky (or yellow), no odor (few records?). Bark uniform dark gray, gray-green or black, ?rarely bearing papery peels; stems thick and may be contorted. Long-shoots ribbed. Short-shoots 10-100 x (3)5-12 mm. The young stem & lvs puberulent, mature lvs glabrous or puberulent, (3)5-20 cm, (3)5-9-fol. Petiole 2-4(10) cm, petiolule to 12 mm in terminal leaflet, 0.5-2(5) mm in laterals. Leaflets ± equal, elliptic or ovate-elliptic, 1.5-5 cm (to 8 cm in young shoots), apex acute or often shortly bluntly or sharply acuminate (or very slightly acuminate/mucronate), base rounded to minutely cordate; (upper surface often with many small blisters); 3-7 prs lateral veins, dark network below. Fr oval, 13-17(20) mm. **(17)**

Has been found twice on gypsum near Gaalkacyo where it grows with *C. guidottii*.

Root and sap have medicinal uses. Wood is burned near women in labor as the smoke is said to reduce pain. In a related application, the root is used for expulsion of placenta (Kokwaro 1976). Resin toxic and used for poison arrowheads (Cufodontis 1956). "Always heavily browsed and always scarce" (J.B.Gillett *in* MOG), nonetheless its browse status is uncertain.

COMMIPHORA GUIDOTTII Chiov. (1932) 91 & figs.54,55
C. sessiliflora Vollesen (1987) 71 & fig.14
C. 'gypsophila' ined.

hadi (addi, haddi, hedi, hethi) (G,EA,KH1,W,(C))
fulnoful[?] (EA)
dhunkaal (dunkal, dunkaal) (V)
qararro (garaho) (V)
xabag (habac, hagag, hagarg) (G)

Resin: **xabag-hadi** [OR **xabag-cad**?] (abbac-addi, habbac-addi) (C)

CR, N, S, also Eth.

Unarmed shrub or small, sometimes thick-trunked tree to 3[5] m (branches may touch ground & root). Sap milky, odorless (few records) (clear & odorless acc. to Vollesen 1985). Bark (light) gray, usually bearing pale tan papery peels revealing green(ish) underbark. Branches may arch. (Twigs may be purplish.) Short-shoots c10-50 x 8-12 mm, black & rough-prickly with old leaf bases. (Foliage glabrous to puberulent.) Lvs 10-15[20] cm, 1-5(7)-fol., at least petiole puberulent, leaflets may be puberulent & slightly felty. Petiole 2.5-7(10) cm, petiolule of terminal leaflet 2-4(7) mm, of laterals 0-1.5 mm. Terminal leaflet 1.3-1.5x laterals, elliptic or obovate to orbicular, (4)5-15 cm, apex often abrupt-acute but can be rounded & notched; 6-12 prs lateral veins, fine dark network below. Fr subglobose or obovate, 10-14 mm. **(17)**

Restricted to gypsum, common in several places in CR.

Sap poisonous (MOG). When woman gives birth, wood is burnt to fill the house with smoke, to anoint the baby (R.Wieland in EA). Sap vigorously sought (in Luuq area), when burnt has a sweet aromatic smell. When woman delivers, the house, woman & baby are anointed. Wood burnt for funerals. Both

bark and wood are used locally in these ceremonies. The resin is collected for selling. (Wieland in MOG)

Doesn't seem to be browsed by stock.

COMMIPHORA `MACROPHYLLA' Gillett ined.
Probably included with *C. guidottii* in FS2

At MOG: Gillett et al. 23008,23801, Thulin 4209;
also Peck 22, Glover & Gilliland 1007, Hemming 2015,2186, Lavranos 9113, Bally & Melville 15404, Gillett et al. 22929,23000, Beckett 480,919, Aronson et al. 14 (likely something else)

hadi (MOG)

N. On gypsum hills, especially near Laas Caanood. Small tree. [Large 1-fol. leaves & strikingly rough, black, thick (1 cm) short-shoots.]

(Aronson et al. 14:) Armed shrub, glabrous except a few hairs on short-shoots and sometimes petiole. Stems pale to medium gray & may have purplish tinge. Armed with stout but fairly short (c1-4 cm) spines & spine-tipped twigs. Lvs on short-shoots mostly 1-2(3) mm, 3-fol, 1-2.5 cm, or apparently 1-fol. Petiole 0-2 mm. Leaflets dull slightly dusty-looking green (dry), concolorous, terminal leaf (or leaflet) oblong, ovate-oblong or obovate-oblong, c1-2.5 cm, laterals minute; apex rounded, margin with 1-4 prs low crenations in distal ½-1/4, can also be entire; white raised midrib below may peter out by 2/3; 3(4) prs lateral veins, no network. (this doesn't sound like sec. Arillopsidium! It's something else!)

COMMIPHORA PAOLII Chiov. (1916) 46; (1932) 62 & figs.27-30, non KTS
C. longipedicellata Vollesen
C. engleriana Guill.
C. engleri sensu KTS non Guill.
Type from Torda N of Kismaayo, 0º05'S 42º45'E.

shanfarood (KH1)
xiltir (helta, heltier, hintir) (KH1,EA,Wo)
higle (KH1)
xudi (hundi, undi) (G,C)
quwaaxeed (KH1)

Fruit: **bacaroor** (baharor,ba-arorh) (KH3,MOG,C)
Resin: **dhunkaal** (duncal,dhunka) (KH2,C,MOG)

(I am uncertain if these names refer to paolii or pseudopaolii:)
caanamacays (aino ma-ais, anamaess) (M,CH,G,C) [v. doubtful - check!]
uruk? (uruck,uruc) (CH,G,C)

CR, S; also Kenya, Eth.

Unarmed tree to 8 m but often shrublike & only 1.5-3 m, narrow crown (highly contorted crown in Kuchar 17746). Sap milky (colorless acc. to a Kenya coll.), odor none or faint. Bark gray, may have green portions, may bear pale orange or pale-yellow papery peels (revealing green underbark). Long-shoots striate (?sparsely orange-bristly). Short-shoots (5)10-40 x (3)4-7 mm, markedly bristly with hard petiole remnants, or actually ovate 3 mm bracts in a dense tight array. Lvs 3-14 cm, (3)5-13-fol, may be conspicuously dotted below with small glands. Petiole 0.5-3.5 cm, bearing a few cilia [or short erect-ascending hairs] at least toward base, it & rachis (usually?) glandular; petiolule (0)0.5-1 mm in lateral leaflets, 1-9[15] mm in terminal leaflet. Leaflets in remote prs along rachis (which can persist after leaflets have fallen); subequal, or basal pr smaller; can be sparsely rough-hairy; orbicular or reniform to ovate-obovate or elliptic, 0.7-2.5(3) cm, base cuneate to cordate, margin with (0)4-10 prs rather coarse teeth or crenations; 3-5(6) prs lateral veins, sometimes a pr from base; maybe a coarse network below. Infl may have light but distinct sweet apple odor (due to the glandular stalks and not the flowers). Fr stalk glandular, 13-20 mm (?incl. c2-3 mm beak). **(13)**

In W Hiraan Region fairly uncommon on shallow limestone/silt mosaics and limestone hills. On the E side rare on sand plains.

Only 1 reference (Kuchar 17746) of use as a food: fruit clearly edible, slightly sour but not unpleasant, reportedly liked by nomads though not sold in markets (due to scarcity?).

A poisonous plant but gum used by people. No gum according to one informant. Toxic resin used for poisonous arrows (Cufodontis 1956).[no Cuf. ref. acc to JBG...] Wood commonly used for utensils, e.g. small cups, milking bowls. Used largely for honey barrels, also as live fence. Occasionally for firewood.

Mixed responses on palatability for camel. "Always heavily browsed and always scarce" acc. to a MOG label; its scarceness is a fact but the hedgeability of this species is in some doubt. As in other members of sec. **Arillopsidium**, the thick truncate twigs may give it a hedged look though they may well be untouched. Very good rating for camel according to Dharyo informants, not used by other stock. According to Buqda Caqable informant, only fair rating for camel or browsed when hungry, not used by other stock.

COMMIPHORA STAPHYLEIFOLIA Chiov. (1932) 97 & fig.58
Type from Bug barde - El Bar c5ºN 44º10'E just inside Eth.
Kuchar 16665,17227,17227b, prob. 16165,17199

bacaroor (baharor, ba-aror, baror) (G,EA,KH2)

Resin: **dhunkaal** (duncal) (M,G)

CR, S; also Eth.

Unarmed tree or single stem shrub to 3(5) m. Sap milky, odorless. Bark smooth (may appear slightly rough-textured), yellowish or gray or very pale gray, may be slightly peeling; wood (fairly) soft. Long-

shoots striate, felty-hairy. Short-shoots (5)10-20(60) x (3)4-10 mm. Lvs to 18 cm (7-16 cm acc. to Chiovenda 1932), 5-7(9)-fol., felty-hairy & tending silky at least when young (sparingly hairy in Kuchar 17199). Petiole (0.5)1-8.5 cm, petiolule of terminal leaflet 0-1 mm (3-12 mm acc. to Chiovenda 1932). Leaflets equal or terminal leaflet 1.3x laterals, ovate-lanceolate or oblong-ovate, (0.5)1-6 cm; 5-10 prs lateral veins & network clear in transmitted light. Fr on stalk 2-4 cm, glaucous, oval, 9-12 mm (13-16 mm acc. to Chiovenda 1932). **(4)**

Scarce in Hiraan Region, on limestone hills, shallow limestone and silt over limestone, and alluvium.

Fruit salty, eaten by people, birds. Gum highly poisonous, used on carcass to poison hyena. Leaves, however, are harmless to stock. Mixed responses on palatability for camel. The question of browsing needs investigating. The extremely gnarled appearance of the plant may well be natural, and the fact it has poisonous gum suggests low browsing intensity. Said to be eaten [fruit?] by jackal.

COMMIPHORA SULCATA Chiov. (1929) 123, (1932) 60 & fig.23

bacaroor (baror, ba-aror) (G,EA)

Resin: **dhunkaal** (duncal) (G,W)

CR, N, S.

Unarmed shrub or tree (0.3)1-4 m. Sap non-aromatic. Bark pale gray to grayish white (or light brown), usually peeling at least toward base. Long-shoots striate. Short-shoots 5-30 x (2)3-5 mm. Lvs (1)2-9 cm, (1)3-5-fol. Petiole (0.5)1-4 cm, can equal rest of leaf; petiolule of terminal leaflet (1.5)3-15 mm, of laterals 0.5-3 mm. Leaflets glabrous or slightly rough-felty puberulent, terminal leaflet (1)1.3-1.5(2)x laterals, reniform less often orbicular or obovate, (1)1-1.5-2.5(3) cm; 3-5(6) prs lateral veins. Fr on stalk 1 cm, oblong-elliptic, 14-18 mm. **(4)**

Wieland 4345 is a stunted form with small lvs, & fr only 10 mm.

According to Chiovenda this and related species are poisonous. Resin and branch decoction used for arrow poison, though fruit edible according to one collector (Cufodontis 1956). `Poisonous, wash hands after touching' (R.Wieland *in* K).

COMMIPHORA UNILOBATA Gillett & Vollesen (1985); Vollesen (1985) 73 & fig.15
C. erlangeriana sensu Chiov. (1932) 53 & figs.17,18; sensu KTS non-Engl.. (1904)

dhunkaal (dhungaal, duncal, dunkal) (KH3,V)
bacaroor (bar arorh, baror) (KH,V)
bacaroor dhurwa (KH)
ciin-bacaroor (KH)
abafulla (EA)

CR, N, S; also Eth., Kenya.

Unarmed sparingly branched or single stem shrub or tree to 2.5 m, rarely a thin straggly tree to 6 m. Sap scarce, milky (clear acc. to Vollesen 1985, FTEA), no odor or slight resinous; slash with an unpleasant pungent smell acc. to Waterman (1986). Trunk rather thick toward base (seen to 2+ dm diam), tapering, bark (intensely) peeling pale yellow papery revealing green underbark. Wood very soft, the thick twigs brittle, snap easily. Long-shoots striate, 0.7-1.2(1.5) cm diam. Short-shoots 15-140 x (6)7-11 mm. Lvs (10)15-25(30) cm, (5)7-11-fol., glabrous or main veins & rachis sparsely puberulent. Petiole 4-10 cm, (lateral petiolules 1-3 mm, terminal to 15 mm). Leaflets equal-subequal, glaucous below, ovate-elliptic, 3-9 cm, apex usually shortly acuminate, margin entire, occasionally with low crenations; 6-10(13) prs lateral veins & dark green network below, clear in transmitted light. Fr fleshy, orbicular or broadly oval-ovate, (15)20-25 mm diam. **(22)**

The sparsely branched form, somewhat bulbous trunk, and clusters of huge fruits make this an odd and unmistakable species. Fairly common in S Somalia (JB Gillett in litt 1984) but rare in CR, only the occasional individual on silts and silt limestones in W Hiraan Region. In NE Kenya seems widespread mainly on heavy soils liable to seasonal flooding.

Wood makes strong stomach medicine. Resin highly poisonous, possibly all parts poisonous. Gum used for poisoning hyenas; but also said not to produce gum. Very poisonous to man and beast, nevertheless reputedly heavily browsed. Some uncertainty among W Buulo Burte Dist. villagers regarding fruit's properties: not poisonous yet not eaten by stock or people, then a change of mind and they felt that the milk of fruit was poisonous.

Very good browse rating for camel and goat according to Jalalaqsi Dist. informants, but more often considered untouched by stock. Not eaten by game.

COMMIPHORA sp. ‘H’ of EA (guidottii, erlangeriana or sulcata)

bacaroor (ba-arorh) (EA)
hadi (hadde) (EA)
ghorar? (EA)

Resin: **dhunkaal** (duncal) (EA)

N.

Small unarmed shrub or tree.

Resin said to be very poisonous. A solution or infusion made with the bark is used to dip stock to rid them of ticks. "One informant said it is good for the head if chewed - but it is also poisonous!!" (Beckett in EA) Smoke used after childbirth as a cleansing agent.

Leaves browsed.

M Sec. **HILDEBRANDTIANAE**

Unarmed ("rarely spiny" acc. to Vollesen 1985); leaves 3-5(7)-foliolate or subtrifoliolate. Flowers solitary or in fascicles, sessile or almost so ("Where Engler got the statement that the flowers are stalked in his protolog I do not know. We must go by the holotype and *C. hildebrandtii* remains as we have always thought a species with sessile flowers." (JG Gillett in litt 1986)); petals usually silky outside. Pseudaril with 2 short triangular or oblong facial lobes, the commissural lobes narrower or missing. Putamen often rugose.

COMMIPHORA ALATA Chiov. (1916) 42; (1932) 116 & fig.75
[A poorly known species; only Gillett et al. 24706,24853 seen; also Friis et al. 4806]
C. agar Chiov. (1932) 119 & fig.80. (Type Paolii 930. A poorly known species, known only from the type. Was at first confused with *Boswellia boranensis* i.e. *B. rivae* but has many fewer leaflets. – JB Gillett in litt 1986.)

xagar-madow (agar-medu) (C)
xagar (agar) (G)

S.

Unarmed shrub or straggling tree to 3 m. Sap with turpentine odor or none. Trunk bark reticulately fissured. ranches blackish, younger ones scarcely felty-puberulent & slightly zigzag. Short-shoots 0.5-3 x 3 mm. Lvs 2-5.5 cm, 5-7(9)-fol. Petiole 5-12(20) mm, rachis winged. Leaflets sessile, finely (densely) puberulent, graded in size with terminal leaflet largest, oval-oblong, obovate-elliptic or oblanceolate, 0.8-2 cm, margin with 3-7 prs teeth or crenations; 2-4 prs lateral veins. Fruit unknown. **(4)**

COMMIPHORA ALATICAULIS Gillett & Vollesen (1985) 52 & fig.6

dibyaxaas (KH2)
dabayaxaas (KH1)
maron saneh[?] (V)
dab-biriq in E Eth

CR, S,N; also Eth., NE Kenya

Slender scrambling shrub or shrubby tree to 3.5 m, almost invariably very heavily hedged. Sap milky (colorless according to Vollesen 1985), sparse, ± odorless. Trunk (mostly) gray, bearing discontinuous corky flanges in c6 series. Branches unarmed but some twigs fray to spinelike points. Younger twigs distinctly 5-angled. Short-shoots 3-20 x 2.5-4(5) mm, black & roughly leafscarred (rarely whitish with dense hair cover). Lvs 2-5.5(10) cm, 3-fol. Petiole 1-2.5(4) cm, petiolule 0.5-1 mm, may seem to 4 mm in terminal leaflet. Leaflets discolorous, puberulent or (silvery) tomentose, (may be felty below), terminal leaflet 1.5-3x laterals, 1.5-3(6) cm, obovate to orbicular, margin with 3-7(13) prs large (rarely

low) teeth or crenations; 3-5(6) prs lateral veins. Fr elliptic-ovate, rather acute, 10-11 mm, 4-angled, crushed odor like orange or orange squash. **(8)**

Over at least parts of its range, e.g. in E Kenya, this species tends to climb inside other trees and bushes and is then often difficult to spot, but this is rare in CR. Here it is an erect little tree, exposed to herbivores particularly camel, and is normally heavily browsed down. The resultant stunted deformed plants may be almost without the characteristic corky stem-wings which give it its Somali name *dibyaxaas* meaning crocodile tail. In camel bushland one of the most heavily hedged of all deciduous woody plants. Fairly common though never really abundant on *hawd* sands.

Kuchar 17309, from Jalalaqsi/Aadan Yabaal Dist. boundary area, is a tree 3 m with a tiny subglobose crown, hardly touched by browsers. The leaves are much smaller than normal, and it may represent a drought-stricken form.

When large enough, trunk made into milk containers.

Fair to more often excellent palatability rating for camel and goat, nil to good for sheep, not used by cattle.

COMMIPHORA ARENARIA Thulin (2000)
(was COMMIPHORA ?n.sp. aff. TRUNCATA Engl.; also Kuchar 17414)
Kuchar 16268(or *holtziana*?),17275,17306(sterile), ?16361

sagaarsal (KH1)
gondod (KH1)
gondod cade (KH1)

CR, S: Jalalaqsi/Aadan Yabaal Dist. boundary, 3º14-44'N 45º47'-46º06'E, also possibly to Buulo Burte Dist. boundary.

Unarmed broad-crowned tree to 4x6 m, stems can be almost from base (may look mildly pseudospinose). Sap scarce, milky, with faint resinous or light slightly sweet resinous odor. Trunk & lower limbs black/dark & scaly, lower trunk rough with small black square plates, other stems (pale) gray. Short-shoots 3-12(22) x 1.75-3 mm. Lvs 1.5-3(5) cm, 3-fol., puberulent & may be slightly felty. Petiole 0.5-1.4(3?) cm, erect-hairy. Leaflets look somewhat discolorous, sessile though terminal leaflet seems to have a petiolule to 3(5) mm; terminal leaflet 1.5-3x laterals, obovate, 1-2.5 cm, apex rounded or truncate, margin with 3-7 prs crenations; dark vein network below. Yellowish-green (or reddish) fls. Fruit sessile (stalk 1-2 mm in K17414), ellipsoid or broadly ovate, 9-11 mm, apiculate. **(5)**

Fairly rare and mostly in small quantity in bushlands of stable sandhills and sand plain in SE Hiraan Dist.

Good or excellent for camel and goat, lopped for kid.

COMMIPHORA CORRUGATA Gillett & Vollesen (1985) 59 & fig.8
C. holosericea sensu Cuf. (1956) non-Engl. (1904)

gendid (gended, gandad) (EA,V,W)
beeyo (bayo) (V)
beeyo-cad (beio ad) (V)
muqlo jareer (KH1) (maybe)

CR, S; also Eth., NE Kenya.

Unarmed [sprawly?] shrub or tree to 5 m. Cut twig with clear sap with mild resinous odor (few records), gummy milky sap (K16093), milky and very resinous on trunk acc to Vollesen 1985. Bark dull yellow or light gray (or grayish-brown), smooth or may bear grayish peels or likely merely rough; becoming (reticulately) fissured in age. Branches black to (dark) gray. Long-shoots felty-puberulent. Short-shoots 1-20 x (3)4-5(6) mm, (quite rough). Lvs 1.5-4.5 cm, (1)3-5(7)-fol. Petiole (0.3)0.5-1(1.5)[2.5] cm; petiole apically & rachis sometimes narrowly winged acc. to FTEA & FS; at least lateral leaflets sessile. Leaflets (markedly) bullate, felty-hairy & often pale gray-wooly below; terminal leaflet 1.5-3x laterals, oblong or obovate, 1-3(5) cm, may be shallowly 3-lobed, margin with 6-12(20) prs crenations; (3)4-7 prs lateral veins, maybe some outer secondaries. Fr with milky sap, elliptic, ovoid, 9-11 mm (or 5-6 mm?). **(10)**

Very rare in Hiraan Region, on orange sandplain and valley sands. Abundant in open bushland on limestone hills and tableland in a Luuq area, S Somalia study (Wieland & Werger 1985).

Gum aromatic, chewed (EA). Sap dries to a whitish resin that makes an excellent chewing gum (R.Wieland in EA). In S Ethiopia it is collected commercially for incense (Vollesen 1985).

May be excellent camel and goat browse, good sheep browse.

COMMIPHORA GARDOENSIS Gillett ex Thulin (2000)
Gillett & Beckett 23528, Beckett 1081, Gillett 22959, Thulin & Warfa 5473

xagar (hagar) (MOG)

N: 9-10ºN 49-50ºE.

Unarmed shrub or small tree 2-5 m. Twigs slender; lvs very sparsely puberulent (mainly on midrib) or subglabrous, 3-fol., leaflets deeply toothed or lobed; fls sessile at ends of twigs; fr ovoid, c6 mm. **(3)**

COMMIPHORA HILDEBRANDTII (Engl.) Engl. (1883)
Balsamea hildebrandtii Engl. (1880) 15
C. ogadensis Chiov. per FS2
C. allophylla Sprague according to JB Gillett in litt (1986), but lvs 3-5 fol. FS has it as a syn of *C. kataf* but fruit does not fit acc to FS.

Incl. Kuchar 16500,17798, Gillett 23610

xagar (KH2)
xagar-madow (haggr-medan, hagr moddu, hagar-madow, hagar-medu, hagar medo) (M,G,C,EA)
fadnafanole (KH1)
bunsur (KH3)
gendigent? (EA)
xagar-sowar[?] (hagar sowar, agarsu) (EA)

Resin: **xabag-xagar** (habbak-hajar) (C)

CR, N, S; also Eth. (Not Kenya: the specimens once named *hildebrandtii* are the closely related *C. ogadensis*. Some Ethiopian plants are intermediate.)

Unarmed somewhat sprawly tree 2-4(7) m. Sap milky, light slightly sweet odor. Trunk dark gray or mottled, bark peeling (in small flakes – FE). Short-shoots (2)6-20 x 2-3(4) mm. Lvs (1)2-6 cm, 3-fol. Petiole (0.5)1-2.5 cm, terminal petiolule 0-5 mm. Leaflets puberulent, can be felty, terminal leaflet 1.5-3x laterals which may be minute; obovate-oblong or elliptic-oblong, 1-5 cm, margin with (3)6-12 prs crenations; c3-6 prs lateral veins, (fine) dark green network below, clear in transmitted light. Fl and fr sessile, petal silky outside. Fr slightly flattened ellipsoid 6-11 mm. **(6)**

The flowers of this species are always sessile or subsessile, as in the type Hildebrandt 1509. Engler in his original description says they are shortly pedicellate. This is probably due to confusion with material of *C. somalensis*, likely Hildebrandt 1513. (JB Gillett in litt 1986)

Acc to FE, *hildebrandtii* is 3-fol whereas *ogadensis* is 3-7(9)-fol. Leaflet margin of *ogadensis* has broad triangular teeth whereas *hildebrandtii* is serrate or biserrate with small sharp teeth. Bark of *ogadensis* peeling in papery strips or small irregular flakes, only latter in *hildebrandtii*. Acc to JB Gillett in litt (1986) the two are closely related and some Eth plants are intermediate. *C. ogadensis* tends to be taller.

Encountered in 8 plots in a veg study of Hiraan Region and was abundant on a shallow-limestone plot, basalt plain and limestone hill, also seen on sand plains.

Heavily browsed (P Kuchar in MOG). Obviously palatable: fairly heavily browsed. Moderately to highly palatable browse for camel and goat, not used by cattle or sheep.

Fruit a favorite food of hornbill.

COMMIPHORA OGADENSIS Chiov. (1932) 103 & fig. 63
C. tephrodes Chiov. (1941)
C. hildebrandtii sensu KTS non (Engl.) Engl.
Incl. Kuchar 16243,16745,16802, H&H 6295, G 22691,24818

xagar-madow (hagar medu) (G,KTS)

CR, N, S; also Eth., Kenya.

Unarmed tree 2-6(7) m with broad sprawly[?] crown. Sap milky, fairly abundant, odor faint or none. Main stems gray or gray-green or yellowish, mottled with yellow or orange-tan patches, also bearing papery peels & a few flakes, may reveal pale gray-green underbark. Twigs (somewhat) zigzag, [puberulent when young]. Short-shoots 5-20 x 3-5 mm, black & roughly leafscarred. Lvs 3-8 cm, 3-5(7)-fol., sometimes only 3-fol. Petiole (1)1.5-3 cm, it & rachis white- or gray-puberulent. Leaflets (sub)sessile, puberulent & may be felty below, terminal leaflet 1-1.5x laterals, oblong or obovate-oblong, 2-4.5 cm, whole margin with (6)8-12(15) prs crenations; 5-7 prs lateral veins, ± fine dark green network below, clear in transmitted light. Fr ovoid-elliptic, c8 mm (FTEA). **(4)**

Along the sandstone escarpment E of the Shabelle River.

Wood for small vessels. Stem yields a glue. (KTS)

COMMIPHORA STELLATOPUBESCENS Gillett ex Thulin (2000)
Gillett et al. 22675,23315, Kuchar 15538,15974,16135,16144,16169,17202

gundod (KH1)
malmal-cadde (KH1)
yucub (KH1) better-known as the name for *Gyrocarpus* (Hernandiaceae)

CR: Hiraan Region.

Unarmed tree to 6 m, rarely shrubby. Sap clouded or milky, sometimes clear, sticky, may be very sparse, mild (sweet-)resinous odor, rarely fairly pungent. Bark smooth gray, slightly rough toward base, occasionally bearing small peels or chips. Long-shoots stellate-puberulent. Short-shoots (0.5)2-12 x (2)3-5 mm, black leafscarred. Lvs 1.5-5 cm, 3-fol. Petiole (0.3)0.5-2 cm. Terminal leaflet with narrowing base, laterals sessile; gray-green to yellowish-gray, densely stellate-puberulent & usually slightly felty at least below; terminal leaflet mostly 2-4(5)x laterals which are sometimes only 1-2 mm; obovate-spatulate, (1)1.5-3 cm, margin strongly wavy & with c2-8 prs irregular teeth or crenations, rarely entire; 2-5 prs lateral veins & network. Fr sessile, ovate-oblong, 7-8 mm, bluntly apiculate. **(13)**

An interesting endemic of the upper Shabelle Valley, with outliers to Dharyo in SW Buulo Burte Dist. It is the only commiphora with stellate hairs (which have several rays like a star, not branched hairs), and within its limited range on limestone hills is often the dominant tree or codominant with *C. gurreh* and *Senegalia* (*Acacia*) *senegal*.

Gum for incense. Firewood.

Hardly ever hedged though rated a very good browse for camel; lower rating for goat (possibly because branches are mostly out of reach).

COMMIPHORA TRUNCATA Engl. (1904)
C. crenatolobata Chiov. (Hutchinson & Bruce 1941)

muqle, muqlo (mogole, mogoleh, mogoloh, muglo, mogol, mogolo) (M,G,C) [may refer to Boswellia neglecta]
gundod, gondod (gundud, gended, gondot) (KH5,W)
gunre cadde (KH1)
gended-libe[lile?] (W)
qaroon (garoon) (C)
qowaax (W)
waaxeed, quwaxeed (KH2)
xagar (hagar) (KH1,EA)
xagar-madow (hagar medou, haghar medu) (EA)
koomadoon (KH1)
luuluaadin (W)

Resin: **xabag-muqle** (C)

CR, N, S, also Eth.

Unarmed tree (1)2-6(8) m, mostly broad-crowned (& seen with open crown of few main limbs), sometimes sprawly-shrubby. Sap clouded or milky, infrequently clear, mild (slightly sweet) resinous odor, rarely strong or faint. Stems (smooth) gray, trunk & main limbs may bear black chips or gray-orange flakes, old trunk becoming finely square-platy or at least slightly rough; twigs gray to brown. Long-shoots puberulent, may be felty, (scarcely zigzag & may be very slightly rough). Short-shoots 0.5-4(12) x 1.5-2 mm. Lvs (0.7)1-3(4?) cm, 3-fol. but laterals minute, at most ¼ size; (may be reflexed on long-shoots). Petiole 1-3(7) mm, petiolule (seems) 0-7 mm. Leaflets densely hairy & felty at least below, quite pale at least when young, often (±) bullate, (oblong-elliptic or) obovate to reniform, 0.5-2(3) cm, margin with (3)4-8 prs teeth & may be somewhat crisped[?]; 2-6 prs lateral veins, dark green network may be seen through hairs below, clear in transmitted light. Fr oblong or oval(-elliptic), 7-8(9) mm, bluntly apiculate (2/3 mm) (or not). **(41)**

Very common in parts of Hiraan Region; one of the larger trees in the plant community though often leaning or somewhat sprawling. Occasionally a codominant but far more often <2% cover in any given stand.

Yields a good gum, medicinal for camel with stomach-ache. This gum is chewed according to some informants, but others say it is not chewed nor used for incense. Gum chewed (R.Wieland in MOG). If there's no tea, bark layers are peeled off, hot water added, making a good tea. Stirring utensils are made of this tree to give a good smell. Wood carved into Quran boards, also camel bells. No wood uses according to some informants, except firewood.

Highly rated by most informants as browse for camel and goat and often hedged to a moderate or fairly heavy extent. No. 1 camel browse according to Buqda Caqable (W Buulo Burte Dist.) informants. Lopped for goat in particular. May also be very good sheep browse.

COMMIPHORA ?n.sp. (?sec. **Hildebrandtianae**) = Kuchar 16503

CR: top of escarpment E of Buulo Burte.

Unarmed dwarf tree 2 m, heavily browsed. All stems smooth gray, younger may be slightly grooved. Sap clear, with fairly strong resinous odor. Long-shoots brownish, striate. Short-shoots glabrous, 4-20 x 3-5 mm. Lvs glabrous except rachis minutely (inconspicuously) puberulent with curved hairs & extending up the midrib. Lvs 3-5-fol., 3.5-7 cm. Petiole 1.5-2.2 cm, may seem narrowly winged. Petiolule of all leaflets seems to 3 mm (or 0-1 mm). Leaflets elliptic or oblong-ovate, 1-2.5(3?) cm, apex shortly bluntly acuminate, base acute, 0-3 prs very low crenations subapically; midrib & 5-9 prs lateral veins reddish, a striking fine dense dark vein network both sides.

N Sec. **HEMPRICHIA** (Ehrenb.) Schweinf.
in Bul. Herb. Boiss. 7 (1899)
Hemprichia as genus Ehrenberg in Linnaea 4 (1829)
(sec. **Glaucidulae** of Engler 1912)

Unarmed; leaves 3-7-foliolate. Receptacle deep, almost tubular, the stamens inserted on its rim. Male flowers in a lax inflorescence. ruit always stalked though sometimes shortly so, wider than thick. Pericarp 2-valved [?but may be 4-lined, e.g. *C. sphaerophylla*], not fleshy, putamen smooth with gently convex faces; pseudaril normally with large broad facial lobes and sub-obsolete sutural lobes, occasionally a short cup with subequal short broad lobes. Kuchar 17290 and 17681 (aff. kataf = Kuchar 17290) have this pseudaril which is ± that of sec. Arillopsidium although in other respects these plants are sec. Hemprichia.).

As well as by their fruit characters, the species of this section are easily recognized by their white trunks with the outer bark peeling in large sheets or rolls revealing a pale dusty-looking blue or greenish-blue underbark. *C. lughensis* (sec. **Latifoliolatae**) would on its bark and trunk be placed in this section were it not for its 4-armed pseudaril.

Specific determination is exceptionally difficult in this section, especially in the *holtziana-kataf* complex. A difficult section according to JB Gillett (in litt 1988), he remarks he had endless trouble with it while preparing his treatment for F.T.E.A.

Vollesen (1985) unites this section with *Arillopsidium* but the two are quite distinct.

COMMIPHORA FOLIACEA Sprague (1927) t.3105

balalol, balolol[?] (balalo) (MOG,EA)
xagar (hagar) (EA)
xagar-cad (hagar ad) (EA)
xagar-qaroon (hagar karon) (EA)
gagop [**gaygab**?] (EA)

xagagaro, hagurgur (FS2)

CR, N; also Arabia.

Unarmed shrub or erect or sprawly tree 0.5-5 m, lower limbs may rest on ground; glabrous. Sap clear or occasionally clouded or milky, strong sweet-musty ± unpleasant odor perhaps like sour parsnip, or reminiscent of *C. rostrata*. Trunk & main limbs strikingly pale, usually creamy white & peeling to reveal blue-green or dusty-looking blue underbark; also stated as smooth purple bark. Short-shoots 1-20 x 1-1.5(2) mm (distinctly thicker in some N plants, 3-4 mm diam). Lvs 1-7 cm, 3-fol. Petiole 0.2-3 cm, sometimes much longer than leaflets, appears narrowly deeply grooved, petiolule of terminal leaflet c2-10 mm, of laterals c1-2 mm. Leaflets somewhat discolorous, glossy both sides & may be glaucous below when dry; terminal leaflet 1.3-1.5x laterals, (broadly) elliptic or oblanceolate to orbicular (rhomboid or subreniform), 0.5-4 cm; rarely 1 pr shallow crenations subapically; 1-4 prs lateral veins, these & a very few outer forks fairly clear in transmitted light. Corolla bronzy-pink or greenish-yellow. Fr on stalk 1.5-3 cm, elliptic-oblong, 7-10 mm, with short apiculus. **(43)**

This species, including forms which may represent an undescribed related species, is fairly common in NE Somalia. The specimens from Hiraan Region seem to represent an isolated population separated by c700 km from the main area of the species in the north. Mostly seen on sandstone escarpment where locally abundant. Rare on sand plain, gypsum and limestone/silt mosaic.

K16499 (possibly this species) heavily browsed, sap odor fairly strong but not unpleasant...

COMMIPHORA FOLIACEA Sprague forma vel sp. aff.
Gillett 23073, 23127, Gillett & Watson 23368

hagargu (MOG)

N: 8º30'N 50º07'E.

Prostrate shrub (puberulent whereas true *foliacea* is glabrous). Sap not resin-scented. Bark (may be) whitish-peeling to reveal blue-green underbark. Stems gray, rough with numerous short-shoots. Young stems puberulent. Lvs (1)3-fol., densely to sparsely puberulent, terminal leaflet 1.5-3x laterals, oblanceolate to obovate-oblanceolate, <1 cm, margin entire or vaguely crenate. Fr subglobose or elliptic, 7-11 mm, pedicellate. **(2)**

COMMIPHORA GORINII Chiov. (1932) 108 & fig.68
C. erythraea (Ehrenb.) Engl. var. *glabrescens* Engl.

kukey (Z) (very doubtful)

S. Type loc. Afmadu (Afmadow) in Transjuba, c 0,35N 42,10E. Probably riverine forests of Jubba area.

Unarmed; 3-fol.

Bark for hemorrhoids (Kazmi 1985a).

COMMIPHORA HOLTZIANA Engl. (1904) (refer to C. kataf)
C. africana sensu KTS fig.17a & Dale 3892, non (A.Rich.) Engl.
C. erythraea sensu FE3 non (Ehrenb.) Engl., sensu KTS Gillett 15171, non (Ehrenb.) Engl. True erythraea apparently does not occur in Som (JB Gillett in litt.).
C. somalensis Engl. (1893)
Syn. of *C. kataf* (Forsk.) Engl. in FS, syn. of *C. erythraea* (Ehrenb.) Engl. in FE, stand-alone in FTEA. "The correct name for this taxon will certainly prove to be one of the older names which have been applied to it in the northern part of its range but which one is not yet clear" (JB Gillett in litt 1986).

Incl G 22472,23559,24360,24544,24582

xagar (hagar, haggar, harr, hargar) (M,EA,MOG,C,W)
xagar-cad (xagarcade, hagar ad, haggr-af, hagarad) (M,G,EA,KTS)
xagar-madow (hagar medou) (M,G,EA)
xagarsu (agarsu) (EA)]
hadi (haddi) (C)
dhudhus (KH1)
yeye (KH1)

N,C.S; also Kenya, Eth, NE Uganda, NE Tanz.

Acc to Vollesen 1985, *C. holtziana* as syn of *C. erythraea* is close to *C. sphaerophylla* which has pinnate lvs, smaller leaflets, shorter fr stalk. *C. kataf* is not mentioned in FE, so presumably it would fall under *C. holtziana*. Closely resembles *C. erythraea* (JB Gillett in litt 1988).

Tree 3-6 (10) m, branches may touch or even lie on ground. Sap sparse, clear, or first clear then milky/clouded, usually unscented or with light sweet-resinous odor. Bark mostly white, &/or with large white (or creamy yellow) peels revealing blue or blue-green underbark. Twigs often black or dark gray though may also be lighter; may be like perpendicular fairly stout blunt spines, sometimes moderately sharp and branded as 'spiny' i.e. pseudospinose. Long-shoots felty-puberulent. Short-shoots 2-20 x (1.5)2-3 mm. Lvs 1.5-6(15) cm, (sparsely) puberulent or hairy, (often felty), the short hairs may stand out on veins beneath, 3-fol rarely 5-fol. Petiole 0.8-3(7) cm. Terminal leaflet with a narrowing base of which c2-5 mm actually seems to be petiolule, laterals (sub)sessile; terminal leaflet obovate to orbicular, (1)1.5-2(7) cm, margin with 5-14 prs crenations or teeth; 3-5 prs lateral veins & network below. Fr on stalk (3)6-13? mm (3-10 mm acc to FTEA), globose or elliptic, slightly flattened, 9-10(11) mm. **(8)**

ssp. **MICROPHYLLA** Gillett
Incl Gillett 25258

xagar (hagar) (EA)
xagar-jareer (hagar jerer, haggar-jerere, haggar jere) (EA,B)

xagar-cad (hagar ade) (EA)

C2,S; E Kenya.

Differs from ssp. *holtziana* in its smaller lvs, the leaflets to 10 mm long, & slightly smaller fr (7-8 mm) on stalk 2-3 mm (FTEA).

Found in Buulo Burte. South of Moyale in Kenya the commonest commiphora and one of the dominants in acacia-commiphora bushland (EA). Wide ecological amplitude in a Luuq area, S Somalia study; most abundant in limestone uplants, also basalt, alluvial plains (Wieland & Werger 1985).

COMMIPHORA KATAF (Forsk.) Engl. (1883)
C. erythraea sensu FS2 non (Ehrenb.) Engl. (1883). Engler does not mention this plant in his 1912 account of African Burseraceae which suggests that he may have thought in 1912 that his 1883 treatment was erroneous. (JB Gillett in litt 1986)
C. allophylla Sprague (1925)
C. holtziana Engl. (1904) [per FS]. Very closely related per FTEA and, given a very broad view of the species complex, would be a subspecies of *C. kataf*. I agree and have placed *C. holtziana* under *C. kataf*.
C. holtziana ssp *microphylla* Gillett [per FS]
C. lughensis sensu Hutch. & Bruce (1941) non Chiov.
C. gallaensis (Engl.) Engl. [under *baluensis* in FTEA]
C. pseudopaolii Gillett [per FS]
(incl. Gillett 4587,4633, Wood S/72/31, Wieland 4561)

xagar (hagar) (KH5,L,MOG)
xagar-yare (W)
dhudhus (dhundhus) (KH2)
dhudhus madoobe (KH)
subagle (KH)
gondob (KH)

Resin: **xabag-xagar** (habbak-hagar) (C)
xabag-hadi (habaghaddi, habbak-haddi) (C)

CR, N, doubtfully S; also Eth., Kenya, E Sudan, Arabia.

Unarmed large shrub or usually tree 2-8 m (recorded to 12 m in Kenya though maybe confusion with *C. baluensis*), trunk to 50 cm diam. Sap clear, may become clouded, or (rarely?) clear turning milky, odor none to strong resinous but often lightly sweet-scented. Trunk & main limbs white or creamy pale yellow, bearing large whitish or pale orange papery sheets revealing dusty-looking blue or blue-green underbark. Branches may arch & even reach the ground. Lvs & young stems (densely) felty-hairy. Short-shoots (1)2-12(25) x 1.5-2.5(3) mm. Lvs (1)2-6(?9) cm, 3-fol. (rarely some 5-fol.), (usually) hairy & may be felty. Petiole (0.5)0.8-3 cm. Leaflets may be somewhat discolorous, (sub)sessile, terminal leaflet with petiolule to 4 mm, usually drying discolorous, may be shiny above or both sides; terminal

leaflet 1.3-2x laterals, reniform, obovate, suborbicular or oblong, 0.7-3(?4) cm, margin with (0?)3-12(15) prs low crenations or teeth, predominantly in distal third; 2-4(6) prs lateral veins, green network below, coarse (broken) network or outer secondary veins clear in transmitted light. Fr on stout stalk 3-11 mm (3-15+ mm acc to FS2), elliptic, suborbicular or oval, flattened, (?6)8-11 mm, apiculate. **(47)**

Appears to include a lot of variability. Gillett et al. 22472 is sparsely puberulent with leaflet margin entire.

(as erythraea:) I think most is attributable to **holtziana** – which here is understood as kataf.
Sap or gum has some medicinal uses. Somalis are said to make an infusion of the dried bark which is taken before long treks. Yields a myrrh-like resin used in perfumes and incense (Greenway 1941). The wood may be burnt and clothes and body fumed for fragrance (Cufodontis 1956). Bark infusion for cleaning calabashes. Poles used for live fencing. Sometimes used on graves and as a live fence (Kahurananga n.d.).

Appears resistant to a certain amount of trampling but not to severe cutting or fire (Glover 1950-51). Browsed by stock and fruit also eaten; reportedly avidly browsed by cattle. Mixed responses on palatability for camel and goat. Mostly rated highly palatable for camel and goat, rarely sheep. In CR has been seen lopped/pollarded.

ssp. **TURKANENSIS** Gillett

xagar (hagar) (MOG,EA)
xagar-jareer (KH1)

CR; also Eth., Kenya (L. Turkana), Tanz.

[Leaflets with only 2-5 subapical crenations or teeth; laterals often entire; lvs glabrous or sparsely puberulent.] Similar to ssp. *kataf* but with much shorter[?] infl., & fr peduncles <4 mm.

In CR: Gillett et al. 22275, (G&H 24360), Kuchar 17179, Wieland 4708,4720,4727

Tree to 5x8 m, reported to 10 m in N Kenya, (±) glabrous or a few inconspicuous hairs on petiole; (many branches downcurved); (branches break easily). Cut twig with clear sap, light resinous odor (or sweet), or unscented. Trunk bearing many pale yellowish-buff, tan or whitish papery peels revealing pale blue, greenish-blue or grey underbark. Twigs predominantly perpendicular, may be indicated as spiny but only bluntly sharp. (Long-shoots brownish-purple, striate.) Short-shoots (2)4-11(24) x 1.5-2 mm, rough with leaf bases. Lvs 1-6 cm, 3(5)-fol. Petiole 0.3-3(4) cm. Terminal leaflet 1.3-2x laterals, (may be fairly markedly discolorous, may be shiny both sides), obovate or broadly elliptic-obovate, 0.6-3 cm, base narrowed & with an apparent petiolule 1-7 mm, margin with 3-5(9) prs very low crenations mostly in distal half, may be entire especially in laterals; midrib tending raised above in groove, also maybe the 3-4 prs lateral veins, white midrib raised below, laterals may be raised, dark coarse network, main veins may be clear in transmitted light, sometimes some network. Fr on stalk 2-14 mm (3-8 mm acc to FTEA), elliptic or suborbicular, scarcely flattened, glaucous, 8-11 mm, minutely apiculate. **(6)**

C. holtziana is very closely related to *C. somalensis* of which it is perhaps but a form, and also to *C. kataf* and *C. baluensis*. *C. holtziana* also occurs in Eth., NE Uganda, Kenya and NE Tanzania but perhaps not in Arabia. Possible intermediates between *holtziana* and *kataf* ssp *turkanensis*.

C. kataf ssp. *erythraea* (Ehrenb.) Gillett, based on the type of *C. erythraea* from the Red Sea, is confined to Arabia, Sudan and Socotra and so far not known from Somalia.

[C. kataf s.lat.:] Source of a gum resin used in perfumery and formerly important in medicine (Greenway 1941). Wood for Quran boards.

Camel food plant (Elmi 1983). Browsed by camel and goat, can also be utilized by sheep. Very good rating for camel and goat particularly the former, not used by other stock except sometimes sheep.

COMMIPHORA AFF. KATAF = Kuchar 17290
Kuchar 17290,17681,16344(sterile), Beckett 553?

Maybe close to *C. kataf* ssp. *turkanensis* but has much longer fr stalk, 1-3 cm, and petiolule of terminal leaflet only to 2 mm.

bacaroor (KH)
xagar cade (KH1)
wacanri (KH1) [the usual name for *Lannea cotoneaster*]

CR, CR/S boundary: Buulo Burte & Aadan Yabaal Districts, 20-40 km W & WSW of Aadan Yabaal, 3º41'N 46º05'E, 3º38'N 45º54'E.

Unarmed broad-crowned tree 2-6 m, erect or a sprawly mass; glabrous. Cut twig with clear sap, (sweet-)resinous odor. Trunk & main limbs smooth white but bearing (a few) pale buff or grayish-yellow papery peels, may expose powdery-looking blue underbark; twigs tending (characteristically) perpendicular. (Branches may be markedly striate/ridged.) Short-shoots 2-10 x 2-2.5 mm, leafscarred toward apex; (long-shoots striate). Lvs 1-2.5 cm, 3-fol. Petiole 5-16 mm, often > leaflets. Leaflets sessile-subsessile though terminal leaflet with petiolule to 2 mm, leaflet margin (sub)entire, terminal leaflet to 2x laterals, obovate or oval-obovate to suborbicular, 5-13(16?) mm; (2)3-4 prs lateral veins & a few outer veins. Fr on stalk 1-3 cm; oval-elliptic, 9-10 mm, ripening light yellow & often with reddish patch. "Very odd in having a shallowly cupular pseudaril ± as in sec. Arillopsidium" (JB Gillett in litt 1987). **(3)**

Very locally common in bushlands on sand plains and stable sandhills in SE Hiraan Region.

Fruit edible though has resinous taste. Bark used like tea. Toothstick. Wood for combs, spoons, stirring spoons, also Quran board though not a very good one. Good live fencing. Has no gum, just sap.

Rated good to excellent browse for camel and goat, low to nil for cattle & sheep though they eat fallen leaves. Browsed by some antelopes.

COMMIPHORA `PETIOLULATA' n.sp. ined. (likely sec. **Hemprichia**, though may perhaps prove to belong to some other section when the fruit is discovered)
Kuchar 16934,17285, Wieland 4288

bacaroor (KH)

CR, just S: 3º40'-4º29'N 45º30'-46º10'E; also Hobyo.

Unarmed shrub and tree to 4.5 m. Sap may be thickly milky, may be sparse, has a light resinous odor or none. Trunk & main limbs mottled greenish-gray-dull yellow, bearing some small pale yellow papery peels & a few black chips. Twigs may be pale gray & striate. Short-shoots (2)4-10 x 2-3 mm. Long-shoots dark (purple). Lvs 1.5-5 cm, 5-9-fol. Petiole 0.5-2 cm, (finely puberulent with strongly curved hairs), petiolule distinct in lateral leaflets, 0.5-2 mm, to 4 mm in terminal leaflet. Leaflets in ± remote pairs, (bristly-)puberulent below at least along midrib with small hooked or curved hairs (Gillett in litt 1986 said leaflets of K16934 are glabrous!), orbicular (to reniform in terminal leaflet) to broadly ovate, 3-7 mm, base rounded to cordate, margin (recurved &) with (0)1-4 prs crenations or large blunt teeth; dark (or red) midrib below, 2-4 prs lateral veins, (?)nothing in transmitted light. Male fl with deeply tubular receptacle. Fr unknown. **(3)**

In NE Hiraan Region very local in bushland on sand plain.

Fruit said to be edible and good-tasting. Said to have no gum. May be moderately hedged and rated a good browse for camel and goat.

COMMIPHORA PSEUDOPAOLII Gillett (1991)
C. paolii sensu KTS non Chiov.
K 17176, Gillett et al. 22059, Herlocker S269, Wieland 1697 (& maybe ST1033,1336)

rosi[?] (EA,MOG)
xagar (hagar) (EA)
xagar-jareer (KH)
xuub-cade? (KH)

CR, S, also E Kenya.

Unarmed (or ± armed?) shrub or tree 1-3 m (in Kenya a tree to 6 m); branches may be to ground level or lying on ground; glabrous. Sap clear, resinous parsnip-like odor or faintly resin-scented or odorless. Stems gray or white, peeling in large very pale creamy papery peels revealing pale dusty-looking blue or blue-green. Branches characteristically horizontal i.e. perpendicular, twigs perpendicular, brittle, may be ridged or striate, pseudospinose, ends may fray to spine-sharp points and may be characterized as ‘spiny’. Short-shoots 1-2(6) x 1.2-1.5 mm. Lvs 1-3(6) cm, 3-5(7)-fol. Petiole 0.3-3 cm, can take up half to 3/4 leaf length; petiolule of terminal leaflet 2-10 mm, of laterals 0-0.5 mm. Terminal leaflet to 1.5(2)x laterals, obovate or elliptic to reniform, 2-15[20] mm, margin with (0)2-6 prs (uneven) teeth in distal

half, (seems petiolulate but a very narrowed leaflet base 1-10 mm – FTEA); 2-3 prs lateral veins, maybe very coarse dark network below. Fr stalked, orbicular(-elliptic), 6-8(9) mm, (2-ridged), apiculate. **(7)**

Is this it in ST1156 (R119[?]): Not a commiphora odor. Glabrous. Branches ± white, somewhat striate. Short-shoots to 6(+)x2-3 mm, rough. Lvs 5-7 fol, to 5 cm, petiole & rachis with a narrow deep groove. Petiole to 1 cm. Terminal petiolule to 7 mm, of laterals 1-1.5 mm. Leaflets concolorous but shiny above, subequal, ovate or broadly elliptic-suborbicular, 6-12 mm, apex acute, 0-5 prs crenations, featureless or a couple vague veins above or 3-4 prs thin dark lateral veins incl 1 pr from base dark green below, very dull to opaque in transmitted light.

Mainly subcoastal in CR. In Hiraan Region fairly scarce on sand plain in E Buulo Burte Dist, rare on shallow limestone/silt in W B/B.

In parts of E Kenya, e.g. Garissa area, may be one of the commonest trees. This species is rather well defined in E Kenya but until more complete material is available it is not certain that the Somali material tentatively assigned here is truly conspecific. (JB Gillett in litt 1986)

Gum used for snakebite. Wood for plates, small stools, generally not used for firewood.

Browsed by camel and goat (KH, R.Wieland in EA), moderately or well browsed.

COMMIPHORA SPHAEROPHYLLA Chiov. (1932) 119 & fig.79
C. ellisiae Vollesen (1985) 67 & fig.12

xagar (hagar) (KH7,EA)
xagar-madow (hagar medou) (EA,KH)
xagar-cad (hagar ad) (EA)
ilka cadey (KH)

CR, N, S; also Eth.

Unarmed tree to 7 m (recorded to 10x11 m). Sap clear rarely turning cloudy, with a pleasant definitely sweet resinous odor, or a fairly strong resinous odor but very rarely (if ever?) pungent (strong acrid-resinous in K16878), also reportedly not resin-scented (which does not exclude a scent) (odorless acc to Vollesen which is dubious). Trunk & often main limbs pale creamy green (or yellow) to off-white, bearing large pale yellow (or orange-yellow) to off-white papery peels revealing powdery-looking blue or yellow-blue or yellow-green underbark. Branches dark (black), (may be) slightly zigzag, (may be somewhat brittle), long-shoots felty-puberulent. Short-shoots (2)5-10(25) x (1)1.5(2) mm. Lvs 2-5.5 cm, (3)5-7(9)-fol. Petiole 0.5-2 cm, petiolule (of terminal leaflet to 6 mm, laterals subsessile). Leaflets somewhat discolorous & pale gray-green below, felty-puberulent especially below, terminal leaflet 1-1.3(1.5)x laterals, oblong or obovate-oblong (to orbicular), 0.5-1.5(2.3) cm, margin with (0)3-6(10) prs crenations mainly in distal half or 2/3; (1)2-3 prs lateral veins may be seen above, usually seen below & raised (at least midrib), a dark green network may be visible below; lateral veins & a few outer secondaries (or submarginal veins) clear in transmitted light. (Fls yellow – FS,FE). Fr (on stalk 1-5 mm), (greenish-)purple, ovate-elliptic to suborbicular, somewhat flattened, 6-8 mm (8-10 mm acc to lit), apiculate, 4-lined(?), 2-valved acc to FS. **(31)**

One of the commoner and, thanks to its white bark, most prominent of CR commiphoras. The sweet-smelling sap is characteristic and normally diagnostic. Common in acacia-commiphora bushlands in S Somalia. In S Somalia E of Dhanabo dominant on red soil thick with *Schizachyrium kelleri* (EA).

Frequently exhibits moderate hedging particularly by camel. Some pastoralists do not rate it high in palatability, but others (seemingly in the majority) consider it one of their top browse plants and the best of the commiphoras for camel and goat along with *C. truncata*. Not browsed much by sheep but in very dry times (presumably meaning when there is little grass), lopped to make leaves and fruit available to sheep.

N* Sec. **MONOICAE**

Monotypic section. Unarmed; leaves 3-foliolate. Flowers solitary or in 1-3-flowered pedunculate cymes; calyx fleshy and warted. Pseudaril thin, covering most of endocarp & united with it, dissolving into a number of irregular lobes near top of endocarp.

COMMIPHORA MONOICA Vollesen (1985)

An unarmed tree, ± scandent when young. Known only from a locality in S-C Ethiopia and sufficiently distinct to merit its own section. Mentioned here on the chance that it or similar taxa may turn up in Somalia.

P Sec. **CILIATAE**

Monotypic section. Unarmed; leaves 3-foliolate. Flowers solitary or in 1-5-flowered cymes. Peduncle, pedicel and the 1-1.5 mm calyx with numerous dark red stalked glands or gland-tipped hairs, petals dark red, 4 mm. Fruit partly 4-valved; pseudaril a basal cup with 2 broad unequal facial lobes.

COMMIPHORA CILIATA Vollesen (1985) 50 & fig.5

hablo subke (habla subke, habla subba, habla subka) (KH1,EA,?W) [male]
aynaad (enad, eynat, enat) (EA,W,KH1)
dhuuso madoobe (KH1) [female]
qaroon? (KH)

CR, S; also Eth., NE Kenya.

Unarmed broad-crowned (shrubby) tree 2-7 m [or sprawly shrub 4x5 m]. Sap clear, often runs from cut twig & sprays from bent twig or punctured bark, "sometimes squirting 30 cm when stem pricked." (Wieland 1781) (though Vollesen says it is sparse); strong slightly acrid, ammoniacal, pungent resinous odor (rarely light odor). Bark usually black or charcoal, may be steely gray (or dark purple), usually

(finely vertically) corrugate, limbs usually smooth rarely peeling, (younger stems slightly zigzag); long-shoots felty-hairy but may eventually become glabrous. Young twigs reddish-brown or brownish-purple, striate, densely glandular with numerous dark short stalked glands and with some ciliate hairs 1(3) mm – incl FTEA. Short-shoots (3)5-15(25) x (2)2.5-3(4?) mm. Lvs 2.5-5.5(8) cm, 3-fol., [turning a conspicuous wine-red when old - Gillett 1987]. Petiole 1-3 cm, (may be) glandular-puberulent & also with sparse long erect ciliate hairs. Leaflets subsessile but terminal with petiolule 0-2 mm, felty-puberulent both sides, terminal leaflet 1.3-1.5x laterals (rarely 2x), obovate or orbicular to subreniform, (1)1.5-3(5) cm; 5-8 prs lateral veins, fine dark green network clear in transmitted light. Infl glandular. Numerous dark red gland-tipped hairs on peduncle, pedicel and 1-1.5 mm calyx. Petals dark red, glabrous, 4 mm. Fr on stalk to 3 cm, elliptic, flattened, (9)11-13 mm, ± beaked (or strongly apiculate), 2-lined. **(17)**

Scattered and never locally abundant in Hiraan Region, seen on limestone hills, gypseous silts, limestone/silt mosaic, alluvial flats, basalt. Recorded from valley sands but not seen throughout the sand plains of E Hiraan.

Firewood. Diverse opinions on palatability, from excellent to nil for camel, good to nil for goat, nil rarely fair for sheep.

People eat the hubuk (dried resin). Bark used for coloring calabashes. (Wieland in MOG)

Q Sec. **OPOBALSAMEAE** (subgen. Opobalsamum of Wild 1959)

Unarmed, rarely spiny; leaves pinnate or 3-foliolate. Flowers white or cream, solitary or in few-flowered cymes; calyx with very short broadly triangular lobes, appearing almost square in the fruiting stage. Fruit 4-valved (2-valved in other sections); pseudaril with cuplike basal part, thinner above & covering most of endocarp or differentiated into broad lobes.

This section is marked by the small (4-9 mm), usually reddish-brown fruit whose pericarp shows 4 longitudinal pale or white lines and divides into 4 valves at maturity. The sterile cell of the putamen is usually much narrower than the fertile cell. It is a very natural group and Wild (1959) may be correct in treating it as a subgenus, although some of the characters which he used cannot be accepted.

The section occupies an almost continuous area extending from southern Sind in Pakistan to the Hajaz, SE Egypt and northern Kenya, but all but 3 of the species are endemic to Somalia (10) or Somalia-Ogaden (7). This includes three armed species, two in Somalia and one also in Ogaden. Material for a further potential 9 species has been collected in Somalia, with one also in Ogaden. Thus a potential max of 26 species in this section.

COMMIPHORA ALBIFLORA/VELUTINA

These two species were deemed too similar in the field (in Hiraan Region) to confidently name, and have been combined under the earlier-published *C. albiflora*.

C. albiflora
dhudhus (dhundus) (KH2)
subcane[?] (G) (likely wrong)
erhaktow? (Wo)
qaroon (qoron) (W)

C. albiflora/velutina
dhudhus (dhundus) (KH5)
lugtoole (KH5)
ilka cadde, ilka cadeys (KH2)
saley (KH)

C. velutina
qaroon (goron, garon, gadon) (C,MOG)
qaroon-madow (garon midu) (EA (in Ogaden))
xagar (agag, agarg, hagag, hagarg) (C)
garon gurun (Drake-Brockman 1912)
jawdheer (chaudere) (G)
luuqtoole (luctole) (C)
beyo (Drake-Brockman 1912)
daseino (Drake-Brockman 1912)

COMMIPHORA ALBIFLORA Engl. (1904) 310 & fig.2
C. anfractuosa Chiov. (1932) 99 & fig.60

CR, S, ?N; also Eth.

Large, unarmed shrub or usually small tree to 5 m. Sap clear, strong to ± pungent resinous odor, occasionally light resinous & somewhat sweet; also noted as parsnip-like. Bark brown or usually black, corrugate or vertically platy-furrowed at least toward trunk base, (may be finely scaly); not peeling (FE3). Twigs smooth blackish or charcoal-colored, may be strongly banded in grays and blacks; blue (aquamarine) branches seen; twigs usually zigzag. Long-shoots striate. Short-shoots (1)2-9(12) x (1.5)2-2.5 mm. Lvs 2-6(7) cm, (3)5-7(9)-fol. Petiole (0.5)1-2.5(3) cm; rachis may be narrowly winged; petiolule 0-1 mm in laterals, may seem a few mm in terminal leaflet. Leaflets felty-puberulent or -hairy, oval or oblong to broadly scarcely obovate or orbicular, 0.5-2.5 cm; 3-5(6) prs lateral veins & dark green network seen through hairs below, main veins & network clear in transmitted light. Fls white (FE3). Fr oval-ovoid, 4.5-6 mm (8 mm acc to FE3), apiculate & with 4 white ridges. **(16)**

Some hairs may be curved (doubtfully hooked), and the species may easily be confused with *C. ancistrophora*. According to FS, the type of *C. anfractuosa* has hooked hairs.

Common in CR though not often codominant in the bushlands.

The bark possibly of this species is used for staining wood carvings (Wieland in MOG).

Toothstick.

High rating for camel, good to high for goat, fair for sheep, rarely cattle.

COMMIPHORA VELUTINA Chiov. (1916) 47, (1932) 78 & fig.59 Types from S Som.
C. coronillifolia Chiov. (1932) 101 & fig.61. Type from El Dubbo.
C. suckertiana Chiov. (1934) 7; Drake-Brockman (1912) 313-315 & figs. Type from between Buulo Burte & El Mocoi [sp?].
Not *C. opobalsamum* var. *induta*

Incl G et al 23075,23346,23756

CR, N, S; also E Eth., NE Kenya.

Unarmed tree 2-6 m, less often shrubby, may be scrambly. Sap clear, usually strong pungent resinous odor; very strong-smelling, rather turpentine-scented; (also lightly scented but not sure it's this species). Trunk of mature trees shallowly vertically fissured especially toward base, dark gray to almost black, otherwise trunk & main limbs smooth gray, greenish-white(gray) or black, may bear pale orange or greenish-white papery peels revealing dusty-looking (blue-)green, (& may show a striking light vs. dark gray banding). Branches strongly banded gray-&-charcoal, zigzag. Long-shoots felty-hairy. Short-shoots 0.5-4(6) x 1.8-3 mm. Lvs (1)1.5-5.5(7?) cm, (3)5-9(11)-fol., densely puberulent-hairy (hairs tending erect especially on petiole) & can look somewhat gray, (mostly?) felty at least below, can be rather pale when young. Petiole (0.3)0.5-1.5(2) cm, rachis (may be) narrowly winged. Leaflets subsessile, basal pair (slightly) smaller; obovate-oblong or elliptic-oblanceolate (or suborbicular), 3-11(15) mm, margin entire or with up to 3 prs very low undulations or crenations in distal half (or apically); (0)2-3(4) prs lateral veins, maybe dark green network below, midrib & maybe laterals slightly dull & bordered in transmitted light, a broken network clear in transmitted light. Fls white or pink (FE3). Fr subsessile [on stalk 1-2 mm,] oblong-oval or elliptic, 4-7(8) mm, apiculate, 4-lined, slight lime odor when crushed. **(30)**

It is significant that Drake-Brockman's informants as well as Chiovenda thought that more than one species was involved in the material here placed together as *C. velutina*, and it may well be that this is correct. Less hairy forms such as Drake-Brockman's BEYO or DASEINO could be the result of introgression with *C. gileadensis* [though I find it hard to connect 3-fol *gileadensis* with the 9-fol BEYO of Drake-Brockman]. *C. velutina* and *C. coronillifolia* differ in fruit size, up to 7 mm long in *velutina* but only to 4.5 mm in *coronillifolia*. *C. suckertiana* is the male plant. (JB Gillett in litt 1986)

In FE3, Vollesen treats *C. opobalsamamum* var. *induta* Hutch. & Bruce based on Gillett 4307 as a synonym for *C. coronillifolia* [*C. velutina*] But var. *induta* which seems to be common in Arabia where *C. coronillifolia* does not occur and which never has more than 5 leaflets is better left as a form of *C. gileadensis*.

Common in Hiraan Region. Sometimes difficult to distinguish from *C. albiflora* which has larger leaflets with sparser cover of hairs.

Sticks used as toothbrush; resin probably eaten. Used for coloring calabashes. Very much liked by camel and goat. (R.Wieland in EA) (May be heavily hedged for a commiphora.)

C.albiflora/velutina Highly rated for camel and goat, less so for sheep, one record for cattle.

COMMIPHORA ANCISTROPHORA Chiov. (1932) 111 & fig.70
I have placed Gillett et al. 22620 [but Gillett called it albiflora] and K17107,17262,17264, others here.

dhudhus, dhuusundhuus (dhun-dhus, doondus, dhusundhus, dhuundhas, dhuuso dhuuso, gusungus, dusungus, dus-dus, dundas) (M,MOG,L,C,W,MIS,KH) NOTE: `dhudhus' seems prevalent in the *hawd* and Ogaden, while south of Gaalkacyo the name is `dhuusundhuus'
qaroon-dhudhus (goron dundas) (MOG)
qaroon (garon) (C)
qaasha-qurun (KH1)
caliboy (alioi eh, aliboy, alioi-eh-aliboy) (M,C,MOG)
dhunkaal (M)
sagaarasol (KH)
geed subagle (M)
xabag-dhudhus (habbak-dundas) (C)
uunjir (KH)
hablosubag (KH) This is only gen name, informant couldn't remember specific name.

CR, N, S; also Eth.

Unarmed shrub or tree (0.5)1-6(7) m, tending vase-shaped when mature, with an open crown of a few stout branches. May bear spikelike projections & appear mildly pseudospinose. Sap clear, usually copious, (sticky), flowing or dripping from cut twig, may even spray from slightly bent twig; strong pungent (sometimes pleasant carroty-) resinous odor; (may not flow e.g. K16459). Trunk dark gray to black, (basal portion) vertically (platy-)furrowed or fissured, the rest smooth but narrow pale bands recorded on trunk; papery peels uncommon. Limbs markedly banded in light gray & charcoal, some sections may be dark blue or gray-blue; twigs slightly zigzag, usually striate (younger & medium ones may be distinctly c10-ridged). Short-shoots (2)4-15(20) x (2)2.5-3(4) mm. Lvs (1.5)2-5.5(7) cm, 3-5(7)-fol. (7-9 in Ceel Dheer material). Petiole (0.5)0.7-1.5(2.5) cm, rachis & petiole with typically few (sometimes densely covered with) erect pale yellow hairs some or all having hooked tips, may give slight impression of glandular-hairy; occasionally subglabrous; Kuchar 17264 also has some long cobwebby hairs; petiolule of terminal leaflet 0-7(10) mm, of laterals 0-1 mm. Leaflets glabrous to felty-hairy, orbicular or reniform to oval, terminal leaflet (1)1.2-2x laterals, 0.7-2(4) cm, margin entire rarely with 1-2 prs (subapical) teeth; 2-4(6) prs lateral veins, (fine) dark green network below, clear in transmitted light. Fls white (FE3). Fr oval-elliptic to orbicular, 5-7 mm, 4-lined, apiculate; crushed fruit of K16396 with strong resinous odor with hint of camphor. **(29)**

Material placed here seems diverse and perhaps more than one species is involved. In some populations (S of Gaalkacyo, 5º15' to 5º50'N) the trunk is markedly constricted at the base giving the plant a curiously unstable appearance. In the southern part of its range glabrescent plants approach *C. setulifera* (e.g. Gillett et al. 22381, Thulin 4646). The hooked bristles characteristic of this species are also seen in some others in this section - *C. setulifera*, *C. chiovendana* - though often less conspicuous and mixed with other types of hairs.

Readily distinguished from C. gileadensis and boranensis, e.g. both ancistrophora (K16459) and boranensis (K16460) in the same stand in sandplain bushland NW of Muqokoori, and clearly different.

C. ANCISTROPHORA AFF: K16814b (incl in ST468,?478,490,581) has big stout pseudospines, may be a relatively big tree. Bark dark gray to almost black, smooth, & typically banded, limbs banded black & gray. May have some black scaly bark. Sap with very strong (somewhat carroty) smell, flows, can spray. Lvs 3-5 fol. May be rather heavily hedged. Found in easternmost Buulo Burte Dist. on shallow sands over outcropping limestone.

"Frequent and widespread on gypsum with limestone" (Gillett et al. in MOG).

Fruit edible and plant used medicinally (Cufodontis 1956). The sap kills camelflies if sprayed on them (Glover 1950-51).

Leaves eaten by stock especially camel (Glover 1950-51, Elmi 1983). Highly palatable for camel and goat, moderately for sheep, not cattle.

C. ancistrophora 'A' - markedly densely hooked-hairy petiole & rachis, leaflets may be felty-hairy. --- ST 712,730

COMMIPHORA BORANENSIS Vollesen (1985) 64 & fig.11
C. gileadensis sensu KTS non (L.) C.Chr.
C. sp. = Gilbert et al. 8171 = no.48 in FE (FS)
(Formerly my C. sec. Opob. = K16880 or C. nsp = K16880 or sec. Opob. n.sp.'ironbark')

xiltir (heltier, hiltir) (MOG,EA)
kulul (gulul) (EA)
denkeli, dengela, dengel (EA)
dhudhus, dhudhuso, dhusdhusa, dhudhuse (KH4)
ilka-cadeey (ilk'adess, ilke ades) (EA)
xagar (hagar) (EA) (likely wrong)
goob hareeg (goba herig, guba harig) (EA,B)
sagaarosal (KH)
quwaaxeed (KH)
geed canoole? (KH)

S, CR; also Eth., Kenya.

Unarmed shrub & tree to 7 m. Sap clear (milky in ST1033), odor none or mild resinous-aromatic, rarely/sometimes fairly strong (strong in Kenya material viz. Vollesen 1985, may be strong in Eth material). Trunk may be lumpy & lumps may bear spike-like projections; pale gray to black, or pale becoming blackish, bark may be finely mottled with tiny peels, or with corky black scales or peeling in blackish or bronzy-black scrolls from the copper-colored underbark, (may be slightly corrugated); stems may be rough-lumpy (may be gray with green tinge, or with black-&-gray stripes, or just gray). Short-shoots 0.5-7 x (1)1.5-3 mm, may be abundant along twigs & making them bumpy, and giving a

somewhat rough look. Lvs 1-2(4) cm (6 cm in a Kenya specimen), 3-5 fol. (and never 7-fol acc to main Floras), puberulent to subglabrous, hairs may be very sparse & only on petiole & midrib above. Petiole up to 2x or more leaflet length, 5-30 mm, petiole & rachis may be narrowly winged. Terminal leaflet 1.3-2x laterals, elliptic or obovate, 0.2-2.5 cm, petiolule to 10 mm, that of laterals 0-2 mm, margin with 2-7 prs crenations (in distal half), may look (sub)entire, 'finely serrate' acc to FE; 2-5 prs lateral veins, usually coarse dark network below; main veins may be purple-orange (or red – dry) beneath. Fls yellowish (FS2). Fr on stalk 1-3 mm, oval-elliptic (orbicular), purple, 5-8 mm, 4-lined, apiculate. **(18)**

In most respects very similar to *C. gileadensis* and likely only a form of that widespread species.

In Hiraan Region, fairly common though rarely abundant on shallow limestone/silt mosaic, fairly rare on sand plains. On basaltic substrate in Luuq area, S Somalia (Wieland & Werger 1985).

Resin collected commercially in S Ethiopia as a raw material for incense (Vollesen 1985). Twig used as toothstick. Bark said to make belts. Wood for stools, camel bells, calabashes, spoons, but useless as firewood.

Eaten by camel, has been rated highly palatable, usually highly rated for goat, rarely recognized for sheep.

COMMIPHORA BORANENSIS Vollesen forma vel sp. aff.
(=Gilbert et al. 7652, sp. no. 47 in FE)
Friis et al. 4782

S: 3º07'N 43º22'E; Eth.

Unarmed shrub to c1 m high. [Not unlike C. 'petiolulata' of CR] Bark whitish & with whitish peels. Short-shoots very low. Young stems very finely puberulent, lvs with minute curled hairs at least along petiole & rachis. Lvs 1.5-3 cm, 3-5-fol. Petiole 6-10 mm; terminal petiolule to 4 mm. Leaflets largest terminally, the basal pr usually only 1/2 or 1/3 size; oblong-obovate or broadly oblong-elliptic to suborbicular, 0.7-1.1 cm, margin with 1-3 prs large crenations in terminal half, white midrib & 2-4 prs lateral veins. Fr sessile, suborbicular, 6 mm incl. a 1 mm abrupt apiculus.]

COMMIPHORA `BRACHYCARPA' n.sp. ined.
Gillett & Hemming 24349, Hayslip SRS 126/1
"A very doubtful taxon" (JB Gillett in litt 1988)

S: 3º50'N 43º01'-43º05'E.

Unarmed shrub 2-3 m. Lvs 3-5-fol., at least petiole & rachis puberulent, 1-3 prs crenations, c3-4 prs lateral veins. Fr on stalk 1 mm, broadly ovoid, flattened, 4 mm, apiculate.]

COMMIPHORA CHIOVENDANA Gillett ex Thulin (2000)
(Formerly I called it C. sec Opob. = K16231 or 16120. I have also called it C. aff parvifolia.)
Gillett et al. 21966,22326,22338,22700,23074,23331,23734, Gillett 23074, Gillett & Beckett 23308, Gillett & Watson 23364[var littoralis ined],23381,23396, Kuchar many collections incl type K16129, Elmi & Hansen 4048, Thulin & Warfa 4641, G et al 22391[var capillaris ined; virtually glabrous]
C. parvifolia sensu Chiov. (1932) 102 & fig.62, non (Balf.f.) Engl. True *parvifolia* is known only from Socotra.
C. sp. no.52 in FE3 = Glover & Gilliland 973 (at Eth-Som border).

doofaar-qod (don farrgot) (M,G)
gino-sagaaro[?] (gino sagar) (G)
gabrar (gobran) (G,L)
gabrar guduud (KH)
qaroon (qoron, goron, garon) (W,MOG)
dhasayn, dhaseen, daseino (KH2)
ilka caddeys, ilko cadays (KH2)
lugtoole, lugtoolo, lugtoole-jareer (KH3)
saley (KH)

CR, N; Eth.

Unarmed tree 1-5 m, seen to 6x8 m, rarely shrubby, usually somewhat flat-topped. Sap clear (rarely clouded), strong (even pungent) resinous odor or often light slightly sweet resinous odor. Bark usually shiny gray, less often yellowish- or greenish-gray or olive-brown to dull white, usually bearing a few pale orange-yellow papery peels that may reveal bronzy green underbark, sometimes also bearing (many) black chips. Branches charcoal or blackish-purple, may be banded & zigzag. Short-shoots 1-2(7) x 2 mm. Lvs 1-6 cm, (5)7-15(17)-fol. but at least some lvs with 13 or 15 leaflets; middle leaflets subalternate. Petiole 1-15 mm, rachis winged, usually bristly with straight or usually hooked hairs. Leaflets subsessile, puberulent (to subglabrous), oval-oblong or obovate, 2-8(12) mm, basal pr much reduced, margin entire or with 2-3 prs teeth; 2-3 prs lateral veins, dark network. Calyx with spreading bristly hairs. Fls pale pink (or yellowish - FS). Fr on stalk 0.5-2.5 cm, oval-elliptic or pyramidal, 4-angled, (5)6-9 mm, apiculate, 4-ridged. **(73)**

A very common little tree on sands and silts as well as rocky hillsides. It is widespread and locally codominant in C Somalia in a belt from 3º20'-5º20'N and 45º50'N-48º30'E. In W Ceeldheer Dist codominant in *Vachellia (Acacia) horrida-Commiphora chiovendana* bushland on sand over limestone (Herlocker et al. 1987).

Some plants with rather short fruit stalks have silky fruit - e.g. Gillett et al. 21966,22326,22338. It was thought that these might represent a distinct species (*C. sericeocarpa*) but the difference from normal *C. chiovendana* seems slight. (JB Gillett in litt 1986)

Browsed by stock. High browse rating for camel and goat, sometimes rated moderate to good for sheep.

COMMIPHORA ENNEAPHYLLA Chiov. (1932) 78 & fig.44
Type: Guidotti (1930) from near El Dabbo 3º54'N 44º44'E.

dhunkaal (duncal) (M,G)
qaroon-weyn (garon uen) (G)
qoron (FS2)
lugtoole (KH1,FS)

CR, S.

Unarmed dwarf shrub or shrub to 3 m. Sap clear, with strong (acrid) resinous odor (few records). Stem pale to dark (marbled) gray, may bear (tiny) papery peels; young shoots (may be) reddish-brown & puberulent. Short-shoots 0.5-7 mm. Lvs 0.5-3 cm, 5-9-fol. Petiole 3-12 mm (4-8 mm acc to FS) [see all coll's]. Rachis narrowly winged (the winged condition may be obscure), it & (sometimes) leaflet margin sparsely (densely in S Som – FS) puberulent to subglabrous, (leaflet surface may be very finely obscurely puberulent or pale-dotted but also indicated as glabrous). Leaflets subsessile, subequal or terminal leaflet to 1.5x laterals; elliptic to obovate, 2-10 mm, apex (abrupt-)acute or blunt [see all coll's], margin with 1-3 prs (large) teeth or crenations; 2-4 prs lateral veins & a few secondaries dark below. Fr on stalk c2 cm, broadly ovate-ovoid & perhaps slightly 4-angled, 5-6 mm, apiculate, 4-lined. **(5)**

Kuchar 17141 from 4º04'N 45º15'E seems definitely to represent this species.

Rated good for camel and goat.

COMMIPHORA aff. ENNEAPHYLLA = Wieland 4287
Wieland 4287,4538, Mohamoud & Wieland 4748, ?also here Gillett et al. 22021,22336 (what about 22391? That's under chiovendana)

sagaarosal (W)

C1: 15 km S of Xingod, also Budbud & Wisil, 5-6ºN 48-48º40'E; also 38 km SW of Galkaacyo.

Unarmed dwarf shrub or tree to 2 m, rather intricately branched & somewhat pseudospinose; (bark blackish); branches may be irregular with bulges. Sap clear, strongly resinous (dieselly) odor. Short-shoots 1-4(7) x 0.9-1.6(2) mm, typically numerous (though mostly low, i.e. 1 mm) & giving twigs a rough appearance. Long-shoots reddish-orange (dry), glabrous. Lvs 0.7-2(2.5) cm, 5-7-fol., very sparsely inconspicuously puberulent along petiole & sometimes leaflet, at least some hairs curved [not hooked]. Petiole 3-11 mm. Rachis (narrowly) winged. Leaflets (sub)equal, terminal leaflet may actually be smaller than laterals, obovate or spatulate-obovate, 3-8 mm, laterals seem shortly petiolulate, terminal leaflet narrowing toward base, margin entire or a vague tooth at apex which may be notched; 2-3 prs lateral veins & maybe a coarse network. **(5)**

Gillett et al. 22021 and 22336 from 6º31' and 7º23'N on the main hwy may represent this species but their leaflets are nearly entire (lobed in the type) and the fruit is widest above instead of below the middle; they may represent a form of *C. enneaphylla* or a related undescribed species.

Good browse for camel & goat (Wieland in MOG).

COMMIPHORA GILEADENSIS (L.) C.Chr. (1922)
C. opobalsamum (L.) Engl. (1883) (1912) p.470 & figs.4F-Fc
C. opobalsamum var. *ehrenbergiana* (Berg) Engl.
C. opobalsamum var. *induta* Hutch. & Bruce
Thulin in FS took a broad view and included these as synonyms: **albiflora**, anfractuosa (syn of albiflora), **ancistrophora**, cassan (syn of lobatospathulata), coronillifolia (syn of velutina), suckertiana (syn of velutina), **velutina**, **gillettii**, microcarpa (maybe syn of lobatospathulata). Some of these may have entered into my description of gileadensis which I take s.str.

"In 1764 Linnaeus published *Amyris gileadensis* and *A. opobalsamum* simultaneously. Today all botanists accept that these epithets refer to a single species. The first botanist, so far as is known, to publish this opinion was Oliver in FTA 1: 326 (1868) who treated *Balsamodendron gileadensis* as a synonym for *B. opobalsamum*. In 1922 for some unknown reason C. Christensen published the opposite view treating *Commiphora opobalsamum* as a synonym for *C. gileadensis*. Although no justification has been found for C. Christ's illegitimate reversal of established nomenclature several recent authors have uncritically accepted it. We now know Christensen's reason which is plausible but inadequate – *opobalsamum* must stand." (JB Gillett in litt 1984)

"Dear Kuchar, I have re-examined *Commiphora gileadensis* var. *pubescens* and *C. opobalsamum* var. *induta* and here are the results of my investigations. In 1893 Riva collected his 1851/1054 in 'Ogaden' vernacular name "Haberr". Riva was at Milmil at approx 8°0 N, 43°44' E from 30.12.1872 – 2.1.1893 and later proceeded in a SSW direction. His 1851/1054 must therefore have been collected either at Milmil or S.S.W. of this point. When in April 1893 he reached Dolo and wet gets[?] into Kenya and S. Ethiopia I do not think that he coc. called the country Ogaden. Sprague in June 1914 obtained a scrap of this specimen which is in a capsule at Kew and is labelled by him *C. opobalsamum* var *induta* but he never published this name. The specimen shows fragmentary leaves which are densely hisidulous and apparently 5- or perhaps 7-foliolate, narrow pointed fruits a pubescent calyx and a pubescent fruit stalk under 1.5 mm long. It is clear that Vollesen in 1981 was right to determine this scrap as C. coronillifolia Chiov. (i.e. *C. velutina* Chiov., *C. suckertiana* Chiov.). Later Hutchinson and Bruce applied the name *C. Opobalsamum* var *induta* Sprague to Gillett 4307 from 9°53' N, 44°17' E in N.W. Somalia which Chiov. had determined as C. *ancistrophora* Chiov. This plant has 3-5-foliolate leaves which are sparsely and very shortly pubescent a glabrous calyx and an almost glabrous fruit stalk 1.5-2 mm long. This seems to me the same as Gillett 4144 from 8°47' N, 44°39' E. Both seem to represent a slightly pubescent form of *C. gileadensis* (L.) C. Christ (*C. opobalsamum* (L.) Engl. Such slightly pubescent forms of *C. gileadensis* occur in Southern Saudi Arabia & The Yemen but S they are not the same as *C. gileadensis* var. *pubescens* (Stocks) Gillett ined. which alone occurs in Sind and Dhofar and is also found in S. Saudi Arabia and N & S Yemen which has a much denser rather longer indumentum and is also 3-5-foliolate. I have consulted D.Verdcourt as to how you should proceed in this rather confusing situation. We agree that as var. *induta* has several times been referred to[,] you (and I in FTEA) must deal with it although it is at best a 'nomen nudum'. Under *C. velutina* you should cite as a synonym *C. opobalsamum* (L.) Engl. var. *induta* Sprague m.s. non sensu Hutch. & Bruce (1941). Under *C. gileadensis* you should cite as a synonym *C. opobalsamum* (L.) Engl. var *induta* Sprague ex Hutch. & Bruce (1941) (nomen nudum) non sensu Sprague, and if you wish add as a note "Gillett 4307 and 4144 cited by Hutch. And Bruce (1941) as var. *induta* Sprague and *C. ancistrophora* respectively represent a

slightly pubeescent form of *C. gileadensis* which is intermediate between the glabrous or almost glabrous var. *gileadensis* and the definitely pubescent var *pubescens* (Stocks) Gillett ined. "Found in Sind, Dhofar and Yemen". As you will say it is rather Diabolical. Sincerely Jan B.G." (JB Gillett in litt 11.8.87)

caliboy (aliboye, alioe) (M,G)
dhasayn (daseino, daseno, dossemo, duseino) (M,MOG,G,C)
ilka-cadeey (ilka-cadeys, ilk'aless, ilkacadaiis) (KH2,KTS)
bacaroor-madow (ba aror medu) (G)
uruk? (uruck) (G)
qaroon (goron) (C), (qoron) (FS2)
qaroon-madow (qaroon madoobe, goron-medu, garron medu) (C,EA,KH2)
sagaarasol (sagaarosal, sagarsul) (EA,KH3)
sagaaro salmadow (KH2)
goob hareeg (goba'herig) (KTS,B)
denkel? (dakellah, denhelleh) (KTS)
gabrar (kabraorh) (EA)
dhundhus dabayara? (KH)
hablosubag (KH)
kocadus (KH)

Resin: **xabag-dhasayn** (habbak-dascino) (C)

CR, N, S; also Eth., E Sudan, Arabia, Pakistan.

Unarmed tree 2-6 m, may be shrubby; usually glabrous. Sap clear, light to (fairly) strong resinous odor, rarely somewhat sweet-resinous. Trunk & main limbs dark with black & bronzy peels or chips revealing green or bronzy underbark, also recorded as pale and peeling to reveal green (or white) underbark, rarely with (big) pale orange-yellow papery peels but then at least the limbs have black & bronzy peels; (limbs banded). Twigs characteristically thin & long, (0.5)1-3 dm, scarcely tapered. Short-shoots (0.5)1-5(9) x (1.5)2(3) mm. Lvs 1-2.5 cm, 3-fol. (also 5-fol. outside our area); usually glabrous but rachis & midrib also recorded sparsely puberulent (midrib never puberulent above acc. to Vollesen 1985, but lvs may be puberulent acc to FE3). Petiole (0.3)0.5-1.5(2) cm, can be up to 2x leaflet length; petiolule of terminal leaflet to 6 mm, laterals sessile. Terminal leaflet >laterals, obovate or elliptic to reniform, 4-8(10) mm (to 25 mm acc to FE), margin entire very rarely with 2-4 prs crenations (possibly referable to *C. boranensis* since acc. to Vollesen and FE, *C. gileadensis* leaflet margin always entire); 2-4 prs lateral veins of which 1 pr can be from base, usually a coarse dark green network below, a broken network in transmitted light. Fl pink or red (white or cream acc to FS2). Fr elliptic, 5-7 mm, apiculate, 4-lined, crushed odor of lemon or orange-lemon. **(47)**

A common and characteristic species of the *hawd* bushlands, easily recognized by the peeling black-and-bronze bark. Virtually never in quantity, <0.5% cover at most sites.

Mostly high palatability for camel and goat, rarely sheep.

var. **'PUBESCENS'** (Stocks) Gillett comb. nov. ined.

Balsamodendron pubescens Stocks (1848)
Commiphora stocksiana (Engl.) Engl. (1883) 17; Abedin & Ali, Fl. W. Pakistan (1972) 3
Commiphora opobalsamum (L.) Engl. (1883) (1912) 470 & fig.4F var. *induta* Sprague; Hutch. & Bruce (1941) 136

N; also S Arabia, Pakistan (Sind).

Differs from var. *gileadensis* in being pubescent. There has been some confusion between var. *induta* and forms of *C. velutina*. The former has lvs 1-2 cm, 3-fol, or -5 fol outside our area. Plants with leaves >2 cm and bearing 5 or more leaflets are probably the latter.

Var. *induta* (recorded for Som in K.B. 1941 p136) was never properly published and thus is a nomen nudum. In S Arabia grows with var. *gileadensis*.

Yields Balm of Mecca, also known as Balsam of Gilead, an oleoresin used in incense and perfumes and of some medicinal value (Greenway 1941, Anderson 1956).

COMMIPHORA GILLETTII Chiov. (1941) 135
C. gileadensis acc to FS2
Gillett 4817,23006,23796, Glover & Gilliland 568

qaroon-madow (goron medu) (MOG)

N of 10ºN, from 45º15'-49º10'E. Unarmed shrub.

[see Hutch. & Bruce 1941 for descr]
Unarmed shrub 1-2 m. Lvs 3-fol., petiole 0.5-2 cm, leaflets unusually narrow, c1x0.3 cm.]

COMMIPHORA `GLOVERI' n.sp. ined.
Drake-Brockman (1912) 321 & fig., Drake-Brockman 767, Glover & Gilliland 925, Gillett 22911

hamhamma, hamhameh (Drake-Brockman 1912,G)

N: 8-9º30'N 46-47ºE.

Unarmed shrub 1-2 m, whitish-looking. Lvs 3-fol., almost sessile, leaflets oval, <4 mm long & wide.

COMMIPHORA HORRIDA Chiov. (1932) 87 & fig.51

gabrar (gabra, gobran, garon) (KH8,EA,G)
kabrarro (kabraro) (MOG)
quwaax (gowueh) (EA), qowaah (FS2)
qaroon (MOG), garon(EA or F)

dhiti (KH)

CR, S, also Eth.

Armed singlestem shrub 0.5-2(2.5) m high, with a broad flat-topped or dome-like extremely firm, impenetrable crown. Sap sparse, clear (gummy), with mild resinous odor. Bark gray, bearing pale orange papery peels revealing pale yellow-orange. Twigs stout, spine-tipped, representing stout spines to 15 cm, dark reddish-brown and hairy when young, becoming glabrous. Short-shoots 0.5-4(6) x 2-3 mm. Lvs (1.5)2-6 cm, 3-fol rarely 1-fol in C1. Petiole 0.8-2.5 cm. Leaflets discolorous, ± white-hairy below, terminal leaflet 2-5x laterals, suborbicular or broadly oblong-ovate, 1-3(3.5) cm, margin with c5-13(16) prs somewhat irregular teeth or crenations; midrib & c4-6 prs lateral veins often reddish or orange below. Fr clinging to underside of thick branches on stalks c1 mm long, flattened ellipsoid 4-5x3.5 mm, apiculate, 4-lined. **(25)**

An unusual and important Somalia/Ogaden endemic. Restricted to sands particularly the *hawd* in parts of which it is the leading dominant of bushlands and shrublands, or codominant with *Cordeauxia edulis* and lesser amounts of *Euphorbia cuneata*, *E. longispina* and emergent *Boswellia microphylla*. Very locally dead patches. Locally abundant in valley sands, and uncommon in shallow sands over limestone, but not on limestone hills or soils e.g. throughout W Hiraan Region, nor on alluvium.

The top favorite material for nomads' temporary stock enclosures (mostly for goat). In habitats where common it often provides the sole material used. But according to Aadan Yabaal informants, used only when more densely spiny material such as certain acacias is unavailable.

Toothbrush (MOG).

Very good browse for camel and goat, also good for cattle and sheep according to the majority of informants. It is unusual among the commiphoras to be regularly utilized by cattle and sheep. (It is conjectured that) where it is the dominant in shrublands on *hawd* sands, fallen leaves may be a valuable dry-season feed for cattle and smallstock. Informants note that fallen leaves are regularly eaten by goat, and in dry times also by sheep and cattle.

COMMIPHORA HORRIDA Chiov. var. '**UNIFOLIOLATA'** Gillett ined.
(formerly I called it C. sp aff horrida = G et al 22345)
Gillett et al. 22345,22394, Kuchar 16474(?sterile), Wieland 4696,4280(sterile)

quwaax (qowax) (W)
dililiqo (L)

CR.

Armed prostrate shrub only 2-3 dm high but forming mats to 10 or 15 m diam; heavily armed with interlaced spine-tipped twigs to 10+ cm. Sap clear, with resinous odor. Stems gray to charcoal, puberulent when young. Short-shoots 1-5 x 1.5-2 mm. Lvs simple (1-fol), 0.5-3 cm. Petiole 1-3 mm. Blade somewhat discolorous, can be pale-hairy, can be felty below, broadly oblong (to suborbicular),

margin crenate or ?at least wavy; midrib & 3-4 prs lateral veins conspicuous reddish below. Fr clinging to underside of thick branches, stalk c1 mm; flattened ellipsoid 4-5 mm [or for *C. horrida*?]; 4-lined. **(5)**

Occupies a zone centrally in the CR from extreme E Buulo Burte Dist. to Hobyo. Can be locally abundant and even a dominant of the dwarf-shrub/herb layer. In *Commiphora*, this mat form is not unique to this speces, a couple of others (especially *C. murraywatsonii*) in N or N-C Somalia are very low-growing. However, the intriguing point is that although the prostrate form likely evolved on the windy coastal plains together with other mat-forming endemics such as *Euphorbia* sp. aff. *cuneata*, *Maytenus obbiadensis* and *Grewia cerasifera*, this commiphora is more common in interior bushlands.

Seems low in palatability for camel and shoats; or readily browsed by shoats but not camel, but stock will not step inside the mats therefore leaving most of the production unutilized.

COMMIPHORA KUCHARII Thulin (2000)
C. 'parvifructa' Gillett ined.
Kuchar 16776 (type), 17209,17114,17117,17084 [4 stamens?]; Gillett et al. 22021

lugtoole (luqtoole) (KH5)
luuqtoole-jareer (KH2)
saley (KH1)

CR.S (incl FS2)

Unarmed shrubby tree 3-4 m. Sap clear (possibly becoming slightly clouded), with strong resinous odor (sweet-parsnip in ST650), can flow. Bark black (or brown?) or smooth gray, (may be) scaly or vertically fissured toward base, rest of stems strongly banded in grays; main limbs may bear a few bronzy-orange papery peels. Twigs may be zigzag. Short-shoots (0.5)2-6(10) x 1.5 mm; the preponderantly shorter ones (2-4 mm) often give the twigs a bumpy appearance. Lvs 1-2(2.5) cm, (3)5-9-fol. Petiole & rachis narrowly winged, & with a spare (or fairly dense?) line of bristly hairs some or all of which are hooked (or lvs glabrous e.g. ST883). Terminal leaflet seems petiolulate, the others sessile, leaflets equal or larger toward apex; sparsely puberulent below at least along midrib, oval or oblong-obovate, 1.5-4(6) mm (margin entire or with a slight subterminal tooth); midrib & 2-4 prs lateral veins dark below. Fls white with pale pink (FS2). Fr subsessile, 4-5x3-4 mm. **(5)**

Not uncommon in bushlands on limestone/silt mosaic in W Hiraan Region, usually in small quantities. Also recorded on shallow sands over limestone, and on limestone hills.

Rated a good or very good browse for camel and goat, recorded for sheep.

COMMIPHORA LACERATA Thulin (2006)
Thulin et al. 10597

N (FS3).

Unarmed subprostrate dwarf shrub, leaflets 10-16. Rocky limestone slope, 270 m. Fruit possibly 2-valved hence not sec. Opobalsameae (Thulin 2007).

COMMIPHORA LOBATOSPATHULATA Gillett ex Thulin (2000)
Two forms, armed and unarmed, quite similar except for spine-tipped twigs in former. Also, armed form may be a dwarf shrub to 1(1.5) m whereas unarmed form to 5 m; & apparently armed form with clear sap often with strong resinous odor, whereas unarmed form with sparse sap that may be milky and with very faint or no odor.

C. LOBATOSPATHULATA armed form
(formerly I called it C. nsp aff horrida = G et al. 22377)
Gillett et al. 22377, Gillett & Beckett 23259, Kuchar 16334,16363,16430,16461,17032,17034

dililiq, dililiqo (KH2)
daliliqo dheer (KH)
geed nugayl (KH)
guray? (KH)

CR.

Armed singlestem dwarf shrub 0.5-1(1.5) m in contrast to the unarmed form which is usually >2 m high. Sap fairly abundant, clear, slightly sticky, with (usually) strong & slightly pungent resinous odor. Bark of even the younger branches may peel revealing green underbark. Crown extremely compact, uniform, flat-topped or dome-shaped, may reach the ground, composed of interlaced spine-tipped twigs (1)5-12+ cm. Short-shoots 0.5-5 x 1-2 mm. Lvs (0.7)1-3.5(4.5) cm, 3-fol. Petiole 0.4-1.5(2.5) cm; petiolule of terminal leaflet seems 2-7 mm, laterals (sub)sessile. Leaflets strongly discolorous, pale gray to ± white felty(-looking) below; terminal leaflet 1.3-3x laterals, obovate or obtriangular to reniform, margin with (1)2-5 prs big teeth mainly in distal half; midrib & 2-4 prs lateral veins orange-red or orange-yellow below; (some) network clear in transmitted light. Fr elliptic, 6-7 mm, (strongly) apiculate, with 4 white lines.

A CR endemic related to and in the same habitats as *C. horrida* viz. sand plains but much less common, only locally abundant and mostly <0.5% cover. Locally very abundant on shallow sands over limestone. Never on limestone substrates.

One of the most awkward to collect of all ENE African plants. “The most difficult of plants to collect because it is virtually impossible to avoid stabbing oneself on the needle-sharp spines.” (P.Kuchar in MOG)

For dry fencing. Highly palatable for goat, moderate to high for camel, also recorded for sheep.

C. LOBATOSPATHULATA unarmed form
(Formerly, I called it *C.* aff. *cassan* = Gillett et al. 23284)
?*C. microcarpa* Chiov. (1932) 126 & fig.87

C. cassan Chiov. (1932) 122 & fig.82 (J.B.Gillett (in litt 1984) stated that it seems to agree fairly well with the description of *C. cassan*. FS states that the illustration in Chiovenda 1932 "shows a plant misleadingly drawn with dentate leaflets" (since he placed it under *C. gileadensis* s.lat. whose leaflets are entire), but such are the leaflets of *C. lobatospathulata*.)

Gillett & Beckett 23284,24632, Herlocker S353, Kuchar 16570,17276,17671,(17314), 16739 (maybe *microcarpa*)

fulaay (KH1) [mainly for yellow-barked acacias]
luuqtool (lugtool) (KH1)
sagaarosal (KH1)
bunsug? (KH1)
deytir (KH1)
kasan?(cassan) (C) (C. cassan)
luuqtoole (lug-tole) (EA) (C. cassan)
dalmak[?] (dalmac, dalmach) (G-actually Chiov,C)
ogir?(oggi) (G-actually Chiov)
aynaad (KH) (ok? Refers to C. microcarpa)

CR; *C. cassan* in S at 3º50'N 43º-43º40'E, *C. microcarpa* in S at 3º50'-4º10'N 43º50'-44º45'E & also CR.

Unarmed tree (or shrub) 2-5 m with a relatively small compact (symmetric) crown; may be pseudospinose or with rare spines, or fairly strongly pseudospinose. Sap sparse (may be imperceptible), milky rarely clouded, no odor or very faint (presumably it includes Gillett & Hemming 24620 which is not resin-scented). Bark basically gray, may be mottly gray or brownish-gray, smooth or (more often?) in rough plates, may have pale buff or orange papery or raggedy peels, may reveal green underbark. Twigs pale gray to off-white, pubescent. Short-shoots 2-15 x 2-3 mm [need more data]. Lvs 1.5-3(3.5) cm, 3-fol. Petiole 0.4-1.3 cm, petiolule seems 1-4 mm in terminal leaflet, 0 in laterals. Leaflets usually bullate, discolorous, ± white-cottony (lanate) below, terminal leaflet (1.3)2-3x laterals, elliptic, cuneate-obovat, obovate to ± orbicular, (0.5)1-2 cm, margin recurved, (2)3-6 prs broad teeth or crenations; midrib & (2)3-5 prs lateral veins usually a contrasting pale orange below; fairly fine network clear in transmitted light. Fls red. Fr on stalk 1-2 mm, dark purple, oval-elliptic, (slightly) flattened, 6-9 mm including 1-2 mm beak. At least in *C. microcarpa* pseudaril almost completely covers the putamen. **(14)**

Less common and in equally low amounts as the armed form, uncommon on sand plains, more frequent on stable sandhills to the south of the sand plains in E Hiraan Region. Never on limestone substrates except one possible record from limestone hill.

Twig used as toothbrush (Watt & Breyer-Brandwijk 1962) - see I.F.Cortesi 1936 instead! Twig possibly of this species used as toothstick. Makes a medium-quality toothstick. Twig put in with cooking meat to add flavor. The tree has a bit of gum but useless (according to some), or a lot of edible gum (according to others).

Excellent palatability rating for camel and goat, not browsed by cattle and sheep but all stock eat fallen leaves. Browsed by all antelopes except oryx (i.e. the kudus, gerenuk, dibatag, dikdiks).

COMMIPHORA MULTIFOLIOLATA Gillett ex Thulin (2000)
Wieland 1747,1787

qaroon (qoron) (FS2)
ari-xaytow (FS2)

S: only 2 colls., SW of Lugh at c3°45'N 42°30'E.

Unarmed shrub or dwarf tree. Rachis winged, hairs hooked, leaflets 11-19(23); infl. pedunculate.]

Perhaps a form of *C. chiovendana* (JB Gillett in litt 1986).

COMMIPHORA MURRAYWATSONII Gillett ex Thulin (2000)
Gillett et al. 22185, Wieland 4423

C1: coastal cliffs at 6°01'N 48°58'E

Unarmed subprostrate dwarf shrub; stems striate. Sap?. Younger stems scurfy-puberulent. Short-shoots 2-6 x 3 mm. Lvs densely (softly) felty-hairy, (1)1.5-3 cm, c19-35-fol., vaguely wormlike due to the many close-spaced prs tiny leaflets. Petiole 0-3 mm. Leaflets coarsely bullate, orbicular or broadly oblong-oval, 1.5-2.5 mm. Fr very shortly stalked, 4-angled. **(1)**

Related to the Socotran *C. planifrons* (Balf.f.) Engl., a flat-topped tree 2-4 m with a distinct petiole & 11-21 leaflets which are bullate & not conduplicate as in the Somali taxon.

C. murraywatsonii has more leaflets than any other *Commiphora* and vegetatively much resembles some *Boswellia* species (JB Gillett in litt 1988). Fruit possibly 2-valved hence not sec. Opobalsameae (Thulin 2007).

COMMIPHORA n.sp. aff. **PARVIFOLIA** (Balf.f.) Engl.
Bally & Melville 15461, Beckett 441,611, McKinnon [S]178, Gillett 22901

N: 8°30'-9°32'N and 45°42'-49°18'E.

Unarmed shrub similar to *C. kucharii*. Lvs 5-7-fol., subglabrous or finely puberulent, rachis winged, leaflet margin entire. The rough appearance, due to numerous 1-4(10) mm short-shoots, may be diagnostic.

COMMIPHORA QUERCIFOLIOLA Gillett ex Thulin (2000)
Bally & Melville 15489,15507, Lavranos & Carter 24937

N: near Eil, 7º55'-8º10'N 49º45'-49º50'E.

Unarmed dwarf shrub 0.5-1 m. Bark dark gray; short-shoots 0.5-7 x 1.5 mm. Lvs 3-5(7)-fol., finely puberulent (subglabrous); rachis winged; leaflets markedly toothed or ± incised. Fr on stalk c1 mm, ovate-lanceolate ellipsoid, 6x4 mm, apiculate. **(3)**

COMMIPHORA SETULIFERA Chiov. (1932) 112 & fig.71

The 4 syntypes are from the area 3º50'-4º10'N 43º50'-44º45'E. Kuchar 17173,17178,17192,17223 from W Hiraan Region 3º40'-4º25'N 44º50'-45º15'E also seem to belong here. How about 17206? (Could also try 17262 which is under ancistrophora) Also G&H 24246[24146?] with stiff cilia on petiole, Wieland 1757,1792 though setae much reduced, B&W 1429
May include *C. 'sulcatostriata'*

aynaad (KH)
aynaad-dabayare (KH1)
dhudhus (KH2)
caliboy (alioe) (G)
kadile[?] (cadile) (G)
caliboy-kadile[?] (alio-cadile) (C)
kasan[?] (cassan) (G)
gambiocurae[?] (G)

CR, S.

Unarmed dwarf tree to 3(4) m, may sprawl, crown may droop & branches may touch ground. Sap clear, usually flows & usually (always?) sprays from bent twig, strong resinous slightly acrid to musty odor, pungent slightly acrid, not unlike marigold. Trunk & main limbs (often) knobbly or lumpy & slightly flanged. Wood fairly hard. Bark usually smooth light (steely) gray, sometimes purple or gray-brown (or slightly reddish-brown). Branches gray to chalk-white or dark red or blackish-red. Short-shoots (3)4-10(20) x 2-3 mm. Lvs 2-5 cm, 3-fol. (perhaps rarely 5-fol. on long-shoots? but not acc to FS), glabrous except for a few stiff hairs (some hooked) distally on petiole & usually also on lower part of leaflet midrib. Petiole 1-2(2.5) cm, can exceed leaflets; petiolule of terminal leaflet 3-7 mm, of laterals 1-2 mm. Terminal leaflet 1-1.5x laterals, broadly obovate to orbicular, (0.8)1.5-2.5(3) cm, margin usually with 2-4 prs broad vague crenations, or entire; 3-6 prs lateral veins & fine dark green network below, clear in transmitted light. Male fls in prs on peduncles c10 mm long, petals c4 mm, red, calyx c1 mm. Fr on stalk 2-4 mm, elliptic to oval, flattened, (5)6-7 mm, 4-lined, (strongly) apiculate. **(12)**

Tentatively I include K17206 which Gillett tentatively suggested as *C. microcarpa* (*lobatospathulata*). Tree 5x7 m (bigger than others). Trunk dark gray, vertically corrugate; limbs smooth gray. Sap flows, strong resinous-carroty odor. Long-shoots striate. Short-shoots 7-20+ x 3 mm. Lvs 2-3.5 cm, 3-fol, puberulent. Petiole 1-1.3 cm. Leaflets subequal, (?)1-2 cm, 3-4 prs lateral veins & network. Fls red.

Uncommon in low amounts in bushlands on limestone/silt mosaics in W Hiraan Region. Rare on limestone hills. Rare, in quantity, on sandstone escarpment.

Rated a very good browse for camel and goat, not used by cattle or sheep.

COMMIPHORA SPINULOSA Thulin (2000)

geed boowne (FS2)

N.

Weakly but richly armed dwarf shrub, lvs simple.

COMMIPHORA `SULCATOSTRIATA' n.sp. ined.
Gillett et al. 22379[or ancistrophora?],22496,22559, Herlocker S264,287,342, Elmi & Hansen 4061, Wieland 4125,4143, ?4265,?4698,?4728

dhuusundhuus (dhusundus, dusungus, gusungus) (MOG,W)
xagar (L,KH) (unlikely as this name seems used for white-trunked members of sec Hemprichia – JB Gillett in litt 1988)
beeyo (KH)
sagaarasol (KH)

CR: 3-6ºN 46º30-49'E.

Unarmed shrub or tree to 3.5 m. Sap clear, pungent to somewhat resinous odor, sometimes mild or pleasant, sweet odor, can [rarely?] spray from bent twig. Bark gray, may have horizontal (pale orange or light gray) peels revealing dark green underbark (K16439 which could be this taxon has papery pale buff-yellow peels revealing dusty blue-green, sap with strong but pleasantly pungent resinous odor & sprays). Twigs pale gray, slightly zigzag, noticeably shallowly striate (& slightly lumpy). Long-shoots dull orange (dry), glabrous or puberulent. Short-shoots 1-6(12) x 1.5-2 mm, may give twigs a bumpy look. Lvs (0.7)1-2.5(3.5) cm, 3-fol., puberulent (or hairy). Petiole 0.4-1.0(1.9) cm, petiolule seems to 1-3(4) mm in terminal leaflet, 0-0.5 mm in laterals. Terminal leaflet 1.3-2x laterals, oval or broadly oblong-obovate (to reniform), 4-10(18) mm, apex rounded occasionally acute-mucronate, narrowing at base; 2-4 prs lateral veins & usually dark network below. Fr on stalk 1-1.5 mm, oval, 4-6.5 mm, (prominently) apiculate, 4-ridged. **(17)**

Some affinity to *C. ancistrophora* and *C. setulifera*. Possibly merely a form of *C. setulifera* but lacking the long stiff hairs on the petiole, and the fr is smaller and on a shorter stalk. If the as yet unknown male flowers prove to be ± the same, it should probably be treated as a geographic form of *C. setulifera*. (But there are also other significant differences…)

COMMIPHORA sp. aff. **'SULCATOSTRIATA'** = Wieland 4477
Maybe Wieland 4688

xagar (W)

C1: Kalad, 5º57'N 48º52'E.

Unarmed dwarf shrub resembling *C.* '*sulcatostriata*', note especially the striate branches, but differing in fruit and leaf. Sap with mild resinous odor. Long-shoots dull orange, puberulent. Short-shoots 3-15 x 1-1.3 mm. Lvs 1-2 cm, 3-fol., puberulent. Leaflets suborbicular. 0.8-1.2 cm, apex rounded to truncate, base acute & with any petiolule <1 mm, margin with 1-3 prs very low crenations in distal third; pale midrib prominent below. Fr sessile, 5 mm, apiculate. **(1)**

COMMIPHORA sp. = Kuchar 17300
Gillett & Beckett 23254(sterile), Kuchar 17300(sterile)

dhunkaal (KH1)

CR/S: boundary area, 3º26-38'N 46º03-12'E.

Unarmed shrub 1-2 m, may be vinelike & draped through shrubbery. Cut twig with milky odorless sap, rather copious toward tips. Stems (motley) gray, puberulent when young. Short-shoots 2-15 x 2.5-3 mm. Lvs 1.5-8 cm, (3)5-7-fol., bristly-puberulent & rough, look white-dotted above. Petiole to 3 cm; rachis winged. Leaflets somewhat discolorous, sessile but terminal leaflet narrowing toward base; terminal leaflet 1.5-2x laterals, obovate or elliptic-obovate, 0.7-3 cm, apex rounded or truncate, margin recurved; midrib strongly raised below, (3)4-5 prs lateral veins mostly white & raised. **(2)**

Very local in bushland on sandplain.

Untouched by livestock. Gum used for poisoning ticks.

COMMIPHORA sp. = Wieland 4163

C1: Hobyo.

Unarmed tree 2 m; [glabrous?]. Sap clear, strongly resinous odor. Stems pale gray, branches twiggy, twigs striate & conspicuously covered with short-shoots 3-6 x 1 mm. Lvs 3-7-fol., [margin entire?]. Fr on stalk 1-2 mm, oval-elliptic, 5-6 mm, apiculate.

Near *C.* '*sulcatostriata'* which however is constantly 3-fol. & has distinctly pedicellate fr.

Wieland 4556(sterile) may be near this taxon: shrub, glabrous or virtually so; short-shoots (1)3-8 x 2.5-3 mm; lvs 1-2 cm, 3-5-fol., petiole 3-7 mm, terminal petiolule 1.5-3 mm, leaflet oval to obovate-orbicular, 6-8 mm, midrib prominent below but lateral veins indistinct.

COMMIPHORA sp. = Kuchar R120

?Shrub; younger stems pale gray to off-white, somewhat rough with pustule-like circular brown lenticels 1.5-2 mm diam. Short-shoots rough, 2-10(+?) x 2-2.5 mm. Lvs (1)1.5-3 cm, 3-fol. Petiole puberulent, 0.7-1.8 cm. Leaflets sessile, markedly discolorous, white-wooly below, sparsely puberulent & drying black above, terminal leaflet c1.5-2x laterals, obovate, c1-1.5 cm, margin notably recurved; midrib & 1-2 prs lateral veins impressed above, pink (dry) & raised below, main veins & coarse network fairly clear in transmitted light.

UNASSIGNED AND EXCLUDED TAXA

COMMIPHORA JULIFERA Chiov. (1932) 59 & fig.22

CR: Beledweyne c4º50'N 45º10'E.

doofaar qod, donfaar-qod (donfat got, donfar-got) (M,G,C)

A longstanding taxonomic puzzle, but in 1989 identified by M. Thulin as *Kirkia tenuifolia* (JB Gillett in litt 1989).

COMMIPHORA QUADRICINCTA Schweinf.
Cited in Glover (1947) but not known from any nearer than Eritrea (JB Gillett in litt 1986).

COMMIPHORA RUSPOLII Chiov. (1932) 116 & fig.76
Type Riva (1893) 961 collected on Shabelle R. but well inside Ethiopia c6º20'N 42º45'E.

COMMIPHORA SIMPLICIFOLIA Schweinf.
In Glover 1947. This is *C. habessinica* var. *simplicifolia*, dealt with by Cuf. on p386. Never published and now there's another *simplicifolia*, from Madagascar. Schweinfurth cited 5 syntypes from S. Arabia which represent different taxa. "It is a hell of a muddle." (JB Gillett in litt 1986)

This was put under **C. PSEUDOPAOLII** but puberulence bothers me:
Kuchar 17176 may belong here. Shrubby tree 2 m. Sap odorless. Trunk very white due to creamy papery peels revealing pale dusty-looking blue. Twigs numerous, many perpendicular. Short-shoots 1-6 x 1.2-1.5 mm. Long-shoots striate. Lvs 1-1.5 cm, 3-fol., sparsely puberulent. Petiole 3-7 mm. Leaflets 4-7 mm, crenate.

COMMIPHORA UN.1 [not in key]

Stout gnarled twigs; glabrous. Short-shoots 2-3 mm diam. Lvs 2.5-3.5 cm, 3-fol. Petiole 1.5-2 cm, flared into a broad attachment [unique, if this is *Commiphora*!]; petiolule of terminal leaflet c5-10 mm, laterals c1 mm. Leaflets obovate-orbicular, 1-1.5 cm, margin with a few mucro-like sharply ascending teeth; main veins raised below, fine dark network.

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APPENDIX 1

CHECKLIST OF SOMALIA BURSERACEAE

Only taxa known from Somalia are listed; other species are known outside this country but are excluded. Names proposed but not yet published are in quotation marks. The species of *Commiphora* are arranged alphabetically within their sections. The sections are as defined by Vollesen (1985) except that sec. *Hemprichia* is separated from sec. *Arillopsidium* (*Spondioideae*) [also

Somalia N,C,S as defined by Fig.1 of INTRODUCTION. OG = Ogaden (SE Ethiopia). KE = eastern Kenya as defined by K1 of FTEA, KX = rest of Kenya, T = Tanzania, U = Uganda, Ar = Arabian Peninsula, ot = other geographic regions.

TAXON	NO. LFLTS	SOMALIA N	C	S	OG	KE	KX	T	U	Ar	ot
BOSWELLIA											
B. bricchettii	5-9	x									
B. frereana	9-13(15)	x									
B. globosa	(5)11-21	x									
B. microphylla	3-7(9)	x	x	x	x	x					
B. neglecta	13-31	x	x	x	x	x	?	x	x		
B. occulta	simple	x									
B. ogadensis	7		?		x						
B. rivae	9-23	x	x	x	x	x					
B. sacra	(11)13-19	x								x	
COMMIPHORA											
A section **Rostratae**											
C. rostrata	1	x	x	x	x	x	x				
" var. reflexa 1	1			x	x	x					
B section **Commiphora**											
C. bruceae	1-3	x	x	x	x	x	x	x			
C. chaetocarpa	1-3		x	x	?	x					
C. ellenbeckii	1-3	x	x	x	x	x					
C. ellenbeckii 1&2	1		x								
C. gowllello	1-3	x	x	x	x	x					
C. gracilispina	1	x	x	x	?	x					
C. habessinica	1-3	x		x	x	x	x	x	x	x	
C. hodai	1-3	x	x	x	x						
C. incisa	1-3	x	x	x	x	x					
C. incisa aff.=Kuchar17185	1		x								
C. kua	1-3	x	x	x	x	x				x	x
C. kua aff. = Kuchar 17189	1(3?)		x								
C. lindensis	1-3		x	x		x		x			
C. oddurensis	1	x	x	x	x	x					
C. oddurensis n.sp.aff. = G 22654 (?C. suffruticosa)	1-3		x	x	x						
C. playfairii	1-3	x									

TAXON	NO. LFLTS	SOMALIA N	SOMALIA C	SOMALIA S	OG	KE	KX	T	U	Ar	ot
B* section **Coriaceae**											
C. myrrha	1-3	x	x	x	x	x				x	x
C section **Campestres**											
C. campestris	3(5-7)			x	x	x		x			
" ssp. glabrata	3(5)		x	x	x	x		x			
C. gurreh	3	x	x	x	x	x					
C. gurreh aff. = Kuchar 17278	3		x	?							
C. palmatifoliolata	3			x							
C. paolii aff. = T&W SMP143	3			x							
C. sennii	3		x	x		x	x				
C. serrulata	3	x			x						
C. tenuis aff. = K16915	3		x	x							
D section **Africanae**											
C. africana	3	x	x	x	x	x	x	x	x		x
C. africana aff. = Kuchar 17089	3		x								
C. obovata	1-3	x	x		x	x	x				
C. samharensis	3	x	x	x	x	x	x	x	x		
C. schimperi	3	x	x	x	x	x	x	x	x	x	x
C. tubuk (?=africana)	3	x	x	x	x	x					
E section **Latifoliolatae**											
C. cornii [doubtful taxon]	3		x	x							
C. cyclophylla	3	x	x	x	x	x					
C. cyclophylla aff. (‘cornii’)	3		x	?							
C. erosa	3		x	x	x	x					
C. lughensis	3	x	x	x	x						
C. sphaerocarpa	3	x	x	x	x						
C. sphaerocarpa aff. = Kuchar 17277	3		x			x					
C. sp. = Kuchar 17326	3		x								
G section **Arillopsidium**											
C. drakebrockmanii	1	x									
C. edulis	(3)5-9		?	x	x	x	x	x	x		
C. erlangeriana	(3)5-9	x	x	x	x						
C. guidottii	(1)3-5(7)	x	x	x	x						
C.`macrophylla'	(1)3	x									
C. paolii	(3)5-11(13)		x	x	x	x	x				

	NO. LFLTS	SOMALIA N	C	S	OG	KE	KX	T	U	Ar	ot
C. staphyleifolia	5-7	x	x	x	x						
C. sulcata	(1)3-5	x	x	x							
C. unilobata	(5)7-11	x	x	x	x	x	x				
C. sp. 'H' of EA		x									
M section **Hildebrandtianae**											
C. alata	5-7(9)			x							
C. alaticaulis	3		x	x	x	x					
C. arenaria	3		x	x							
C. corrugata	(1)3-5(7)		x	x	x	x					
C. gardoensis	3	x									
C. hildebrandtii	3(5)	x	x	x	x						
C. ogadensis	3-5(7)	x	x	x	x	x					
C. stellatopubescens	3		x								
C. truncata	3	x	x	x	x						
C. sp. = Kuchar 16503	3-5		x								
N section **Hemprichia**											
C. foliacea	3	x	x							x	
C. foliacea sp.aff. = G 23073	(1)3	x									
C. gorinii	3			x							
C. holtziana ssp. holtziana	3(5)	x	x	x	x	x	x	x	x		
C. holtziana ssp. microphylla	3(5)		x	x		x	x				
C. kataf	3(5)	x	x	x	x	x	x	x		x	
C. kataf ssp. turkanensis	3(5)		x		x	x	x	x			
C. aff. kataf = Kuchar 17290	3		x	x							
C.`petiolulata'	5-9		x	x							
C. pseudopaolii	3-5(7)		x	x		x	x				
C. sphaerophylla	(3)5-7(9)	x	x	x	x						
P section **Ciliatae**											
C. ciliata	3		x	x	x	x					

	NO. LFLTS	SOMALIA N	SOMALIA C	SOMALIA S	OG	KE	KX	T	U	Ar	ot
Q section **Opobalsameae**											
(1) Armed											
C. horrida	3		x	x	x						
C. horrida var. ‘unifoliolata’	1		x								
C. lobatospathulata armed form	3		x								
C. spinulosa	1	x									
(2) Unarmed											
C. albiflora	(3)5-7(9)	?	x	x	x						
C. ancistrophora	3-5(7)	x	x	x	x						
C. ancistrophora aff. = K16814b	3-5		x								
C. boranensis	3-5		x	x	x	x	x				
C. boranensis sp. no. 47 in FE	3-5			x	x						
C.`brachycarpa'	3-5			x							
C. chiovendana	(5)9-17	x	x	x	x						
C. enneaphylla	5-9		x	x							
C. enneaphylla aff. = Wieland 4287	5-7		x								
C. gileadensis	3(5)	x	x	x	x					x	x
C. gileadensis var. pubescens	3(5?)	x								x	x
C. gillettii	3	x									
C.`gloveri'	3	x									
C. kucharii	(3)5-9		x	x							
C. lacerata	10-16	x									
C. lobatospathulata unarmed form	3		x								
C. multifoliolata	11-19(23)			x							
C. murraywatsonii	19-35		x								
C. parvifolia aff. = G 22901	5-7	x									
C. quercifoliola	3-5(7)	x									
C. setulifera	3		x	x							
C. spinulosa	1	x									
C.`sulcatostriata'	3		x								
C.’sulcatostriata’ = Wieland 4477	3		x								
C. velutina	(3)5-9(11)	x	x	x	x	x					
C. sp.=Kuchar 17300	(3)5-7		x								
C. sp.=Wieland 4163	3-7		x								
Position uncertain											
C. sp. 1 [see Key III]											

APPENDIX 2

HOW TO COLLECT *COMMIPHORA*

A. Locality Give latitude, longitude and altitude whenever possible. Although you may know these details future workers using your specimen will not.

B. Soils Besides sand, limestone, alluvium and `black cotton' which are easily detected gypsum is important but difficult to detect. With practice it can usually be recognized if anyone can be found to demonstrate it.

C. Stem characters

Bark (if possible, a sample with specimen), color, peeling or not, relative size and abundance of peels, color of underbark, presence of dark chips.

Multi-stemmed or not.

Any noticeable flanging or angularities; spiky trunk; zigzag branches.

Sap characters in snipped twig or gashed bark: color (basically milky vs. clear), texture (viscous vs. thin and free-flowing), odor (none, faint, moderate, strong, sharp/acrid, anything else obvious).

Presence or absence of spines. This is a very useful key character which can be falsified if not noted and specimens of a spinose species prepared from spineless pieces. Young stems zigzag or straight.

D. Leaf characters Try always to secure leafy material; even in the dry season a dried-up leaf or two can usually be found still attached. Carefully place such leaves in an envelope or packet, though at the same time noting on the label the leaflet number, as dried leaves can break up and be hard to reconstruct. Leaves are vitally important in identification, and every effort should be made to secure them, in addition to some reproductive portion.

Try to note and collect the full range of leaflet numbers on the plant. Leaves scattered singly on long-shoots often but not always have more leaflets than those bunched together on short-shoots.

E. Male inflorescences Found on trees separate from female trees.

F. Fruit It is often helpful to note the size, e.g. 10 * 8 * (2+4) mm where 10 is the length, 8 the width in the plane of the septum, 2 the thickness of the sterile cell (at right angles to the plane of the septum), and 4 the thickness of the fertile cell. The putamen (stone) of this fruit if the pericarp is 1 mm thick would be 8 * 6 * (1+3). The pseudaril is most important and notes and sketches of it most valuable. Unripe fruit if kept in a matchbox for a few days often ripens permitting the pseudaril to be observed.

G. Vernacular names The knowledge which Somali pastoralists possess about their trees and shrubs is extensive and valuable; however, not wishing to seem ignorant some may pretend to more knowledge than they really have. Try to check one against the other - they do not mind this - and to discuss the names with one another.

A feature of Burtt's (1935) paper on commiphoras of Tanzania was his recommendations on collection and preservation. Because he felt that leaf drop in collected material was a serious problem, he emphasized the frequent changing of presses ("The drying papers should be changed every morning without fail") and drying in the hot sun. We have by and large not had that problem with Somali material, possibly because most of the species have much smaller leaves than material with which Burtt dealt. We have found, in line with Burtt, that the relatively very large leaves of *C. unilobata* do indeed tend to break up in the press.

INDEX TO SOMALI NAMES
(Commiphora sections in brackets)

?**abafulla** C. unilobata (G)
afbuq C. gowllello (B)
afgub C. oddurensis (B), C. n.sp. aff. C. oddurensis (B), C. palmatifoliolata (C), C. schimperi (D), C. tubuk (D)
afqub C. tubbuk (D)
angub C. oddurensis (B)
anka C. schimperi (D)
aynaad C. erosa (E), C. ciliata (P), C. microcarpa (Q)
aynaad-dabayare C. setulifera (Q)

bacaroor C. paolii (C), C. erosa (E), C. sphaerocarpa (E), C. drakebrockmanii (G), C. erlangeriana (G), C. longipedicellata (G), C. staphyleifolia (G), C. sulcata (G), C. unilobata (G), C. aff. unilobata (G)
bacaroor-grue? C. erlangeriana (G)
bacaroor-madow C. gileadensis (Q)
balalol OR **balolol** [bacaroor?] C. foliacea (N)
bay-bay Boswellia microphylla, B. neglecta
beeyo Boswellia rivae, B. sacra, C. kua (B), C. corrugata (M), C. 'sulcatostriata' (Q)
beeyo-cad Boswellia rivae, C. corrugata (M)
borah C. edulis (G)
bunsug C. cassan (Q)
bunsur C. hildebrandtii (M)

caanamacays OR **caanammaceeya** C. bruceae (B), C. ellenbeckii (B), C. paolii (C), C. africana (D)
caliboy C. rostrata (A), C. samharensis (D), C. sp.aff. cyclophylla (E), C. ancistrophora (Q), C. gileadensis (Q), C. setulifera (Q)
caliboy-kadile C. setulifera (Q)
ciin-bacaroor C. unilobata (G)

dabacuncun C. palmatifoliolata (C), C. africana (D)
dabar-cad C. africana (D)
dabayaxaas C. alaticaulis (M)
dab-biriq C. edulis (G)
dalat C. kua (B)
dalmak C. microcarpa (Q)
danu C. rostrata (A)
dano-sagaaro C. rostrata (A)
denkel OR **dengel** [dhunkaal?] C. boranensis (Q), C. gileadensis (Q)
dhammaaji C. kua (B)
dhammajo C. incisa (B)
dhasayn [OR **dhasayno**?] C. gileadensis (Q)
dhiddin OR **dheddin** OR **dhadin** C. myrrha (B*); also various armed species with 1-3 leaflets such as C. habessinica (B), C. ?africana (D), C. samharensis (D), C. tubuk (D)
dhiintaar C. ellenbeckii (B), C. incisa (B), C. (?)kua (B), C. aff. kua (B)
dhirindhir C. ellenbeckii (B), C. gracilispina (B), C. kua (B), C. incisa aff. = Kuchar 17185 (B), C. tubuk (D)
dhirindhir xaws C.gracilispina (B)
dhudhus OR **dhuusundhuus** C. gurreh (C), C. erythraea (N), C. kataf (N), C. albiflora (Q), C. ancistrophora (Q), C. boranensis (Q), C. setulifera (Q), C. `sulcatostriata' (Q)
dhunkaal C. erosa (E), C. sphaerocarpa (E), C. aff. sphaerocarpa (E), C. edulis (G), C. drakebrockmanii (G), C. erlangeriana (G), C. guidottii (G), C. longipedicellata (G), C. staphyleifolia (G), C. sulcata (G), C. unilobata (G), C. aff. unilobata (G), C. ancistrophora (Q), C. enneaphylla (Q), C.sp.=Kuchar17300 (sec.unkn.)
dhunkaal-itin C. edulis (G)
dhunkaal-madow C. erosa (E)
dhuuso madoobe C. ciliata (P)
dibyaxaas C. alaticaulis (M)
dililiq C. kua (B), C. lobatospathulata (Q)
dililiqo C. lobatospathulata (Q)
dilindiqo C. incisa (B)
disin-kakabi C. africana (D)
domod C. samharensis (D)
doofaar-qod OR **donfaar-qod** C. `chiovendana' (Q)
dufenud C. oddurensis (B)

eleucadide? C. lughensis (E)
?**enjir** C. gurreh (C)
erhaktow C. albiflora or velutina (Q)

fadnafanole C. hildebrandtii (truncata?) (M)
fullay C. cassan (Q)
fulnoful C. guidottii (G)

gaargey C. gowllello (B)
gabrar C. rostrata (A), C. ancistrophora (Q), C. `chiovendana' (Q), C. horrida (Q)
gadon [qaroon?] C. kua (B)
gagop [gaygab?] C. foliacea (N)
gambiocurae? C. setulifera (Q)

.geed danaan C. rostrata (A)
.geed fogr? Boswellia microphylla
.geed-hawaaleed C. edulis (G)
.[**geed**] **quwaax** C. bruceae (B), C. incisa (B), C. africana (D), C. tubuk (D)
.[**geed**] **subagle** C. sphaeocarpa (E), C. ancistrophora (Q)
.geed-xabaaleed C. edulis (G)
gehai C. sphaeocarpa (E)
gendid C. corrugata (M)
gendigent? C. hildebrandtii (M)
ghorar? C. aff. unilobata (G)
gino[jinow?]-sagaaro C. sphaerocarpa (E), C. `chiovendana' (Q)
goob hareeg C. boranensis (Q), C. gileadensis (Q)
goborosc? C. erlangeriana (G)
gondod C. truncata (M)
gowlallo OR **gawlallo** C. ellenbeckii (B), C. gowlello (B), C. habessinica (B), C. incisa (B), C. kua (B), ~~C. myrrha~~ (B*), C. `simplicifolia' (sec.?)
gumbo weyne C. samharensis (D)
gundod [gondod?] C. stellatopubescens (M), C. truncata (M)
gunre C. ?campestris (C), C. gurreh (C)
gunre cadde C. gurreh (C)
gunre-cadley[cadde?] (gunrey adei) C. indet. (ref. B)
gunre-madobe (guniri modiibe) C. indet. (ref. B)
gunre-madow C. gurreh (C)
gurre Boswellia neglecta, C. gurreh (C)
gurre-cadde C. tubuk (D)

hablo subke C. sp.aff. cyclophylla (E), C. ciliata (P)
hadi C. flabellulifera (C), C. guidottii (G), C. 'macrophylla' (G), C. aff. unilobata (G), C. erythraea (N)
hagar – see **xagar**
hamhamma, **hamhameh** C. ‘gloveri’ (Q)
hammes-sagara C. africana (D)
hangool? C. tenuis (C)
hithi C. erlangeriana (G)
hobla-loho? C. incisa (B)
holbe C. ellenbeckii (B), C. kua (B)
horgooy C. samharensis (D), C. schimperi (D)
hubole [or cf. **xuubley**] C. gowlello (B)
humbawe C. sennii (C)
?**hunbaawe** C. campestris (C)

ilan C. tubuk (D)
ilka-cadeey OR **ilka-caddeys** C. bruceae (B), C. myrrha (B*), C. cyclophylla (E), C. boranensis (Q), C. gileadensis (Q)
itin C. edulis (G)
iyeen C. ellenbeckii (B)

jagcar Boswellia neglecta
jawdheer Boswellia microphylla, C. bruceae (B), C. gowlello (B), C. tubuk (D), C. velutina (Q)
jawle C. erosa (E), sphaerocarpa (E)
jinaw OR **jinow** C. rostrata (A); C. campestris (C) doubtful
jinow sheere C. rostrata (A)

kabrarro [gabrar?] C. gileadensis (Q), C. horrida (Q)
kadile C. setulifera (Q)
kana C. edulis (G)
karen [qaroon?] **karbo** C. incisa (B)
kasan C. cassan (Q), C. setulifera (Q)
kuka OR **kukey** C. lughensis (E), C. gorinii (G)
kulul C. boranensis (Q)
kuru, kura C. campestris (C)

lalagar [xagar?] C. lughensis (E)
libow C. rostrata (A), C. sp.aff. cyclophylla (E)
lufod Boswellia sacra
luubaan Boswellia frereana
luubaan-bedowi Boswellia sacra
luubaan-mayddi Boswellia frereana
luubaan-sheheri Boswellia sacra
luuluaadin C. truncata (M)
luuqtool C. sp.aff. cassan (Q)
luuqtoole C. cassan (Q), C. velutina (Q)
luuqtoole-jareer C. kucharii (Q)

madow Boswellia sacra
mag deeye C. indet. (ref. B)
mala waxarod C. gracilispina (B), C. kua (B)
malmal OR **molmol** C. myrrha (B*)
malmal-cadde C. stellatopubescens (M)
malmal-jinaw C. sennii (C)
maron saneh C. alaticaulis (M)
mayddi Boswellia frereana
meisimbac? C. sp.aff. cyclophylla (E)
midqooli C.(?)ellenbeckii (B), C. kua (B)
mira C. myrrha (B*)
mirafur OR **merafur** Boswellia microphylla, B. neglecta, B. rivae
mirafur-cad Boswellia rivae
mirafur-madoobe Boswellia neglecta
moxor Boswellia frereana, B. sacra, B. neglecta
moxor-cad Boswellia sacra, B. frereana, B. neglecta
moxor-lab Boswellia sacra
moxor-lo' Boswellia sacra
moxor-madow Boswellia sacra

muqle OR **muqlo** Boswellia microphylla, B. neglecta, B. rivae, C. truncata (M)
muqlo-jareer Boswellia neglecta, B. rivae
murjaan Boswellia neglecta
muurjen Boswellia rivae

naxan-reeb C. incisa (B)

ogir C. cornii (E)[cyclo?...]
ogo-malmal C. myrrha (B*)
ombada C. sennii (C)
orah [quraar?] C. rostrata (A)
orldo? C. africana (D)

qadhoon (gadon) C. indet. (refs. C,M)
qaran qaar C. indet. (ref. L)
(?)**qararro** C. guidottii (G)
qaroon Boswellia microphylla, C. samharensis (D), C. ?erosa (E), C. truncata (M), C. ?kataf (N), C. ciliata (P), C. ?albiflora (Q), C. ancistrophora (Q), C, 'chiovendana' (Q), C. gileadensis (Q), C. velutina (Q)
qaroon-dhudhus C. ancistrophora (Q)
qaroon-madow C. gileadensis (Q), C. gillettii (Q), C. velutina (Q)
qaroon-weyn C. enneaphylla (Q)
qoral (or **qaral**) C. lughensis (E), C. sp.aff. cyclophylla? (E)
qudha (guda) C. indet. (ref. B)
quraar C. aff. campestris (‘sabulosa’) (C), C. samharensis (D), C. cyclophylla (E), C. sp.aff. cyclophylla (E)
quraar cad C. aff. campestris (‘sabulosa’) (C)
quraar madoobe C. samharensis (D)
quraar madow C. erosa (E)
quwaax C. bruceae (B), C. gowlello (B), C. incisa (B), ?C. samharensis (D), C. tubuk (D). C. truncata (M), C. horrida (Q), C. horrida var. ‘unifoliolata’ (Q)
quwaax-tibbuk C. gowlello (B)
quwaxeed C. truncata (M)

raxan-reeb C. ellenbeckii (B), C.gracilispina (B), C. incisa (B), C. kua (B)
reymol OR **rimoole** C. oddurensis (B)
roos C. aff. kua (B)
rosi C. pseudopaolii (N)

sagaarasol C. arenaria (M), C. ancistrophora (Q), C. cassan sp.aff. (Q), C. enneaphylla forma (Q), C. gileadensis (Q), C. 'sulcatostriata' (Q)
salmadoobe C. samharensis (D)
shan maalees C. obovata (D), C. samharensis (D)
sheheri Boswellia sacra
subagle C. samharensis (D), C. cornii (E)[cycl?...]
subcane C. albiflora (Q)
surut C. ellenbeckii (B), C. myrrha (B*)

tibbuk OR **tubuk** C. ellenbeckii (B), C. gowlello (B), C. oddurensis (B), C. schimperi (D), C. tubuk (D)

uruk? C. paolii (C), C. gileadensis (Q)
uunsi Boswellia rivae
uur jir (urjir) C. indet. (ref. B)

wacanri C. samharensis (D), ?C.aff kataf =Kuchar17290 (N?)
?**wano** C. schimperi (D)
waraabe C. incisa (B)
waraabe-reeb C. ellenbeckii (B), C. gowlello (B), C. habessinica (B), C. incisa (B), C. kua (B), C. ?africana (D)
waxar-waalis C. kua (B)
wedu C. habessinica (B), C. myrrha (B*)
wongass? C. africana (D)

xabag C. guidottii (G)
xabag-caliboy C. samharensis (D)
xabag-dhasayn C. gileadensis (Q)
xabag-dhudhus C. ancistrophora (Q)
xabag-dhunkaal C. drakebrockmanii (G)
xabag-gowlallo C. gowlello (B)
xabag-gunre C. gurreh (C)
xabag-hadi [xabag-cad?] C. guidottii (G), C. erythraea (N)
xabag-malawaxarod C. kua (B)
xabag-muqle C. truncata (M)
xabag-raxanreeb C. incisa (B)
xabag-tibbuk OR **xabag-tubuk** C. tubuk (D)
xabag-xagar C. hildebrandtii (M)
xabag-xoday C. hodai (B)
xabuboole C. kua (B)
xagar (‘**hagar’**) applied to unarmed white-barked species without a strongly resinous smell and with slender ultimate twigs. This includes all of sec Hemprichia and similar species in sec Hildebrandtiana. Some other species have been named xagar but certainly not correct. When 2 species of this group occur together the paler is **xagar-cad** (‘white xagar’) and the darker **xagar-madow** (‘black xagar’). C. ?ellenbeckii (B), C. kua (B), C. myrrha (B*), C. campestris (C), C. ?africana (D), C. lughensis (E), C. agar (M), C. 'gardoensis' (M), C. hildebrandtii (M), C. truncata (M), C. sphaerophylla (N), C. erythraea (N), C. foliacea (N), C. kataf (N), C. holtziana (N), C. pseudopaolii (N), C. boranensis (Q), ?C.

microcarpa (Q), C. sp.aff. 'sulcatostriata' (Q), C. velutina (Q)
xagar-cad C. africana (D), C. lughensis (E), C. sphaerophylla (N), C. erythraea (N), C. foliacea (N), C. holtziana ssp. kataf (N), C. somalensis (N), C.aff kataf = Kuchar17290 (N?)
xagar-jareer C. erythraea (N), C.kataf ssp. 'turkanaensis' (N)
xagar-madow C. campestris (C), C. serrulata (C), C. africana (D), C. alata (M), C. hildebrandtii (M), C. ogadensis (M), C. truncata (M), C. sphaerophylla (N), C. kataf (N)
xagar-qaroon C. foliacea (N)
xagar-sowar C. hildebrandtii (M)
?**xagarsu** C. erythraea (N)
xanjo-beeyo OR **xaajo-beeyo** Boswellia frereana, B. sacra
xiltir C. edulis (G), C. longipedicellata (G), C. boranensis (Q)
xoday C. bruceae (B), C. hodai (B), C. incisa (B), C. kua (B), C. oddurensis (B), C. myrrha (B*), C. campestris (C), C. sennii (C), C. schimperi (D)
xodley (hodei) C. indet. (ref. B)
xudi C. hodai (B), C. paolii (C), C. sennii (C)
xuubley C. gowlello (B)

yaaq C. africana (D)
yagcar Boswellia frereana
yeye C. erythraea (N)
yobuun-malmal C. myrrha (B*)
yucub C. stellatopubescens (M)

INDEX TO *COMMIPHORA* SPECIES NAMES AND SECTIONS

foliacea N

gallaensis N
"gardoensis" M
gileadensis Q
gileadensis sensu KTS
= boranensis Q
gillettii Q
glabrata = campestris C
GLAUCIDULAE = HEMPRICHIA N
"gloveri" Q
gorinii G
gowlello B
gracilispina B
guidottii G
gurreh C

habessinica B
HEMPRICHIA N
HILDEBRANDTIANAE M
hildebrandtii M
hirtella = sphaerocarpa E
hodai B
holosericea sensu Cuf. non Engl.
= corrugata M
holtziana ssp. holtziana = kataf N
holtziana ssp. `microphylla' N
horrida Q
incisa B

julifera Kirkia tenuifolia

kataf N
kua B
kucharii Q

LATIFOLIOLATAE E
lindensis B
lobatospathulata Q
longipedicellata G
lughensis E

"macrophylla" G
madagascariensis sensu Wild
non Jacq. = habessinica B
microcarpa may = cassan Q
mildbraedii E
molmol = myrrha B*
"multifoliolata" Q
myrrha B*

neumannii = schimperi D

obovata D
oddurensis B
oddurensis sp. aff. B
ogadensis M
OPOBALSAMEAE Q
opobalsamum = gileadensis Q

palmatifoliolata C
paolii C
paolii sensu KTS = pseudopaolii N
parvifolia sensu Chiov.
= chiovendana Q
"petiolulata" N
pilosa = africana D
playfairii B
playfairii var. benadirensis
= myrrha B*
pseudopaolii N
pteleifolia sensu KTS = samharensis

quercifoliola Q

reflexa = rostrata var.
reflexa A
resiniflua = schimperi D
retifolia = erlangeriana G
rivae = myrrha B*
rivae sensu Chiov. non Engl.
= sennii C
robecchii = rostrata A
rostrata A
ROSTRATAE A
ruspolii sec. unkn.

samharensis D
savoiae G
schimperi D
schimperi sp.aff. D
sennii C
serrulata C
sessiliflora = guidottii G
setulifera Q
sphaerocarpa E
sphaerophylla ?= ellisiae N
staphyleifolia G
stellatopubescens M
stocksianum = gileadensis var.
induta Q
suckertiana = velutina Q
sulcata G
"sulcatostriata" Q

tenuis C
tenuis aff. = K16915 C
tephrodes = ogadensis M
terebinthina = samharensis D
trothae = schimperi D
trothai sensu Chiov. = gurreh C
truncata M
tubuk D

unilobata G

velutina Q
virgata Chiov. non Engl.
= sennii C

Table 6. Use categories and numbers of species recorded used among *Commiphora* and *Boswellia* species. (A 2nd line for some categories indicates strong/major usage.)

USES	BOSW	COMMIPHORA SECTIONS												TOTALS
		A	B	C	D	E	G	M	N	P	Q	Oth	Und	
NO. SPP IN NE TROP AFR (3)		8	1	24	11	9	13	16	12	12	1	24	4	135
MEDICINAL	7	1	7	2	3	3	3	1	3		2	1	5+	33
	3		3	1	2	1	1		1					12
POISONS			?				7							7
PEST FUMIGANT, DIP		2	1	3		1		1			1		1	10
RESIN														
INCENSE/PERFUME		3		1		3		2	3		2		1	15
	2										1			3
GLUE				1	1	3	1	1				1	1	8
CHEWING GUM		3			1	2			1			1		8
INK-MAKING		1		1	1									3
OTHER (4)			1	1	1							1		3
SOLD COMMERCIALLY		3		1		2						2		8
EDIBLE PRODUCTS														
FRUIT			?	?	?	?	3				1	2		6+
ROOT/WOOD/LVS			1			2	1	1		1		4	1	10
BARK FOR TEA			1			2				1				4
CHEWSTICK			1			2					4		1	7
WOOD PRODUCTS		2	5	1		5	3	2	2	4		1	2	27
MILK/WATER CONTAINER				4	1	5	1	2	2		1	1	1	17
DISHES, SPOONS				2	2	1	4	1		1		1	1	13
STOOLS, BENCHES		1		3		1		1		1		1	1	9
BEEHIVE/HONEYBARREL				1				2		2		1	1	6
TIMBER/POLES							1	1					3	2+
ORNAMENTS						3	1							4
QURAN BOARD							1		1	1				3
OTHER (5)			1		2	1	1	2	1		1	1	1	11
FENCING														
LIVE	1		5	1	3	3	2		2			4		21
			4		2							2		8
DEAD	1	1	4		1						2			9
			1		1						1			3
FIREWOOD/FIRESTICK		2		2	1	3		2	2		1			13
NOT FIREWOOD				1			2			1		1		5
BARK PRODUCTS (6)		3		1		1				1		2	1	9
BROWSE														
CAMEL	5	1	9	2	3	5	6	5	4	1	11		3+	52
	3		2	1	2	1		3	1		6			19
GOAT	5	1	9	2	3	5	4	5	4	1	9		4+	48
	3		1	2	2	2		1			3			11
SHEEP	4	1	6	1	2	1	1	1	3		3			19
				1	1									2
CATTLE	1		1		1		1		1		1			6
ELEPHANT	1		2	1	2	1	1		1			1	3	10
	1			1	1	1			1			1	1	6
BLACK RHINO				2		2						1	2+	5
				1										1

GIRAFFE	1	1	2	1				1		5
	1	1						1		3
ELAND, KUDU				1	2				2	3
GERENUK, etc.		2		2					2	4
BABOON	1		1		1	1				4
OTHER (7) 1	3		1					2		7

(1) Oth.: Sec. Ugogenses, sec. Pedunculatae, & 2 species presently unassignable to section.
(2) Und.: Undetermined *Commiphora* species.
(3) Aside from a few S African records, virtually all data in this table come from species in NE Trop. Africa especially Somalia, Kenya & Tanzania.
(4) Sealant for waterskins, adhesive/separator in sorghum-winnowing apparatus, soap.
(5) Camel bells (2), fishnet floats (1), troughs (1), game traps (2), sword sheath (1), knife/awl handle (2), quiver (1), saddle (1), threshing stick (2).
(6) Writing paper (1), painting or cleaning calabashes (4), tanning (3), belt-making (1), dye (2).
(7) Porcupine, bushpig/warthog, hyrax.