

*Conservation Assessment
for
Port-hole lichen (Menegazzia terebrata) Hoffm. Massal.*



*USDA Forest Service, Eastern Region
March 2002*



This document is undergoing peer review, comments welcome

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This Conservation Assessment was prepared to compile the published and unpublished information on the subject taxon or community; or this document was prepared by another organization and provides information to serve as a Conservation Assessment for the Eastern Region of the Forest Service. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject taxon, please contact the Eastern Region of the Forest Service - Threatened and Endangered Species Program at 310 Wisconsin Avenue, Suite 580 Milwaukee, Wisconsin 53203.

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ABSTRACT

This Conservation Assessment provides available information regarding *Menegazzia terebrata* (Hoffm.) Massal. (port-hole lichen) and its distribution, habitat, range, status, life history and ecology. *Menegazzia terebrata* can be found on trees in open woods and swamps/bogs from the upper Great Lakes, Southern Ontario, and New England southward in the mountains and foothills to Georgia and Alabama (Flenniken 1999). *Menegazzia terebrata* can also be found in coastal mountain ranges from Alaska to California (Geiser *et al.* 1994). It is Red-listed as a vulnerable species in much of Europe. In the Great Lakes Region common habitat for this species is old growth cedar swamps. It is an R9 Sensitive Species on the Hiawatha and Ottawa National Forests in Michigan and the Superior National Forest in Minnesota. Factors threatening *Menegazzia terebrata* in Minnesota (Wetmore in Coffin 1988) include logging, road construction, overgrowth by mosses, and excessive shade. In the western Upper Peninsula of Michigan the major threat is deer herbivory on cedar, its favored habitat (S. Trull pers. comm. 2001). In addition, this lichen is highly sensitive to air pollution (Geiser *et al.* 1994). This lichen was formerly classified in the genus *Parmelia*, and was known previously as *Parmelia pertusa*.

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Clifford M. Wetmore, Professor, Department of Botany, University of Minnesota

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National Forest Reviewers

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Jan Schultz (Hiawatha), Sue Trull (Ottawa), and Jack Greenlee (Superior)

Herbarium and Heritage Data

We appreciate the sharing of occurrence information for this species from Heritage personnel both in the United States and Canada, along with the helpful assistance of Herbarium personnel. See Contacts section at end of report for a complete list.

Editorial Committee

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Initial Draft

We are grateful to Donna Peppin, contract horticulturist, on the Hiawatha National Forest for her efforts in providing us with an original draft for this Conservation Assessment.

INTRODUCTION

The National Forest Management Act and U.S. Forest Service policy require that Forest Service lands be managed to maintain viable populations of all native plant and animal species. A viable population is one that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its range within a given planning area. In addition to those species listed as endangered or threatened under the Endangered Species Act, the Forest Service maintains a list of species that are Sensitive within each Region (Regional Forester Sensitive Species, RFSS). *Menegazzia terebrata* is on the Regional Forester Sensitive Species list for the Eastern Region for all three of the National Forests on which it occurs. *M. terebrata* occurs on the Ottawa National Forest, and within the proclamation boundary of the Hiawatha National Forest (both in Michigan), it also occurs on the Superior National Forest in Minnesota (USDA Forest Service 2000a).

The objectives of management for such species are to ensure their continued viability throughout their range on National Forest lands, and to ensure that they do not become threatened or endangered because of Forest Service actions. The objectives of this Conservation Assessment are (1) to review and compile currently known information on the biology, status, and distribution of *Menegazzia terebrata*, and (2) to provide the background information necessary to prepare a Conservation Approach, the latter which will include management actions to conserve this species.

NOMENCLATURE AND TAXONOMY

(USDA NRCS Database, W-5)

Family: Parmeliaceae

Scientific name: *Menegazzia terebrata* (Hoffm.) Massal.

Common names: port-hole lichen
magic treeflute
honeycombed lichen

USDA plant code: METE7

Synonyms: *Menegazzia pertusa* (Schrank) Stein
Parmelia pertusa (Schrank) Schaerer
Parmelia sipeana Gyeinik

SPECIES DESCRIPTION

(Flenniken 1999), (Hale 1969), and (Brodo *et al.* 2001)

“*Menegazzia terebrata* is a foliose (leaf-like) lichen which can be recognized by its light mineral gray thallus with inflated puffy lobes, more or less regularly perforated with holes through the upper cortex and medulla into its hollow interior” (Flenniken 1999).

Thallus foliose: pale gray, cream, or greenish gray thallus; paler toward the center; small to medium sized (mostly 2-6 cm broad); appressed, closely flattened to substrate.

Lobes: narrow (mostly 1-2 mm), puffed, hollow, and contiguous.

Upper surface: soreciate, “the soralia bursting from the lobe tips or forming around round perforations” (W-2).

Lower surface: black, brown at the edges, wrinkled.

Rhizines: lacking or absent

Soredia: small clusters, powdery, on ends of erect lobes.

Apothecia: very rare

Lichen chemistry: (Flenniken 1999)

Cortex: Atranorin in cortex; K+ = yellow; P+ = yellow

Medulla: Strictic acid in the medulla; K+ = dark yellow; P+ = orange

Identification notes:

“Once the perforate upper surface is recognized, this lichen will seldom be mistaken. Small individuals with few or no perforations or soredia may be confused with *Hypogymnia sp.*” (McCune & Geiser 1997).

Key Partial (Macrolichens of Maine, W-2)

FOLIOSE; MINERAL GRAY, LOBES BROAD, NEITHER SOREDIATE OR ISIDIATE

- Thallus subfruticose, with sharp reticulate ridges *Platismatia tuckermanii*
- Thallus flattened, with smooth upper surface *Lobaria quercizans*

FOLIOSE; MINERAL GRAY, LOBES NARROW, HOLLOW AND INFLATED

- A. Sorediate; apothecia rare
 - B. Upper surface perforated with holes; soredia capitate *Menegazzia terebrata*
 - B. Upper surface entire
 - Soredia labiform on broad lobe tips *Hypogymia physodes*
 - Soredia ring-shaped on narrow sub-erect lobes *Hypogymia tubulosa*
- A. Nonsorediate
 - B. Lower surface with spongy layer of tomentum; lobes solid *Anzia colpoides*
 - B. Lower surface without spongy tomentum; lobes hollow *Hypogymnia sp.*

DISTRIBUTION AND ABUNDANCE

Menegazzia terebrata is incompletely circumpolar occurring in much of Europe and Asia (China, Russia, and Japan) (Macrolichen project 1996, W-1). The relatively rare genus *Menegazzia* is represented only by *M. terebrata* in the Northern Hemisphere (Hale & Cole 1988, Macrolichen project 1996, W-1). In the western United States, *M. terebrata* occurs in many coastal areas from Alaska to California. In eastern North America it occurs from southern Ontario to the upper Great Lakes Region east to New England, and southward in the mountains and foothills to Georgia and Alabama (Hale 1969). The Appalachian-Great Lakes distribution is also typical for several other lichens of special concern (Wetmore in Coffin 1988). Historically in the United States (1935), *M. terebrata* (*Pamelia pertusa*) was described on tree bark (rarely rock substrate) in New England, Ohio, Minnesota, and Washington (Fink 1935).

In the Great Lakes Region *M. terebrata* has a scattered distribution, mainly associated with bog and cedar swamps (Wetmore 1999), perhaps revealing its oceanic (moist oceanic forests) origin (McCune & Geiser 1997). In southern Ontario, only two modern collections have been made; therefore, it is considered rare in Ontario (Wong & Brodo 1992). *Menegazzia terebrata* occurs in Minnesota in the northeastern counties of St. Louis (historical), Lake, and Cook (10 occurrences, Wetmore 1999), Wisconsin (2 occurrences in 2 counties, W-3; historically 4 sites (Wetmore 2000), and in the Upper Peninsula and the northern Lower Peninsula of Michigan. *M. terebrata* is known from the following counties in Michigan: Alger, Cheboygan, Gogebic, Mackinac, Presque Isle (MNFI 1999) and Houghton (S. Trull pers. comm. 2000) along with Isle Royale National Park in Lake Superior in areas not burned by 1930's and 1940's fires (Wetmore 1985).

HABITAT AND ECOLOGY

Typical habitats for *Menegazzia terebrata* in Europe are swampy older forests, spruce forests, birch forests, pine forests, oak forests, forested scree, aspen stands, and also grazed woodlands (Macrolichen project 1996, W-1). Often this lichen is found near rivers/streams, or maritime habitats. *M. terebrata* grows on rocks in inland areas and on acid bark of deciduous trees in coastal areas (Macrolichen project 1996, W-1). Forest habitats are humid; "*M. terebrata* thrives in areas of daily fog and rain such as lake and ocean shores and in swamps (Wetmore in Coffin 1988). To avoid being overgrown by

mosses in shady forests, *Menegazzia terebrata* requires light, especially in the upper canopy to thrive (Macrolichen project 1996, W-1). On the Superior National Forest in Minnesota many of the sites were fairly open with only 50% shade (Wetmore 2000).

In Norway, *M. terebrata* is known from the lowlands of southern Norway from sea level to 560m. In Sweden, *M. terebrata* is confined to moss-covered rocks or *Alnus glutinosa* bark. In Finland, this lichen is found only on rocks near lakes (Macrolichen project 1996, W-1). In Great Britain this species occurs on heather stems and rocks along the Northwest shoreline (Dobson 1979). In central Europe, common habitat for *Menegazzia terebrata* is old-growth montane *Fagus-Abies* forests (Macrolichen project 1996, W-1). In the European portion of Russia, *M. terebrata* grows only on the bark of *Alnus glutinosa* (Istomina 1993).

Menegazzia terebrata is a forest species of clean air; it is rated as a 10 (the highest rating) in terms of sensitivity to pollution (Geiser *et al.* 1994). In the Pacific Northwest, *M. terebrata* is a coast range lichen of forests or riparian buffers with clean air (McCune & Geiser 1997). “Some lichens are killed by sulfur dioxide at as low as 0.01 parts per million; however, lichens are not sensitive to acid precipitation “ (Wetmore in Coffin 1988). When this lichen occurs on bark, the tree trunk pH has tested at 4.0 to 4.5 (Macrolichen project 1996, W-1). *M. terebrata* demands a more shaded and humid microclimate than *Cetrelia olivetorum*, a lichen species which partially overlaps its distribution in Europe (Macrolichen project 1996, W-1). Substrates for *Menegazzia terebrata* include deciduous trees (in decreasing frequency as found in Europe): *Alnus glutinosa*, *Betula ssp.*, *Quercus spp.*, *Populus tremula*, *Sorbus acuparia*, and *Alnus incana* (Macrolichen project 1996, W-1). Moss covered boulders or rocks are slightly less often the preferred substrate (46%) for this lichen in Europe (Macrolichen project 1996, W-1).

Moss-covered boulders are infrequently the preferred substrate in North America (Fink 1935). In the western United States, *Menegazzia terebrata* occurs along coastal ranges in humid oceanic forests, often on riverbanks; it is even more scattered in occurrence on the western slope of the Cascades (McCune & Geiser 1997). In California, *M. terebrata* occurs on conifer bark and *Myrica californica* (Hale & Cole 1988).

In the Great Lakes Region, *Menegazzia terebrata* survives in the oldest and wettest white cedar bogs as a few scattered individuals on *Thuja* trunks (estimated 200+ years) in relatively open areas with 50% to 60% canopy cover (Wetmore 2000). On Isle Royale *M. terebrata* is found only on the southwest end of the island and offshore islands that were not burned by the fires of the 1930's and 1940's (Wetmore pers. comm. 2001). In Minnesota overstory consists of 9 to 11 meter tall *Thuja occidentalis*, understory tall-shrub is dominated by *Alnus rugosa*, bog floor is dominated by *Sphagnum* and *Carex* species such as *Carex gracillima*, *C. intumescens*, *C. trisperma*, and *C. disperma*. Other rare lichens found at Minnesota sites include *Cetraria aurescens* and *Usnea longissima* (Wetmore pers. comm. 2001). Sue Trull (pers. comm. 1999) made these observations on sites found on the Ottawa National Forest in the western Upper Peninsula of Michigan: only in cedar-spruce swamps, only on *Thuja*, on trunks 6" dbh. or larger, within 6 ft. of the ground; 75% to 90% overstory cover; usually with other lichens, liverworts, and

mosses on the same *Thuja* trunk. Ground cover species at sites: *Sphagnum sp.*, *Cornus canadensis*, *Carex disperma*, *Carex trisperma*, and *Trientalis borealis*.

PROTECTION STATUS

Currently, the official Conservation Status for *Menegazzia terebrata* with respect to federal, state, and private agencies is:

U.S. Fish and Wildlife Rank: NA
Global Heritage Status Rank: G3G4 (1999-06-14)
United States National Heritage Status Rank: N?
Ontario, Canada: S1S3

U.S. Forest Service, R9 Sensitive Species: Hiawatha National Forest and Ottawa National Forest in Michigan, and Superior National Forest in Minnesota.

The Regional Forester has identified it as a species for which viability is a concern as evidenced by: **a)** significant current or predicted downward trends in population numbers or density, and or **b)** significant current or predicted downward trends in habitat capability that would reduce its existing distribution (FSM 2670.5.19).

With a global rank of 3 and 4, and a national rank of ?, The Nature Conservancy lists these ranking as:

G3= the species is either rare or uncommon.

G4= the species is either globally or nationally widespread, abundant, or apparently secure, but with reason for long-term concern.

S1= Extremely rare; typically 5 or fewer known occurrences in the state; may be especially vulnerable to expiration.

S3= Rare to uncommon; typically 21 to 50 known occurrences; not yet susceptible to becoming extirpated in the state.

? = the species is either unranked or has a questionable rank.

- In many states non-vascular plants such as lichens are not ranked. Michigan has not given this species a rank, but they do track occurrences for this lichen (MNFI 1999). Minnesota has 10 occurrences, with 6 on the Superior National Forest (Wetmore 2000). Wisconsin has only 2 known (1970+) occurrences (W-3). Wetmore (pers. comm. 2001) recommends listing for Minnesota, Wisconsin, and Michigan.

Red list categories: Norway: Vulnerable+, Sweden: R (lower risk), Finland: Vulnerable+ to Endangered.

The main purpose of the IUCN Red List is to catalogue and highlight those taxa that are facing a higher risk of global extinction (Critically Endangered, Endangered and Vulnerable) (2000 IUCN Red List, W-6). This is a comprehensive effort. Birds and mammals have been assessed against the 1994 Red List Criteria. The vast majority of plant taxa have not been evaluated against the criteria so their status could be reevaluated (2000 IUCN Red List, W-6).

LIFE HISTORY

“The annual growth-rate of foliose lichens is generally faster than crustose lichens; the thalli reach a maximum size after a relatively short time and then begin to decay”, usually first at the center then towards the margins (Richardson 1974). “The growth-rate of a particular species is not constant but reflects the micro-environment; therefore, a thallus in a favorable habitat will grow faster. For example, the thalli of *M. terebrata* on one tree grew twice as rapidly as others of similar size only a few feet away on a second tree; even individual lobes of the same lichen often grow at different rates” (Richardson 1974). “Growth rate often varies over the life span of a lichen; growth is significantly slower in early juvenile and senile stages and most rapid in the maturing (middle) years” (Ahmadjian & Hale 1973). The early maturing years are the most critical stage for lichens since at this stage it must occupy its habitat as quickly as possible to compete with mosses and other lichens (Ahmadjian & Hale 1973).

After establishment, *Menegazzia terebrata* produces anchoring hyphae within the first month after transplantation (Zoller *et al.* 2000). Initial lobes resembling adult thalli were observed after 16 months on *M. terebrata* contrasted with 8 to 12 months with *Sticta fuliginosa* and *Leptogium saturninum*, two other threatened lichen species. *M. terebrata* can reach a diameter of 6 cm. after about 25 years, but soon after the margins and center of the thallus show extensive erosion indicating the start of senescence (Richardson 1974). For an undetermined number of years at this last stage, lichens do not show any growth increase.

Reproduction is usually asexual, rarely sexual. Method of dispersal when sexual: wind, water, or insects (Wetmore 1999).

POPULATION BIOLOGY AND VIABILITY

In Europe, *M. terebrata* was mapped in 354 mapping units needing attention, but not as seriously threatened as *Letharia vulpina* with just 121 mapped units (Trass 1997). *M. terebrata* is Red-listed as a Vulnerable plant that could become endangered if habitat is not conserved (Red List Categories 1994, W-4) in Norway (88 sites) (W-1), Sweden (rare), and Finland, Vulnerable to Endangered (10 sites) (Kuusinen *et al.* 1993), and the European portion of Russia (Istomia 1993).

Menegazzia terebrata is much more limited in the Great Lakes Region with 10 occurrences in Minnesota (Wetmore 1999), 2 occurrences in Wisconsin (Wetmore 2000), and 10 occurrences in Michigan (4 on the Ottawa National Forest, 3 on Isle Royale, one within the proclamation boundary of the Hiawatha National Forest). In the Great Lakes area this lichen species is found in cedar swamps so their inaccessibility provides some protection. In the long-term this species could be at risk due to lack of *Thuja* regeneration due to deer browse (S. Trull, pers. comm., 2001). In Minnesota, six sites were found on the Superior National Forest in the summer of 1999 within interior portions of old growth *Thuja* bogs (Wetmore 1999). Wisconsin’s population appears to be at risk because of lack of cedar regeneration (USDA Forest Service 2000b).

Compared with other threatened lichens, *M. terebrata* appears to be more sensitive to microhabitat requirements of shade and greater humidity. Wetmore (2000) noted *Thuja* bark substrates in open bogs or swamps with 50 % canopy cover. Its other major requirement is forest aging as it only occurs in very old *Thuja* stands (often 200+ years). It tends to grow in the centers of wet cedar stands several hundred feet from any roads (Wetmore pers. comm., 2001). This lichen normally occurs on *Thuja* bark 3 to 5 feet up from the ground, frequently on live leaning trees (Wetmore 2000). From juvenile to first adult lobes, *M. terebrata* takes somewhat longer to become established, 16 months compared to 8 to 12 months for other threatened lichens (Zoller *et al.* 2000).

Protection of lichens is further complicated by the lack of specially trained botanists to identify this lichen species. Fruiting bodies need to be examined under a compound microscope. Chemical tests are often needed for final determination of species. “There are over 2,800 lichen species in North America north of Mexico. In Minnesota there are over 550 species” (Wetmore in Coffin 1988), so identification can be overwhelming.

Menegazzia terebrata is known from the following federal lands: the Ottawa National Forest (MI), the Superior National Forest (MN), and within the proclamation boundary of the Hiawatha National Forest (MI). This lichen is also found within Pictured Rocks National Lakeshore in Alger County, Michigan (Wetmore 1988) and Isle Royale National Park (Wetmore 1985).

“For *in situ* conservation of endangered lichen species, the transplantation technique of vegetative diaspores has proved to be very useful for the augmentation of small populations without damaging the existing thallus” (Zoller *et al.* 2000). It is suggested that this method be considered to supplement vulnerable populations (Zoller *et al.* 2000).

POTENTIAL THREATS

Logging is the biggest threat to *Menegazzia terebrata* in Finland, Norway, and Sweden where this lichen occurs on a variety of tree barks. Air pollution is a major threat to this lichen species as this lichen is rated as a 10 (highest sensitivity to pollution) (Geiser *et al.* 1994). Wetmore (1999) suggests changes in vegetation structure, climate change, and pollution or toxins are significant risks for this lichen both over the short term (10 yr.), and long term (100 yr). Road construction, overgrowth by mosses, abrasion, and agricultural expansion are also threats to populations of this lichen (Macrolichen project 1996, W-1). Competition with bryophytes, insufficient diaspore dispersal or forest management practice may account for small population sizes (Zoller *et al.* 2000).

In the Great Lakes Region, this lichen species occurs most frequently in old-growth cedar swamps (Wetmore 1999). In Minnesota, much of this lichen’s former habitat was destroyed “by lumbering, agriculture, and city growth with its accompanying air pollution” (Wetmore in Coffin 1988). Currently the main short term threat in cedar bogs/swamps is hydrological change often due to road building and logging. Edge effect is also a major concern. Wetmore (pers. comm. 2001) once found *M. terebrata* within 50 feet of an infrequently used dirt road, but otherwise he has only found it in the centers of

wet cedar stands several hundred feet from roads. Wetmore (pers. comm. 2001) found most of the cedar were hollow so there should be no incentive for logging. When cedar logs are favored over pine and other hardwoods, then logging could become a threat in the eastern portion of the Upper Peninsula of Michigan (J. Schultz pers. comm. 2001). Currently lowland cedar is not logged on the Ottawa National Forest (S. Trull pers. comm. 2001). Over the long term, the lack of *Thuja* regeneration due to deer browse could effect this lichen's distribution (S. Trull pers. comm. 1999).

“Because lichens are slow growing and have very precise environmental requirements, many species occur only in old forests. When a forest is cut, it may take 100 years or more for conditions to become suitable again for some of the lichens” (Wetmore in Coffin 1988). In Britain, where old-growth forests have been left undisturbed for hundreds of years the difference in lichen species is dramatic. Forests less than 200 years old contained fewer than 50 species of lichens. Those left undisturbed for over 200 years usually contained between 120 to 150 lichen species per square kilometer (Rose 1976).

RESEARCH AND MONITORING

In the Great Lakes States, only Minnesota (Fink 1896-1910) has good presettlement data on lichen distribution. Wetmore (1988 in Coffin) visited many of the areas where Fink previously collected and found that some lichen species have disappeared and many others were less abundant than previously.

A thorough study is needed to determine the actual rarity of this lichen. In the Great Lakes States this lichen seems to be limited to old growth cedar; however, habitat in other sections of the country needs to be studied. In the meantime, every effort should be made to prevent further disturbance of old growth cedar swamps that provide habitat for rare circumboreal lichen species.

In general, ecology of lichens has only been studied in the Great Lakes Region by examination of herbarium specimens. For the Canadian Arctic, more detailed information is available on current distribution, ecology, preferred substrate or soil type (Thompson 1984). In Canada where this lichen occurs more frequently it would be useful to monitor the effects of logging and other disturbance near this lichen. An updated version of Fink's (1935) work on the lichens of North America is needed.

SUMMARY

Menegazzia terebrata, formally known as *Parmelia pertusa*, is a lichen for which information is limited for North American populations. Its distribution is as metapopulations over much of its circumpolar range, and is Red-listed as Vulnerable in much of Europe. *Menegazzia terebrata* is especially sensitive to air pollution so it is often used to track air quality changes (Geiser *et al.* 1994, Wetmore 1985, Wetmore 1988). Its habitat seems to be abundant in the Appalachians and along the northwest coast of the United States, but scattered and even threatened from the Great Lakes Region (Wetmore

1999 & 2000) to southern Ontario because of habitat destruction (Wong & Brodo 1992). In the Great Lakes area, *M. terebrata* can be most commonly found in cedar swamps (Wetmore 1999 & 2000). Cedar swamps provide both a wet substrate and a filtered light environment.

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Web Sites

- W-1. Fact sheet: *Menegazzia terebrata* in Norway (Macrolichen project)
 By the threatened macrolichen project – updated November 1996
www.toyen.uio.no/botanisk/bot-mus/lav/factshts/meneter.htm
- W-2. Macrolichens of Maine
<http://members.aol.com/atmane77/page/MAINE5.html>
- W-3. Rare Lichenized Fungi of Wisconsin

<http://wiscinfo.doit.wisc.edu/herbarium/LichenTAB-B.htm>

W-4. Red-List Categories (IUCN) 1994

<http://www.wcmc.org.uk/species/animals/categories.html>

W-5. USDA NRCS Plant Database

<http://plants.usda.gov>

W-6. 2000 IUCN Red List of Threatened Species (Red List Criteria)

<http://www.redlist.org/info/introduction.html>

Web Photo (Stephen and Sylvia Sharnoff)

<http://www.lichen.com/bigpix/mterebrata.html>

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