Synopsis


Based on phytosociological and ecological studies of low-elevation grazed grasslands in northwestern Kyushu and on a comparison of them with related communities, the Zoysia japonica community found in the area studied was recognized as a new association of Zoysion japonicae and was named Centello-Zoysietum japonicae. The association is found only in lowland areas of the warm-temperate region. It is characterized and differentiated from the four associations of the alliance described by SUGANUMA (1966) by the presence of two character species, Centella asiatica and Lespedeza cuneata var. serpens, and by the absence of the character species of SUGANUMA’S four associations.

The Centello-Zoysietum is subdivided into three subassociations: Subass. of Cnidium japonicum, Typical Subass. and Subass. of Arundinella hirta. The first two subassociations are located on coastal areas influenced by salt spray from the sea. The Subass. of Cnidium japonicum is further subdivided into Variant of Aster spathulifolius and Typical Variant. The former variant is restricted to steeper slopes under lighter grazing and trampling by animals, while the Typical Variant and the Typical Subass. occupy gentle slopes and flat sites which are heavily disturbed. The Subass. of Arundinella hirta is found on hills, 1 km to 5 km from the sea.

Received Feb. 13, 1970

* Contribution from JIBP-CT No. 78. This research was partly supported by the special project research "Studies on the dynamic status of biosphere" sponsored by the Ministry of Education.
The Zoysia japonica community is a representative of the continuously grazed grasslands of Japan. It has neither been plowed, fertilized nor sown. Physiognomically, it is of a shorts-grass type, 5 to 15 cm tall, composed of wild grasses, forbs and sedges tolerant to grazing and trampling by animals (ITOW, 1963); phytosociologically, it is named Zoision japonicae (Suzuki and Abe, 1959; Suganuma, 1966), which, so far as was described, comprises four associations, Violo-, Geranio-, Erigeru- and Arundinello-Zoisietum (SUGANUMA, 1966).

The present paper deals with the Zoysia japonica community in lowland areas of north-western Kyushu. The community was first reponed by ITOW (1968) as a Zoysia-type lacking Arundinaria pygmaea var. glabra (dwarf bamboo) from low elevations of the warm-temperate region in Kyushu. NUMATA (1969) described its floristic composition at several stands in the same region with an ecological remark on their extreme habitat conditions.

The present study was made along the phytosociological method of the Braun-Blanquet system, as the first step to gain a comprehensive knowledge about the Zoysia japonica- and Miscanthus sinensis-communities found in many localities and regions that are different in climatic, edaphic and anthropogenic conditions. In the treatment of data, therefore, much attention has been paid not only to grasslands in northwestern Kyushu, but also to those of other regions of Japan, so far as data are available.

Laboratory works of the present study were made at Arbeitstelle fur Theoretische und Angewandte Pflanzensoziologie, Todenmann, Germany, during my stay from November, 1969 to January, 1970. I wish to express my sincere thanks to Prof. Dr. h. c. REINHOLD TUXEN for his valuable suggestions and comments to every phase of the study. Thanks are also due to Dr. K. OKAMOTO, OKAYAMA College of Science, for identification of Carices, and to Messers. M. KONDO, T. NISHIYAMA and T. KAWASHIMO for their assistance in the field.

Outline of the Area Studied

The localities treated in the present paper are situated in northwestern Kyushu, excepting one locality in westernmost Honshu (Fig. 1). Climatically, the area is warm-temperate. The mean annual temperature at Hirado, which is located within the area, is 15.4°C. This value indicates a warmer condition, as compared with the Zoysia japonica grasslands in western Honshu (ITOW, 1963) and those studied by SUGANUMA (1966) which range from 5.2°C to 11.6°C in mean annual temperature. Ecologically, the potential natural vegetation of the area is the evergreen broad-leaved forests dominated by Castanopsis cuspidata var. sieboldii and Machilus thunbergii.

Most of the grasslands studied are located on coastal areas influenced by seawater spray brought by winds, especially by northwesterly winds in winter. Some grasslands, however, are situated on hills, 1 to 5 km from the coastline. The altitudinal range of the grasslands is from 5 m to 300 m above sea level.
Field studies were made in summer from 1967 to 1969.

**Phytosociological and Ecological Description**

The *Zoysia japonica* community in the area studied was recognized as a new association of *Zoysion japonicae* on the basis of its phytosociological comparison with related communities. Details of the community are as follows.

**Centello-Zoysietum japonicae.**

Characteristic species: *Centella asiatica* and *Lespedeza cuneata* var. *serpens*.

Centello-Zoysietum japonicae is a shortgrass type community of continuously grazed grasslands, 5 cm tall in heavily grazed stands and 15 cm tall in less disturbed sites. The ground cover is almost 100 per cent excepting severely trampled stands. The dominant species is *Zoysia japonica*, a chamaephyte which has a compact network of aboveground stolons and rhizomes ca. 1 cm below the ground surface.

The present association is distributed in the lowland areas of northwestern Kyushu (Fig. 1). New localities will be probably found by researches in other regions of similar environmental conditions.

Based on available data, 15.5 species are found in a stand-sample in average, and 100 species were recorded in the 54 stand-samples from 13 localities. These figures may show the simple and homogeneous floristic composition of the community.

The floristic composition of all stand samples treated in the present study is given in Table 1. Presence classes of 20 per cent each (I to V) for each species are also shown at the right-hand of the table. The last column gives the presence classes of species in 90 stand-samples collected from 19 localities of central Kyushu and western Honshu for a comparison with the association under consideration.

As given in Table 1, two character species of the association, *Centella asiatica* and *Lespedeza cuneata* var. *serpens*, occur constantly in the stands studied, but not in the *Zoysia japonica* grasslands in central Kyushu and western Honshu. This is also true of SUGANUMA's (1966) four associations, Violo-, Erigero-, Geranio- and Arundinello-Zoysietum. The following species are absent in Centello-Zoysietum but frequently found in the 90 stands of central Kyushu and western Honshu: *Gentiana scabra* var. *buergerii* (presence class in the latter, IV), *Ranunculus japonicus* (IV) *Geranium, thunbergii* (III), *Agrimonia pilosa* (III), *Lysimachia japonica* (III), *Adenophora triphylla* var. *japonica* (III), *Arundinaria pygmaea* var. *glabra* (III) and *Parnassia palustris* (IV). The first four of the species just cited are treated by SUGANUMA (1966) as character species in some of his four associations. The above-stated floristic features are the prime basis of setting up this new association.

The Centello-Zoysietum is subdivided into the following three subassociations.

1. **Subassociation of Cnidium japonicum**
The Subassociation of Cnidium japonicum is distinguished from the other subassociations by the presence of *Cnidium japonicum*, *Ischaemum anthephoroides* and *Heteropappus arenarius*. These three species are coastal plants and their natural growth is exclusively restricted to specialized coastal habitats, that is, *C. japonicum* and *H. arenarius* on coastal screes and *I. anthephoroides* on sand dunes. They are deformed, more or less, by grazing and trainpling by livestock, when they are found in grazed grasslands. As their presence indicates, the present subassociation is restricted to coastal areas, mostly within 0.3 km from the sea, as schematically shown in Fig. 2, and influenced by sea water spray.

The Subass. of Cnidium japonicum is further subdivided into Variant of Aster spathulifolius and Typical Variant. The former variant is distinguished from the latter by the presence of *Aster, spathulifolius*, *Crepidiastrum lanceolatum* and *Lysimachia mauritiana* (Table 1). They are also coastal species whose natural growth is seen only on coastal screes and cliffs. Two other coastal plants, *Sedum oryzifolium* and *Hedyotis biflora var. parvifolia*, also occur in this variant, though they are not listed as differential species because of their low presence value or rather irregular occurrence. As indicated by their presence, the variant is strongly influenced by salt spray from the sea, and is restricted only within 100 m from the coastline. The physiognomy is somewhat different from the others because of the prominence of *Aster spathulifolius*

Stands of this variant are generally on steep slopes of 10 to 35 degrees (23° in an average) (cf. Table 1). Only steep slopes provide foothold for those coastal plants, since the steep slope is under lighter grazing and trampling by animals, as described in the grasslands of western Honshu (ITOW, 1963).

The Typical Variant of the Subass. of Cnidium japonicum is found both on slopes and on flat sites. The average degree of the slopes of the stands is 8°. (When the first 8 and remaining 9 stands of this variant given in Table 1 are treated separately, the average degrees of the slopes are 16° and 2°, respectively.) Apparently the Typical Variant is more heavily grazed and trampled, as compared with the former. It occupies a larger acreage in coastal grazed grasslands.

2. Typical Subassociation

The Typical Subassociation is also found on coastal areas, within 0.5 km from the sea. It lacks the above-stated coastal species, because of the greater distance from the sea in some stands and of the heavy disturbance by animals in others. The heavy disturbance condition is indicated by the frequent occurrence of *Erigeron sumatrensis* and *Kummerovia striata*, which are common weeds in denuded habitats and along trampled trails. The average degree of the slopes of the stands is 5°.

3. Subassociation of Arundinella hirta

The Subassociation of Arundinella hirta is distinguished from the former two subassociations by the presence of *Arundinella hirta*, *Carex nervata* and *Solidago virga-aurea*. It is found on hills, 1 km to 5 km from the sea, 80 m to 300 m above sea level, which are not, or very little, influenced by
seawater spray even on stormy days.

The present subassociation shows a floristic similarity with SUGANUMA’s (1966) Arundinello-Zoysietum. It is different, however, from the latter by the presence of the two association character species, *Centella asiatica* and *Lespedeza cuneata* var. *serpens*, and the absence of *Gentiana scabra* var. *buergerii*, a character species of the latter.

The two association character species were absent in three stands, although some character species of Alliance, Order and Class occurred there (Table 2). Those stands, however, contain *Plantago asiatica* and *Sporobolus elongatus* which are characteristic to trampled plant communities, Plantaginetalia asiaticae (MIYAWAKI, 1964). The stands, therefore, are thought of as a degraded phase of the Centello-Zoysietum caused by severe trampling.

Discussion: Two stands containing the two character species of the present association have been reported by NUMATA (1962, Tables 4 and 5) from a lightly grazed coastal grassland on the Pacific coast of central Honshu. Those stands are composed of *Zoysia japonica*, *Miscanthus condensatus*, *Ischaemum anthephoroides*, *Imperata cylindrica* var. *koenigii*, together with *Centella asiatica* and *Lespedeza cuneata* var. *serpens*.

NUMATA (1962) described those stands as an example of “precursory type of mesic grassland” from which some of the typical grassland communities are derived. *Miscanthus condensatus* is a representative species of windy coastal natural grasslands influenced by seawater spray. It was found not only in the close vicinity of some grasslands but also in some stands treated in the present study (cf. Table 1). It is probable that the Centello-Zoysietum, especially Subass. of Cnidium japonicum and Typical Subass., are developed when the *Miscanthus condensatus* grasslands, mixed with *M. sinensis* or not, have been used for grazing for long years.

References

3) MIYAWAKI, A. : Bot. Mag., Tokyo, 77,365-374 (1964)
5) --- : Zoysia japonica grasslands at periphery of its distribution, pp. 16, Chiba Univ., Chiba (1969)
摘要
伊藤秀三（長崎大学教養部）：シバ・ツボクサ群集について。
九州北西部・本州西端部の標高300m以下の13地区のシバ草原は、他地域の群落との比較
にもとづいて、シバ・ツボクサ群集と認められた。その発達領域はシイ林域にあり、標徴種ツ
ボクサとハイメドハギにより、シバ群団の他の群集より区別される。
本群集は、ハマゼリ・典型・トダシバ亜群集をふくみ、前二亜群集は塩風の影響をうける海岸
部に発達する。ハマゼリ亜群集は、ダルマギクおよび典型・変群集に区分され、前者は海にも
っとも近くかつ放牧家畜の影響が少ない傾斜地にあり、海岸植物を多くふくむ。典型変群集
および典型亜群集は緩傾斜地ないし平坦地に発達し、家畜による影響が強く、沿岸部放牧草
原の広い面積を占める。トダシバ亜群集は塩風の影響をうけず、1kmないし5km内陸の丘
陵地に発達する。
Fig. 1. Map of northern Kyushu, showing the localities treated in this paper


Fig. 2.

Schematic cross-section from coast to hill, showing the distribution of the communities

A: Subass. of Cnidium japonicum (A1: Variant of Aster spathulifolius, A2: Typical Variant), B : Typical Subass., C : Subass. of Arundinella hirta.
Table 1. Centello-Zoysietum japonicae.

Table 2. *Zoysia japonica* community on heavily trampled sites (Uku Isl.)

For Table1 and Table 2, see [http://ci.nii.ac.jp/naid/110001881395/](http://ci.nii.ac.jp/naid/110001881395/)