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The Morphology of a Vegetatively Proliferating Inflorescence of Kentucky Bluegrass, *Poa pratensis*

S. G. AIKEN[1,2] and S. J. DARBYSHIRE[2]

[1]Biosystematics Research Institute, Agriculture Canada, Wm Saunders Building, Central Experimental Farm, Ottawa K1A 0C6

[2]Present address: Botany Division, National Museum of Natural Sciences, National Museums of Canada, Ottawa, Ontario K1A 0M8

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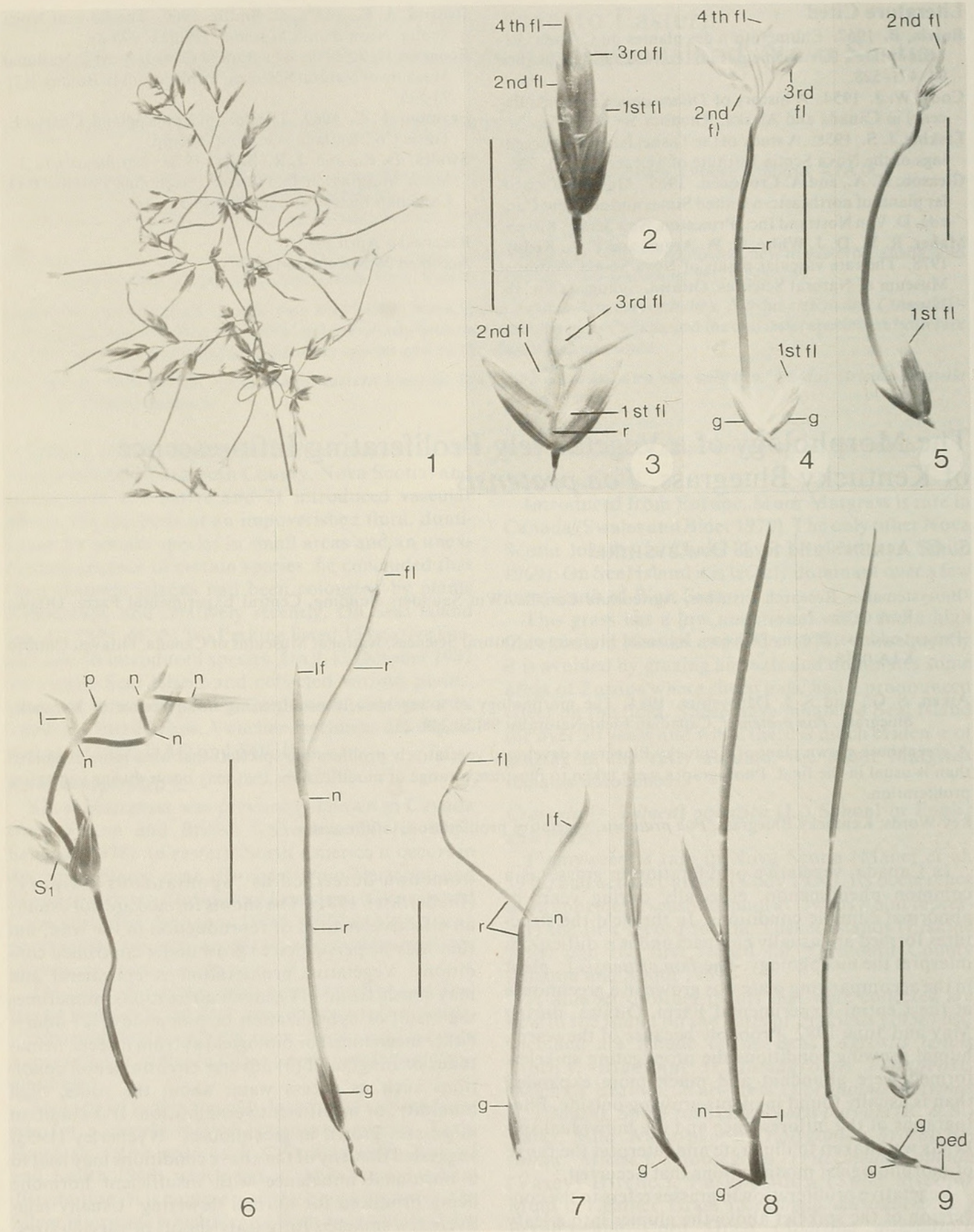
A greenhouse-grown plant of Kentucky Bluegrass developed vegetatively proliferating spikelets that were more expanded than is usual in the field. Photographs were taken to illustrate a range of modifications that may occur during vegetative proliferation.

Key Words: Kentucky Bluegrass, *Poa pratensis*, vegetative proliferation, inflorescenes.

In Canada, vegetative proliferation in grasses is a common phenomenon, especially during years of abnormal climatic conditions. In the field the structures formed are usually compact and it is difficult to interpret the morphology. The *Poa pratensis* L. plant in the accompanying plate was grown in a greenhouse at the Central Experimental Farm, Ottawa, during May and June 1982. Probably because of the warm, humid growing conditions the propagating spikelets formed were abundant and much more expanded than is usually found in plants growing outside. Photographs of the inflorescence and the individual spikelets were taken to illustrate and interpret the range of morphological modifications that occurred.

Vegetative proliferation in grasses refers to the conversion of the spikelet above the glumes into a leafy shoot (Beetle 1980). It has been called ephemeral proliferation (Wycherley 1953) and is probably the phenomenon described as "spontaneous vivipary" (Frederiksen 1981). The shoots formed are not usually an effective method of reproduction in the wild, but they may be persuaded to grow under controlled conditions. Vegetative proliferation is ephemeral and may result from: (1) genetic aberrations, sometimes the result of hybridization or polyploidy; (2) injury, either mechanical or biological as from insects, nematodes or fungi; and (3) adverse environmental conditions such as excess water about the roots, high humidity, or insufficient vernalization. It is common in grasses grown in greenhouses. Wycherley (1953) suggested that any of the above conditions may lead to a hormonal imbalance with insufficient hormone being produced for normal flowering. Usually relatively few spikelets form leafy shoots of varying sizes, resulting in an odd, asymmetrical appearance to an inflorescence.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Vivipary, in contrast with vegetative proliferation, refers to the development of deciduous vegetative propagules or bulbils in the spikelets. It is a genetically controlled, reproductive strategy of a relatively few grass species. In *Festuca vivipara* (L.) Sm., the fresh weight of the bulbils is at least 10 times that of the seeds of the closely related and non-viviparous *F. ovina* L. *sensu lato* (Frederiksen 1981). The bulbils normally develop adventitious roots before they are shed and in favorable conditions new plants develop rapidly. Only rarely does the lowest floret of the spikelet develop functional sexual organs. Almost every spikelet on the inflorescence will form bulbils of more or less similar morphology, resulting in a relatively uniform leafy appearance.

Vivipary is also used to refer to the germination of an embryo *in situ* before the seed falls, and without any dormancy period (Pope 1949). It has been observed in tropical bamboos, but has not been reported for any Canadian grass.

Beetle (1980), in a paper on vivipary, proliferation and phyllody (the metamorphosis of spikelet bracts, glumes, lemmas or paleas into leaves), presented an annotated list of more than 90 taxa of grasses where inflorescence variants have been recorded. Most of the taxa listed have spikelets with indeterminate growth. The list includes several species of *Poa* and seven references to *Poa pratensis*. All the references are European and none contain a diagram or photographs of the condition referred to.

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FIGURE 1. An inflorescence of Kentucky Bluegrass showing many spikelets undergoing vegetative proliferation. Actual size.

FIGURE 2. Young spikelet with four florets.

FIGURE 3. Spikelet with three florets at anthesis.

FIGURE 4. Spikelet with extensively elongated rachilla. At the base are the two glumes and a floret at anthesis. Between the first and second floret (also at anthesis) the rachilla internode has greatly elongated. Beyond the second floret is a third floret in bud and a fourth vestigial floret.

FIGURE 5. Similar to 4. The rachilla has elongated between the first and second florets. To the left of the second floret the rachilla is extended in a confused structure that has three scales which may represent reduced lemmas of vestigial florets.

FIGURE 6. A branch of the inflorescence bearing two spikelets. Spikelet S_1, to the left, has undergone only slight vegetative proliferation. In the other spikelet the rachilla has greatly elongated and vestigial florets, consisting of a leafy lemma and palea, have formed at the nodes.

FIGURE 7. In both spikelets the elongated rachilla has given rise to a vegetative leaf at the first node above the glumes and an apparently terminal floret at the second node.

FIGURE 8. Two vegetatively proliferating spikelets with glumes and one lemma at the base. The rachilla of the spikelets has undergone phyllody and formed a culm with developing leaves. A node is visible at the base of the culm in the right hand proliferating spikelet.

FIGURE 9. Right, normal spikelet; left, spikelet that has undergone almost complete vegetative proliferation. The floral origin is apparent by the pedicel of the spikelet and the two glumes.

Abbreviations, fl = floret, g = glume(s), l = lemma, lf = leaf, n = node, p = palea, ped = pedicel, r = rachilla, s = spikelet. Scale bar = 10 mm.

Photographs by C. E. Beddoe. Voucher specimen at Department of Agriculture herbarium, Ottawa.