

**MELIGETHES VIRIDESCENS (F.) (COLEOPTERA: NITIDULIDAE) IN
MAINE, NOVA SCOTIA, AND PRINCE EDWARD ISLAND: DIAGNOSIS,
DISTRIBUTION, AND BIONOMICS OF A PALEARCTIC SPECIES
NEW TO NORTH AMERICA**

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Abstract.—One of the common “blossom” or “pollen” beetles (Nitidulidae) of the Palearctic region, *Meligethes viridescens* (F.), is reported for the first time from North America. Adults were collected in June 1993 and 1995 in Maine (USA) and in July 1994 and 1995 at several localities in Nova Scotia and Prince Edward Island (Canada). This immigrant species, a known pest of brassica-type cruciferous crops (oilseed rape), is diagnosed and redescribed. A habitus photograph of the adult and other principal morphological characters that facilitate its identification are provided. Its known distribution and habitat in North America, interception records at North American ports, host plants, seasonal history, and economic importance are summarized. An existing key to the North American species of *Meligethes* is modified to include *M. viridescens*. The historic and current status of the similar *M. aeneus* in North America is also discussed.

Key Words: Coleoptera, Nitidulidae, *Meligethes viridescens*, pollen or blossom beetles, North America, distribution, bionomics

The Canadian Maritime Provinces and Newfoundland have yielded more records of adventive species of insects than any other region of North America. The port city of Halifax, Nova Scotia, is especially noteworthy for its rich immigrant fauna (Brown 1940, 1950, 1967, Lindroth 1957, Turnbull 1979, Hamilton 1983, Morris 1983, Wheeler and Henry 1992). Recently reported Palearctic insects occurring in the Canadian Maritimes include the nabid bug *Himacerus apterus* (F.) in eastern Nova Scotia (Larivière 1992), the weevil *Apion hookeri* Kirby in northern Nova Scotia (Peschken et al. 1993), the micropezid fly *Micropeza corrigiolata* (L.) in New Brunswick (Hoebeke and Wheeler 1994), and the pteromalid *Pteromalus elevatus* (Walker), a parasitoid

of a knapweed gall fly, in Nova Scotia, New Brunswick, and Newfoundland (Hoebeke and Wheeler 1996).

We report herein the first known occurrence in North America of the Palearctic nitidulid *Meligethes viridescens* (F.). We observed numerous beetles attracted to the inflorescences of wild radish or charlock [*Raphanus raphanistrum* (L.)] growing along the upper shoreline at various coastal localities in Nova Scotia and Prince Edward Island in July 1994 and 1995; additional specimens were collected along the shoreline at Lincolnville (Waldo Co.), Maine, in late June 1993 and early June 1995.

DIAGNOSIS AND DESCRIPTION

From all other metallic green or bluish species of the genus *Meligethes* occurring

in North America [*M. aeneus* (F.) and *M. simplipes* Easton], *M. viridescens* can be readily distinguished by the presence of a subapical tooth along the posterior margin of the middle femur (Fig. 1); the other species lack this subapical tooth.

Meligethes viridescens agrees with characteristics of the genus as described by Parsons (1943), Easton (1955), and Audisio (1993), and can be additionally characterized by the following description taken (in part) from Audisio's monograph:

Body elongate-oval, moderately convex (Fig. 2), shining, color extremely variable, the great majority of specimens dark green with strong metallic luster, frequently blue, sometimes violet, rarely blackish, bronze, copperish or goldish. Legs and mouthparts yellowish or orange-yellow, proximal antennal segments uniformly yellowish. Pubescence fine, short and sparse, silver or yellow, somewhat uniformly distributed. Punctuation of the dorsal portion of the body somewhat coarse and conspicuous, with the diameter of punctures about equal to $2\times$ that of an ommatidium (of the compound eye), and each puncture separated $0.5\text{--}1.5\times$ their own diameter; punctuation of head in general finer and denser, while more coarse and scattered on elytra. Dorsal surface between punctures often with microreticulations, generally dull in appearance; surface sometimes smooth and glossy, microsculpture variable among populations. Length 2.0–2.9 mm.

Pronotum transverse, somewhat feebly arcuate laterally, with maximum width at the middle. Scutellum somewhat conspicuous, semicircular. Elytra elongate, in general subparallel or feebly oval, distinctly wider than pronotum at base, humeri distinctly angulated. Mesosternum with longitudinal median carina, not attaining posterior margin. Metasternum of male with weak triangular impression along posterior margin, less distinct in female.

Middle and posterior femora relatively large and robust; anterior femur more narrow and feebly undulate along anterior mar-

gin, without evident tooth near insertion with trochanter; middle femur very characteristic, a strong dentiform tooth along posterior margin near apex (Fig. 1); anterior tibia moderately long and narrow, finely denticulate along external margin.

Male and female genitalia are described and illustrated fully by Audisio (1980, 1993).

In habitus (Fig. 2) and other principal morphological features, *M. viridescens* is most similar, and probably closely related, to *M. czwalinai* Reitter, a montane species occurring in south-central Europe. Detailed descriptions and illustrations of the immature stages of *M. aeneus* and *M. viridescens* and a diagnosis for distinguishing the larvae of both species are provided by Fritzsche (1955) and Osborne (1965).

Easton's (1955) key is modified below to provide the primary characters to distinguish *M. viridescens* from other species of *Meligethes* occurring in North America.

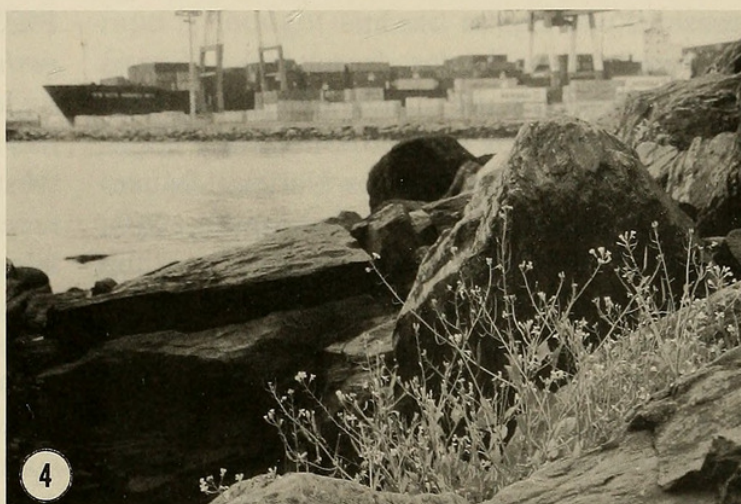
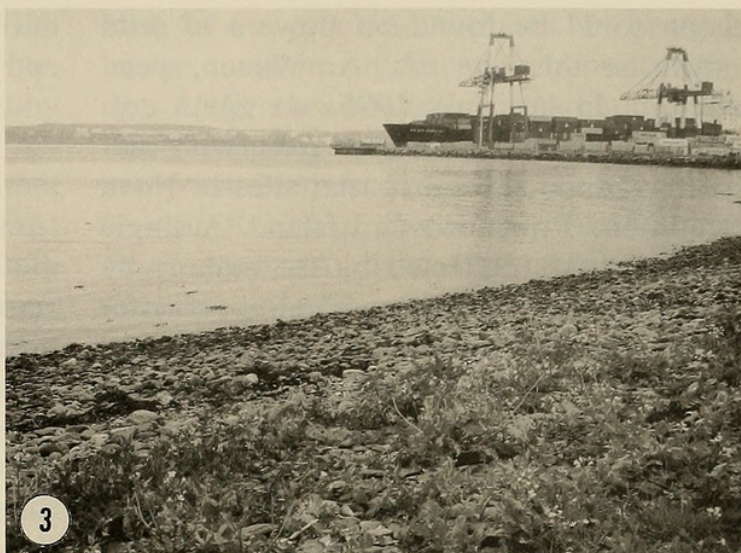
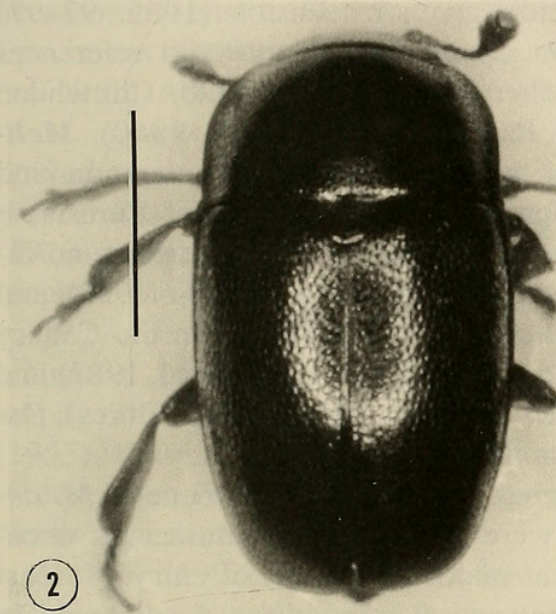
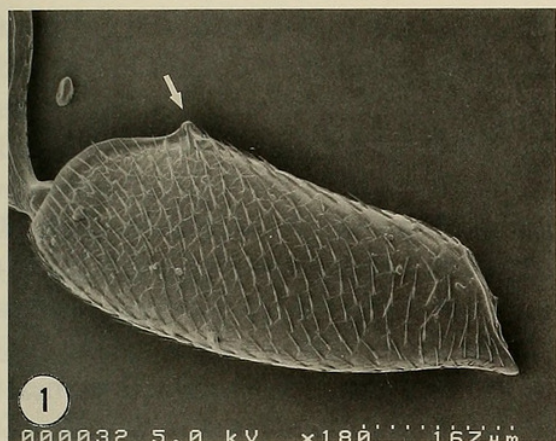
(Couplets 1–2 unmodified).

3. Middle femur with subapical tooth along posterior margin (Fig. 1) *viridescens* (F.)
- Middle femur without subapical tooth 3a
- 3a. Form slightly to moderately convex; punctures of elytra more dense, as large as eye facets, separated by 1 to $1\frac{1}{2}$ their diameters *aeneus* (F.)
[sensu Audisio (1993) including the junior synonyms *dauricus* Motschulsky, *rufimanus* Leconte, and *cleominis* Easton]
- Form distinctly more convex; punctures of elytra less dense, slightly larger than eye facets, separated by $2\frac{1}{2}$ their diameters
. *simplipes* Easton

(Couplets 4–6 unmodified).

DISTRIBUTION OF *MELIGETHES VIRIDESCENS* AND NORTH AMERICAN INTERCEPTION RECORDS

In the Palearctic region, *M. viridescens* exhibits a primarily Euro-mediterranean distribution pattern (see map in Audisio 1993:555). It is widespread throughout most of Europe, ranging north to Sweden, northcentral Norway, and southern Finland,



Figs. 1–4. 1, Middle femur of *Meligethes viridescens*; note dentiform tooth along outer posterior margin (arrow). 2, Dorsal habitus of *Meligethes viridescens*. Scale line = 1.0 mm. 3–4, Host plant habitat: wild radish (*Raphanus raphanistrum*) growing along upper shoreline of Halifax harbor, adjacent to the cargo container terminal.

east to Kazakhstan of the former Soviet Union, southeast to the Caucasus, northern Iran and Syria, and southwest to Morocco, Algeria, and northcentral Tunisia.

In North America, *M. viridescens* is known from several coastal localities in Nova Scotia and Prince Edward Island, and Lincolnville, Maine. Complete locality data for all specimens collected to date are as follows (all collections were made from flowers of wild radish (*Raphanus raphanistrum*), unless stated otherwise):

UNITED STATES: Maine: *Waldo Co.* Lincolnville, 24-VI-1993, 2-VI-1995 (ex *Lathyrus maritimus*).

CANADA: Nova Scotia: *Colchester Co.*, Truro, 22-VII-1995; Bible Hill, Nova Scotia

Agricultural College, 22-VII-1995. *Halifax Co.*, Halifax, Pt. Pleasant Park nr. container terminal, 18-VII-1994, 20/21-VII-1995. *Lunenburg Co.*, Lunenburg, 21-VII-1995. *Pictou Co.*, Pictou, 22-VII-1995. Prince Edward Island: *Kings Co.*, Georgetown, 25-VII-1995. *Prince Co.*, Summerside, 26-VII-1995. *Queens Co.*, Charlottetown, 26-VII-1995; S. of Cymbria, 26-VII-1995; North Rustico, 26-VII-1995.

Initially, we collected specimens on 18 July 1994 from flowers of wild radish growing abundantly along the upper shoreline of Halifax Harbour adjacent to Point Pleasant Park and the harbor container terminal (Figs. 3–4). By 15 August 1994, beetles had apparently dispersed, as no speci-

mens could be found on flowers of wild radish at this site (A. A. Wilson, pers. comm.). In late July 1995, we again collected numerous specimens from wild radish flowers at several coastal sites in Nova Scotia and Prince Edward Island. A single specimen was collected by the authors by sweeping flowers of a shoreline crucifer (subsequently identified as *Raphanus raphanistrum*) at Lincolnville, Maine, on 24 June 1993. Five specimens were collected at this site on 2 June 1995 from flowers of beach pea, *Lathyrus maritimus* (L.) Bigelow (Fabaceae); the wild radish, although present, was not in bloom.

Voucher specimens from Nova Scotia and Prince Edward Island are deposited in the collections of Cornell University (Ithaca, NY), the United States National Museum of Natural History (Washington, DC), the Nova Scotia Museum (Halifax), and the Canadian National Collection of Insects (Ottawa); the Maine specimens are deposited at Cornell.

Confirmed specimens of *M. viridescens* have seldom been intercepted at U.S. ports of entry. In fact, only 1 interception report (for the period July 1, 1971–June 30, 1972) is documented in the "List of Intercepted Plant Pests" compiled by the U.S. Department of Agriculture: in Michigan on heather [*Calluna vulgaris* (L.)] originating from the United Kingdom. Through the courtesy of J. Pakaluk (Systematic Entomology Laboratory, USDA-ARS, Washington, D.C.), we became aware of 2 specimens of *M. viridescens* (or near *viridescens*) housed in the collection of the U.S. National Museum of Natural History with interesting label data. One specimen bears the labels: "Canada, Intrc. Boston, Mass., 20 July 1959"/"G. Crampton, ex *Syringa* sp., 59-14448"/"*viridescens* (F.) det. Connell, Easton AMNH 14:64," and the other specimen with the labels: "Poland, Intrc. New York, N.Y., 25 July 1963"/"L. N. Sedgewick, ex flower - Rose, 63-362"/"*Meligethes* nr. *viridescens* (F.) det. Connell 63." These two specimens obviously represent cases of interception

during USDA cargo inspections at ports of entry (Boston and New York).

STATUS OF *MELIGETHES AENEUS* IN NORTH AMERICA

Checklists, catalogues, and faunal lists of the Coleoptera, as well as notes in the literature, have included *M. aeneus* (sometimes under one of its various synonyms) as a member of the western North American fauna for well over a century (see explanation given by Easton [1955: 92–97] for *M. rufimanus* LeConte and references cited therein; also Leng 1920, Chittenden 1925, Parsons 1943, Horion 1960). *Meligethes aeneus* is extremely common and widespread throughout most of Eurasia; it has also been reported in the extreme northwest portion of Mexico (Audisio 1993), and recent citations also place it in the Canary Islands (Tenerife) (Israelson et al. 1982) and the Azores (San Miguel and Flores) (Israelson 1984).

During 1967–1977, specimens of *M. aeneus* were intercepted on numerous occasions at major U.S. ports of entry. At least 11 interception records are documented in the "List of Intercepted Plant Pests" compiled by the U.S. Department of Agriculture. Most specimens found during inspection were associated with various mixed (indeterminate) flowers, cut flowers including *Gladiolus* sp., cauliflower and cabbage (*Brassica oleracea* vars.), lupine (*Lupinus* sp.), and apple (*Malus sylvestris*), originating from such European countries as England, Germany, Denmark, Norway, France, Netherlands, and Poland.

As a result of A. M. Easton's (1947, 1955, 1959) revisionary studies of the North American element of the genus *Meligethes*, eight species in the Nearctic fauna were recognized, including *atratus* Olivier, *nigrescens* Stephens, *dauricus* Motschulsky, *pinguis* Horn, *canadensis* Easton, *cleominis* Easton, *simplipes* Easton, and *saevus* LeConte. Easton concluded that all previous North American records of the Palearctic *M. aeneus* actually referred to other

species, not the "true" *aeneus* (sensu Fabricius). On careful examination most Nearctic specimens among material studied by Easton and previously determined as *M. aeneus* proved to be representatives of either *M. simplipes* Easton if collected in the East (Ontario and eastern United States to Ohio and Tennessee), or *M. dauricus* Motschulsky (= *rufimanus* LeConte) if collected in the West (a Holarctic species, in western Canada, western United States, adjacent Mexico, and east to Kansas and Nebraska). Specimens that formed the basis for an eastern North American record (Pennsylvania) of *M. aeneus* (Peng-Fi and Larson 1949) proved to be the Holarctic species *M. nigrescens* (see Easton 1955:93). Blatchley's (1910) record of "*M. aeneus*" in his Coleoptera of Indiana actually refers to *M. simplipes* (Easton 1955:97). Not having examined a "true" specimen of *M. aeneus* among the material he studied, Easton (1955) thus removed this common and widespread Palearctic species from the North American faunal list.

Audisio (1993:526, 528), in his monograph of the Nitidulidae of Italy, reestablished the presence of *M. aeneus* in western North America, by synonymizing *M. dauricus*, *M. rufimanus*, and *M. cleominis* under *M. aeneus*.

BIONOMICS AND ECONOMIC IMPORTANCE OF *MELIGETHES* SPP.

Both *M. viridescens* and *M. aeneus* have been discussed extensively as pests of cruciferous crops. The following bionomic information has been gleaned mainly from Fritzsche (1957), Horion (1960), Fougereux (1987), Halstead (1988), Lamb (1989), and Audisio (1993). Their biology and seasonal history are very similar.

Meligethes viridescens and *M. aeneus* breed in the flower buds of brassica seed crops (Brassicaceae) and other related plants. Host injury is greatest at the early bud stage. The extent of injury depends on the weather, the time and severity of feeding, and the nutritional and developmental

state of the cruciferous plants. In general, larvae cause no significant economic damage. *Meligethes viridescens*, particularly its larval stages, is closely associated with many cruciferous genera, but mostly species of *Brassica*, *Cardamine*, *Arabis*, and *Erucastrum* (Audisio 1993). Adults also feed on pollen from a wide array of flowers, including the Asteraceae, Ranunculaceae, and Rosaceae. Because of their pollen-feeding habits as adults and larvae, they are commonly referred to as "pollen" or "blossom" beetles in the European literature. In Europe, the increasing acreage of oilseed rape is thought to have triggered problems from *Meligethes* beetles in gardens and cash crops (Finch et al. 1990, Winfield 1992). *Meligethes viridescens*, considered one of the more adaptable species of the genus, is encountered frequently and abundantly where crucifers grow or are cultivated, from sea level to 800–1000 m elevation. It is less common at mountain sites.

Meligethes adults may be effective pollinators of their brassica-type hosts based on field and experimental evidence (Faber et al. 1920, Halstead 1988), and are regularly observed to chew stigmas and anthers of their hosts (Scherney 1953). Crowson (1988) suggested that dorsal setiferous pits on the adult mandibles (of *Meligethes* spp.) actually serve to transport pollen grains that effect pollination.

Overwintering *Meligethes* beetles generally leave the soil when the ambient temperature reaches about 8–10° C (46–50° F, usually the end of March or early April) and seek out flowering plants near their overwintering quarters. Beetles overwinter in moderately damp, well-ventilated soil that has unmatted plant cover; these overwintering sites are generally found in wooded areas, or in the transitional vegetative zones bordering these areas. Emergence from overwintering sites depends on temperature, and on moisture and CO₂ content of the soil; *M. aeneus* is generally the first to appear in the spring, followed by *M. viridescens*. Females leaving the soil have

undeveloped ovaries, and to reach sexual maturity they begin to feed on pollen of various flowering herbaceous weeds and shrubs. As soon as the air temperature approaches ca. 15° C (59° F), the beetles fly in search of cruciferous plants (including cultivated brassica crops such as oilseed rape). While the weather is cool, the beetles can cause considerable feeding damage to the flower buds and developing flowers of crucifers. When the weather becomes warmer, the beetles feed mostly on pollen and nectar and cause little damage to the plant and reproductive structures. Eggs are laid in the flower buds, with preference for buds 2–3 mm long. Fecundity depends on temperature and relative humidity; 78–210 eggs are generally laid by each female, with 1–2 eggs per flower bud. A large number of eggs in a single bud indicates multiple ovipositions. The female chews through the involucre or bracts of the flower bud and lays an egg on the stamen, seldom on the pistil or petals. Eggs generally hatch in 4–9 days. The newly hatched larva feeds only on pollen, thus causing little damage to the plant. There are 3 larval instars and complete larval development requires about 4–6 weeks. Pupation takes place in the soil in an earthen chamber about 0.5–2 cm deep. The pupal stage lasts about 15 days. First generation beetles emerge from the beginning of June to mid-July. By the end of summer, beetles begin to seek out overwintering sites. Generally only a single generation is produced annually. Optimal egg development, oviposition, and larval development occur when a temperature of 20–27° C and a relative humidity of >95% are obtained.

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Museum of Natural History collection resulting from cargo inspections at major U.S. ports of entry. We are also grateful to Alex A. Wilson (Natural History Section, Nova Scotia Museum, Halifax) for checking the Halifax site (adjacent to Point Pleasant Park) and providing us with an identification of the cruciferous host plant, to W. L. Mountain (Pennsylvania Department of Agriculture, Harrisburg) for identification of the Maine cruciferous host plant, and to Francesco Ferrini (Department of Horticulture, Florence University, Florence, Italy) for translating some Italian literature on *Meligethes*.

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