

# CHARACTERIZING PATHWAYS OF INVASION USING *STERNORRYHNCHA* ON IMPORTED PLANT MATERIAL IN CARGO

Timothy T. Work

Chaire d'aménagement forestier durable,  
Centre de recherche de la forêt,  
Université du Québec à Montréal, CP 8888  
Succursale Centre-Ville, Canada

## ABSTRACT

Non-indigenous Homoptera, mainly scales, aphids, and mealy bugs, intercepted on plants destined for cultivation represent an elevated risk for the establishment of invasive insects in North America. These insects [grouped as the suborder *Sternorrhyncha*] are often parthenogenic and are imported on viable host plants. This may allow these species to effectively bypass major biological obstacles to establishment in North America. Here I examine five factors often attributed to elevated risk within pathways of introduction for these organisms: (1) number of points of interception, (2) number of countries of origin, (3) number of host plants, (4) total number of reported hosts plants worldwide, and finally (5) trade volume as expressed as value of imported plants destined for cultivation.

My analysis is based on interceptions recorded in the PestID database maintained by USDA APHIS between the years 1984 and 2000. These data included 4,681 recorded interceptions of *Sternorrhyncha* insects associated with imported plant products in cargo. These products included those related to nursery stock and ornamental plants but excluded fruits specifically (as hand baggage remains a dominant pathway of introduction for insects associated with fruit). I compared factors related to elevated risk within pathways using log-log linear regressions.

Armored and soft-shell scale insects as well as mealy bugs were the most abundant insects intercepted on plants destined for cultivation. While abundant, soft-

shelled scale insects were less numerous in terms of species richness in comparison to either armored scales or mealy bugs. Overall patterns of interceptions varied extensively over the 16 years examined. For example, I observed a major peak in interceptions mainly attributed to three species (*Aleuroplatus cococolus*, *Asterolecanium inlabefatum*, and *Dinaspis aculeate*) primarily from Mexico and Guatemala into El Paso, Laredo, Miami, and to a lesser extent Chicago. During this peak, accumulation of overall number of species was three times higher than compared to the rest of the 16-year period. Nearly all of these interceptions were recorded on *Chamaeodorea* palms. In contrast to this pulse of interceptions, I also observed highly regular, annual patterns of interceptions for species such as *Parlatoria blanchardii* on Phoenix, which showed increased interceptions every September for the 16 years examined.

When comparing factors related to pathways of introduction, I observed numerous strong relations between (a) number of ports and number of origins ( $r^2=0.93$ ,  $P<0.001$ ), (b) number of origins and number of host plants ( $r^2=0.88$ ,  $P<0.001$ ) and (c) number of hosts and number of reported hosts worldwide ( $r^2=0.91$ ,  $P<0.001$ ). However, none of these variables were strongly linked to increased numbers of interceptions nor was there a steadily increasing trend in the value of plant commodities imported over this period. The first trend seems logically related to shipping practices: commodities originating from numerous origins should arrive at numerous locations

thus minimizing shipping distances. The second and third trends suggest that more cosmopolitan species are likewise associated with a greater number of imported plant species and a larger range of plant hosts in general. I suggest that insects that are intercepted frequently but that depart from the log-log models may be those species that are easily targeted for increased inspections or actions on the part of APHIS. For example, species such as *A. inflabefactum*, a pitscale that arrives at numerous port locations, originates from only two countries. Foreign inspection stations in

these countries may thus limit potential introductions. Similarly, species such as *A. hardii* (yam scale) arrive from numerous origins but on a single host plant. Thus, inspection efforts for this species could be increased based on host plant preferences. These species serve as examples that could be expanded to other insect and host plant species. One plant genera, *Tillandsia*, for example, merits further attention because it has both frequent interceptions and harbors a diverse community of Homoptera.