detected in the lichen was found in the cultures (pp. 489–497).

Three papers utilize molecular phylogenetic approaches to systematics. Traditional groupings and most species of *Physconia* are confirmed as distinct, although doubt is shed on the monophylly of two species pairs (pp. 498–505). The *Lecanora rupicola* group is shown to be distinct from *Lecanora s. str.*, with the species containing sordidone as well as having pruinose apothecial discs (pp. 506–514). ITS data is used in a revision of the marine *Collemopsidium* species in north-west Europe, along with statsitical analyses of morphological and habitat variables, leading to the recognition of five species (pp. 515–532).

A critical revision of the non-yellow species of *Rhizocarpon* with hyaline muriform ascospores in the Nordic countries is presented; 16 species are accepted and keyed, along with maps, descriptions, synonyms, spore drawings and habit photographs (pp. 533–570). Finally, a survey of *Trichothelium* species on bark in the neotropics revealed three new species, bring the known number to five (pp. 571–575).

The increased inclusion of lichenological papers in *Mycological Research* in recent years reflects the continuing integration of lichenologists into the broader mycological community. However, now that *The Lichenologist*, has a new publisher (Cambridge University Press) and is expected to provide an improved service, *Mycological Research* will in future give priority to lichen papers which will also be of interest to a wider mycological audience.

DOI: 10.1017/S0953756204230362

OTHER PAPERS IN THIS ISSUE

In addition to the papers and theme highlighted above, this issue includes molecular evidence that the original type species of *Verticillium* is not related to the plant pathogenic species of the genus (pp. 576–582). It is suggested that the generic name be conserved with *V. dahliae* as the type to preserve current usage, the original type species now being placed in *Acrostalagmus*. Experimental studies show that a range of chytrid species are able to survive drought and high temperatures in nature, the sporangia shrinking, but rapidly become turgid again on rehydration (pp. 583–589). The problem of fungal infection in seasonal insect hosts is examined in the case of *Laboulbenia phaeoxanthae* on the beetle *Phaeoxantha aequinoctialis*, infestation being less when the host was most abundant (pp. 590–594).

DOI: 10.1017/S0953756204240369

PATHOGEN INTRODUCTION AS A COLLATERAL EFFECT OF MILITARY ACTIVITY

The introduction of exotic tree diseases has occurred many times over the past 150 years (Wingfield *et al.* 2001). The most common pathways for introduction of pathogens are movement of infected planting stock (Milgroom *et al.* 1996, Coetzee *et al.* 2001) or infested wood (Brasier 2001). These pathways are well understood and monitored by regulatory agencies. Less understood pathways, however, exist for the introduction of exotic pathogens.

Heterobasidion species are important root pathogens with circumboreal distributions. *H. annosum* was found to be consistently associated with mortality of stone pine (*Pinus pinea*) in the forest of the Presidential Estate of Castelporziano, near Rome (Italy). Several pure cultures of the pathogen were obtained from fertile fruiting bodies, DNAs were extracted, and PCR amplification using *H. annosum*-specific primers showed the presence of a mitochondrial insertion reported from North America, but known to be absent in Europe (Gonthier *et al.* 2001). This unusual finding prompted us to sequence portions of the insertion and of three additional loci from seven Castelporziano (vouchers in MUT, accession nos. 3555-61) and 97 *Heterobasidion* individuals of worldwide distribution. Maximum parsimony analysis of the nuclear glyceraldehyde 3-phosphate dehydrogenase was performed using PAUP (Swofford 1998), with gaps and insertions counted as single characters. This analysis differentiated North American from European populations with a bootstrap value of 100 %, and showed that the Castelporziano individuals always clustered within *H. annosum* populations infecting North American pines. Additional analyses of the nuclear elongation factor 1-α, the mitochondrial ATPase subunit 6, and of the insertion in the mitochondrial ribosomal operon, never before reported from Europe, all clustered the Castelporziano individuals with *H. annosum* populations from eastern North America (Fig. 1). Inferences for this study were made from analyses of a total of 2236 base pairs, including 127 parsimony informative characters, from four unlinked loci. Bootstrap values were calculated using the Fast Step algorithm in PAUP for 1000 replicates. Trees were constructed using three closely related taxa as outgroups.

The data support the hypothesis that the *Heterobasidion* population at Castelporziano originated

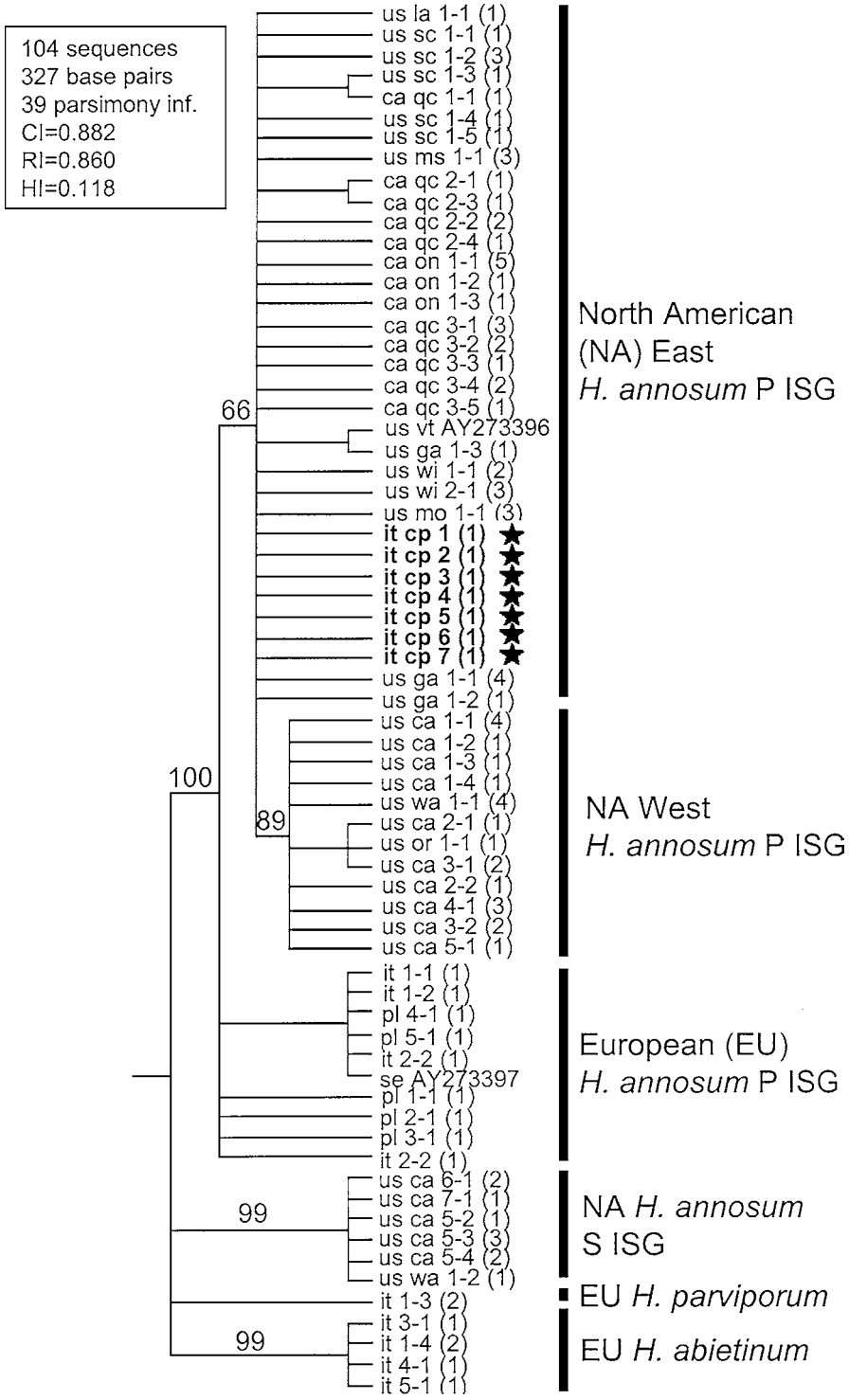

Fig. 1. Strict consensus of 3840 most parsimonious trees of a portion of the nuclear elongation factor 1-α, shows that Italian individuals of *Heterobasidion annosum* from Castelporziano (cp) are all included within the eastern North American clade of *H. annosum,* intersterility group (ISG) P. Bootstrap values are shown above branches. Sequences from GenBank are labeled with their accession numbers, otherwise isolate names are as follows: country (e.g. us = USA; ca = Canada; It = Italy; pl = Poland; se = Sweden), state or province abbreviation for North America isolates, and two numbers referring to site and genotype, respectively. The number of identical genotypes is in parenthesis.

from eastern North America. Native *Heterobasidion* populations rely on sexual reproduction and are comprised of several different genotypes (Chase & Ullrich 1983, Korhonen & Stenlid 1998). Individuals from Castelporziano were all different genotypes based on microsatellite fingerprinting and on somatic self-compatibility tests. These findings suggest that this introduced population has become successfully

established in the Castelporziano woodlands. The exotic disease is not widespread outside the Presidential Estate, and its further spread could be limited by a disease mitigation/eradication strategy.

The Estate is not a park but a reserve covered by woodlands; it has been closed to the public for centuries, and is comprised of an exclusively native Italian flora with the exception of a few *Eucalyptus* trees (Manes *et al*. 1997). The question remains: how was *Heterobasidion* introduced from North America? Regiments of the 5th US Army occupied the Estate grounds for several weeks during World War II (Cole 2003). We suggest that the introduction of this exotic population is linked to transport crates, pallets or other military equipment made of untreated lumber from infected trees. The short-range spread of *Heterobasidion* spp. via infected wood posts has been previously documented (Stenlid & Redfern 1998), but this fungus is generally thought as an unlikely exotic pathogen because of the lack of resting propagules, the short life span of its airborne basidiospores, and its inability to freely grow in the soil.

Our findings are noteworthy not only because they indicate fungi such as *Heterobasidion* may become exotic introductions, but also because they provide new information regarding the poorly studied collateral effects of military operations on natural ecosystems. As in the case of Castelporziano, it may take decades for the effects of introductions to become visible; the time lag between introduction of the disease agent and the development of visible disease symptoms, underlines the urgency to monitor all potential introduction routes.

We thank the Technical and Scientific Committee of the Presidential Estate of Castelporziano for giving us the authorization to publish this note. We are also grateful to Naldo Anselmi (University of Studies of Tuscia, Italy), for donating additional isolates from Castelporziano, and to David Rizzo (University of California, Davis), and Thomas Bruns (University of California, Berkeley), for reviewing the manuscript.

Brasier, C. M. (2001) Rapid evolution of introduced plant pathogens via interspecific hybridization. *BioScience* **51**: 123–133.

Chase, T. E. & Ullrich, R. C. (1983) Sexuality, distribution, and dispersal of *Heterobasidion annosum* in pine plantations of Vermont. *Mycologia* **75**: 825–831.

Coetzee, M. P. A., Wingfield, B. D., Harrington, T. C., Steimel, J., Coutinho, T. A. & Wingfield, M. J. (2001) The root rot fungus *Armillaria mellea* introduced into South Africa by early Dutch settlers. *Molecular Ecology* **10**: 387–396.

Cole, S. (2003) History of the 85th 'Custer' Division. Based on a booklet entitled Minturno to the Appennines – 85th Infantry Division. http://members.aol.com/Custermen85/History85.htm.

Gonthier, P., Garbelotto, M., Varese, G. C. & Nicolotti, G. (2001) Relative abundance and potential dispersal range of intersterility groups of *Heterobasidion annosum* in pure and mixed forests. *Canadian Journal of Botany* **79**: 1057–1065.

Korhonen, K. & Stenlid, J. (1998) Biology of *Heterobasidion annosum*. In *Heterobasidion annosum: biology, ecology, impact and control* (S. Woodward, J. Stenlid, R. Karjalainen & A. Hüttermann, eds): 43–70. CAB International, Wallingford.

Manes, F., Grignetti, A., Tinelli, A., Lenz, R. & Ciccioli, (1997) General features of the Castelporziano test site. *Atmospheric Environment* **31**: 19–25. SI.

Milgroom, M. G., Wang, K. R., Zhou, Y., Lipari, S. E. & Kaneko, S. (1996) Intercontinental population structure of the chestnut blight fungus. *Cryphonectria parasitica*. *Mycologia* **88**: 179–190.

Stenlid, J. & Redfern, D. B. (1998) Spread within the tree and stand. In *Heterobasidion annosum: biology, ecology, impact and control* (S. Woodward, J. Stenlid, R. Karjalainen & A. Hüttermann, eds): 125–141. CAB International, Wallingford.

Swofford, D. L. (1998) PAUP*: pylogenetic analysis using parsimony (*and other methods). Version 4d64. Sinauer Associates, Sunderland, Massachusetts.

Wingfield, M. J., Slippers, B., Roux, J. & Wingfield, B. D. (2001) Worldwide movement of exotic forest fungi, especially in the tropics and the Southern Hemisphere. *BioScience* **51**: 134–140.

Paolo Gonthier[1], Rachel Warner[2], Giovanni Nicolotti[1], Angelo Mazzaglia[3] and Matteo M. Garbelotto[2]*

[1] *Department of Exploitation and Protection of the Agricultural and Forestry Resources, University of Torino, Via L. da Vinci 44, I-10095 Grugliasco, Italy*.

[2] *Department of Environmental Science, Policy and Management, University of California at Berkeley, 151 Hilgard Hall, Berkeley, CA 94720, USA*.

[3] *Department of Plant Protection, University of Studies of Tuscia, Via S. Camillo de Lellis, I-01100 Viterbo, Italy*.

E-mail: matteo@nature.berkeley.edu

* Corresponding author.