A NEW FUNGAL FARMER
Abstract from Presentation at SFSGI "WORKSHOP 2007"

D. W. Gover

In addition to humans, it was thought that fungal farming was restricted to three terrestrial insects; the *Atta*, leaf-cutter or 'parasol' ants, construct within their nest a compost, on which they grow the Basidiomycete *Leucocoprinus gongylophora* and consume the ellipsoid swellings, termed gongylidia or bromatia, produced at the tips of the hyphae, the termites, Subfamily Macrotermitinae (Old World and areas of Asia), cultivate the Basidiomycete fungus *Termitomyces* on 'combs' to degrade collected plant material, consuming the energy–rich fungus and comb while the wood wasp, *Sirex noctilio* produces two or three tunnels from a single entrance in the bark when laying its eggs in a tree trunk of *Pinus radiata* , injecting spores of the fungal genus *Amylostereum* (Stereacae) that colonises the wood, forming a white rot, that reaches the egg tunnels in time for the young larvae to feed on the mycycelium, the emerging adults carrying fresh spore for dispersal.

Now a new fungal farmer is reported; the marine snail, *Littoraria irrorata* is found on the seashore marsh grasses, mainly smooth cordgrass, *Spartina alterniflora,* native to North America's Atlantic coast. The symbiont ascomycete fungi are of the genera *Phaeosphaeria* and *Mycosphaerella* that are the dominant marine fungi of the seashore marsh.

Mycosphaerella is a large genus of plant fungi many of which are important pathogens. *M. graminicola* is an economically important pathogen of wheat, while *M. fijiensis,* the cause of Black Sigatoka disease of banana.

Phaeosphaeria spartinicola is one of the principal species of ascomycetes that carry out the decay of standing-dead parts of *S. alterniflora*.

S. alterniflora, is grazed by *L.irrorata*, to create and maintain, with the saw-like teeth of the snail's radula, longitudinal wounds that penetrate the leaf surface exposing the sensitive inner surface. *L. irrorata* feeds, primarily, on the *Phaeosphaeria* and *Mycosphaerella* fungi infecting the wounds that appear to be the snail's preferred food. As *L. irrorata* moves about it also deposits faeces, rich in nitrogen and unconsumed hyphae, that promote fungal growth around and into the sensitive inner-tissue of the *S. alterniflora* leaf.

Although, it is not clear whether *L. irrorata* intentionally deposits faeces or the faecal pellets are concentrated on the wounds because of the greater time spent in the area by feeding snails.

Fungal farming by animals may be considered to require a number of elements; ecosystems are modified to promote or protect fungal growth, a substrate is provided to encourage and sustain fungal growth, additional nutrients and/or propagules provided, the fungus is consumed as food. While the criteria of fungal farming is met by the Snail-Grass symbiosis, unlike the ants, termites and wasps, the snails do not seem to inoculate or initiate fungal growth, weed their crops, or obligately rely on one fungal species for farming. Nevertheless*, L. irrorata* with a lower-level fungal production strategy suggests that the success of a fungal farmer may not depend on pest management and inoculation techniques, provided the cultivated fungi naturally occur and are successful even without the farmer's care. Maybe this fungal farming technique is more common than thought previously? Perhaps it is necessary to more carefully redefine fungal farming?