Achatina fulica (Giant African Land Snail) Management Information

Contents

1.0 Preventative Measures

Once this snail becomes established it is difficult to eradicate. If the snail is observed in an area previously free of the pest it is essential to act quickly to control it (de Paiva Barcante *et al*. 2005). Molluscs are one of the most intractable pests once established. As there is a high risk of *Achatina fulica* being spread via trade routes there is potential to prevent its spread through international quarantine and surveillance activities. The snail has been intercepted widely by quarantine officials (Moore 2005), including in "empty" containers on a vessel travelling from Pagopago, American Samoa, to New Zealand (MAF 2005). Small incipient populations of *A. fulica* have been eradicated at various times from California, USA; Florida, USA; Queensland, Australia; Fiji; Samoa; Vanuatu and Wake Island (Abbott 1949, Mead 1961 1979a, Colman 1977 1978, Muniappan 1982, Waterhouse & Norris 1987, Watson 1985, in Raut & Barker 2002). Attempts to eradicate *A. fulica* in Queensland and in three states in the USA have all involved hand collection of animals, followed by subsequent destruction (Mead 1979).

Control costs can range from USD 60 000 dollars for a 7-month procedure, to over USD 700 000 dollars for the eradication in Florida (Muniappan *et al*. 1986, Smith and Fowler 2003). In terms of the “do nothing” approach Mead (1979a) suggests that the overall picture is one in which:

> “*The snail continues to be a serious pest in the peripheral areas but is becoming less so in the older infested areas, to the point… where it essentially ceases to be a pest*”.

For the few species in which spontaneous collapse has been repeatedly observed, the possibility of such an event is warranted as a potential rationale for a do-nothing approach to management (Simberloff & Gibbons 2004). However, in some places, such as parts of India, the snail has continued to be a pest for over 150 years (Raut & Barker 2002).

Physical inaccessibility often complicates censuses of poorly mobile organisms. We therefore assessed the effectiveness of using a sample of quadrat counts to generate a population estimate corrected for inaccessible areas. The result is directly applicable to management of the introduced snail *A. fulica* on Ile aux Aigrettes, a small island off the coast of Mauritius, but also has implications for counting this and similar species elsewhere (see Craze & Mauremootoo 2002).

2.0 Physical Control

Physical control relies primarily on the collection and destruction of the snails and their eggs. This has been reported to be effective in Guam (Peterson 1957c, in Raut & Barker 2002), Hawaii (Olson 1973, in Raut & Barker 2002), Japan and Sri Lanka (Mead 1961, in Raut & Barker 2002), Australia (Colman 1977, in Raut & Barker), USA (Mead 1961 1979a, in Raut & Barker 2002). Schotman (1989, in Raut & Barker 2002) maintains that this can be an effective control strategy when practiced on a small scale or in organised campaigns of farmer groups or the public.

Physical barriers that prevent movement of snails include the use of a strip of bare soil around the crop, a fence that consists of a screen of corrugated tin or security wire mesh. Schotman (1989, in Raut & Barker 2002) recommends that ditches be dug around the field and snails collected every day. Protection of valuable horticultural plants can be provided during their vulnerable seedling stage by ringing them with a strip of cardboard that has been dipped in a suspension of metaldehyde, dispersion is aided by use of a detergent (Bridgland & Byrne 1956, Dun 1967, in Raut & Barker 2002).

3.0 Chemical control

Metaldehyde and/or calcium arsenate were used in early attempts to control A. fulica a. Bran-based baits containing metaldehyde were initially developed in the 1930s for gastropod control in temperate regions. A number of new molluscicide chemicals are now available. Bait formulations can be rendered ineffective by rain, unfortunate as gastropods are most active in the rainy season. Because a proportion of A. fulica a are arboreal there has been interest in the efficacy of dusts or sprays; Nair and colleagues (1968, in Raut & Barker 2002) demonstrated the effectiveness of kaolin dusts containing 1% metaldehyde and suspensions containing 1% to 4% metaldehyde.

The principal toxic effect of metaldehyde is through stimulation of the mucous glands, which cause excessive sliming, leading to death by dehydration; metaldehyde is toxic to slugs and snails both by ingestion and absorption by the 'foot' of the mollusc (Prasad *et al*. 2004). The pesticidal properties of methiocarb are similar to the toxic action of other carbamates which prevent effective nerve transmission by inhibiting the enzyme acetylcholinesterase (Prasad *et al*. 2004). Sodium chloride (common table salt) is an effective dehydrating agent; it may be applied as a 12-inch barrier application on the perimeter of known or suspected snail-infested areas; during periods of rain or high relative humidity, salt barriers should be renewed frequently (Prasad *et al*. 2004).

Various molluscicides like metaldehyde are non-selective, thus their use has a chance of endangering the survival of non-target snails, including endemic fauna (Prasad *et al*. 2004). The indiscriminate use of molluscicides containing metaldehyde is a concern. For instance in Vale do Ribeira, state of Sao Paulo, a major infestation of *A. fulica* caused losses in the production of bananas, the main agricultural product of the area (Thiengo *et al*. 2007). Farmers in the area, unaware of the environmental problems associated with the use of molluscicides, used poison baits in the banana crops. As a result, in addition to *A. fulica*, the local animals including insectivorous bats, skunks, lizards, and small rodents, many of them possibly important as natural control agents of agricultural pests, were also killed (Faraco Unpub., in Thiengo *et al*. 2007). There is also the possibility of illegal use of other pesticides that may have harmful effects on non-target organisms and human health (Thiengo *et al*. 2007). Please see section 2.1.3 of Barker and Watts (2002) for information on the application of molluscicides.

Because of continuing concern about the environmental effects of synthetic chemicals and the fact that high and unpredictable rainfall washes away metaldehyde there is much interest in naturally occurring chemicals as molluscicides. Panigrahi and Raut (1994, in Raut & Barker 2002) have demonstrated that an extract of the fruit of *Thevetia peruviana* has activity against *A. fulica*. In 2002, in the Garacharma farm of Central Agricultural Institute it was noted that cuttings of alligator apple, *Annona glabra* a were untouched by *A. fulica* (Singh *et al*. 1961, in Prasad *et al*. 2004). After this observation, Prasad and colleagues (2004) undertook studies in the Andaman and Nicobar Islands to use natural softwood cutting fences as snail repellents to protect the nursery beds. One of the advantages of *A. glabra* a is that the cuttings sprout when planted and they can be constantly trimmed to maintain a live fence around the nursery beds to ward off the Giant African snail from gaining entry into nursery bed (*Prasad et al. 2004)*. This method of using *A. glabra* a softwood cutting fence is a feasible and practically applicable alternative to save nursery beds from the menace of *A. fulica* (Prasad et al. 2004).

4.0 Biological Control

The rosy wolfsnail (<i>*Euglandina rosea*) has been introduced throughout much of the introduced range of *A. fulica* in "biological control programmes" (Mead 1961, Tillier & Clarke 1983, Murray *et al*., 1988, in Gerlach 2001). The failure of these programmes and the devastating effect that *E. rosea* has had on many indigenous, non-pest species is well known (Tillier & Clarke 1983, Clarke, Murray & Johnson 1984, Hadfield 1986, Murray *et al*. 1988, Cowie 1992, Pearce-Kelly, Clarke & Mace 1994, Coote *et al*. 1999 2000, in Gerlach 2001). Unfortunately the eagerness to control *A. fulica* by introducing other species has not been matched by consideration of environmental impacts, particularly the impacts on the indigenous mollusc biodiversity (Gerlach 2001). Tests of host specificity have often been perfunctory or non-existent (Gerlach 2001). There is no evidence that *E. rosea* or any other introduced pathogen, parasite or predator against *A. fulica* has been successful in controlling the pest (eg: van der Schalie 1969, Tillier 1992, Tillier & Clarke 1983, Clarke *et al*. 1984, Pointier & Blanc 1985, Cowie 1992, Hopper & Smith 1992, Griffiths *et al*. 1993, Hadfield *et al*. 1993, Civeryrel & Simberloff 1996, in Raut & Barker 2002). Control of *A. fulica* has not been achieved as this species is able to coexist with *E. rose* a by virtue of its relative unpalatability and high reproductive rate (Cooke 1989*b*, Gerlach 1994 1999, in Gerlach 2001).

Populations of *A. fulica* have often passed through three phases following establishment (Mead 1961 1979a, Pointier & Blanc 1985, in Raut & Barker 2002): (i) exponential increase phase; (ii) stable phase and (iii) decline phase. Naturalised populations of *A. fulica* often eventually decline greatly. The regulating factors causing declines in *A. fulica* populations could include disease by the bacterium *Aeromonas hydrophil* (Mead 1979a, in Raut & Barker 2002). There has been a widespread belief among local people that introduced biological control agents, particularly *E. rosea* were responsible for these declines (Wells 1988, in Raut & Barker 2002). The Hawaiian islands were often viewed as a pilot study that served as a model for other biological control projects and it is mainly from the Hawaiian island that *E. rosea* and other predatory gastropods such as *Gonaxis quadrilateralis* were introduced to other regions for control of *A. fulica*. Generalist predators such as *E. rosea*, *G. quadrilateralis* and, more recently, *Platydemus manokwar,* continue to be dispersed to new areas in misguided attempts to control this invasive gastropod. Some unsubstantiated reports have led to *E. rosea* being viewed as an effective control agent in the Pacific (Gerlach 2001).

5.0 References

Please see the GISD Species Profile for: *Achatina fulica* (References Section).