CHAPTER I

INTRODUCTION

Abalone are economically important marine gastropods distributed along the coastlines of both temperate and tropical regions. They are sold in the high price owing to the high demand of the market. China and Taiwan are the major abalone markets which contribute approximately 80% of the world market annually. In addition, Japan, Korea and European countries are also important market for abalone products.

More than 100 species are taxonomically recognized worldwide (Linberg, 1992) but approximately 20 species are economically important in terms of fisheries and/or aquaculture (Table 1.1). Most of them are regard as the large abalone for example, *Haliotis rubra* and *H. rufescens*. However, the small size abalone are also found in the tropical area and called "the cocktail size" (shell length about 60-80 mm) for example, *H. diversicolor supertexta*. The cocktail size abalone is not the premium product but has obtained a favor from the consumers especially Taiwan due to its affordable price and good flavor (Chen, 1989).

Previously, the major production of abalone was from fisheries. Nevertheless, the market demand is significant increasing but the supply is still limited. The export from Mexico, USA, Japan and Thailand was reduced for approximately 30% during 1989-2002. (Gordon. 2000) The total amount of wild-caught abalone was reduced from 14,830 metric ton (MT) in 1989 to 10,150 MT and to 10,212 MT in 1999 and 2002, respectively. Accordingly, abalone aquaculture has been carried out in many countries such as China, Taiwan, Japan, Australia and USA. The rapid development of abalone cultivation has taken place in those countries during the 1990s. The largest producer of cultured abalone is China with the production of approximately 3500 tons annually.

Table 1.1 Commercial important abalone species

Scientific name	Common name	Shell length (mm)
H. rufescens	Red abalone	>275
H. fulgens	Green, southern green or blue abalone	125-200
H. corrugata	Pink or corrugated abalone	150-175
H. sorenseni	White or sorensen abalone	125-200
H. assimilis	Threaded abalone	<100
H. cracherodii	Black abalone	75-125
H. walallensis	Flat or northern green abalone	75-125
H. kamtschatkana	Pinto abalone	100
H. discus hannai	Ezo awabi abalone	180-200
H. discus Kuro	Awabi, oni or onigai abalone	200
*H. diversicolor supertexta**	Tokobushi abalone	50
H. gigantea	Madaka abalone	250
H. sieboldii	Megae abalone	170
*H. asinina**	Mimigai, donkey's ear abalone	70-100
H. rubra	Black lip abalone	120-140
H. laevigata	Green lip abalone	130-140
H. roei	Roe's abalone	70-80
H. iris	Paua or black abalone	170
H. australis	Silver or queen paua abalone	125
H. virginea	Virgin abalone	70
H. tuberculata	Ormer abalone	120
H. midae	Perlemon abalone	90

* Tropical species. Source: Jarayabhand and Paphavasit (1996)

Three species of tropical abalone, *H. asinina* (Linnaeus, 1758) *H. ovina* (Gmelin, 1791) and *H. varia* (Linnaeus, 1758) are found in Thai waters (Jarayabhand and Paphavasit 1996). They inhabit in the coral reefs at 1-8 m in depth. Both *H. asinina* and *H. ovina* are distributed along the east coast of the upper Gulf of Thailand

and all three species are found in the Andaman Sea (Tookwinas et al. 1986; Nateewatana and Bussarawit 1988). On the basis of their size and meat textures, there are potential to culture these species commercially and market as the cocktail-sized abalone (Jarayabhand and Paphavasit 1996).

Among these three species, *H. asinina* has the highest percentage of a ratio between the meat weight and the total weight (85%) compared to that of 40% and 30% for *H. ovina* and *H. varia*, respectively (Singhagraiwan and Doi, 1993). Moreover, the spawning cycle of *H. asinina* is highly predictable allowing convenient incorporation of genetic-based breeding programs to increase management and culture efficiency of this species. It is currently culture commercially in Thailand at present.

Selective breeding programs are long-term processes used to increase economically important traits in selected populations through domestication (artificial and natural selection). To carry out effective SBPs in *H. asinina*, high genetic diversity stocks should be established. Integrated knowledge on population genetics for estimation of genetic variation levels, molecular genetics for identifying genetic markers at different levels and quantitative genetics for selection scheme and estimation of heritability for economically important phenotypes are required.

Appropriate genetic markers can be used to elevate the culture and management efficiency of abalone. Microasatellites can be applied to assist breeding programs of this economically important species (Selvamani et.al., 2001) allowing the ability to track large numbers of individuals and families in commercial production systems (Jerry et.al., 2005). Therefore, family selection and/or within family selection schemes can be effectively carried out by the incorporation of microsatellite data to breeding programs of *H. asinina*.

In Thailand, breeding programs and genetic improvement of hatchery-propagated *H. asinina* have been carried out at Chulalongkorn University for a period of time. The basic information on levels of genetic diversity of *H. asinina* in hatcheries and the number of contributed founders for each generation is necessary to avoid inbreeding and to improve the stock performance of the cultured stock. This means that).

Objectives

1. To examine genetic diversity of Thai abalone (*H. asinina*) in hatchey-propagated stocks in comparison with a wild population.

2. To examine the effective population size and inbreeding coefficient of *H. asinina* in hatchery-propagated stocks.

3. To examine possible correlation between genotypes of microsatellites and growth of abalone in hatchery.

Beneficial

1. Understanding the genetic diversity of hatchery-propagated stocks and wild abalone for proper management of resources.

2. Elevating the culture and management efficiency of breeding programs of *H. asinina*.