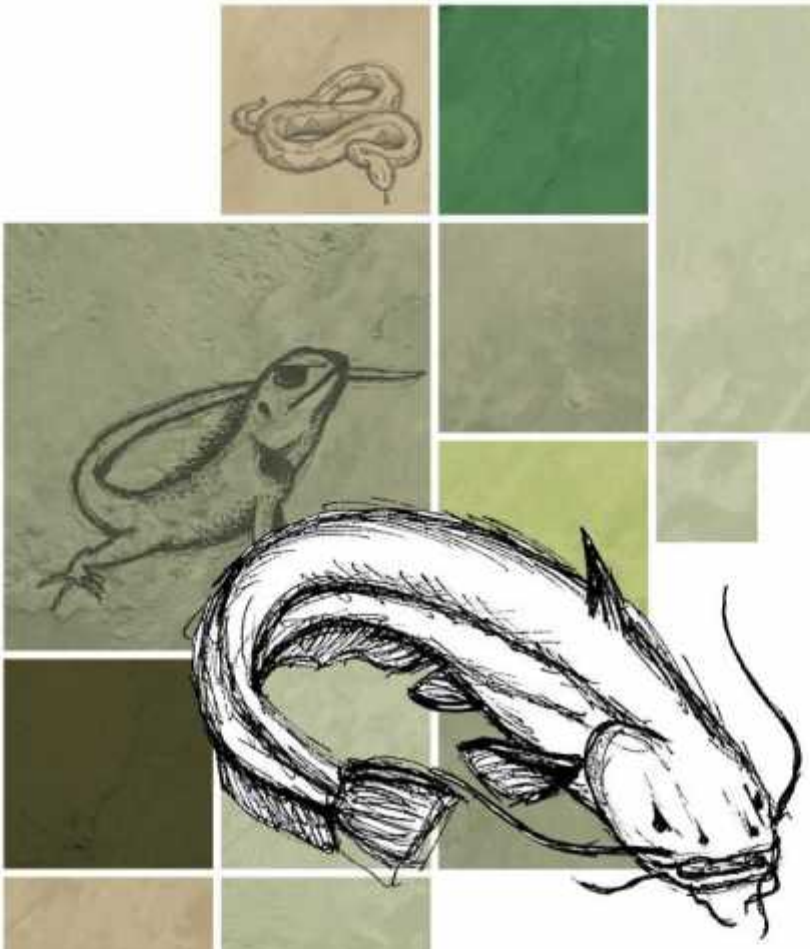

PESTSMART

Indicative 10 Project

National Resource Material

Walking Catfish

(*Clarias batrachus*)

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2017
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An Invasive Animals CRC Project

Department of Primary Industries and Regional Development
Invasive Animals CRC
Australian Government
Department of Industry and Science
Business Cooperative Research Centres Programme

Contents

Summary

Species on VPC List 2007?	No
Species on the live import list (EPBC Act 1999)?	No
Risk of establishment:	Extreme (Bomford 2008)
Pathways:	Unintentional (discarded bait), Intentional (aquaculture, pet trade and food)

Key Messages

Introduction pathway – Discarded bait in fishing vessels

Impact to economy – Risk to food production and the aquaculture industry

Impact to environment – outcompetes native species and transmits disease

- Coupled with its voracious appetite, the walking catfish is particularly harmful when invasive
- Because of their mobility and tolerance, and their indiscriminate feeding habits, they have been labelled an aggressive invasive species and banned from entry in several countries including Australia

Classification

***Clarias batrachus* (Linnaeus, 1758)**

Class:	Actinopterygii
Order:	Siluriformes
Family:	Clariidae
Genus:	*Clarias*
Species:	*batrachus*

Figure 1. *Clarias batrachus* Photo: Vassil (CC0 1.0)

Common names

Walking catfish, clarias catfish, freshwater catfish and Thailand catfish; Pla duk thai hito, pla duk nam jued (Thai); alimudan (Visayan), hito, hitong batukan (Tagalog), ikan keling (Malay), ito (Kapampangan), kawatsi (Kuyunon), keli (Malay), klarievyi som (Russian), konnamonni (Finnish), leleh (Javanese), magur (Bengali), nga-khoo (Burmese), paltat (Ilokano) trey andaing roueng (Khmer), and wanderwels (German)

Biology and Ecology

Identification

Walking catfish are typically grey or grey-brown with small white spots. This scaleless species has a flat, broad head with small eyes and tapering body (Froese and Pauly 2017). The mouth is wide with fleshy lips and numerous small pointed teeth in large bands on both the upper and lower jaw (Baird et al. 1999). There are four pairs of barbels, one pair each of maxillary and nasal barbels and two pairs of mandibal barbels. The fish has a lengthy dorsal and anal fin that each terminate in a lobe near the caudal fin (Courtenay et al. 1974). The pectoral fins, one on each side, have rigid spine-like elements (Taki 1974). To move outside of water, the fish uses these "spines" and flexes its body back and forth to "walk" (CABI 2017). The walking catfish doesn't have an adipose fin (a fin on the back behind the dorsal fin).

In addition to the brown or grey-brown colouring noted above, albinos and calico morphs are also possible. However, these are uncommon in the wild. Originally escaped fish in Florida were albinos but today the albino is rare and descendants have generally reverted to the dominant, dark colouring (Courtenay 1979).

The fish grow to 600 mm in its native range (Van Weerd 1995). However, in Florida it rarely exceed 350 mm (Kottelat and Whitten 1996).

Figure 2 *Clarias batrachus*. Photo Don Clara (CC BY-NC-ND 2.0)

Figure 3. *Clarias batrachus*. Photo: Florentino Floro (CC BY-SA 4.0)

Behaviours and Traits

Walking catfish possess a large accessory breathing organ which enables them to breathe atmospheric oxygen (Sayer 2005). They are well known for their ability to "walk" on land for long distances, especially during or after rainfall.

This elongated fish has lung-like organs and a high tolerance to harsh living conditions (Loftus 1979). It thrives in slow-moving and often stagnant waters in ponds, swamps, streams and rivers, flooded rice paddies or temporary pools (Courtenay et al. 1974). In these situations, the catfish is able to travel across dry land to find food or suitable environments using its pectoral fins to keep it upright as it moves (Sayer 2005). As long as it stays moist, the walking catfish can remain out of water from several hours to several days (Harvey 2014).

The scaleless fish is frequently farmed throughout the world (Diana et al. 1988; Knud-Hansen et al. 1990). Currently, no species of *Clarias* is farmed in Australia (Stephan and Hobsbawn 2014).

Food and Foraging

Walking catfish are benthic (i.e., bottom-dwelling) and stir up sediment in the hunt for food (Thakur 1978). In the wild, the catfish has a voracious appetite and varied diet, feeding on a variety of species including smaller fish, insect larvae, earthworms, shells, shrimps, aquatic

plants and debris (Thakur 1978). The catfish is highly predatory and will eat practically anything it can fit into its large mouth. Because it can survive out of water and traverse land, it is also capable of predating terrestrial invertebrates (Sayer 2005).

Reproduction and Lifecycle

The walking catfish is highly fecund and reach reproductive maturity at one year. Lachner et al. (1970) harvested as much as 544 kg per hectare of walking catfish per acre from isolated Florida small ponds.

In south-east Asia, spawning period is during the rainy season, when rivers rise and fish are able to excavate nests in submerged mud banks and dikes of flooded rice fields (Ref. 40977. Pairs gently nudge each other in the genital region and flick their dorsal fins. The female releases a stream of adhesive eggs (Knud-Hansen et al. 1990).

Habitat

An incredibly hardy species, the walking catfish is tolerant of a very wide range of water chemistry and temperature (Sayer 2005). It can also survive in oxygen-depleted conditions due to its ability to breathe atmospheric air (Loftus 1979). In fact, it is thought that the fish can literally drown if deprived access to the water surface for long enough. Several physiological adaptations allow the species to leave the water for extended periods (Mahon et al. 2013). These include a greatly reduced gas bladder and gills that are structurally stiffened to prevent collapse on land. The gills also exhibit highly vascularized arborescent (tree-like) organs that act as accessory breathing structures aiding respiration on land and in stagnant waters (Loftus 1979).

Global Range

Native to south-eastern Asia, walking catfish is present in eastern India, Sri Lanka, Bangladesh, Burma, Indonesia, Singapore, and Borneo (Kottelat and Whitten 1996; Lee et al. 1983; USGS 2017). Walking catfish have also been reported from Laos (Baird et al. 1999)

The catfish has also successfully established in Pakistan and the Philippines (USGS 2017). In the United States, it is established in Florida and been reported in California, Connecticut, Georgia, Massachusetts, and Nevada (Courtenay 1979; Courtenay and Miley 1975; Deacon and Williams 1984; Dill and Cordone 1997; Moyle 2002) where it is considered invasive (Figure 4).

The walking catfish was imported to Florida, reportedly from Thailand, in the early 1960s for the aquaculture trade. The first introductions apparently occurred in the mid-1960s when adult fish imported as brood stock escaped, either from a fish farm or a truck transporting brood. Additional introductions to Florida were supposedly purposeful. Aquarium releases likely are responsible for introductions in other US states.

In Florida, walking catfish are known to invade aquaculture farms, entering ponds where these predators prey on fish stocks. In response, fish farmers have had to erect fences to protect ponds.

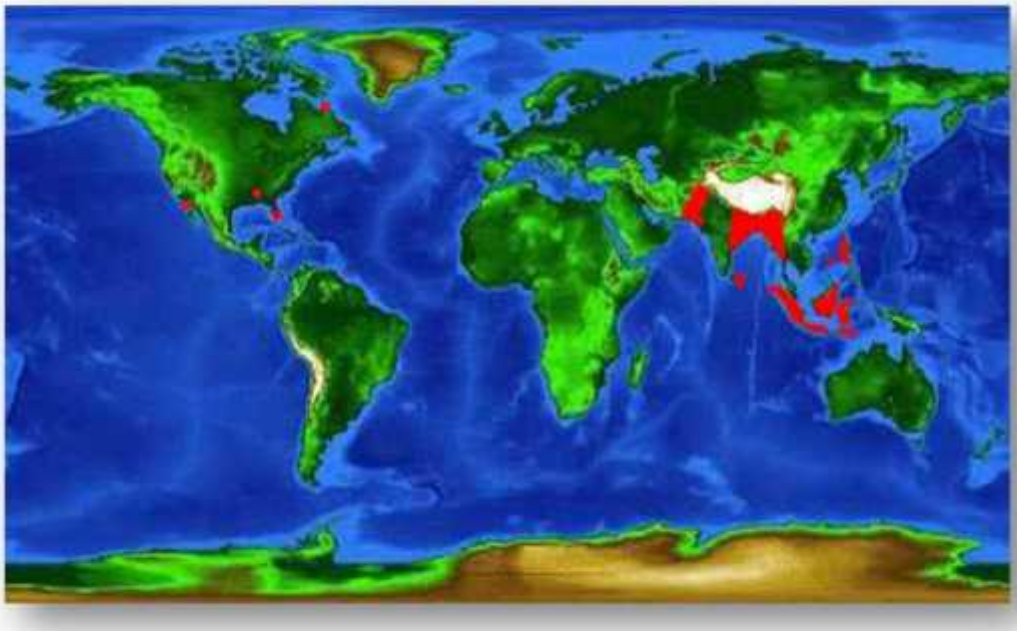

Figure 4. Map showing the native (beige) and introduced (red) range of *Clarias batrachus*. Image Robert H. Robins at the Florida Museum of Natural History. August 2017.

Potential for Introduction

If introduced, the walking catfish may be misidentified as the native eel-tailed catfish (*Tandanus tandanus*) found in the Murray-Darling Basin (Allen et al. 2002; Froese and Pauly 2017). Although the species can be distinguished by differences in caudal and dorsal fin length, this difference may be overlooked and an incursion may not be reported.

When individuals are dormant within mud burrows they typically survive for several months without feeding (Courtenay et al. 1974). Because the species has the ability to disperse overland during rainy periods, walking catfish can colonise new areas quickly. For example, they colonised almost every waterbody in Florida with 10 years (CABI 2017; USGS 2017).

Other avenues of introduction include improperly discarded fishing bait. Walking catfish, accidently caught as bycatch during fishing trips, are often left in bottom of boats. Assuming the fish is dead, the “carcasses” are thrown away onshore where they can move to a nearby waterbody. The catfish is also known to escape from aquariums when held in captivity.

Potential for Eradication

In the countries where the incursion and establishment has occurred, no effective control methods are currently available; management actions are limited to preventing access of the species to new locations or assets (CABI 2017; ISSG 2017; USGS 2017). If Australia was to experience an incursion in the wild, likely methods deployed would include electrofishing and net trapping (Acevedo et al. 2013; Barrett et al. 2014; Sutherland 2006; Tonkin et al. 2014). However, these conventional methods of fish sampling may not be adequate to detect freshwater fish at low densities (Lyon et al. 2014). Fencing high risk assets such as fish farms or conservation ponds may be successful in some circumstances. However, it is unlikely these methods would result in complete eradication (unless the incursion is geographically very limited and the number of individuals small) without negatively impacting native aquatic species.

The use of environmental DNA (eDNA; Mahon et al. 2013; Turner et al. 2014) may be used to determine if an incursion has occurred or if eradication has been successful (Jerde et al. 2011; Mahon et al. 2013; Noble et al. 2015). Both applications would enhance the potential for eradication. Presently the technology for eDNA testing is currently unavailable for walking catfish detection in Australia.

Impacts

Economic

Introduced walking catfish in Florida cause considerable damage to the aquaculture industry because they consume high numbers of stocked fish (Froese and Pauly 2017; Lachner et al. 1970).

The species is also known to carry the disease enteric septicemia (ESC) (Chappell 2008; Froese and Pauly 2017; Hawke et al. 1998). This highly fatal and fast-spreading systemic infection caused by the bacterium *Edwardsiella ictaluri* has become one of the two most significant diseases of economic significance in the catfish industry (Chappell 2008). Although the disease primarily affects catfish, several non-catfish species are also affected including seabass, salmon and trout (Hawke et al. 1998). Because of this, ESC is listed in the Australia's National List of Reportable Diseases of Aquatic Animals (http://www.agriculture.gov.au/animal/aquatic/reporting/reportable-diseases).

Environmental

The impacts from this opportunist feeder are probably most pronounced in small, isolated wetlands where walking catfish quickly consume or outcompete other resident species to become the dominant species in the pond (Shafland 1996). The walking catfish is known to outcompete native fish species in Florida and the Philippines where it have been introduced (Shafland 1996). As a result, some native species are considered threatened because of catfish predation (CABI 2017; Froese and Pauly 2017; ISSG 2017; Lever 1996; USGS 2017). Baber and Babbitt (2003) note that the catfish can also negatively impact native amphibian populations by preying on tadpoles. The ability of walking catfish to exploit isolated, ephemeral water bodies allows them to access tadpole prey stocks that other fish cannot

reach (IUCN 2017). It is therefore unlikely Australian native fish or amphibians will outcompete walking catfish should the species be successfully introduced.

Walking catfish may also spread ESC to native fish species such as eel-tail catfish or Australian bass (Hawke et al. 1998).

Social

Since walking catfish predation in small, isolated ponds has particular impact, farm dams and recreational ponds may be especially vulnerable (Shafland 1996). As a benthic feeder, the walking catfish will also stir up sediments in the ponds, impacting the aesthetic nature of these waterbodies. All these impacts are likely to have negative consequences to recreational fishing.

Legislation

The high risk and potential pest status of the walking catfish is recognised throughout Australia, as indicated in Table 1.

Table 1: Current status of the walking catfish under jurisdictional legislation

Jurisdiction	Legislation	Status
Australia	Biosecurity Act 2015	Noxious under Schedule 1
Australia	Environment Protection and Biodiversity Conservation Act 1999	not suitable for import
Australia	List of specimens taken to be suitable for live import	not listed
Western Australia	Fish Resources Management Regulations 1995	Noxious under Schedule 5
South Australia	Fisheries Management Act 2007	Noxious
New South Wales	Fisheries Management Act 1994	Class 1 Noxious under Schedule 6c
Queensland	Fisheries Act 1994	Noxious under Schedule 6
Victoria	Fisheries Act 1995	Noxious

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Image Library - Walking catfish (*Clarias batrachus*)

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