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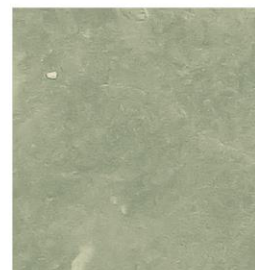
Asian Black-Spined Toad (*Duttaphrynus melanostictus*)

Michelle T. Christy and Win Kirkpatrick
2017

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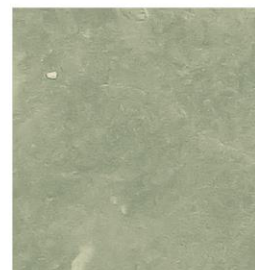
An Invasive Animals CRC Project





Contents

Summary	1
Key Messages	1
Classification	1
Common Names	2
Biology and Ecology.....	2
Identification	2
Behaviours and Traits.....	4
Food and Foraging.....	4
Reproduction and Lifecycle	4
Habitat	4
Global Range	5
Potential for Introduction	6
Potential for Eradication	6
Impacts.....	6
Economic.....	7
Environmental	7
Social	7
Legislation	8
Image Library	9
Copyright Licence Restrictions of Use.....	9
Image Library - Asian Black-Spined Toad (<i>Duttaphrynus melanostictus</i>).....	16
References	20



Summary

Species on VPC List 2007?	No
Species on the live import list (EPBC Act 1999)?	No
Risk of establishment:	Serious (Bomford 2008; Csurhes 2010)
Pathway:	Unintentional (stowaway)

Key Messages

Introduction pathway - Accidentally transported, often by tourists in shoes and towels

Impact to Industry - Risk to food production and the aquaculture industry

Impact to Environment - Outcompetes native species and transmits disease

Misidentification - Resembles the cane toad (*Rhinella marina*). Asian black-spined toad (ABST) morphology is highly variable, especially the juveniles. As a result, it is often confused with co-existing species throughout its range (Daniels 2005).

Risk - multiple risks:

- Widespread and abundant throughout south-east Asia, which could increase propagule pressure. It is not known to occur in the wild in Australia however the species is frequently intercepted at Australian borders.
- Like the cane toad, ABST have parotoid glands that secrete toxins. These toxins are likely to cause severe impacts on native species and pets.
- ABST can tolerate relatively cooler weather conditions than the cane toad. If established, ABST could have comparable environmental impacts to those of the cane toad.

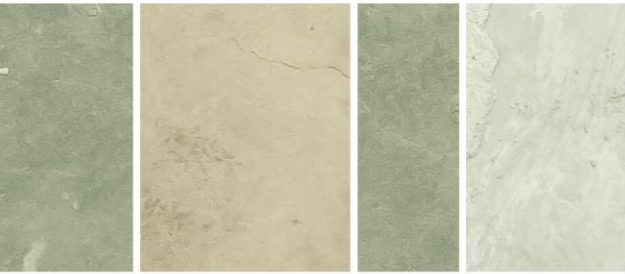
Classification

Duttaphrynus melanostictus (Schneider, 1799)

Class:	Amphibia
Order:	Anura
Family:	Bufoidea
Genus:	<i>Duttaphrynus</i>
Species:	<i>melanostictus</i>



Figure 1. *Duttaphrynus melanostictus* Photo: Ian Jacobs (CC BY-NC 2.0)



Common Names

Asian black-spined toad, Asian common toad, Asian spined toad, Southeast Asian toad, spectacled toad, common Indian toad, black-spined toad, common Sunda toad, black-lipped toad, keeled-nosed toad, South Asian garden toad, black-spectacled toad, house toad, Asiatic toad, Asian eyebrow-ridge toad, Asian black-spotted toad, and Javanese toad.

Biology and Ecology

Identification

Asian black-spined toads (ABST) are stocky, medium to large size, with a relatively small head and short hind limbs (Mattison 1987). The toad has elevated bony ridges on its head, with long dark crests that border the eyelids and down the side of the eyes to the prominent parotoid glands (Csurhes 2010). Colouration is highly variable, usually grey to red-brown, but ranging from brick-red to almost black. Colour pattern is often yellow-brown marked with dark or reddish-brown streaks and spots, and the back is covered with various sized warts which are capped with tiny dark spines (Bartlett et al. 2001). Small warts are also found on the soles and toes. The underside is largely whitish with fine black spots. Juveniles have a blackish band between the chin and chest, and lack warts and the conspicuous eardrum. Tadpoles are black and small, up to 15 mm long (Bartlett et al. 2001; Daniels 2005).



Figure 2 *Duttaphrynus melanostictus* Photo: Bernard Dupont (CC BY-SA 2.0)



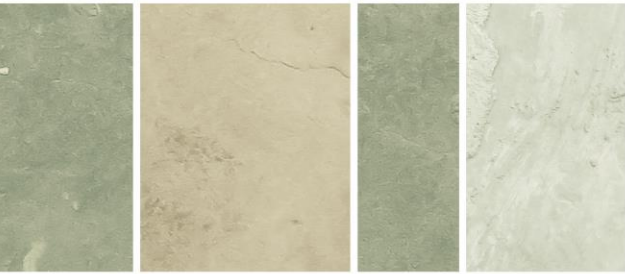
Males have a subgular vocal sac, and when breeding, the vocal sac in the throat region becomes bright yellow/orange (Bartlett et al. 2001). Nuptial pads (pigmented, cornified swelling used to assist grip during copulation), develop on the inner side of the first and second fingers.

Snout-vent length of males is between 57–83 mm, and females between 65–85 mm, although females can often exceed 150 mm (Bartlett et al. 2001; Jørgensen et al. 1986).

ABST morphology is highly variable, especially the juveniles. As a result, it is often confused with co-existing species throughout its range (Daniels 2005). In Australia, it may be misidentified as a cane toad (*Rhinella marina*) and some native species.



Figure 3. *Duttaphrynus melanostictus* Photo: J. Maughn (CC BY-NC 2.0)



Behaviours and Traits

The toad is poisonous and is well adapted for life in urban areas. Although longevity in the wild is unknown, ABST are known to live between 4 and 10+ years in captivity (Bartlett et al. 2001). The toad can carry a number of parasites including microfilarial worms and nematodes (Rahman et al. 2008).

Food and Foraging

ABST has a generalist diet and will take most food items that it can fit in its mouth, typically between 5-20 mm in size (Berry and Bullock 1962). It hunts exclusively on the ground, often consuming a wide variety of invertebrates, especially ants and termites. Additional prey includes earwigs, grasshoppers, bugs, beetles, cockroaches and other flying insects, spiders, and molluscs. Even invertebrates with noxious protective and offensive mechanisms such as scorpions, centipedes and millipedes are frequently taken (Berry and Bullock 1962). They are also known to feed on the eggs, larva and juveniles of other native amphibians (Gleb 2013).

The tadpoles eat mainly phytoplankton (Sinha et al. 2001). Young toads actively feed during the night and during the day, most often on soft-bodied ants (Daniels 2005; Sinha et al. 2001).

Predation on ABST varies depending on geography, but are most commonly taken by snakes and birds (Gleb 2013). The lack of predators is likely due to their toxicity (Keomany et al. 2007).

Reproduction and Lifecycle

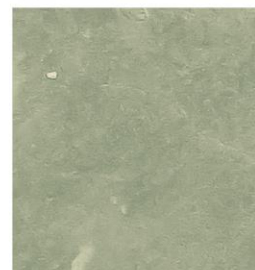
ABST breed once or twice a year. Breeding starts at the beginning of the wet season, but where seasons are less pronounced, breeding occurs year-round (Jørgensen et al. 1986). Males congregate at breeding sites including still and slow-flowing rivers ponds, puddles, and gutters where they call to females (Daniels 2005; Saidapur and Girish 2001).

Females are highly fecund and their ovaries, which can occupy a third of their body weight, can produce up to 40,000 eggs per clutch (Murray et al. 2010; Whitten et al. 1996). The female lays a long string of black eggs which are enclosed in a double gelatinous capsule and laid in a double jelly string around submerged vegetation (Khan 2016). The eggs develop into larvae in 24–48 hours, depending on water temperature (Bartlett et al. 2001; Jørgensen et al. 1986). Once hatched, tadpoles reach metamorphosis within 34 to 90 days, followed by 25-30 days of metamorphosis, depending on habitat and food availability (Bartlett et al. 2001; Jørgensen et al. 1986; Saidapur and Girish 2001).

The call of the ABST is similar to that of a telephone dial tone (creo-o-o; croro-ro-ro). The call is sustained for about 30 seconds and repeated in a chorus (example of call [ABST Call](#)). It will be heard at night and sometimes on overcast days.

Habitat

ABST is a nocturnal, terrestrial habitat generalist, found across temperate, subtropical and tropical habitats, from sea level to 2 km (Khan 2016). It is generally detected in disturbed, lowland habitats such as disturbed forests, forest margins, riparian areas and human-dominated agricultural and urban areas, but are uncommon in closed forest (Van Dijk et al.



2004). During the day, adults shelter under rocks, leaf-litter, logs and man-made structures such as drains, rubbish piles and even houses. In populated areas, they often gather to feed around street lamps at night. ABST can breed close to the ocean with tadpoles tolerating brackish water up to 1% salinity (Daniels 2005; Strahan 1957).

Global Range

ABST is one of the most widespread and abundant species in its genus (Csurhes 2010: Figure 4). Its native distribution extends from north Pakistan through Nepal, Bangladesh, India, Sri Lanka, southern China (including Taiwan, Hong Kong and Macau), Myanmar, Lao People's Democratic Republic, Vietnam, Thailand and Cambodia to Malaysia, Singapore, and Indonesia (Sumatra, Java, Borneo, Anambas Islands and Natuna Islands)(Van Dijk et al. 2004).

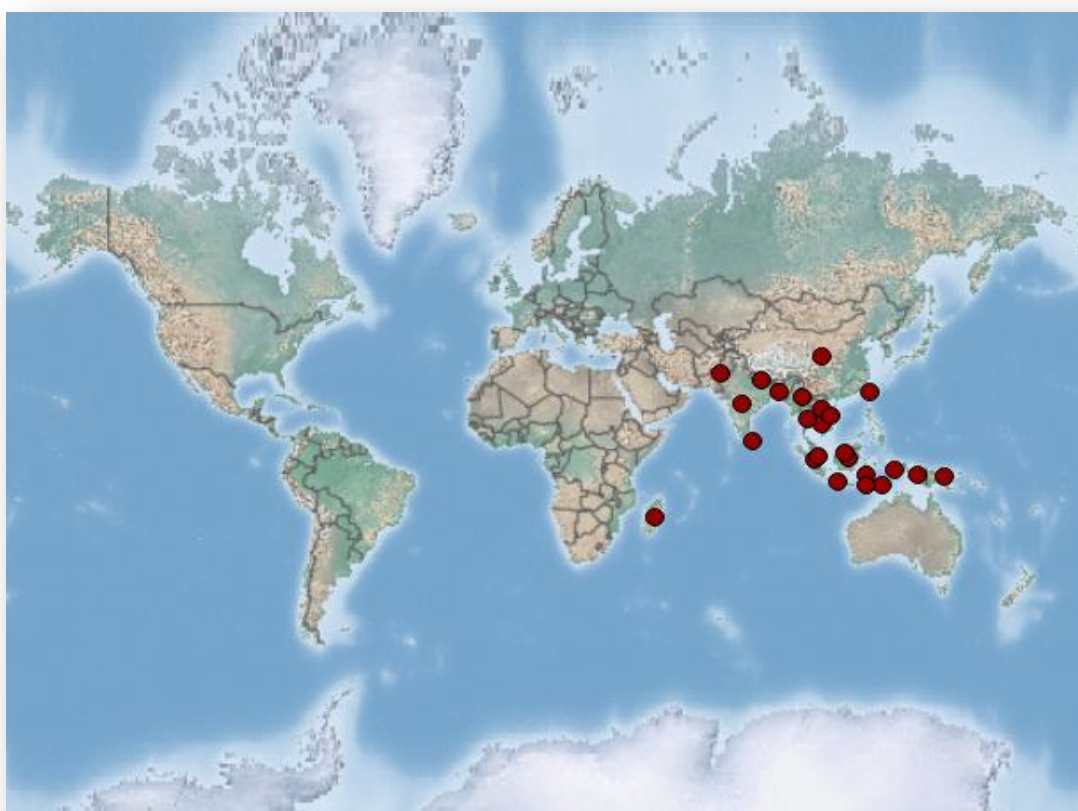
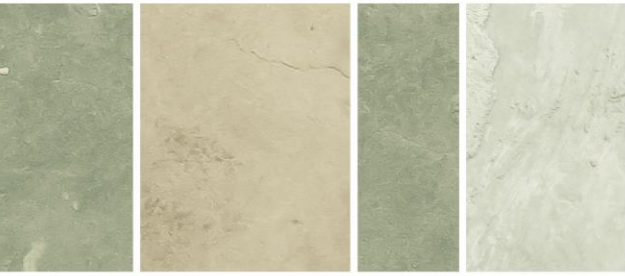


Figure 4. Map showing where *Duttaphrynus melanostictus* are present. Image taken from CABI Invasive Species Compendium (<https://www.cabi.org/isc/datasheet/121979>) November 2017.

The toad has spread and naturalised in parts of Indonesia including Bali, Sulawesi, Ambon, Manokwari, Maluku, the Guinean areas of West Papua and Papua New Guinea, and the Indian



Ocean's Andaman and Nicobar Islands (Church 1960; Khan 2016; Lever 2003; Van Dijk et al. 2004; Whitten et al. 1996). Further, ABST was recently discovered in East Timor (Khan 2016).

ABST has not yet established in Australia. However, individuals have been intercepted at Australian airports and sea ports aboard flights and sea vessels originating from Asia. The toads are usually found in international vessels, shipping containers, machinery and personal effects such as bags, shoes, boxes and cartons. A small number of individuals have been detected "at large", however, all have been of single individuals and the path of entry determined as ports of entry (air and sea ports), particularly shipping containers and personal luggage.

Potential for Introduction

Although ABST is not yet established in Australia, future incursions are highly likely, based on the number of incursions that have occurred in the past. García-Díaz and Cassey (2014) and Henderson et al. (2011) reported that 82 ABST were transported as stowaways between 1988-2012, and all were discovered in harbors and airports by Customs and Biosecurity agencies. Depending on the frequency, routine inspections should continue to be effective at detecting new incursions. If individuals are detected at the border inspections, then ABST may be prevented from establishing here. However, as with cane toads, if ABST pass through the border and become widely established, they will be difficult, if not impossible, to eradicate.

ABST usually move within a home range size of no more than 5 km (reported in García-Díaz 2014). Brown et al. (2006) and Phillips et al. (2006) found that distances moved by cane toads at the invasion front were significantly higher than in other areas occupied. It is likely that the same pattern of movement could occur with ABST.

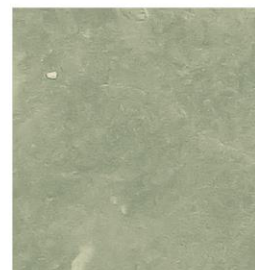
Potential for Eradication

Based on coloration, size and movement patterns, ABST are likely to have low detectability at low densities (e.g., Phillips et al. 2006). If established, control methods developed for cane toads may be useful (Crossland et al. 2012; Kelehear et al. 2012; Pizzatto and Shine 2012a, b; Saunders et al. 2010; Shine and Doody 2011; Ward-Fear et al. 2010). Note, that no method or combination of methods and techniques have been used to successfully eradicate cane toads in Australia and this will likely be the same for ABST if it becomes wide spread.

Impacts

ABST is likely to survive throughout much of Australia, thriving primarily in coastal and northern areas.

The toad shares similar attributes, such as size, reproductive output, diet, and habitat preferences, to cane toads which have become well established in much of Australia (Van Dijk et al. 2004). It is reasonable to predict that if ABST become established in Australia, its impact would be comparable to that of the cane toad.



Economic

No economic impacts have been reported in the ABST's introduced range, although tadpoles of the species are known to clog irrigation and outlet pipes and may negatively impact the aquaculture industry. ABST are used as a food source in some parts of its native range (Van Dijk et al. 2004), however, it is unlikely to be used as a food source in Australia. The consumption of skin and eggs, or use of parotid gland secretions for the psychedelic properties, can cause serious illness or even death (Das et al. 2000; Keomany et al. 2007), This could have a small impact to the health care sector.

Environmental

Introduced populations of ABST are known to reproduce rapidly (Gleb 2013) and this rapid increase can result in competition and displacement of native species (Church 1960; Csurhes 2010). These toads are also known to eat the eggs, larva and juveniles of other native amphibians, causing further environmental impacts (Gleb 2013).

Although no quantitative assessment of impacts has been carried out, the ecological impact of ABST in East Timor is considered serious (Csurhes 2010). In Indonesia, the species is known to displace the small, less active crested toad (*Ingerophrynus biporcatus*) (Iskandar 2004). Church (1960) reported that “nothing can hinder its expansion” in Indonesia.

ABST, as do other species of the family Bufonidae, carry the chytrid fungus (*Batrachochytrium dendrobatidis*). This fungal disease is responsible for the decline and extinction of amphibians worldwide (Kilpatrick et al. 2010; Skerratt et al. 2007) including significant negative impacts on native Australian frogs (e.g., Berger et al. 1998; Fisher et al. 2009; Kilpatrick et al. 2010; Murray et al. 2010; Skerratt et al. 2007; Woodhams et al. 2006). As a consequence, chytrid has been listed in Australia's National List of Reportable Diseases of Aquatic Animals. ([National List of Reportable Diseases](#), Last accessed 7 September 2017). Incursions of the toad could further increase the risk of chytrid infections in Australian frogs.

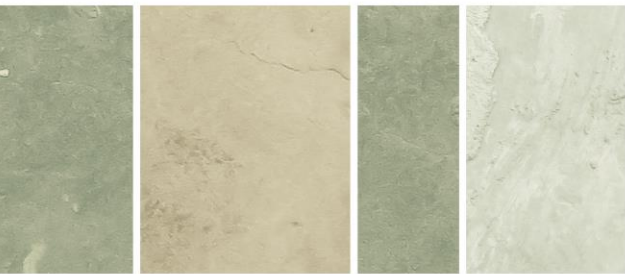
As with other Bufonidae, ABST produce cutaneous toxic substances that could cause harm to naive native species (Vitt and Caldwell 2013) and possibly domestic pets. However, harmful effects of poisoning of predators has not yet been reported in its introduced range (Khan 2016).

ABST can carry a number of parasites including microfilarial worms, nematodes (primarily *Oxysomatium* sp. and *Rhabdias* sp.) and trematodes (*Mesocoelium burti*) that could impact native species (Rahman et al. 2008) as well as pathogens such as Ranavirus, and chytrid fungus (e.g., Jancovich et al. 2010; Vredenburg et al. 2010).

Social

No social impacts have been reported in the introduced range.

ABST can pose a direct threat to human safety and there are reports that eating the skin and eggs can cause fatality (Keomany et al. 2007). Adults secrete a milky toxin, with a pungent odour, that contains several bioactive compounds with lethal, hypotensive, hypertensive, neurotoxic, cardiotoxic, haemolytic and sleep inducing factors (Das et al. 2000; Keomany et al. 2007). When handled by people, the toad can cause itching in the nostrils, eyes and



exposed skin (Daniels 2005). As discussed above, the consumption of skin and eggs, or use as a psychedelic drug can cause serious illness or death.

Legislation

The high risk and potential pest status of the ABST is recognized throughout Australia, as indicated in Table 2. ABST is listed on the IUCN Red List as ‘Least Concern’ due to its wide distribution, tolerance of a broad range of habitats, and large population. It is an abundant species throughout its range that is probably increasing in many areas (Van Dijk et al. 2004). The species is not listed on any of the three CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) appendices.

Table 2: Current status of the Pacific rat under jurisdictional legislation

Jurisdiction	Legislation	Status
Australia	Biosecurity Act 2015	included
Australia	List of specimens taken to be suitable for live import	not listed
Western Australia	Biosecurity and Agriculture Management Act 2007	prohibited
South Australia	Natural Resources Management Act 2004	prohibited
New South Wales	Non-Indigenous Animals Regulation	high risk
Queensland	Land Protection (Pest and Stock Route Management) Act 2002	Class 1 declared animal
Victoria	Catchment and Land Protection Act 1994	prohibited



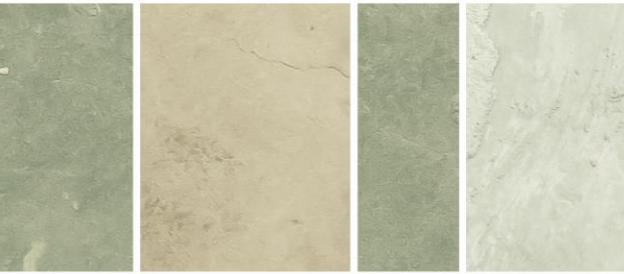
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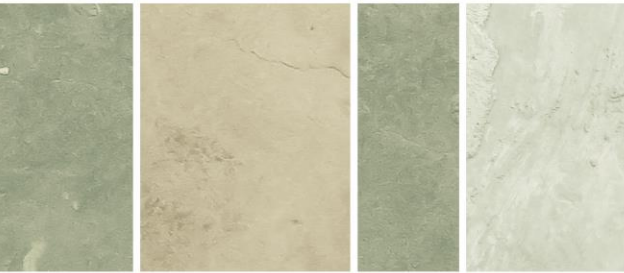
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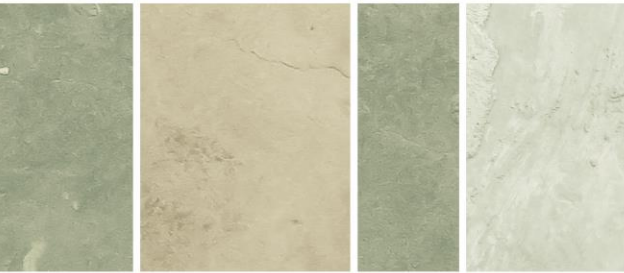
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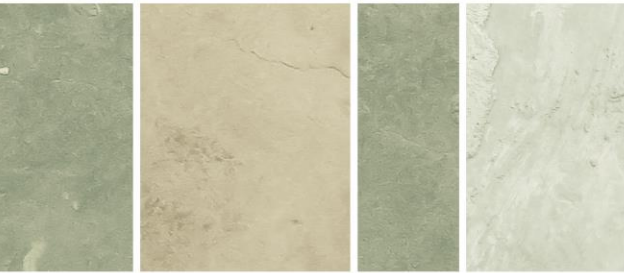









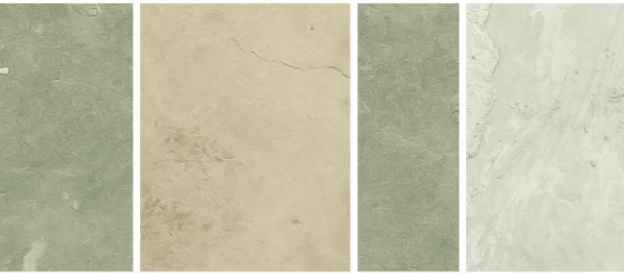
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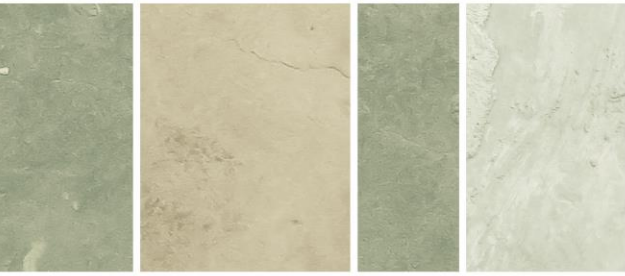
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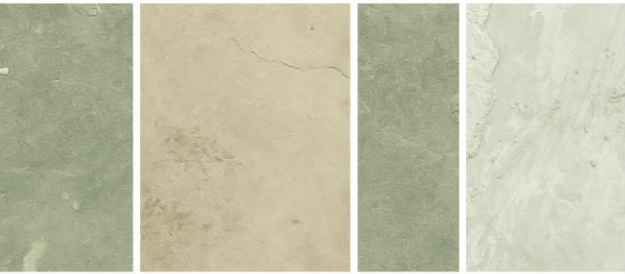
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