

# THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

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The Minister approved this conservation advice and included this species in the Endangered category, effective from 07/12/2016

## Conservation Advice

### *Adclarkia cameroni*

brigalow woodland snail

#### **Taxonomy**

Conventionally accepted as *Adclarkia cameroni* Stanistic, 2010.

#### **Summary of assessment**

##### **Conservation status**

Endangered: Criterion 2 B2 (a)(b)(i)(ii)(iii)(iv)(v)

The highest category for which *Adclarkia cameroni* is eligible to be listed is Endangered.

*Adclarkia cameroni* has been found to be eligible for listing under the following categories:

Criterion 2: B2 (a)(b)(i)(ii)(iii)(iv)(v): Endangered

Criterion 4: Vulnerable

Species can be listed as threatened under state and territory legislation. For information on the listing status of this species under relevant state or territory legislation, see

<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

#### **Reason for conservation assessment by the Threatened Species Scientific Committee**

This advice follows assessment of information provided by a public nomination.

#### **Public consultation**

Notice of the proposed amendment and a consultation document was made available for public comment for 31 business days between 20 June 2016 and 1 August 2016. Any comments received that were relevant to the survival of the species were considered by the Committee as part of the assessment process.

#### **Species information**

##### **Description**

Shell medium to large (diameter 20 mm), thin, light brownish yellow, with a reddish band on the whorls (spirals) on the shell (Stanistic et al., 2010). The shell is somewhat flattened, with a low, domed spire. The whorls are rounded and tightly coiled; the last whorl is flared. The sutures (junctions between the whorls) are weakly present. The tip of the shell bares small rounded knobs (Stanistic et al., 2010). Much of the rest of the shell bares fine, scaly knobs on the upper half of the whorls, glossy underneath. The shell also bares very fine, wavy ridges running across each whorl. The animal is grey (Stanistic et al., 2010).

This species differs from *A. dulacca* by having a less flattened shell, with 'looser' coiling (Stanistic et al., 2010).

##### **Distribution**

The brigalow woodland snail (family Camaenidae) is endemic to south-east Queensland, where it occurs in a small number of remnant and scattered *Acacia harpophylla* (brigalow) and eucalypt woodland patches (such as road verges and riparian corridors) on the Condamine River floodplain, especially in the area around Dalby and Chinchilla (Stanistic 2011). This is a highly

developed agricultural area (Seaton 2016). These remnant vegetation patches are subject to many disturbances such as excessive drying due to clearing, stock grazing, and fire. The brigalow patches occur on alluvial black soils. The narrow Condamine River riparian corridor is an important refuge for the species, particularly in an area that has been largely cleared for cattle grazing and agriculture. Here the canopy cover is dense, scattered timber (flood debris) is greatest and environmental moisture is at its most stable, even in drier times (Stanisic 2011). The species was first discovered during a major survey of the Queensland Brigalow Lands Bioregion conducted in 1996-1997 (Stanisic 2011), and records are adequate to determine the species' range (Koehler et al., 2016).

The extent of occurrence (EOO) was calculated to be 27 924 km<sup>2</sup>, and the area of occupancy (AOO) 76 km<sup>2</sup>, based on locality records from 1976 to the present (DotEE 2016). However, the EOO and AOO are likely to be much less, because the approximately 19 known records include only seven with live individuals (Stanisic 2013). Most of the sampled current populations comprise juveniles and sub-adults, indicating that the brigalow woodland snail is breeding in some locations.

The current distribution of this species is severely fragmented. The brigalow communities within the Condamine River floodplain that were once contiguous in the area of the species' historical distribution have been extensively cleared for agriculture and farming, and the current distribution of the brigalow woodland snail reflects this broad scale clearing (Stanisic 2011).

One population occurs in the State owned St Ruth's Reserve, via Dalby (on the Condamine River), which is managed by Western Downs Regional Council. However, no management of the species in this reserve is currently being undertaken (Stanisic 2011). There are no other populations in reserve systems (Stanisic 2011). The brigalow woodland snail occurs in the 'Brigalow (*Acacia harpophylla* dominant and co-dominant)' ecological community (Seaton 2016), currently listed as Endangered under the EPBC Act (TSSC 2013). The snail may also occur in the 'Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt Bioregions' ecological community, currently listed as Endangered under the EPBC Act (TSSC 2011).

### **Relevant Biology/Ecology**

The brigalow woodland snail is known to occur under logs (Stanisic et al., 2010) and leaf litter, where it likely feeds on fungi, lichen, algae and other detritus/biofilm growing on forest debris, thereby recycling nutrients into the soil (Stanisic 2011). Feeding by this species has not been observed, but likely occurs during periods of higher humidity, such as evenings and rain events.

The brigalow woodland snail needs both canopy and on-ground timber cover for survival and egg-laying (Stanisic 2011). Generally, camaenids lay their eggs in depressions in the soil under logs and other debris, and although egg-laying has not been recorded for this species, it is highly likely that it follows a similar pattern (Stanisic 2011). Desiccation is the greatest threat to land snail eggs and hence, in addition to ground debris, an over-storey of trees and shrubs is also required in order to maintain high levels of relative humidity at the substrate level (Stanisic 2011). Land snails can aestivate during drier phases but the extent of this hibernation is limited by their body reserves (Stanisic 2011).

The age at sexual maturity is unknown, but is likely to be approximately two years, based on the growth patterns of other snails from the same family (Stanisic 2011). The life expectancy is also unknown, but is likely to be at least five years, based on the longevity of similar species (Stanisic 2011). Mature snails will lay eggs on an annual basis and, depending on the length of the summer rain period, could lay more than a single clutch of eggs in one year. The number of mature individuals is unknown, and there is no evidence that this species undergoes extreme natural fluctuation in population size (Stanisic 2011).

Snails in seasonally dry environments in the northern half of Australia in particular are generally considered to become sexually mature during their second wet season. The brigalow woodland snail would be expected to follow a similar pattern (Solem 1981, cited in Stanisic 2011). Natural

mortality is likely to be most significant for the immature stages, when shell growth has not been fully completed (Stanisic 2011).

The brigalow woodland snail is of very limited mobility. Under favourable conditions, such as rain, this species can move between suitable areas of microhabitat, but the extent to which this occurs will be limited by the spatial arrangement of habitat patches.

## Threats

Table 1 – Threats impacting the brigalow woodland snail in approximate order of severity of risk, based on available evidence

Threat factor	Threat type	Threat status	Evidence base
Habitat loss and fragmentation			
Land clearing	known	current	Habitat with tree cover and ground debris is critical to survival of native land snails, and increases the species' ability to disperse and recolonise (Stanisic 2011). Tree cover ensures a level of environmental moisture. Habitat clearing has increased with coal seam gas extraction and coal mining developments in the region (QMDC 2016). The burning of woody debris during land clearing also leads to loss of habitat. The impacts of land clearing on the brigalow woodland snail are ongoing (Stanisic 2016). Clearing of roadsides has also led to habitat loss (Seaton 2016).
Habitat disturbance	known	current	Accumulated ground debris provides important shelter for the species. Undisturbed habitat ameliorates the effects of drought events, as desiccation is generally the greatest threat to land snails (Stanisic 2011). The harvesting of timber on the ground for firewood may also threaten this species, although the extent and impact are unknown (Koehler et al., 2016).
Invasive species			
Predation by rats ( <i>Rattus</i> spp.), mice ( <i>Mus musculus</i> ) and feral pigs ( <i>Sus scrofa</i> )	known	current	Rats, mice and pigs are known to prey on land snails (Stanisic 2011). The incidence of predation is likely to be high, as rats and mice are nocturnal scavengers, and the brigalow woodland snail most likely also feeds at night. Predation by invasive species is an ongoing threat at all locations (Stanisic 2011), although the impact is unknown. Feral pigs use disturbance corridors for more easy access to native habitat (QMDC 2016).
Invasion of buffel grass	known	potential	Buffel grass ( <i>Cenchrus ciliaris</i> ) has replaced native grasses in some areas, and increases in fuel load are correlated with buffel grass invasion (Miller et al., 2010), leading to more intense fires. Increased fire activity in the grassy fringes will damage natural vegetation and facilitate further spread of grass away from the road areas (QMDC 2016).

Impacts of domestic species			
Trampling by cattle and horses	known	current	Cattle and horses—animals with solid hooves—directly kill the snails and destroy valuable microhabitat (logs and timber), which provides feeding and breeding habitat for snails (Stanisic 2011). Cattle are currently excluded from the St Ruth’s Reserve locality, but they are an ongoing threat to all other known populations (Stanisic 2011).
Fire			
High intensity	known	potential	Any fire can cause loss of individuals and negatively impact their habitat. Hot fires in particular not only affect canopy structure but also tend to eliminate ground debris, which is essential habitat for snails (Stanisic 2011). The low mobility of land snails means they are especially susceptible to the effects of fire. The progressive process of habitat decline due to changed fire regimes caused by high biomass grasses (such as buffel grass) is already recognised as a key threat to conservation reserves within the Queensland Murray-Darling Basin (QMDC 2016).

**How judged by the Committee in relation to the EPBC Act criteria and regulations**

<b>Criterion 1. Population size reduction (reduction in total numbers)</b>			
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	<b>Critically Endangered Very severe reduction</b>	<b>Endangered Severe reduction</b>	<b>Vulnerable Substantial reduction</b>
<b>A1</b>	<b>≥ 90%</b>	<b>≥ 70%</b>	<b>≥ 50%</b>
<b>A2, A3, A4</b>	<b>≥ 80%</b>	<b>≥ 50%</b>	<b>≥ 30%</b>
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p>	<p><i>based on any of the following:</i></p> <ul style="list-style-type: none"> <li>(a) direct observation [except A3]</li> <li>(b) an index of abundance appropriate to the taxon</li> <li>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</li> <li>(d) actual or potential levels of exploitation</li> <li>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</li> </ul>		

**Evidence:**

**Not eligible**

Habitat destruction is the greatest threat to land snail communities, and land clearance has affected 85 percent of the brigalow communities in Queensland (Stanisic et al., 2010). On a national scale, the brigalow (*Acacia harpophylla* dominant and co-dominant) Ecological Community has declined to approximately 10% of its former area (TSSC 2001). The greatest decline in extent of this Ecological Community occurred during the decade from 1960 to 1970, (TSSC 2001), and the greatest decline in distribution of the brigalow woodland snail is also likely to have occurred during this period.

Historical decline in the extent of occurrence of the brigalow woodland snail can be inferred based on the reduction in brigalow habitat. The brigalow woodland snail now occurs mostly in small remnant vegetation patches that are subject to many deleterious disturbances such as excessive drying, stock grazing, and fire (Stanisic 2011). However, how much of the original brigalow habitat that was occupied by this species is unknown.

Areas of relatively undisturbed remnant vegetation communities within the EOO of the brigalow woodland snail have been heavily impacted by a regularly spaced pattern of drill sites, infrastructure corridors and service roads constructed in the last 12 years (QMDC 2016), which is within the appropriate period for assessment under this criterion. However, examination of satellite imagery showing the drill sites and access roads indicates that the level of habitat disturbance caused by this threat does not exceed 30 per cent of the EOO of the snail.

Land clearing—mainly for conversion to pasture—is also continuing in the region: the Brigalow Belt bioregion had the highest woody vegetation clearing rate for 2014-15, with 1300 km<sup>2</sup> (DSITI 2016). Land clearing is also continuing in the Condamine subcatchment (which comprises a total runoff area of 30 439 km<sup>2</sup>) (Accad & Neldner 2015), and includes much of the distribution of the brigalow woodland snail. The following table shows the decline in extent of remnant vegetation in the Condamine subcatchment from 2003 to 2013 (Accad & Neldner 2015):

Year	Extent of remnant vegetation (km <sup>2</sup> )
2013	7355.69
2011	7369.24
2009	7375.43
2006	7395.64
2005	7400.97
2003	7429.66

These data show that 74 km<sup>2</sup> of remnant vegetation were cleared over this period, representing a decline of approximately 1 percent. However, there has been extensive historical decline in total remnant vegetation in this subcatchment: as at 2013, only 24.2 percent of total remnant vegetation remained (Accad & Neldner 2015).

These data indicate that habitat (remnant vegetation) extent and quality have declined from 2003 to 2013, but at a rate less than the 30 per cent threshold for this criterion.

Although the brigalow woodland snail is very likely to still be declining, there are no data regarding historical distribution of this species to enable any decline over time to be quantified. Following assessment of the data the Committee has determined that the species is not eligible for listing in any category under this criterion as the past, current or future population declines are thought unlikely to exceed 30% in any 3-generation period.

<b>Criterion 2. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy</b>			
	<b>Critically Endangered Very restricted</b>	<b>Endangered Restricted</b>	<b>Vulnerable Limited</b>
B1. Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

### Evidence:

#### Eligible under Criterion 2 B2 (a)(b)(i)(ii)(iii)(iv)(v) for listing as Endangered

The extent of occurrence was calculated to be 27 924 km<sup>2</sup>, using the IUCN convex hull/minimum convex polygon method, based on the mapping of point records from 1976 to 2016 obtained from state governments, museums and the CSIRO (DotEE 2016). The area of occupancy was calculated to be 76 km<sup>2</sup>, based on locality records from 1976 to 2016 (DotEE 2016), using the 2x2 km grid cell method described in the IUCN Red List Guidelines 2014 (IUCN, 2014).

The distribution of the brigalow woodland snail is severely fragmented. The brigalow communities within the Condamine River floodplain that were once contiguous in the area of the species' historical distribution have been extensively cleared for agriculture and farming, and the known locations of the brigalow woodland snail reflect this broad scale clearing (Stanisic 2011). The brigalow woodland snail now occurs mostly in small remnant vegetation patches that are subject to many disturbances such as excessive drying due to clearing, stock grazing, and fire (Stanisic 2011). Large areas of relatively undisturbed remnant vegetation communities throughout this area have been heavily impacted by a regularly spaced pattern of drill sites, infrastructure corridors and service roads constructed in the last 12 years (QMDC 2016). Land clearing is also continuing in the Condamine subcatchment (Accad & Neldner 2015) (see previous criterion), which includes much of the distribution of the brigalow woodland snail. The species is subject to continuing threats, and is therefore likely to still be declining, although there are no available data on historical distribution or robust measures of current abundance.

The species has very limited mobility, and the capacity for dispersal is therefore also very limited. There is no evidence that this species undergoes extreme natural fluctuation in population size (Stanisic 2011).

The Committee considers that the species' area of occupancy is restricted, with a severely fragmented distribution, and inferred continuing decline in extent of occurrence, area of occupancy, habitat, number of individuals and number of locations due especially to the effects of land clearing. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 2 to make it eligible for listing as Endangered.

<b>Criterion 3. Population size and decline</b>			
	<b>Critically Endangered Very low</b>	<b>Endangered Low</b>	<b>Vulnerable Limited</b>
Estimated number of mature individuals	< 250	< 2,500	< 10,000
AND either (C1) or (C2) is true			
C1 An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future)	<b>Very high rate 25% in 3 years or 1 generation (whichever is longer)</b>	<b>High rate 20% in 5 years or 2 generation (whichever is longer)</b>	<b>Substantial rate 10% in 10 years or 3 generations (whichever is longer)</b>
C2 An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(a) (i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(a) (ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals			

**Evidence:**

**Insufficient data to determine eligibility**

There are no direct measures of abundance for this species. Stanisic (2016) estimated the number of mature individuals to be between 251 and 1000, with a level of confidence of 31-50 per cent.

The Committee considers that there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

<b>Criterion 4. Number of mature individuals</b>			
	<b>Critically Endangered Extremely low</b>	<b>Endangered Very Low</b>	<b>Vulnerable Low</b>
Number of mature individuals	< 50	< 250	< 1,000

**Evidence:**

**Eligible under Criterion 4 for listing as Vulnerable**

There are no direct measures of abundance for this species. Stanisic (2016) estimated the number of mature individuals to be between 251 and 1000, with a level of confidence of 31-50 per cent.

The Committee considers that based on this estimate the total number of mature individuals is low. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 4 to make it eligible for listing as Vulnerable.

<b>Criterion 5. Quantitative Analysis</b>			
	<b>Critically Endangered Immediate future</b>	<b>Endangered Near future</b>	<b>Vulnerable Medium-term future</b>
Indicating the probability of extinction in the wild to be:	<b>≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)</b>	<b>≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)</b>	<b>≥ 10% in 100 years</b>

**Evidence:**

Population viability analysis has not been undertaken.

**Conservation actions**

**Recovery plan**

A recovery plan for the species is not recommended, because the Approved Conservation Advice provides sufficient direction to implement priority actions and mitigate against key threats.

**Primary conservation actions**

1. Prevent land clearing and resulting habitat destruction at all known localities. Any further habitat destruction at known or potential localities will have a significant impact on the species.

**Conservation and management priorities**

Land clearing

- Prevent clearing of all brigalow habitat within the species' range, and in other areas where the brigalow woodland snail may occur.
- Investigate formal conservation arrangements, management agreements and covenants on private land, and for crown and private land investigate and/or secure inclusion in reserve tenure if possible. Seek to increase the level of legislative protection and active management planning for localities where this species occurs.

Habitat disturbance and modifications

- Retain a buffer of native vegetation and leaf litter around all occurrences of this species.
- Manage any other likely, potential or emerging threats to habitat quality, such as further invasion of weeds and habitat modification by removal of firewood.
- Erect appropriate signage to indicate conservation of individuals or groups of this species.
- Ensure land managers are aware of the species' occurrence and provide protection measures against key and potential threats.

Invasive species

- Identify and control buffel grass and any other weeds that could threaten the brigalow woodland snail with the careful use of herbicides. Ensure that any mechanical

disturbance and overspray associated with chemical control are minimised, and do not impact this species.

- Manage predation and possible trampling by feral pigs at important sites through exclusion fencing or other barriers. Where possible, control feral pigs using appropriate methods (DEH 2005).
- Where possible, manage predation by rats and mice using appropriate methods (e.g. DEWHA 2009). Consider monitoring the impact of feral predator control after any large fire or large rain event.

#### Impacts of domestic species

- If livestock or horses occur in the area, manage trampling (and potential grazing of native vegetation) at important sites through exclusion fencing or other barriers.

#### Fire

- Prevent all high intensity fires. Fires must be managed to ensure that prevailing fire regimes do not disrupt the life cycle of the brigalow woodland snail, that they support rather than degrade the habitat necessary to this species, that they do not promote invasion of exotic species, and that they do not increase the impacts of grazing/predation.
- If fire operations are necessary, physical damage to the habitat and individuals of the brigalow woodland snail must be avoided during and after operations, noting that fires during the active life stages of the snail are likely to be highly detrimental.
- Fire management authorities and land management agencies should use suitable maps and install field markers to avoid damage to this species.
- Ensure that a high proportion of the habitat is maintained with a post-fire age sufficient to provide adequate canopy cover (or habitat) for the brigalow woodland snail.
- Ensure that areas of dense ground cover/leaf litter are retained within the habitat if any prescribed low intensity fires are implemented.

#### Stakeholder Engagement

- Raise awareness of the brigalow woodland snail within the local community. Engage with the relevant land managers (especially managers of private land and the Western Downs Regional Council) and encourage these key stakeholders to contribute to the implementation of conservation management actions.
- Engage with additional stakeholders that could contribute to the implementation of conservation management actions, such as local catchment organisations (e.g. Queensland Murray-Darling Committee), land regeneration and wildlife care groups, local schools, ecological consultants, and the Queensland Museum.
- Land managers (including pastoralists and the Western Downs Regional Council) should be given information about managing fire for the benefit of this threatened species.
- Prepare a management strategy with input from local experts.

## Survey and monitoring priorities

- Conduct targeted surveys throughout the range of the brigalow woodland snail to better define population distribution and abundance, and especially to determine the currency of all known sites. Accurately identify potentially suitable habitat and undertake survey work to locate and map any additional populations. The brigalow woodland snail lives under forest debris and is best detected by turning logs and raking accumulated leaves. The presence of dead shells, particularly of juvenile and sub-adult snails, is usually an indication of living adults (Stanisic 2011). The best times for survey are during the months of summer storms and rain (generally October to March). The snail is nocturnal, suggesting that night surveys would be preferable; however, given the difficulty with night observation of snails in their habitat, daylight searching can be equally effective (Stanisic 2011). Survey effort for recording presence/absence should be at least two person hours targeting areas of preferred snail microhabitat. At all times disturbance should be minimised to avoid damage to live snails (Stanisic 2011).
- Establish and maintain a monitoring programme at all sites based on these data to:
  - determine trends in population size and distribution, mortality and timing of life history stages;
  - determine threats and their relative impacts; and
  - monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
- Precise fire history records must be kept for the habitat and current populations (confirmed and suspected) of the brigalow woodland snail.

## Information and research priorities

- Prioritise management actions at all sites based on the currency, degree and nature of threats. Population genetic studies could be used to determine where best to focus conservation effort to maximise genetic and morphological diversity within the species (Clark 2016).
- Assess the species' ecological requirements relevant to the persistence of the species. Investigate the impact of microhabitat and substrate on presence and abundance of the brigalow woodland snail at each locality. Assess the relative importance of: coverage of the canopy layer, coverage of the herbaceous layer, size and percentage of on-ground timber cover, size and percentage of rock cover, and leaf litter cover. Assess how they affect moisture/relative humidity at each locality. Assess the presence and abundance of co-occurring species at each locality.
- Where possible, assess the disturbance history at all localities. Where possible, differentiate between the time since disturbance, type of disturbance (e.g. fire history, mechanical disturbance, etc.), and presence of the brigalow woodland snail.
- Investigate optimum conditions and habitat for egg-laying. Record microhabitat characteristics at all sites where eggs are observed.

## **Recommendations**

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the Endangered category:  
*Adclarkia cameroni*
- (ii) The Committee recommends that there not be a recovery plan for this species.

Threatened Species Scientific Committee

06/09/2016

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