REVIEW OF DEPARTMENT OF ENVIRONMENT AND CONSERVATION CANE TOAD FIELD OPERATIONS 2005/06

INTRODUCTION

After a full year of the Department of Conservation and Land Management's (now Department of Environment and Conservation) operation of the State Cane Toad Initiative, it is timely to take stock, review progress of the on-ground actions of the cane toad program and fine tune strategies and plans for future operations.

This report reviews the outcomes and effectiveness of the CALM-managed on-ground operations implemented under the State Cane Toad Initiative to fight the westward spread of cane toads over the period July 2005 to June 2006. It does not review the community efforts undertaken under the auspices of Kimberley Toad Busters (KTB) or the Stop the Toad Foundation (STTF).

BACKGROUND

On 1 July 2005, CALM became the lead agency responsible for the fight to prevent cane toads reaching WA. The Department of Agriculture and Food (DAF) and the Agriculture Protection Board (APB) are also involved in implementing the State Cane Toad Initiative, primarily in the areas of quarantine and biosecurity, as cane toads are a declared pest species under the *Agriculture and Related Resources Protection Act 1976.*

Four key programs are being implemented under the Initiative:

1. Fighting the entry and establishment of cane toads in WA;
2. Identifying and protecting biodiversity assets at greatest risk from cane toads;
3. Raising public awareness of the cane toad threat; and
4. Ensuring effective statewide coordination of cane toad initiatives.

CALM appointed a five-member surveillance and control team during 2005 to undertake on-ground operations, mostly in the Victoria River District (VRD) of the Northern Territory (Fig. 1). The team has, among other things:

- deployed and serviced cane toad traps, and collected cane toads by hand, mostly in the VRD as part of a control program;
- undertaken surveillance to identify the extent and spread of cane toads in the VRD; and
- responded to reported sightings of cane toads, both in WA and the NT.

Western Australia is the first State to mount a concerted pre-emptive effort to prevent cane toads invading the State. By necessity operations have involved trial and error, with adaptive management used to ensure that experience gained is built into operational planning.

Throughout the year under review (1 July 2005 to 30 June 2006) there have been significant findings in terms of the effectiveness of trapping, trap design, placement and monitoring and also in surveillance methodologies and hand collecting of toads. Most significantly, following a run of poor wet seasons, the operations coincided with a very good wet season.

It is prudent to take stock of what movements cane toads have made, as well as what impacts the control efforts to date are likely to have had ahead of the next major offensive against toads planned for late in the 2006 dry season. We now need to formally review what has been done and what could be done in the next and subsequent years to ensure that we build the best possible strategy and action plan.

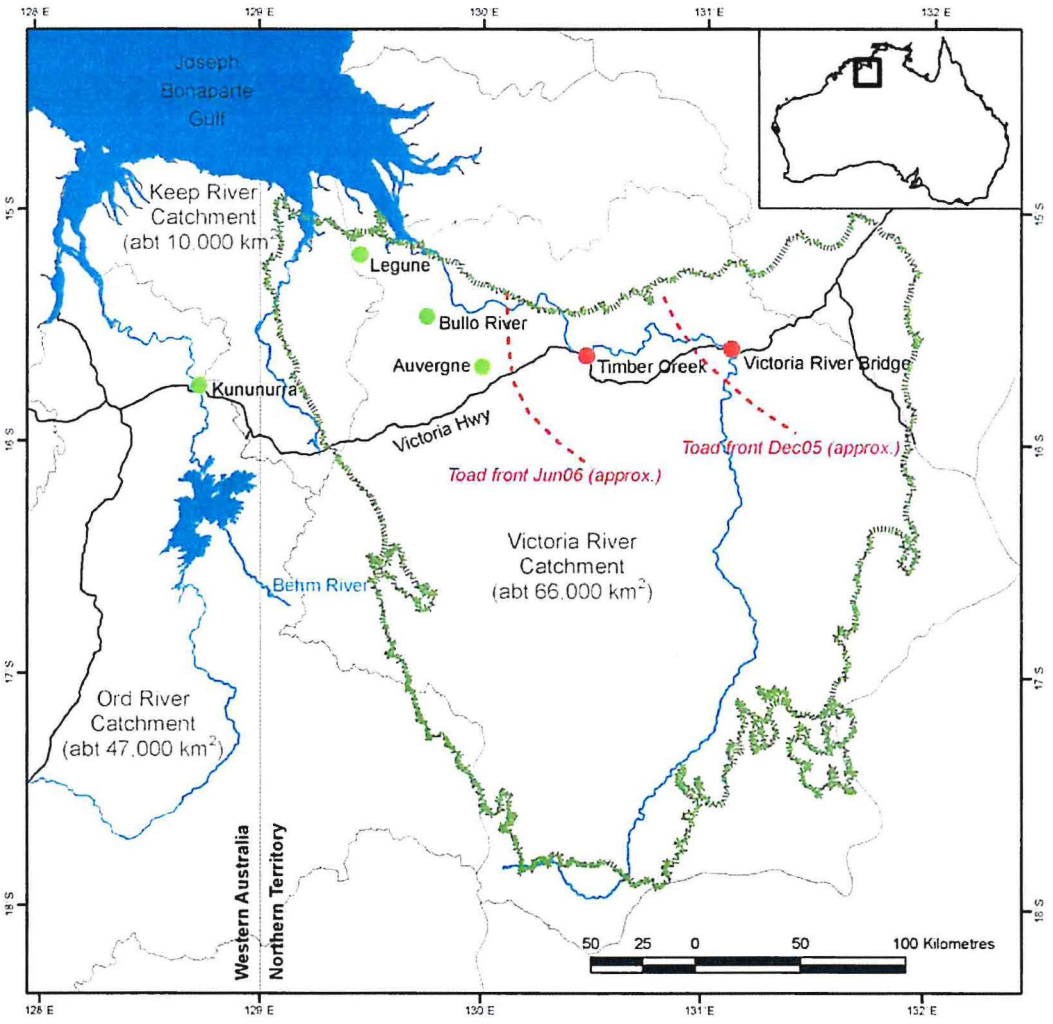

Fig. 1. Area of cane toad operations in the Northern Territory. Tasmania has been superimposed in green to give a perspective of scale.

This review evaluates the outcomes and effectiveness of the CALM-managed on-ground cane toad operations during 2005/06. It is not intended to review all aspects of the State Cane Toad Initiative, nor other operations against cane toads by volunteers and community groups. However, it is intended to consult with these groups to learn what techniques and strategies they believe, from their experience, are most effective and how we can facilitate an enhanced cooperative effort against cane toads in the future.

TERMS OF REFERENCE

The terms of reference for this review are:

1. Review the outcomes and effectiveness of CALM-managed on-ground actions to date against cane toads, with particular focus on:

    a. the degree of success or failure of measures to prevent, or reduce the rate of, westward movement of cane toads through the Northern Territory;

    b. identifying the reasons for this where possible;

    c. identifying the best means of improving the effectiveness of the operations; and

    d. identifying any key focal areas for operations and innovation in 2006/07.

2. Advise on the effectiveness of partnerships with community efforts and coordination with these and any scope for improvement.

3. Recommend improvements for future on-ground actions against cane toads ahead of the 2006/07 wet season.

4. Recommend strategies for the State Cane Toad Initiative in 2006/07 and subsequent years.

SUMMARY OF OPERATIONS

The surveillance and control team deployed approximately 100 traps in the field during 2005/06. Depending on seasonal conditions, they regularly serviced and maintained about 70 traps in the field, with the remainder being serviced by interested third parties at strategic locations such as caravan parks, station homesteads and Aboriginal communities. The number of traps serviceable by a two-person team is a linear function of hours spent in the field and is inversely related to the amount of time spent travelling between traps. Consequently, there is only a finite number of traps a team can service while also maintaining adequate standards of animal welfare for trapped toads. More traps can be serviced when access is good during the dry season but this number will decrease during the wet season as access becomes difficult.

Operational experience during the last wet season suggests that one, two-person team based in Kununurra and travelling to the VRD in the NT can at most service about 50-60 traps in any one week on a regular basis, which involves clearing each trap once per week and performing trap maintenance such as repairs to lights and regulators. The vehicles used by the surveillance and control team travelled a cumulative distance of about 96,000 kilometres during the twelve month review period.

The following problems were encountered while undertaking the trapping program:

- Component failure, in particular regulators and light sources, especially during the wet season;
- Interference with, or vandalism of, traps including theft of components;
- Environmental damage to traps such as flood damage and heat warping the trap gates;
- By-catch of native fauna (Table 1); and
- Toads escaping from traps.

Many of these problems are to be expected in such a field program, particularly one developing and trialling new techniques. By the end of the year problems with component failure had largely been solved and the rate of by-catch was very low (< 1 animal per 100 trap-nights).

However, toads escaping from traps is of concern. Observations of one trap on three separate occasions in March/April 2006 indicate that the proportion of toads escaping from traps can be quite high. The number of toads in the trap was counted at night and then re-counted the following morning. Numbers had decreased from 24 to 3 on the first occasion, 9 to 2 on the second and 6 to 2 on the third. These results suggest that toads escaping from traps may be a significant problem with the trap design currently being used and further evaluation is warranted.

Table 1. List of by-catch caught in cane toad traps during 2005/06.

Species	Fate		
	Dead	Alive	Not rec.
Giant frog (*Cyclorana australis*)	3	9	1
Green tree frog (*Litoria caerulea*)	0	1	0
Magnificent tree frog (*Litoria splendida*)	0	1	0
Dragon (Agamidae)	1	0	0
Dragon (*Diporiphora* sp.)	0	0	1
Northern blue-tongue skink (*Tiliqua scincoides*)	1	6	1
Gould's monitor (*Varanus gouldii*)	0	1	0
Monitor (*Varanus sp.*)	0	1	0
Python (Boidae)	1	0	0
Australian freshwater crocodile (*Crocodylus johnstoni*)	3	2	0
Quail	0	1	0
Blue-winged kookaburra (*Dacelo leachii*)	0	0	1
Feral cat (*Felis catus*)	0	0	1
Totals	9	22	5

Note: The number of trap-nights recorded in the database was about 3750, which is likely to be an underestimate.

Over 8,000 toads were caught and destroyed by the CALM team during the year under review (Table 2). CALM focused its trapping efforts at what was believed to be the leading edge of the invading front with the assumption that this would have maximum effect on restricting the westward dispersal of cane toads. This used an obvious natural barrier in the form of the Victoria River as a point of reference. The focal areas did not necessarily have the highest densities of toads in the region and more toads could have been caught in areas with established populations further east. However, the team took the view that focusing control operations on established populations was unlikely to retard the westward movement of toads.

Most toads (75%) were caught by hand at night. In a trial to compare hand-capture with trapping techniques, the team found that for every toad caught in a trap, nine could be caught by hand. This finding suggests that hand-capture is more efficient than trapping when toads are active and reasonably abundant. However, because traps can be left unattended for a number of days, they are certainly useful as sentinel devices and in slowly capturing toads using a specific area. They may also be useful in situations where individuals are reluctant to handle toads, such as for control in urban or semi-rural environments.

Table 2. Total number of cane toads caught during 2005/06.

	Number of toads	Approx. sex ratio (% male)
Traps	2012	48
Hand capture	5999	60
Totals	8012	56

Note: Death tallies are of limited value in the science of pest management. Pest species often compensate for the effects of increased mortality due to control efforts. It is more meaningful to determine whether there has been a measurable decrease in the surviving pest population following the control operation.

Not surprisingly, there was a strong seasonal pattern to toad activity and, therefore, capture success (Fig. 2). The results in Figure 2 are, to some extent, confounded by unequal sampling effort, largely due to access difficulties in the wet season (see Fig. 3), and also the use of a mixture of capture methodologies. If access remained similar across seasons, there would likely be a more pronounced peak in captures during the wet season.

The peak is not solely attributable to reproduction and recruitment, but also to increased activity in adults. Juvenile toads only became a significant proportion of captures from December to May and do not explain the increase from October to December. Trap success in the VRD from June to August was low. This corresponds to a time of year when toad activity in the VRD is likely to be at its lowest, on average, due to lower seasonal temperatures. This conclusion is corroborated by radio-tracking data from Queensland (Schwarzkopf & Alford 2002, Schwarzkopf & Alford 1996).

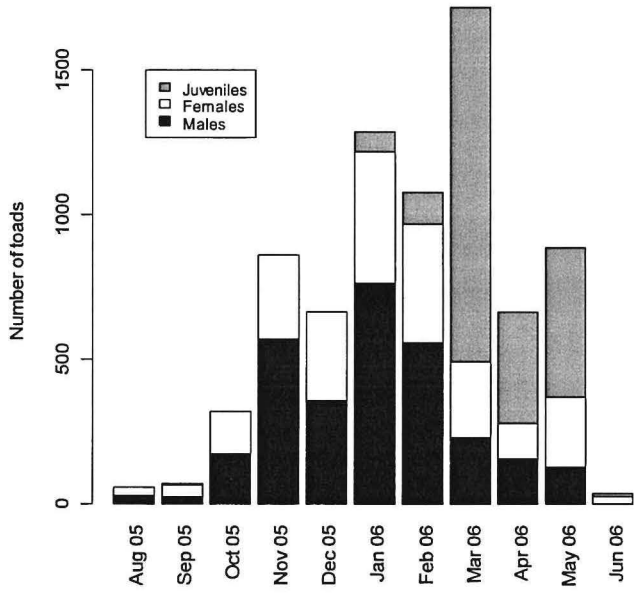

Fig. 2. Monthly capture totals of cane toads in the Victoria River District, NT.

It can be considered to be relatively inefficient to undertake trapping operations from June to August in the VRD because trap success appears to be at its lowest at this time of year. This assessment would, however, benefit from more rigorous testing and there is a view, yet to be proven, that significant numbers of toads can be removed from areas (identified as toad refuges), particularly around permanent water bodies, due to their reliance on water at this time of the year. Nevertheless, rates of capture per unit effort are likely to be most efficient when toad activity is at its greatest during the warmer months.

Fig. 3. Flood damage to the Victoria Highway, NT, in April 2006.

The interplay between rates of capture, rates of movement and rates of colonisation of areas by toads is likely to be quite complex. It would appear, however, that the greatest rates of movement are in the wet season.

Prior to the onset of the 2005/06 wet season, the leading edge of the cane toad front was in the vicinity of the Victoria River Roadhouse (Fig. 4: 15°37'S, 131°08'E). Consequently, the trapping program focussed on this region. The highest capture rates were observed in the Victoria River Grid (Fig. 4: 15°35'S, 131°05'E) – an array of 15 traps that were placed in a narrow valley bounded by precipitous cliffs that tended to funnel the overland movement of cane toads. The success of these traps was likely attributable to:

- Natural geographic features in the area;
- Proximity to the invading front; and
- Proximity to the Victoria Highway.

Higher capture rates were also observed in traps placed near the Victoria Highway. This pattern was not surprising given that cane toads have previously been reported as using roads as movement and activity corridors (Seabrook & Dettmann 1996).

Of interest is the capture success of one of the traps placed at Brownies Creek (Fig. 4: 15°42'S, 130°47'E). One trap included a device that played a male call on a regular cycle and caught more male toads than any other trap. This finding suggests that playback devices may improve capture success for males, though more rigorous testing is needed. It has, however, been conjectured that reducing male densities may in fact improve reproductive success in toads because male toads may cause significant female mortality through drowning while in amplexus. Also, only a few males are required for effective breeding in any area.

REPORT AGAINST TERMS OF REFERENCE

TERM OF REFERENCE 1.A: *Review the outcomes and effectiveness of CALM-managed on-ground actions to date against cane toads, with particular focus on the degree of success or failure of measures to prevent, or reduce the rate of, westward movement of cane toads through the Northern Territory.*

To the best of our knowledge as at 31 July 2006, the most westward populations of cane toads in the NT were at Auvergne Lagoon (15°36'S, 130°06'E) and Alpha Creek (15°40'S, 130°13'E), approximately 120 km from the WA border. Survey work undertaken throughout 2005 had previously identified toads no closer than 90 km east of this area. This suggests a 90 km westward movement from December 2005 to April 2006 (see Figure 1). There is also a distinct possibility that cane toads have dispersed along the downstream sections of the Victoria River during the last wet season and are further west than was known at 31 July. Answering this question is one focus of current surveillance efforts.

From information provided by others, cane toads are estimated to have moved across the Gulf country from Queensland to the NT at a rate of about 30 km per year. The rate of expansion has accelerated since cane toads moved into what are now believed to be more climatically favourable habitats further west in the NT.

It is not yet clear whether cane toads have moved to the Auvergne area across country or by following drainage lines. In either case, the distance travelled has been significant.

One strategy trialled throughout the 2005/06 year was the use of a trapping grid along the Victoria Highway west of the Victoria River Roadhouse. While significant numbers of toads were trapped in this area (Figure 4), it does not appear that the grid was successful in preventing toads moving further west.

The distance travelled by the 'toad front' over the last wet season, despite a very concerted effort by the CALM team and volunteers, has demonstrated the enormity of the challenge to keep toads from reaching Western Australia. It is likely that a very wet 'wet season' has made movement easier for toads and reduced any impact the trapping and hand collecting may have had and so some caution is required in making too many predictions for future years. We also need to take into account plans for a major offensive against toads by STTF, KTB and the DEC team over the late dry season in 2006.

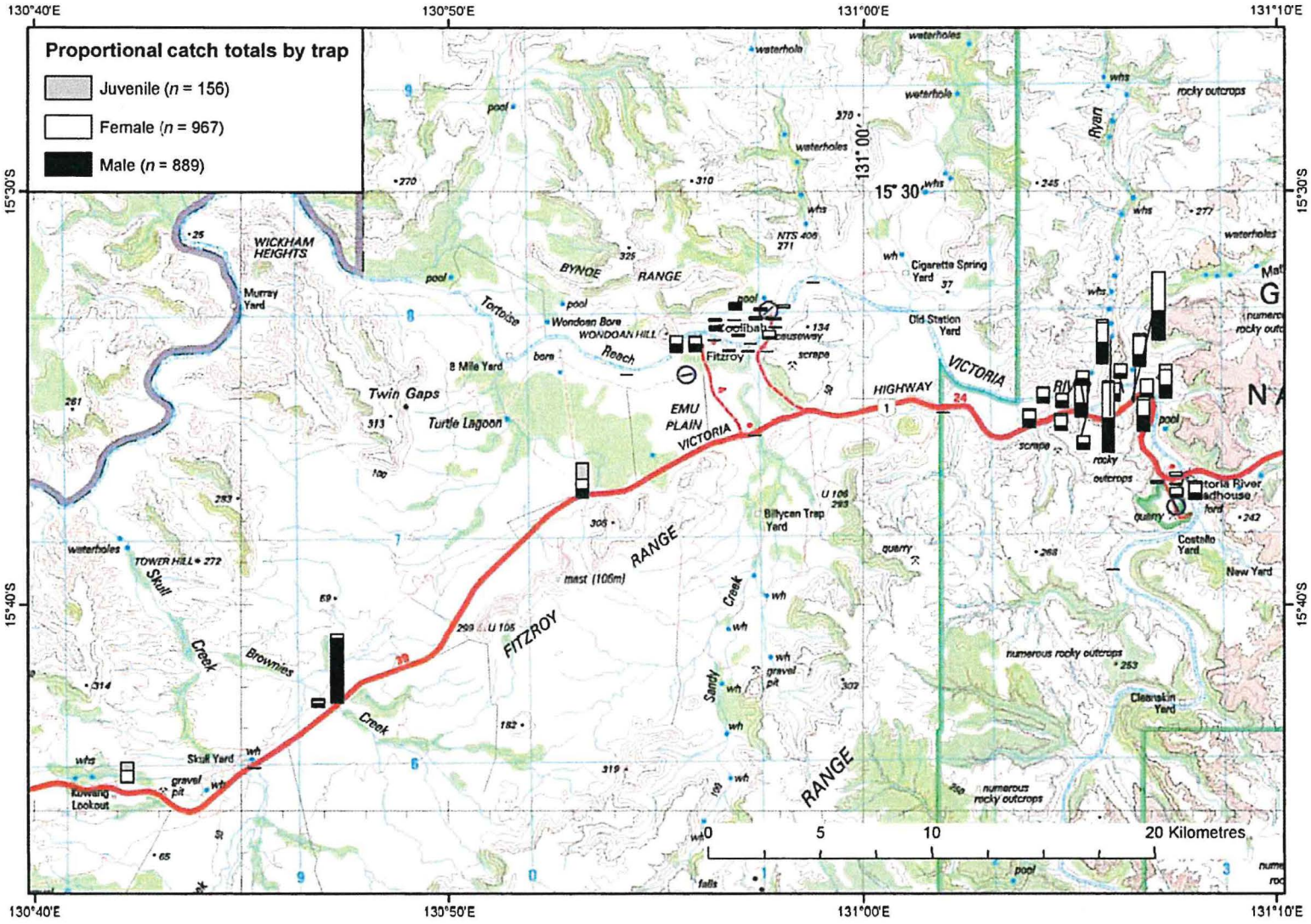

Fig. 4. Capture success for various cane toad traps set in the Victoria River District, NT.

The STTF are advertising a 'Toad Muster' based in Timber Creek. The hope behind these efforts is that they can effectively push toads back from newly colonised areas by removing them when they are most stressed and potentially congregating around remaining waters and in shelter. This is a logical plan, but one that will depend greatly on the following wet as to how much impact it could possibly have.

While the 2005/06 program was only the initial stage for the CALM/DEC operations and there was certainly a major impact from the very wet 'wet' season, it is clear that the control efforts during the last 12 months have not been anywhere near as successful as hoped in restricting the westward movement of cane toads. Cane toads have moved at least 90 kilometres westward and have not been contained by the trapping grid trial. This assessment should not detract from the tenacious efforts of the field staff and also the volunteers in their linked programs who worked under very hostile conditions to fight the westward expansion. Also, because of the operational nature of the work, rather than conducting it as a scientific experiment, we do not know how far cane toads may have moved without these combined efforts. It is possible that they could have been closer to WA than they are now.

However, in the final analysis, the control efforts have not stopped cane toads moving westward in significant numbers. They may have slowed this movement and reduced the numbers of toads that are in the newly colonised areas, but we cannot establish the degree to which this has been achieved with the data we have.

TERM OF REFERENCE 1.B: *Review the outcomes and effectiveness of CALM-managed on-ground actions to date against cane toads, with particular focus on identifying the reasons for this where possible.*

Clearly, the most significant factor that facilitated the dispersal of toads during the previous twelve months was the nature and extent of the wet season. Timber Creek experienced above average rainfall in each month from October 2005 to April 2006, except February 2006 (Fig. 5). Furthermore, rainfall in December 2005 was the highest recorded for the period 1981-2004. During this period there were four flood events that closed the Victoria Highway between the Victoria River Bridge and the WA/NT border and effectively prevented control operations. At the extreme, the surveillance and control team had to be evacuated from the field in April 2006 due to flooding in the Victoria River catchment.

Further, it is difficult to conceive how a sufficient number of traps could be deployed over such a vast area, in the event of very significant wet season rainfall, to effectively control toad populations, given the human resources available. The catchment area of the Victoria River in the NT is about 66,000 km^2, which is larger than the state of Tasmania (Fig. 1).

In order to effectively eliminate cane toads in the VRD, or maintain them at very low densities, they would need to be destroyed at a rate equal to or greater than the intrinsic rate of increase of the toad population (McCallum 2006). It is estimated that this would require about 25% of the adult population needing to be destroyed each and every month until the population is eliminated (McCallum 2006). Unless environmental factors cause significant mortality in toad populations in the VRD during the late dry season and major efforts can be successfully implemented against surviving populations by a coordinated trapping and capture campaign as some have argued, there is little prospect that the required toad control can be achieved. In this regard, it appears that the best outcome we could anticipate would be for the combined toad campaign to slow the rate of spread across the landscape and perhaps to significantly reduce the population density of toads in targeted areas.

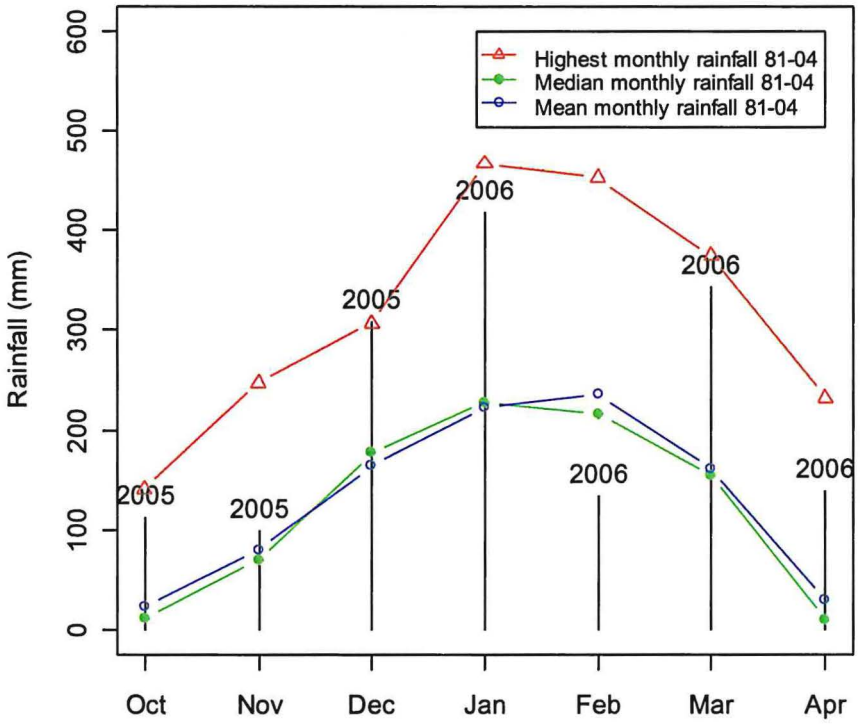

Fig. 5. Monthly rainfall for Timber Creek, NT (data from Bureau of Meteorology).

TERM OF REFERENCE 1.C: *Review the outcomes and effectiveness of CALM-managed on-ground actions to date against cane toads, with particular focus on identifying the best means of improving the effectiveness of the operations.*

Based on data collected by the surveillance and control team during 2005/06, it appears to be less efficient to undertake trapping operations from June to August than in the hotter months of the year. This is probably due to reduced cane toad activity in the cooler months. However, if the sniffer dog trial (from mid-September 2006) proves successful at detecting toads, the dry season may be suitable for surveillance activities as the dog would increase the probability of detecting toads. It is therefore suggested that cane toad operations should be stratified seasonally.

The following seasonal strategy is recommended, but this needs to be flexible as it will be influenced by temperature and rainfall, in particular the nature and extent of the wet season, and also results from further innovations, including the use of sniffer dogs:

- March-May: Higher toad densities and comparatively warmer temperatures at the end of the wet season will facilitate easier detection. Consequently, this period should be used primarily for surveillance to determine how far cane toads have dispersed over the previous wet season and to identify key breeding sites and pathways, which will be vital for informing the control strategy that will be implemented in later months.

- June-August: Maintenance of field equipment; clearing of leave/time in lieu; planning; administration; data analysis and reporting; fencing trials and additional surveillance activities if required. It is likely that control operations undertaken early in the dry season (March-August) would reduce competitive interactions among cane toads, which may improve survivorship of any remaining toads over the course of the dry season. Therefore, control operations undertaken during this time of year are not recommended as they may be counterproductive.

- September-November: This should be the primary season for control efforts due to increased toad activity as temperature and humidity increase prior to the onset of the wet season resulting in higher probabilities of detection/capture, likely greater impact on toad populations as they become stressed toward the end of the dry season when food and water resources are limiting, and good access throughout the region. This time of year will also be useful for identifying habitats that are significant dry-season refuges for cane toads.

- December-March: Wet season operations will largely depend on the amount and recency of rainfall, which will determine access within the region. Control efforts should focus on pathways that will facilitate the rapid movement of toads toward WA such as roads or rivers.

TERM OF REFERENCE 1.D: *Review the outcomes and effectiveness of CALM-managed on-ground actions to date against cane toads, with particular focus on identifying any key focal areas for operations and innovation in 2006/07.*

Surveillance to determine the present extent of cane toads and identify significant breeding sites and pathways within the VRD is the priority through to September and this has been under way for 2006. Key areas to focus on include pathways that will facilitate the rapid movement of cane toads towards WA. These areas include the lower Victoria River, Keep River, Victoria Highway and sections of the Ord catchment that extend into the NT such as the Behm River (Fig. 1). Additionally, these areas should also be considered for monitoring during the wet season, which will require access via helicopter. Wet season control operations in these areas may be required if significant incursions are detected.

The following questions are critical to the development of control and management strategies but remain to be answered:

- Are there any landscape elements in the VRD that are unlikely to be colonised by cane toads?

- Are there key weakness points for access into WA that can be targeted for special control action and where such action is achievable, such as the headwaters of drainage lines into the Ord River system?

- Does the invading front contract, or can it be forced to contract through concerted effort, during the dry season, or does it remain in position or continue to advance albeit at a slower rate?

- What refugia in the VRD do cane toads use to survive until the next wet season?

- Can a fence be designed for the protection of significant but localised habitats that will remain intact under the environmental conditions of the wet-dry tropics and be successful at excluding cane toads?

TERM OF REFERENCE 2: *Advise on the effectiveness of partnerships with community efforts and coordination with these and any scope for improvement.*

DEC has established good relations with both major WA community groups (Kimberley Toad Busters and the Stop the Toad Foundation) involved in cane toad initiatives. Lines of communication are good though all groups are working independently and not always to a coordinated strategy. There is some friction between the two community groups in terms of funding and organisation of activities. However, given the magnitude of the logistics required for implementing effective control measures in the VRD and the lack of clear and unequivocal data on what strategies will work to keep the toads at bay, there is plenty of scope for more efforts and indeed multiple efforts against toads. We need to ensure if possible, that all stakeholders work together in a collaborative partnership as much as possible and certainly avoid working at cross purposes in order to maximise the chances of effectively restricting the westward movement of cane toads.

TERM OF REFERENCE 3: *Recommend improvements for future on-ground actions against cane toads ahead of the 2006/07 wet season.*

On-ground operations ahead of the 2006/07 wet season should adopt the seasonal strategy identified under Term of Reference (TOR) 1.c above, which should be subject to ongoing feedback and review. The surveillance and control team's activities should also be expanded to address some of the key questions identified under TOR 1.d that are yet to be answered but remain critical to the success of any control operations. Given the relative efficiencies of trapping and hand-capture found over the last year, hand-capture at night during the warmer months should be used in addition to, and in reasonably accessible areas, in preference to trapping. However, more rigorous comparisons of both methodologies would be useful. Traps will be useful as sentinel devices for confirming the presence of, and capturing significant numbers of, cane toads in non-focal areas. This latter benefit will be enhanced if the trap designs are further improved and they are adequately maintained to be fully secure against toads escaping.

It has been conjectured that permanent surface waters are likely to be the only refuges that will enable cane toads to survive the late dry season in the VRD and that control efforts only need target these areas. This is probably an overly simplistic assessment. There are likely to be other areas, such as seepage areas near sandstone escarpments or scree slopes, that will provide refuge for cane toads during the late dry season and the ability of toads to survive in other shelters in key areas is unknown. Physiological data on cane toads indicates their ability to survive hot and dry conditions in the VRD during the late dry season may have been underestimated (see Lever 2001). Given the reproductive capacity of this species, only a very few individuals need to survive the late dry season in order to re-populate an area during the wet season.

If the sniffer dog proves reliable at detecting toads, she should be used to identify other refuge areas for cane toads in the VRD. Further, if the dog trial proves successful, more sniffer dogs would be useful for surveillance, detection and possibly control operations.

Modifications to the database and to data capture procedures would improve data management and the ease of extracting data for analysis. Also, photographs of all by-catch caught in traps should be taken to aid in identification.

TERM OF REFERENCE 4: *Recommend strategies for the State Cane Toad Initiative in 2006/07 and subsequent years.*

Of the five staff originally employed by the Department of Agriculture to establish the surveillance and control team in early 2005, four transferred across when CALM became the lead agency responsible for the cane toad initiative on 1 July 2005. All four have subsequently left – three soon after the transition and one on 30 June 2006. This is not unusual in Kununurra, as there is ongoing turnover of workers in response to seasons, other employment opportunities, housing shortages and normal remote area issues.

In undertaking this review it is clear that recruitment and retention of cane toad team staff have been hampered most significantly by a severe housing shortage in Kununurra. In addition, employees were initially offered short-term contracts which created uncertainty. Dedicated office space in Kununurra has been provided and long term contracts offered to staff but the availability of rental housing in Kununurra remains a major problem. The housing shortage has also impacted on the cost of rental accommodation: $190-$290 per week for a room in a share house and $350-$450 per week for a house.

High staff turnover has impacted on the operational capacity of the surveillance and control team in the past and may well do so in the future unless the contributing factors can be satisfactorily addressed. Housing shortages in Kununurra are beyond the Department's control and managing team dynamics is a challenge given the hostility of the operational environment during the wet season and the arduous nature of the field work. Greater diversification of the team's duties and improved security of tenure should assist with retaining staff over the longer term. Staff have expressed interest in participating in other biodiversity conservation work and this should be followed up. The Department is also competing for staff against higher paid employment elsewhere in the region. For example, one former employee has taken up employment with the Argyle Diamond Mine.

Suitable housing needs to be found for all team members. Also, with confirmed funding for the next four years (2006/07 to 2009/10), we need to establish greater security for contract staff involved in the State Cane Toad Initiative.

Over the longer term, the biological control of cane toads offers the best option for a broad scale approach to mitigate the impacts of cane toads in Australia. However, it needs to be recognised that the development of an effective bio-control agent is likely to be a long-term proposition and that, worldwide, there are only two examples of the successful use of a biological agent for controlling a vertebrate pest species – myxoma virus and calicivirus, both of which failed to achieve the complete eradication of rabbits in Australia.

Considerable research into the biological control of cane toads has already been undertaken, primarily by the CSIRO. While Western Australia has made financial contributions to support research into the biological control of cane toads in the past, via the Council of Nature Conservation Ministers, it has made no recent financial contributions.

A number of new approaches to biological control were proposed at a workshop held in Brisbane in June 2006. The Department should consider the most effective way it can support or facilitate current or new research into the biological control of cane toads without duplicating any existing programs and without detracting significantly from existing field operations against cane toads. While there is no evidence that the current field operations can stop cane toads getting to WA, it is still a reasonable hope that this can be delayed with improved techniques and kind wet seasons.

KEY RECOMMENDATIONS

1. Continue to undertake extensive surveillance in the Victoria River District to determine the present extent of cane toads and identify key breeding sites and pathways into WA and potential protection strategies.

2. Continue to work with community groups in the development and implementation of a major effort against known cane toad populations on the front line ahead of the 2006/07 wet season.

3. More rigorously test the relative efficiencies of different capture methods and the influence of seasonal factors on these.

4. Stratify surveillance and control operations seasonally to achieve the greatest impact on toad populations.

5. Develop, in consultation with community groups, an overarching strategy for coordinating cane toad operations in the Victoria River District to achieve the most effective control measures possible using available resources.

6. More rigorously evaluate the rate of escape from cane toad traps and develop means to eliminate this.

7. Use the sniffer dog (if proven effective) to identify which habitats in the Victoria River District are used as dry season refuges by cane toads and those landscapes, if any, that will not be colonised by toads.

8. Train and employ additional sniffer dogs if they prove effective in the forthcoming trial.

9. Diversify the duties of the surveillance and control team, and increase their security of tenure to reduce staff turnover.

10. Negotiate with other State agencies, the Shire of Wyndham-East Kimberley and private owners in relation to securing better long-term housing options for cane toad team staff.

11. Increase the number of two-person teams to three and rotate them through three key operations: surveillance, control and biodiversity conservation work. (This will require additional resources.)

12. Undertake a fencing trial to determine whether localised fencing is viable for protecting small areas of high biodiversity value.

13. Determine the most efficient and cost-effective way the State can invest in bio-control research.

14. Modify the database and data capture procedures of the cane toad team to improve data management.

15. Take digital photographs of all by-catch caught in cane toad traps to ensure accurate identification.

16. Decommission the array of traps known as the "Victoria River Grid" as cane toads have moved much further west of this area and these resources should be focussed nearer to the invading front or in sentinel locations.

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