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Comparison of methods used to capture herpetofauna: an example from the Carnarvon basin

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Abstract – We used a combination of pitfall-trapping and hand-foraging methods to sample the frog and reptile species on 63 quadrats in the southern Carnarvon Basin of Western Australia. The quadrats were positioned to represent the geographical extent and diversity of terrestrial environments in the 75 000 km^2 study area.

We compared the three types of pit-traps that systematically captured species: fenced tubes (125 mm diameter and 550 mm deep), fenced buckets (300 mm diameter x 450 mm deep) and unfenced invertebrate-pits (300 mm x 450 mm, containing glycol and covered by a sheet of wire mesh with square 10 mm x 10 mm holes). The buckets contributed only 5 (0.12%) of the 820 quadrat-species intersections derived from the trapping programme. After standardising for differences in the number of trap-nights, the average tube caught 1.33 times more reptiles than the average bucket.

We compared the classification structure derived from the entire data-matrix with that from a reduced matrix, which excluded difficult-to-sample taxa as well as data derived by hand-foraging. We could have ignored hand-foraging as a sampling technique, as well as the snake, pygopid and varanid components of the fauna, without changing the patterns in species composition revealed by the analysis, or reducing its ecological discrimination.

INTRODUCTION

Considerable time and money was spent sampling herpetofauna during the survey of non-aquatic environments of the Irwin-Carnarvon study area (McKenzie *et al.*, 2000). This study explores the relative effort-effectiveness of the various trapping methods used, of trapping versus hand-foraging, and of including all components of the herpetofauna in the sampling programme.

In particular, we investigate the contributions that hand-foraging, and the inclusion of the 'difficult-to-sample' taxa in the sampling programme, made to the analysis outcome in McKenzie *et al.* (2000).

METHODS

The Irwin-Carnarvon Study Area encompassed 75 000 km^2. Herpetofauna were sampled on 63 quadrats positioned throughout the geographical extent of the study area in a stratified random array – in typical examples of each of the surface stratigraphic units that characterise the study area. Each quadrat was 400 x 400 m, and 2 to 6 quadrats were clustered around each of 13 survey areas, herein referred to as 'campsites'.

Two pitfall-trap arrays were placed on each quadrat. Each array comprised a line of six PVC tubular pitfall-traps ('tubes'), 125 mm in diameter and 500 mm deep, spaced at 10 m intervals along a 50 m flywire drift fence that was 300 mm high. About five m from either side of the 50 m fence was a 'bucket' pitfall-trap 300 mm in diameter and 450 mm deep positioned at the centre of a 10 m long drift fence. In addition, 30 plastic 'tubs', 150x150x200 mm deep, were scattered across each quadrat during the Autumn (May) 1995 survey. The tubs were sunk into the ground around the periphery of grass tussocks, and in the leaf litter under trees and shrubs.

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            ------O------              bucket fence
o---------o---------o---------o---------o---------o    tube fence
            ------O------              bucket fence
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Survey effort is summarised in Table 1. McKenzie *et al.* (2000) provide details of the timing of sampling sessions on the quadrats. We estimate that a total of 691 person-hours was spent on the trapping programme (approximately 2 person-hours per quadrat per session to install and close the drift-fence arrays, and 0.3 hours per quadrat per day to check them). In comparison, a total of 702 person-hours were spent foraging. Except for the first day (when the pitfall-trap arrays were being established), a minimum of one person-hour per day per quadrat was spent foraging for herpetofauna during each sampling session, mainly

Table 1 Herpetofaunal survey effort per sampling session, excluding the 9260 tub-nights in May 1995 (160 person-hours to install and check).

	Oct94	Jan95	May95	Nov95	Mar96	Total
Number of quadrats	61	2	63	23[a]	61	–
Average number of days/quadrat	5	3.5	5	1.87	3.72	–
Person-hours spent foraging	244	5	252	36[a]	165	702
Person-hours spent trapping	214	7	221	59	190	691[b]
Bucket-nights	1220	12	1244	–	–	2476
Tube-nights	3660	72	3704	516	2736	10688
Total trap-nights	4880	84	4948	516	2736	13164

[a] see McKenzie *et al.* (2000)
[b] plus 400 hours for invertebrate pits and 160 hours for tubs.

by visual searching, stripping dead bark, turning logs, raking leaf litter, and digging. The staff involved all had prior experience in herpetofaunal surveys. Because the hand-foraging and pitfall-trapping programmes were carried out concurrently, time spent travelling between the quadrats and the campsites is ignored in these calculations.

Reptiles and frogs were also caught in the five pitfall-traps set for invertebrates on each quadrat, and left open for 12 months (114 000 trap nights). Each trap was 300 mm in diameter and 450 mm deep. Unlike the vertebrate pitfall-traps, each of the invertebrate pits was partially filled with a solution of glycol-formalin (see Harvey *et al.*, 2000), unfenced, and covered by a sheet of wire mesh (10 mm square holes) designed to minimise accidental vertebrate deaths. They took an additional 300–400 person-hours to install and check.

To compare the two main pit-trap types used to capture herptofauna (tubes and buckets), we scaled the number of captures of each species in each trap-type according to the ratio of tube : bucket trap-nights. For each herptofaunal family, we then carried out a 'Students t-test' to test the null-hypothesis that capture rates were no different.

To determine whether the hand-foraging programme, in combination with the difficult-to-sample taxa (snakes, pygopodids and varanids), influenced the analysis outcomes, we compiled a 'species-x-quadrat' matrix based solely on the frog, gecko, dragon and skink trapping records (presence/absence data). We also excluded the species-records that were not assigned to a collection method ("not specified" in Table 2). Next. we defined classification partitions in the matrix using the same clustering algorithms as McKenzie *et al.* (2000) used to partition the entire herpetofaunal matrix. Finally, the two partitions were compared using a modification by Hubert and Arabie (1985) of the statistic by Rand (1971).

Species names suffixed with 'A' or 'B' indicate related, but undescribed, taxa (see Aplin *et al.*, in press).

RESULTS

Appendix 1 lists the methods by which the frog and reptile species were captured. It is summarised in Table 2.

Table 2 Number of specimens (and species) of each herpetofaunal group captured by each method. Total trapping effort is listed in terms of trap-nights.

	Tubes	Buckets	Tubes plus Buckets*	Tubs	Invert. Pits	Foraging	Not Specified	Total Species
Frogs	98 (9)	1 (1)	99 (9)	2 (2)	150 (11)	5 (4)	10 (3)	**12**
Geckos	415 (15)	50 (14)	564 (15)	15 (5)	135 (15)	310 (14)	27 (7)	**17**
Pygopodids	15 (6)	2 (2)	18 (7)	0	3 (2)	15 (6)	0	**10**
Dragons	258 (14)	75 (12)	357 (15)	45 (9)	85 (9)	176 (15)	22 (6)	**16**
Skinks	441 (37)	83 (29)	628 (43)	101 (22)	1055 (42)	749 (39)	106 (25)	**58**
Varanids	43 (4)	7 (3)	58 (4)	1 (1)	3 (2)	16 (3)	1 (1)	**4**
Snakes	15 (6)	6 (4)	28 (7)	0	31 (6)	51 (14)	3 (2)	**16**
Totals	1285 (91)	224 (65)	1752 (100)	164 (39)	1462 (87)	1322 (95)	169 (44)	133
Trap-nights	10688	2476	13164	9450	114000			

* The sum of 'Tubes' + 'Buckets' is usually less than the value in the column headed "Tubes plus Buckets"; one of the three field teams did not distinguish between tube- and bucket-captures during the first sampling session, and there were occasional lapses by others.

The Various Pitfall-trapping Methods

Allowing for the 4.3:1 ratio in tubes:buckets within the vertebrate trap arrays (10 688:2476, from Table 2), the tubes were more effective than the buckets in capturing frogs (22.7 times more individual frogs were captured in the average tube), geckos (x 1.9 more), pygopodids (x 1.7), skinks (x 1.2) and varanids (x 1.4), but buckets were better for dragons (x 1.3) and snakes (x 1.7). Overall, the average tube-night caught 1.33 times more reptiles and frogs than the average bucket-night (Students-t= -2.43, p. = 0.02).

A species-by-species comparison didn't reveal many strong biases in capture-rates after correcting Appendix 1 for differences in trapping effort:

- 14 species were caught more often in tubes by a factor of three or more (*Arenophryne rotunda, Cyclorana maini, Litoria rubella, Neobatrachus wilsmorei, Diplodactylus pulcher, Gehyra variegata, Nephrurus levis, Rhynchoedura ornata, Lerista uniduo, L. muelleri*A, *Ctenotus schomburgkii, C. iapetus, C. hanloni*A and *C. hanloni*B), and
- 5 species favoured buckets by a factor of three or more (*Ctenophorus femoralis, Lerista elegans, L. planiventralis planiventralis, Menetia greyii*B and *Demansia calodera*).

The five invertebrate pitfall-traps set on each quadrat for one year (*circa* 114 000 trap-nights) yeilded a total of 150 frog and 1312 reptile specimens (11 frog and 76 reptile species). In comparison, 99 frog and 1653 reptile specimens (9 frog and 91 reptile species) were captured on the same set of quadrats by the vertebrate traps (excluding tub captures) with 11% of the trapping-effort (13 164 tube+bucket nights). Overall, the invertebrate traps were less effective than the vertebrate trap arrays. Even so, they added an average of 1.5 +/- 0.2 (s.e.), n=63, species to each quadrat list. Considering that 16.3 +/- 0.7 (s.e.) species were recorded on the average quadrat (McKenzie *et al.*, 2000), this was a 9.2% improvement.

Relatively few species were captured more commonly in invertebrate traps than in the vertebrate trap arrays (Appendix 1), and nearly all of those were small, suggesting that the relative inefficiency of the invertebrate traps was exacerbated by the mesh filters (as we intended). For instance, *Arenophryne rotunda* (110 from invertebrate pits : 28 from vertebrate trap arrays) and *Uperoleia russelli* (6:0) are the smallest of the study area's frogs (snout-vent length less than 33 mm). Similarly, *Lerista planiventralis decora* (10:1), *L. bipes* (7:0), *L. elegans* (159:32), *L. gascoynensis* (10:0), *L. humphriesi* (4:0), *L. kendricki* (18:3), *L. lineopunctulata*A (30:9), *Menetia greyii* (45:18), *M. greyii*B (46:9) and *M. greyii*C (5:0) are amongst the smallest skinks. Considering their relatively large mass, *Ctenotus severus* (5:0) and *Rhamphotyphlops grypus*A (11:2) were exceptions. In terms of their body diameter however, all of these species could pass through the 10 mm holes in the wire mesh that covered the invertebrate pits. The larger species captured by the invertebrate traps were represented by small individuals (sub-adults), or had forced their way past the edge of the wire mesh. After allowing for the difference in trapping effort (9:1), no frog or reptile species was captured more efficiently by the invertebrate traps.

Because the tubs were used only in May 1995, we can make no valid comparison with tubes, buckets or invertebrate pits. However, considering how little time was needed to install and check them over the sampling session (2.5 person-hours per quadrat) compared to the 4 hours per quadrat spent on hand-foraging, the tubs yielded a surprisingly high return in small *Ctenotus* and *Lerista* species, and in sub-adult dragons (Appendix 1).

Overall, the vertebrate buckets added only 5 quadrat-species intersections (7 specimens) to the tube captures, and one intersection to the combined 'tube + invertebrate-pit' captures (the term 'quadrat-species intersections' is defined in Table 3). This was only 0.5% and 0.1% of total trapping intersections, respectively (Table 3).

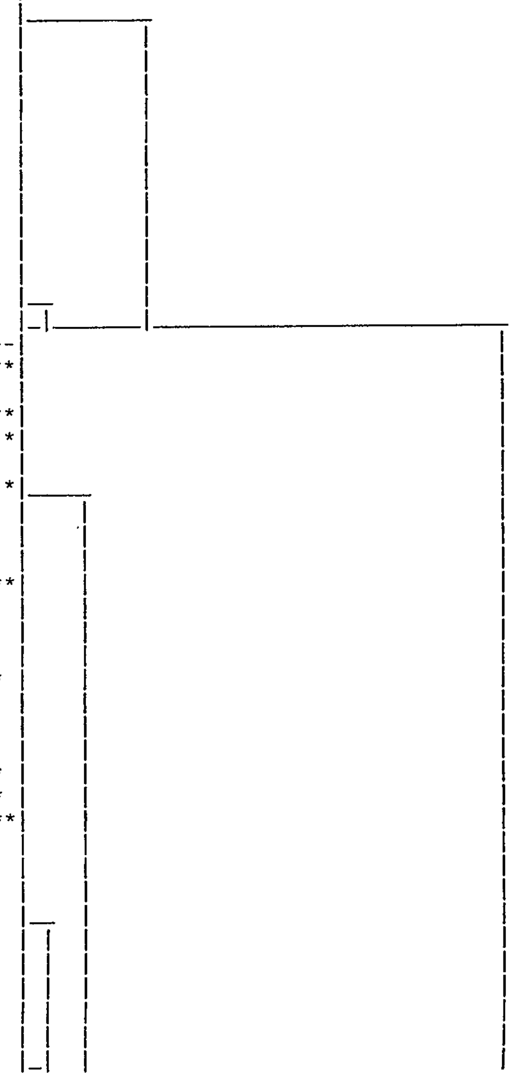
Table 3 Number of quadrat-species intersections* added by hand-foraging compared with trapping.

	Both trapped and foraged	Trapped only	Foraged only (%)	Total
Frogs	3	43*	1 (2)	**47**
Geckos	77	136	41 (16)	**254**
Dragons	63	61	23 (16)	**147**
Skinks	159	181	86 (20)	**426**
Varanids	4	31	11 (24)	**46**
Pygopodids	2	17	13 (41)	**32**
Snakes	9	34	30 (41)	**73**
TOTAL	317	503	205	1025

* There were 43 events where a frog species was caught in a quadrat by trapping only (4 species of frog at one quadrat, 3 at another, 2 at 13 others, and 1 at 10 others = 43).

QUADRATS

	BBW**PM**BBBBWMMWMMM**N**WN**N**NNNNW BOO**ED**OOOOODDODDR**A**OE**E**EEEEO 152**43**13424125451**2**31**2**3451	GGGGG JJJJJ 12354	KKMMMM EERRRR 122534	BCN BUA 311	P E 1	KKK EEE 345	BBBCCCCC**EEZZ**PPPNNN BBBUUUUU**LLUU**EEEAAA 25423456**1221**253345	ZZZ UUU 345
ASSEMBLAGE_1								
Ctenotus saxatilis			**					
Diporiphora winneckei			**					
Notoscincus ornatus ornatus			**					
Lerista kennedyensis			*					
*Lerista muelleri*C			*					
Ctenotus calurus			****					
*Ctenotus hanloni*B			******			*		
Ctenotus pantherinus			******				*	
*Ctenophorus rubens*B		*	******					
Ctenotus iapetus + marioni			******				****	
Ctenophorus clayi			**					
*Menetia greyii*C			****					
Ctenotus rufescens			* ***					
Menetia surda cresswelli			* **					
Lerista bipes			*					
Ctenophorus femoralis			* *					
Cyclodomorphus melanops melan.			*					
Cyclorana platycephalus			*					
ASSEMBLAGE_2								
Arenophryne rotunda							* **	***
Strophurus spinigerus spinig.							****	*
Lerista planiventralis decora							* *	***
Ctenotus australis								* *
Lerista humphriesi								*
Neobatrachus pelobatoides								*
Crenadactylus aff. *'ocellatus'*	**						* ***	
Ctenotus alleni	**						**	
Menetia surda subsp. indet.	* *						** **	
Ctenophorus maculatus maculat.							**	***
Lerista kendricki	*						* *	*
Ctenophorus maculatus badius	* *						* ******** *	
Lerista elagans	* * *		* *				*************** *	*
Morethia lineoocellata	* **		*				** *** *******	**
Lerista planiventralis planiv.			* *				***** **	
Ctenotus fallens							* * ** ** ***	
Cyclodomorphus celatus							* * * ***	
Diplodactylus alboguttatus	*						** ** ******	**
Lerista lineopunctulata	* *						*** * ** * *****	**
*Lerista praepedita*A							****** * ***	***
Diplodactylus ornatus							* ** * **	*
Menetia 'amaura'	* * *						* * * * *	*
*Lerista praepedita*B	*						* * ***	
Lerista varia	*						* ***	
*Ctenotus hanloni*A							****	
Lerista haroldi							*	
*Ctenophorus rubens*A							*	
Strophurus rankini							* *	
*Menetia greyii*B							****	
Tympanocryptis parviceps							****	



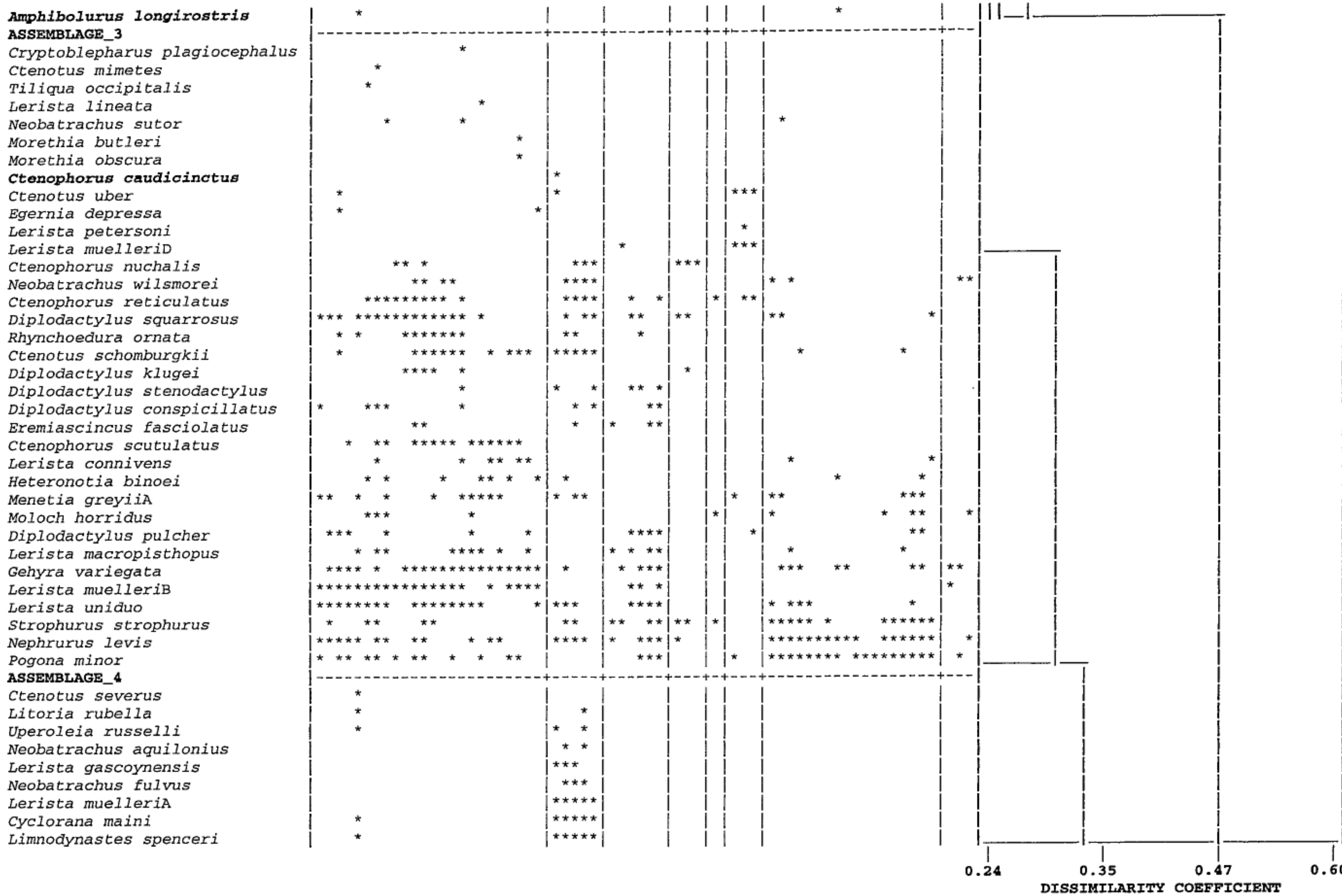


Figure 1 Matrix of frog, gecko, dragon and skink trap-records re-ordered according to species co-occurrences at the same quadrats and similarities in the overall species composition of the quadrats. Quadrat codes are printed vertically. The species dendrogram is included to indicate classification structure down to the 10 group level. To save space, *Diplodactylus* aff. *alboguttatus* has been abbreviated to *Diplodactylus* aff. *albogut*.

Hand-foraging

A detailed examination of Appendix 1 revealed that the 702 hours spent on hand-foraging by the survey personnel added only 17 species to the 116 species derived from the overall trapping program (13% of the 133 species total), and most of those were snakes or pygopodids: no dragons, no varanids, no frogs, two geckos (12% of 17 species), five skinks (9%), two pygopodids (20%) and nine snakes (50%).

In terms of the species-lists from each quadrat individually (quadrat-species intersections as defined in Table 3), hand-foraging added only small proportions of frogs, geckos, dragons and skinks, but larger proportions of snakes, pygopodids and varanids (Table 3).

Effect of Eliminating Snakes, Pygopodids and Varanids Recorded by Hand-foraging

Figure 1 is the matrix of frog, gecko, dragon and skink records collected from the various pitfall traps. The species have been re-ordered according to similarities in their co-occurrences at the same quadrats, and the quadrats re-ordered in terms of similarities in their species composition, using the numerical clustering procedures applied by McKenzie *et al.* (2000).

Four discrete species assemblages and eight quadrat groups are apparent, and have been delineated in Figure 1. The same numbers of classification partitions were identified when the entire herpetofaunal data-base was analysed (see Figure 3 in McKenzie *et al.* 2000). The two classifications are compared quantitatively in Table 4 using a modification by Hubert and Arabie (1985) of the statistic of Rand (1971). The statistic for the quadrat partitions was 0.7020 (diagonal/total = 55/63 = 0.8730), and for species assemblage partitions was 0.9127 (diagonal/total = 90/93 = 0.9677). The eight quadrats and three species assigned to different clusters by the two analyses are indicated in bold in Figure 1. Even the distributions of data points and the classification structures inside the species- and the quadrat-partitions defined in the two figures are similar. We concluded that the data collected by hand-foraging, and the inclusion of the difficult-to-sample taxa (snakes, pygopodids and varanids), had little effect on the analysis results.

Table 4 Comparison between the classification partition derived from the entire data-matrix (Partition-1, see Figure 3 in McKenzie *et al.*, 2000) and the partition derived from a matrix that excluded hand-foraged records, snakes, varanids and pygopodids (Partition-2, see Figure 1 herein). For instance, group-1 in both classifications had 20 quadrats in common.

(a) Quadrat Groups

Partition-1	Partition-2: 1	2	3	4	5	6	7	8
1	20	0	0	0	0	0	0	0
2	1	5	0	0	0	0	0	0
3	0	0	6	0	0	0	0	0
4	0	0	0	3	0	0	0	0
5	0	0	0	0	1	0	0	0
6	0	0	0	0	0	3	0	0
7	3	0	0	0	0	0	14	0
8	0	0	0	0	0	0	4	3

(b) Species Assemblages

Partition-1	Partition-2: 1	2	3	4
1	19	1	0	0
2	0	29	0	0
3	0	1	34	0
4	0	0	1	8

DISCUSSION

The 1.33 : 1 difference between tube and bucket specimen capture-rates in the fenced vertebrate trapping arrays may have been caused either by differences in trap design or by predation:

- The six tubes in each array were connected by their 50 m fence, so an animal that turned and followed the fence away from four of these tubes might be caught by an adjacent tube. In contrast, each of the buckets was centrally located along its own 10 m fence, so an animal that followed the fence in the wrong direction would not be captured. On the other hand, a resident animal might encounter the fence on several occasions before capture, and each bucket had a proportionally longer fence (10 m) than each tube (50/6 = 8.3 m on average). We also note that the two bucket-fences straddled the tube-fence in each vertebrate trap array, effectively reducing the effectiveness of the central section of the tube-fence.
- Hopping mice can remove smaller animals from tubes and buckets, while foxes, cats, snakes and large varanids steal from buckets. Tracks of these species were sometimes observed along the drift-fences, and capture-rates at the NA quadrats in May 1995 improved after we began to check the vertebrate buckets late in the evening as well as in the morning.

Although hand-foraging involved approximately one third of the total sampling effort (in person-hours, see Table 1), it added only 17 species (13%) to the combined trapping result (Appendix 1), and 11 of these 17 were snakes or pygopodids. In contrast, trapping added 38 species to the foraging result, and only seven of these were pygopodids or snakes. Quadrat-species intersections (Table 3) provided a more sensitive comparison between hand-foraging and trapping, and yielded a similar result.

Snakes, varanids and pygopodids are often eliminated from quantitative analyses of quadrat data because they occur in low densities and are poorly sampled by our quadrat-based sampling designs (How, in review; McKenzie *et al.*, 1989). In the Carnarvon study area we detected 94% of the previously known dragon species, 85% of the geckoes, 80% of the varanids, 79% of the skinks, 77% of the pygopodids, 73% of the frogs, and 65% of the snakes (McKenzie *et al.*, 2000). Although the snake and pygopodid inventories of the quadrats are likely to be too unreliable for quantitative analysis, the gecko and frog percentages are probably under-estimated because the three gecko species and two of the four frogs that were overlooked have geographical ranges that barely intrude into our study area.

The possibility that trapping would have been sufficient without hand-foraging was confirmed by our final analysis. This showed that the classification structures derived from a matrix of frog, gecko, dragon and skink trap-records (Figure 1) were virtually identical to the structures derived from the total data-set (Figure 3 in McKenzie *et al.*, 2000). Pragmatically, snakes, pygopodids and varanids could have been ignored, and the labour-intensive hand-foraging methods deleted, without sacrificing biogeographical discrimination or changing the outcomes of the study.

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APPENDIX 1

Numbers of frogs and reptiles captured by various methods.

Species	Tube	Bucket	Tube or Bucket*	Tub	Invert Pit	Foraging	Not Specified	Totals
			FROGS					
Arenophryne rotunda	27	1		1	110			139
Cyclorana maini	25				4			29
C. platycephalus					2			2
Limnodynastes spenceri	5				17		3	25
Litoria rubella	9				3	1		13
Neobatrachus pelobatoides	1				1	2	2	6
N. aquilonius	4				2	1		7
N. fulvus	5							5
N. sutor	1				2			3
N. wilsmorei	21			1	2		5	29
Pseudophryne guentheri					1	1		2
Uperoleia russelli					6			6
			GECKOS					
Crenadactylus aff. *'ocellatus'*	4		4		1	2	1	12
Diplodactylus alboguttatus	24	4			18	10		56
D. stenodactylus	3	3			5		1	12
D. conspicillatus	13	3			7		2	25
D. klugei	23	5	6		1	3		38
D. ornatus	5	1		1	3	6		16
D. pulcher	16	1	3		5	3		28
D. squarrosus	80	14	18	5	11	10	7	145
Strophurus michaelseni						1		1
S. rankini	5	1			1			7
S. spinigerus spinigerus	5	1		4	2	25		37
S. strophurus	28	4	19		21	20		92
Gehyra punctata						4		4
G. variegata	26	1	23	1	10	170	7	238
Heteronotia binoei	4	2	5		5	38		54
Neprurus levis	131	6	19	4	36	13	8	217
Rhynchoedura ornata	48	4	2		9	5	1	69
			PYGOPODIDS					
Aprasia sp. aff. *fusca*		1			2			3
A. haroldi						1		1
A. smithi	1							1
Delma australis					1	4		5
D. butleri	3					2		5
D. nasuta	1	1						2
Lialis burtonis	5					5		10
Pletholax gracilis edelensis	4							4
Pygopus lepidopodus						1		1
P. nigriceps	1		1			2		4
			DRAGONS					
Amphibolurus longirostris	1			1		3		5
Ctenophorus caudicinctus	1					1		2
C. clayi		2			1	4		7
C. femoralis	7	5	2	1		10		25
C. nuchalis	11	5	1		5	7	2	31
C. maculatus badius	71	16	2	11	16	33	3	152
C. maculatus maculatus	12	2		1	1	10		26
C. reticulatus	47	13	1	7	20	34	8	130
*C. rubens*A	5	3				3		11
*C. rubens*B	34	9	3	8	5	23		82
C. scutulatus	13	5	6	1	11	19	7	62
Diporiphora winneckei	1		2			1		4
Moloch horridus	11	1				4	1	17
Pogona minor	30	12	7	10	20	23	1	103
Rankinia adelaidensis adelaid.					1			1
Tymanocryptis parviceps	14	2		5	5	1		27

Species	Tube	Bucket	Tube or Bucket*	Tub	Invert Pit	Foraging	Not Specified	Totals
			SKINKS					
Cryptoblepharus carnabyi						3		3
C. plagiocephalus	1					2		3
Ctenotus alleni	2	1	1			1		5
C. australis	1				3			4
C. calurus	4	1			1	2		8
C. fallens	14	3		4	5	4		30
*C. hanloni*A	8			3	4			15
*C. hanloni*B	10		1	2	5		1	19
C. iapetus + marioni	35	2	2	12	11	6	3	71
C. mimetes					1	2		3
C. pantherinus	10	2		5	6	7	1	31
C. rufescens	9	3	4	1	14	3		34
C. saxatilis			2					2
C. schomburgkii	39	3	8	10	78	10	15	163
C. severus				1	5	6		12
C. uber	6	1	1	3	9	6	7	33
Cyclodomorphus celatus	4				2	10		16
C. melanops melanops		1			1			2
Egernia depressa	2					8		10
E. stokesii badia						1		1
Eremiascincus fasciolatus	7	3	1	3	22		1	37
Lerista bipes					7			7
L. connivens	3	2	7		18	34	9	73
L. elegans	9	10	13	16	159	11	5	223
L. gascoynensis					10	29	1	40
L. haroldi					2			2
L. humphriesi					4	5		9
L. kendricki	1	2			18	4		25
L. petersoni			1					1
L. kennedyensis	5	1	11	1	4			22
L. lineata	3							3
*L. lineopunctulata*A	5	1	3		30	68	1	108
L. macropisthopus	7		3		12	102	1	125
*L. muelleri*A	41	3			49	25	12	130
*L. muelleri*B	37	7	11	14	159	96	11	335
*L. muelleri*C	1	1					2	4
*L. muelleri*D	3		1	2	7	11	7	31
L. planiventralis decora		1			10			11
L. planiventralis planiventralis	15	9	2	5	45	2	1	79
*L. praepedita*A	10	1		2	20	40	2	75
*L. praepedita*B	6	1			5	10	1	23
L. uniduo	92	7	24	3	160	156	10	452
L. varia	5	2			12	17	4	40
Menetia 'amaura'	2	3	2	2	14	13		36
*M. greyii*A	14	1	3		45	23	6	92
*M. greyii*B	4	5		2	46	4		61
*M. greyii*C					5		1	6
M. surda cresswelli	2	1						3
M. surda subsp. indet.	5	1	1	2	5	6	1	21
Morethia butleri			1					1
M. lineoocellata	19	3		8	35	13	2	80
M. obscura					1			1
M. ruficauda exquisita						1		1
Notoscincus ornatus ornatus	2		1		2			5
Tiliqua multifasciata						1		1
T. occipitalis		1				1		2
T. rugosus						5	1	6
			GOANNAS					
Varanus brevicauda	8	1	2					11
V. caudolineatus	3	1				6	1	11
V. eremius	29	5	6	1	2	3		46
V. gouldii	3				1	7		11

Species	Tube	Bucket	Tube or Bucket*	Tub	Invert Pit	Foraging	Not Specified	Totals
			SNAKES					
Acanthophis pyrrhus						1		1
Antaresia perthensis						3		3
Brachyurophis. semtifasciatus						1		1
Demansia calodera	2	3	2			5		12
D. psammophis						1		1
Furina ornata						2		2
Neelaps bimaclata						1		1
Pseudechis australis						2		2
Pseudonaja modesta		1	1		2	2	1	7
P. nuchalis						4		4
Ramphotyphlops australis					1			1
*R. grypus*A	1	1			11			13
*R. grypus*B	1							1
R. hamatus	5				5	1		11
Simoselaps bertholdi	5		4		6	24	2	41
S. littoralis	1	1			6	3		11
Suta fasciata						1		1
Totals	**1285**	**224**	**243**	**164**	**1462**	**1322**	**169**	**4867**

* Data sheet did not specify whether from tube or bucket.