

Use of personal digital assistants for data collection in field biology classes

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THE PROBLEM

context

- investigation of the composition of a plant community on a shingle bar in Devon
- part of year 2 undergraduate field biology unit

current situation

- with 6 groups of students this exercise generates a very large amount of data
- collation and processing of data from written recording sheets is very time consuming
- occupies most of the evening lab session that should be focussed on **evaluation** of analysed data
- so how to capture and process data rapidly?

THE SOLUTION?

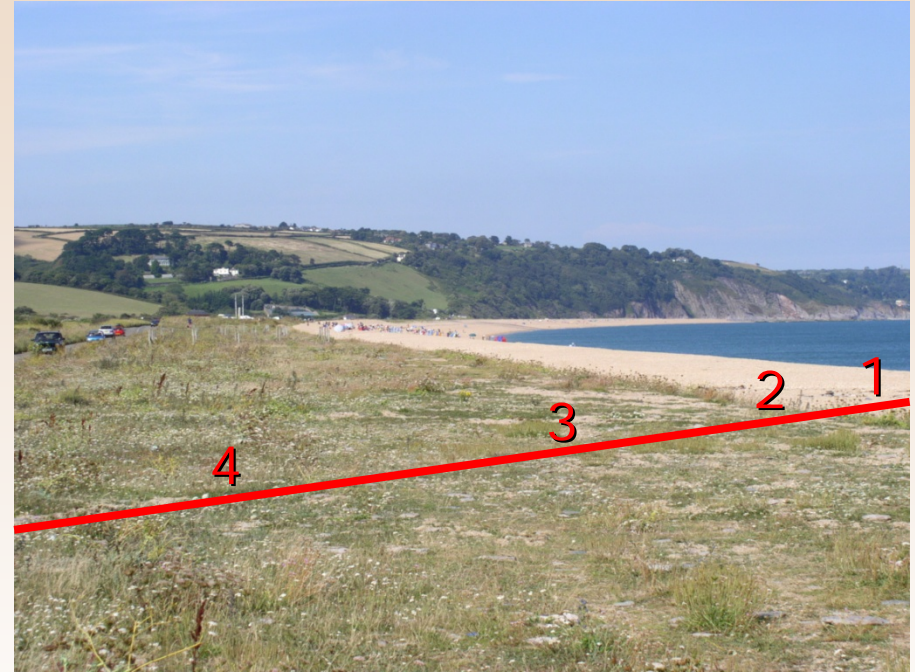
- collect data directly into Personal Digital Assistants (PDAs)
- in the field transfer data by Bluetooth to laptop
- extract data into a form utilisable by bespoke analysis software

July 2006

- done along with paper recording methods used in previous years

How is the data collected?

Belt transect



Stations 4 to 10

= 8 * 10 quadrats/group – 6 groups = 480 data points

more than 60 species

Stations 1 to 4

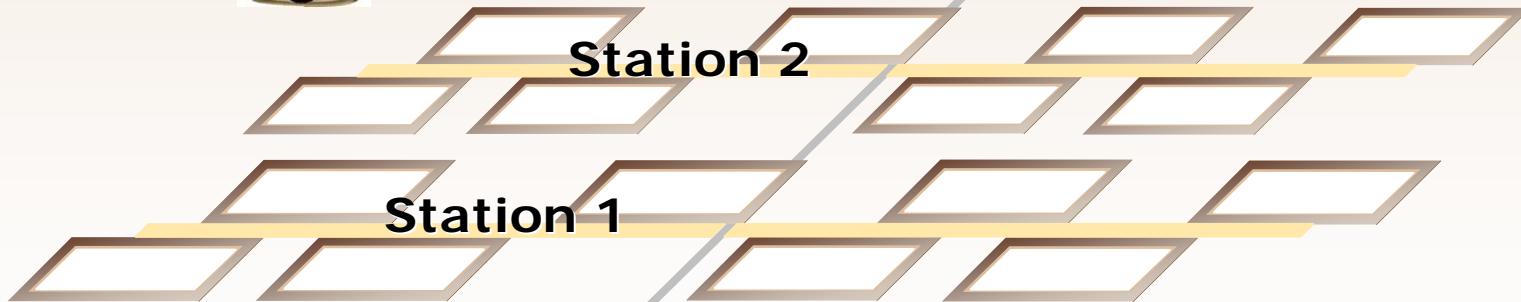


for each group



Sea

8 quadrats per station
quadrat 0.5m*0.5m



16 quadrats

Sea



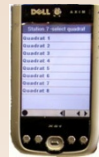
Station 3

Station 2

Station 1

24 quadrats

Sea



Station 4

Station 3

Station 2

Station 1

32 quadrats

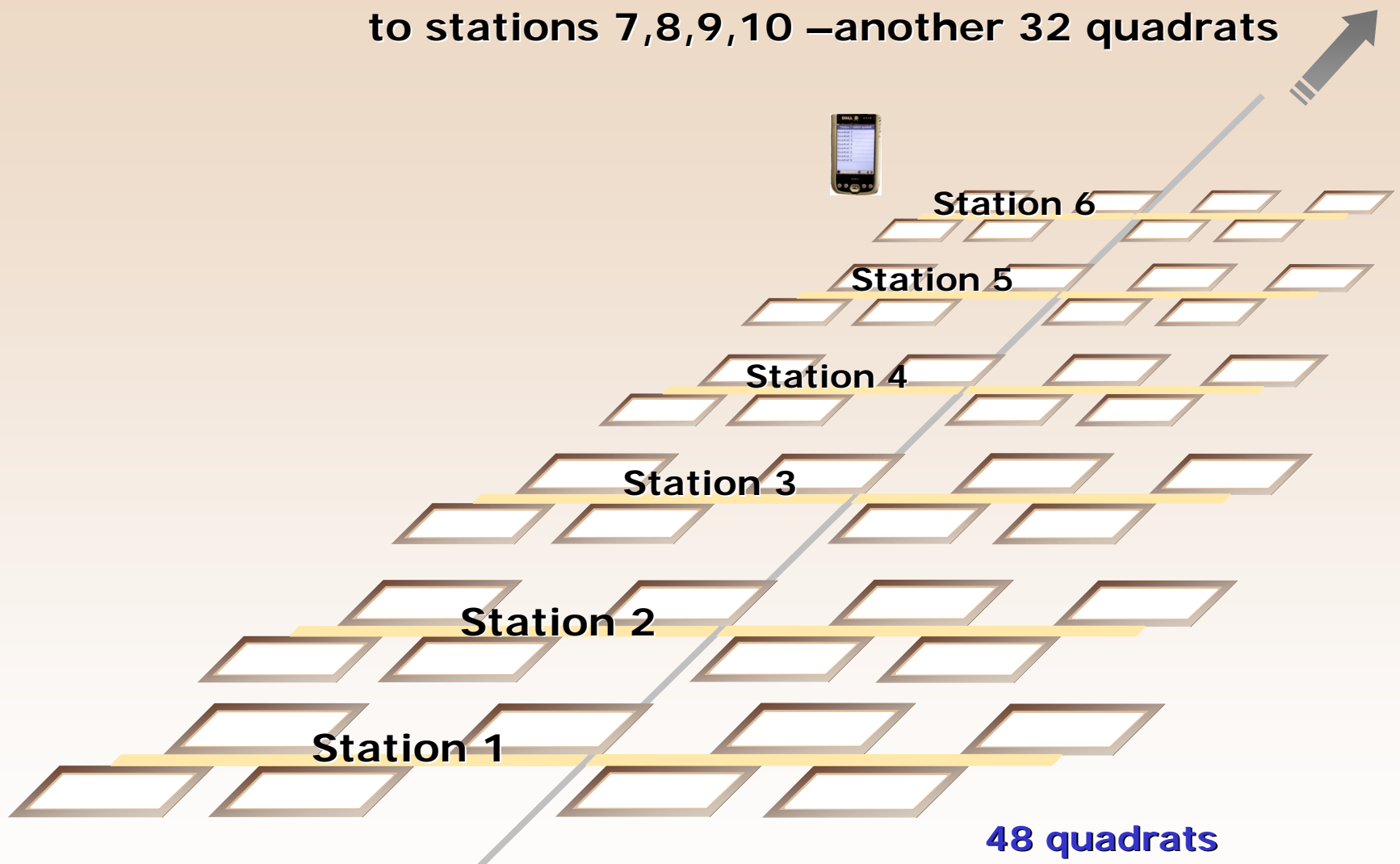
Sea



40 quadrats

Sea

to stations 7,8,9,10 –another 32 quadrats



Sea

48 quadrats

Recording sheet 2006

Recording sheet 2006

GROUP NAMES.....		SHINGLE RIDGE STATION NUMBER.....				
Quadrat Number		1	2	3	4	5
Bare ground (%)						
Sea Kale	<i>Crambe maritima</i> P					
Rock Samphire	<i>Crithmum maritimum</i> P					
Sand couch grass	<i>Elymus farctus</i> P					
Sea Spurge	<i>Euphorbia paralias</i> P					
Yellow Horned Poppy	<i>Glaucium flavum</i> P					
Sea Mayweed	<i>Tripleurospermium sp.</i> P					
Yarrow	<i>Achillea millefolia</i> H					
Halberd-leaved orache	<i>Atriplex hastata</i> H					
Common Orache	<i>Atriplex patula</i> H					
Mouse eared chickweed	<i>Cerastium sp.</i> H					
Hogweed	<i>Heracleum spondylium</i> H					
Yellow composites	<i>Hypochoeris/Leodon</i> H					
Birds foot Trefoil	<i>Lotus corniculata</i> H					
Rest Harrow	<i>Ononis repens</i> H					
Ribwort Plantain	<i>Plantago lanceolata</i> H					
Curled Dock	<i>Rumex crispus</i> H					
Ragwort	<i>Senecio jacobaea</i> H					
Dandelion	<i>Taraxacum officinale</i> H					
Hop Trefoil	<i>Trifolium campestre</i> H					
Red Clover	<i>Trifolium pratense</i> H					
Thrift	<i>Ameria maritima</i> MS					
Frosted Orache	<i>Atriplex sabulosa</i> MS					
Sea Beet	<i>Beta vulgaris</i> MS					
Sea Bindweed	<i>Calystegia soldanella</i> MS					
Sea Carrot	<i>Daucus carota</i> MS					
Vipers Bugloss	<i>Echium vulgare</i> MS					
Red Fescue	<i>Festuca rubra</i> MS					
Sea Plantain	<i>Plantago maritima</i> MS					
Sea Radish	<i>Raphanus maritimus</i> MS					
Sea Campion	<i>Silene maritima</i> MS					
Other grasses						
Kidney Vetch	<i>Anthesis vulneraria</i> MC					
Mugwort	<i>Artemisia vulgaris</i> MC					
Hairy Bitter cress	<i>Cardamine hirsuta</i> MC					
Black Kapweed	<i>Cerastium nigra</i> MC					
Chenil	<i>Chaerophyllum agg.</i> MC					
Field Bindweed	<i>Convolvulus arvensis</i> MC					
Fogfloss	<i>Digitalis purpurea</i> MC					
Common Stork's bill	<i>Egypus scaberrimus</i> MC					
Eye bright	<i>Euphrasia nemorosa</i> MC					
Hedge Bedstraw	<i>Gallium mollugo</i> MC					
Lady's bedstraw	<i>Gallium verum</i> MC					
DovesfootCrane's bill	<i>Geranium molle</i> MC					
Herb Robert	<i>Geranium robertianum</i> MC					
Meadow Veitching	<i>Lathyrus pratensis</i> MC					
Toadflax	<i>Lithalia vulgaris</i> MC					
Bright Saxifrage	<i>Pimpinella saxifraga</i> MC					
Creeping Chickweed	<i>Potentilla reptans</i> MC					
Sorrel	<i>Rumex acetosa</i> MC					
Bitterweet	<i>Solanum dulcamara</i> MC					
Lesser Trefoil	<i>Trifolium dubium</i> MC					
White clover	<i>Trifolium repens</i> MC					
Field Trefoil	<i>Vicia cracca</i> MC					
Hairy Vetch	<i>Vicia hirsuta</i> MC					
Common Vetch	<i>Vicia sativa</i> MC					
Ox Man's beard	<i>Clematis sp.</i> SC					
Goosegrass	<i>Gallium aparine</i> SC					
Hvy	<i>Hedera helix</i> SC					
Honeyuckle	<i>Lonicera sp.</i> SC					
Blackberry	<i>Rubus spinosus</i> SC					
Strawberry	<i>Rubus fruticosus</i> SC					
Elder	<i>Sambucus nigra</i> SC					
Woodsage	<i>Teucreum scorodonia</i> SC					
Goose	<i>Ulex sp.</i> SC					
Nettle	<i>Urtica dioica</i> SC					

recording

GROUP NAMES.....SHINGLE RIDGE STATION NUMBER.....

Quadrat Number		1	2	3	4	5	6	7	8	Total
Bare ground (%)										
Sea Kale	<i>Crambe maritima</i> P									
Rock Samphire	<i>Crithmum maritimum</i> P									
Sand couch grass	<i>Elymus farctus</i> P									
Sea Spurge	<i>Euphorbia paralias</i> P									
Yellow Horned Poppy	<i>Glaucium flavum</i> P									
Sea Mayweed	<i>Tripleurospermium sp.</i> P									
Yarrow	<i>Achillea millefolia</i> H									
Halberd-leaved orache	<i>Atriplex hastata</i> H									
Common Orache	<i>Atriplex patula</i> H									
Mouse eared chickweed	<i>Cerastium sp.</i> H									
Hogweed	<i>Heracleum spondylium</i> H									
Yellow composites	<i>Hypochoeris/Leodon</i> H									
Birds foot Trefoil	<i>Lotus corniculata</i> H									
Rest Harrow	<i>Ononis repens</i> H									
Ribwort Plantain	<i>Plantago lanceolata</i> H									
Curled Dock	<i>Rumex crispus</i> H									

recording

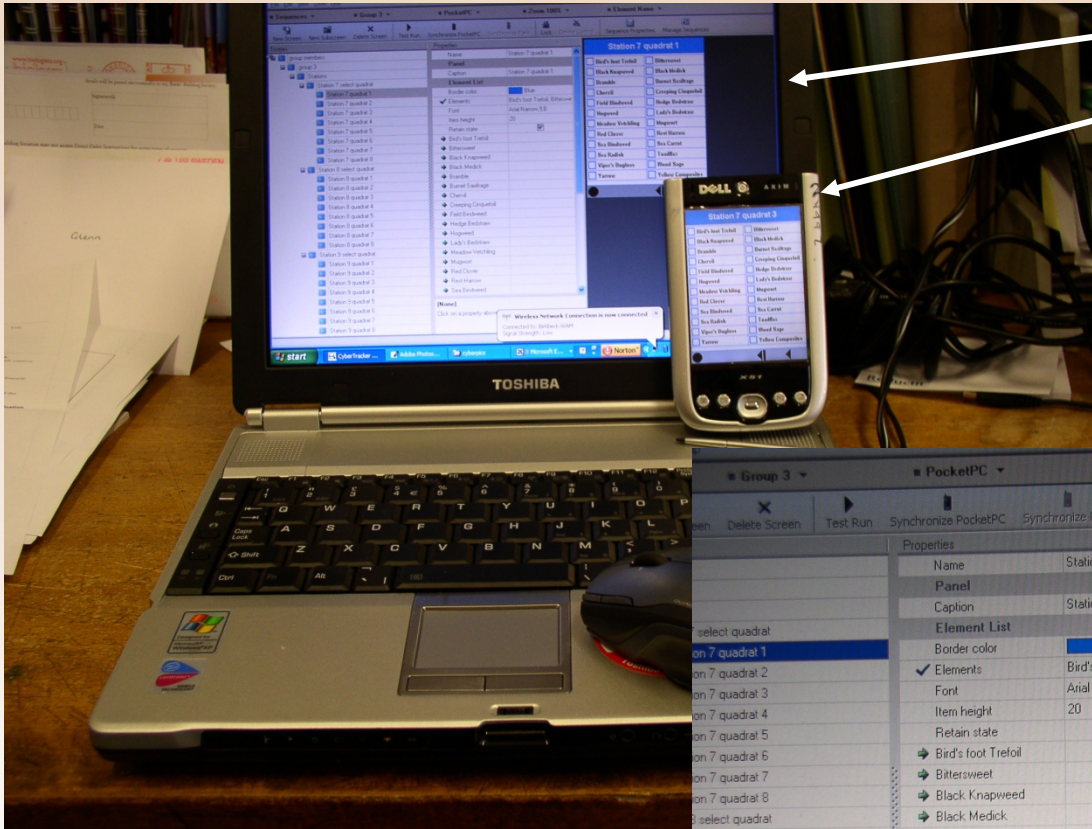
Summary sheet 2005 – SHINGLE RIDGE VEGETATION : enter no. of quadrats recorded at each station for each species

STATION NUMBER -		1	2	3	4	5	6	7	8	9	10
Bare ground (%)											
Sea Kale	<i>Crambe maritima</i> P										
Rock Samphire	<i>Crithmum maritimum</i> P		10								
Sand couch grass	<i>Elymus farctus</i> P		19								
Sea Spurge	<i>Euphorbia paralias</i> P	2	18								
Yellow Horned Poppy	<i>Glaucium flavum</i> P	3	1		1						
Sea Mayweed	<i>Tripleurospermium sp.</i> P	2	17	1		5	1				
Yarrow	<i>Achillea millefolia</i> H		3	28	32	21	12	5	5	1	
Halberd-leaved orache	<i>Atriplex hastata</i> H									1	
Common Orache	<i>Atriplex patula</i> H					1					
Mouse eared chickweed	<i>Cerastium sp.</i> H										
Hogweed	<i>Heracleum spondylium</i> H					1	3	14	19	19	
Yellow composites	<i>Hypochoeris/Leodon</i> H		16	7	14	25	23	10	4		
Birds foot Trefoil	<i>Lotus corniculata</i> H			6	12	8	4	19	16	4	
Rest Harrow	<i>Ononis repens</i> H		23	27	24	24	10	8	11	5	
Ribwort Plantain	<i>Plantago lanceolata</i> H		16	28	30	25	3	1	6		
Curled Dock	<i>Rumex crispus</i> H						1				
Buck's-horn plantain	<i>Plantago coronopus</i> H										
Dandelion	<i>Taraxacum officinale</i> H					1					
Hop Trefoil	<i>Trifolium campestre</i> H					7	1				
Red Clover	<i>Trifolium pratense</i> H			5	16	26	3	2	4		
Thrift	<i>Ameria maritima</i> MS		20	26	27	23	8				
Frosted Orache	<i>Atriplex sabulosa</i> MS					1					
Sea Beet	<i>Beta vulgaris</i> MS					4	3				
Sea Bindweed	<i>Calystegia soldanella</i> MS		4	4	3	1		4			
Sea Carrot	<i>Daucus carota</i> MS		23	30	29	24	24	21	27	10	
Vipers Bugloss	<i>Echium vulgare</i> MS		1		7	4	6			1	
Red Fescue	<i>Festuca rubra</i> MS		15	27	32	27	15	15	19	8	
Sea Plantain	<i>Plantago maritima</i> MS		5	2	1				1		
Sea Radish	<i>Raphanus maritimus</i> MS			1	1	6	8	13	10	16	
Sea Campion	<i>Silene maritima</i> MS		21	22	24	21		3			
Other grasses						12	18	30	31	28	32
Kidney Vetch	<i>Anthesis vulneraria</i> MC										
Mugwort	<i>Artemisia vulgaris</i> MC									8	
Hairy Bitter cress	<i>Cardamine hirsuta</i> MC										

summary

P – pioneer; MS – maritime specialist; H – hardy generalist; MC – mesowood

paper recording



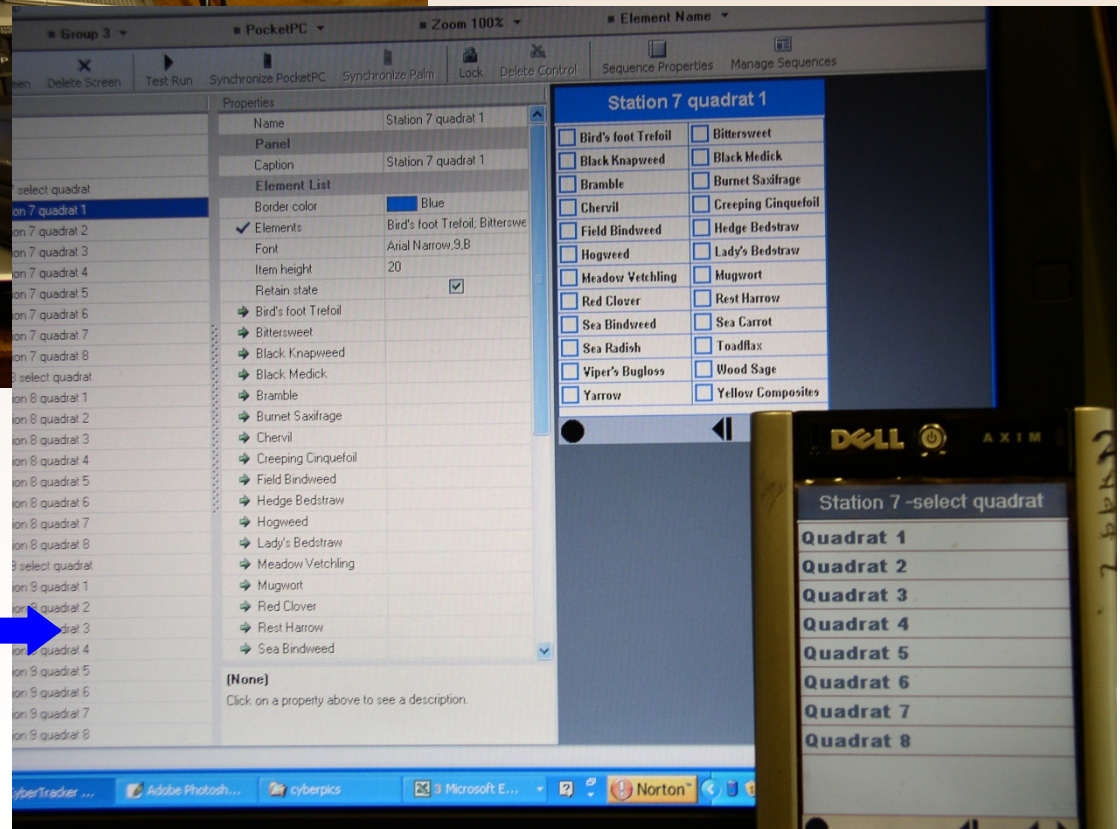
Toshiba Portege with Dell Axim x51 PDAs. Data transfer by Bluetooth.

Portege R200 only 1.3 kg and Axim battery life >6 hours of field work.

data collected in MSAccess database
Cybertracker v3 forms

<http://www.cybertracker.co.za/>

- integrated GPS



database structure

shingle234 - CyberTracker Professional v3.048

File Edit View Tools Help

Sequences Group 1 PocketPC Zoom 100% Element Name

New Screen New Subscreen Delete Screen Test Run Synchronize PocketPC Synchronize Palm Lock Delete Control Sequence Properties Manage Sequences

Screen

- group members
 - group 1
 - Stations
 - Station 2 select quadrat
 - Station 2 quadrat 1**
 - Station 2 quadrat 2
 - Station 2 quadrat 3
 - Station 2 quadrat 4
 - Station 2 quadrat 5
 - Station 2 quadrat 6
 - Station 2 quadrat 7
 - Station 2 quadrat 8
 - Station 3 select quadrat
 - Station 3 quadrat 1
 - Station 3 quadrat 2
 - Station 3 quadrat 3
 - Station 3 quadrat 4
 - Station 3 quadrat 5
 - Station 3 quadrat 6
 - Station 3 quadrat 7
 - Station 3 quadrat 8
 - Station 4 select quadrat
 - Station 4 quadrat 1
 - Station 4 quadrat 2
 - Station 4 quadrat 3
 - Station 4 quadrat 4
 - Station 4 quadrat 5
 - Station 4 quadrat 6
 - Station 4 quadrat 7
 - Station 4 quadrat 8

Properties

Name Station 2 quadrat 1

Panel

Caption Station 2 quadrat 1

Element List

Border color Blue

Elements Bird's foot Trefoil; Buck's h

Font Arial Narrow,9,B

Item height 20

Retain state

- Bird's foot Trefoil
- Buck's horn Plantain
- Curled Dock
- Dandelion
- Orache
- Ragwort
- Red Clover
- Red Fescue
- Rest Harrow
- Ribwort Plantain
- Rock Samphire
- Sand Couch Grass
- Sea Beet
- Sea Bindweed
- Sea Carrot
- Sea Campion
- Sea Mayweed
- Sea Plantain
- Sea Radish
- Sea Spurge
- Thrift
- Viper's Bugloss
- Yarrow
- Yellow Composites

(None)

Click on a property above to see a description.

Station 2 quadrat 1

<input type="checkbox"/> Bird's foot Trefoil	<input type="checkbox"/> Buck's horn Plantain
<input type="checkbox"/> Curled Dock	<input type="checkbox"/> Dandelion
<input type="checkbox"/> Orache	<input type="checkbox"/> Ragwort
<input type="checkbox"/> Red Clover	<input type="checkbox"/> Red Fescue
<input type="checkbox"/> Rest Harrow	<input type="checkbox"/> Ribwort Plantain
<input type="checkbox"/> Rock Samphire	<input type="checkbox"/> Sand Couch Grass
<input type="checkbox"/> Sea Beet	<input type="checkbox"/> Sea Bindweed
<input type="checkbox"/> Sea Carrot	<input type="checkbox"/> Sea Campion
<input type="checkbox"/> Sea Mayweed	<input type="checkbox"/> Sea Plantain
<input type="checkbox"/> Sea Radish	<input type="checkbox"/> Sea Spurge
<input type="checkbox"/> Thrift	<input type="checkbox"/> Viper's Bugloss
<input type="checkbox"/> Yarrow	<input type="checkbox"/> Yellow Composites

within quadrat 24 species

- tap box to record presence

database report

Microsoft Excel - shingle234slap2

File Edit View Insert Format Tools Data PopTools FlashPaper window help

MS Sans Serif 8 B I U % , +.0 -.0

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T		
	Time	Group 1	Group 2	Group3	Group4	Station 2	Station 3	Station 4	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5	Quadrat 6	Quadrat 7	Quadrat 8	Yarrow	Rock Samphir	Sand Couch Grass	Sea Spurge	Sea Maj	
1																						
2	11:18:30	1				1			1									1	1	1	1	
3	11:25:32	1				1				1								1	1	1	1	
4	11:28:11	1				1					1							1	1	1	1	
5	11:28:45	1				1						1							1	1	1	
6	11:32:52	1				1							1						1	1	1	
7	11:34:25	1				1								1					1	1	1	
8	11:35:39	1				1									1				1	1	1	
9	11:37:30	1				1										1			1	1	1	
10	11:37:46	1				1											1		1	1	1	
11	11:43:46	1				1			1									1				
12	11:47:08	1				1				1								1				
13	11:51:21	1				1					1											
14	11:55:08	1				1						1										
15	11:59:01	1				1							1									
16	12:01:36	1				1								1								
17	12:04:14	1				1									1							
18	12:06:27	1				1										1						
19	12:06:33	1				1											1					
20	12:13:22	1				1			1									1				
21	12:16:06	1				1				1								1				
22	12:19:29	1				1					1							1				
23	12:22:08	1				1						1						1				
24	12:24:15	1				1							1					1				
25	12:25:48	1				1								1				1				
26	12:27:19	1				1									1			1				
27	12:29:04	1				1										1		1				
28	12:29:06	1				1											1	1				
29	12:29:15	1				1												1				
30	11:34:07	1				1			1									1	1			
31	11:41:21	1				1				1								1	1	1	1	
32	11:46:12	1				1					1							1	1	1	1	
33	11:52:01	1				1						1						1	1	1	1	
34	12:01:07	1				1							1					1	1	1	1	
35	12:05:10	1				1								1				1	1	1	1	
36	12:07:58	1				1									1			1	1	1	1	
37	12:11:20	1				1											1	1	1	1	1	
38	12:12:23	1				1											1	1	1	1	1	
39	12:12:24	1				1											1	1	1	1	1	
40	12:19:31	1				1			1									1	1	1	1	

group (blue box around B2-B30)

station (red box around F2-F10)

quadrat (green box around I2-I8)

recprd (pink box around R2-R8)

Sheet1 | Sheet2 | shingle234slap /

Ready

report structure

Microsoft Excel - shingle234slap2

File Edit View Insert Format Tools Data PopTools FlashPaper window Help

MS Sans Serif 8 B I U % , +.00 +.00 75%

DB11 =

	A	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	E
1	Time	12:02:51	12:04:28	12:07:15	12:11:14	12:14:40	12:16:48	12:19:58	12:22:25	12:22:29	12:27:15	12:29:03	12:31:55	12:34:30	12:38:20	12:41:19	12:46:48	12:49:54	12:49:56	12:4
2	Group 1																			
3	Group 2																			
4	Group3																			
5	Group4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	Station 2																			
7	Station 3	1	1	1	1	1	1	1	1	1										
8	Station 4										1	1	1	1	1	1	1	1	1	1
9	Quadrat 1	1									1									
10	Quadrat 2		1									1								
11	Quadrat 3			1									1							
12	Quadrat 4				1									1						
13	Quadrat 5					1									1					
14	Quadrat 6						1									1				
15	Quadrat 7							1									1			
16	Quadrat 8								1									1		
17	Yarrow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18	Rock Samphire										1	1	1	1	1	1	1	1	1	1
19	Sand Couch												1							
20	Sea Spurge													1						
21	Sea Mayweed																			
22	Yellow										1				1					
23	Bird's foot															1				
24	Rest Harrow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25	Ribwort		1	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1
26	Curled Dock																			
27	Buck's horn	1		1																
28	Ragwort																			
29	Dandelion																			
30	Red Clover								1		1	1	1	1	1	1	1	1	1	1
31	Drache																			
32	Thrift	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
33	Sea Beet																			1
34	Sea Bindweed																			
35	Sea Carrot		1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1
36	Viper's Bugloss											1					1	1	1	1
37	Red Fescue				1			1	1		1	1	1	1	1	1	1	1	1	1
38	Sea Plantain		1			1					1			1						
39	Sea Radish																			1
40	Sea Campion	1	1	1		1			1	1	1	1	1	1	1	1	1	1	1	1

transposed

Sheet1 / Sheet2 / shingle234slap /

Ready

transfer to processing software

number		Quadrat Number		1	2	3	4	5	6	7	8	sum	1	2	3	4
1	1	Yarrow	<i>Achillea millefolia</i>	H	1	1	1	1	1	1	1	7				
2	2	Rock Samphire	<i>Crithmum maritimum</i>	P								0	1	1	1	1
3	3	Sand Couch Grass	<i>Elymus farctus</i>	P								0	1	1	1	1
4	4	Sea Spurge	<i>Euphorbia paralias</i>	P								0	1	1	1	1
5	5	Sea Mayweed	<i>Tripleurospermium</i> spp.	P								0	1	1	1	1
6	6	Yellow Composites	<i>Hypochoeris/Leodon</i>	H								0	1	1	1	1
7	7	Bird's foot Trefoil	<i>Lotus corniculata</i>	H								0	1	1	1	1
8	8	Rest Harrow	<i>Ononis repens</i>	H	1	1	1	1	1	1	1	7	2	2	2	2
9	9	Ribwort Plantain	<i>Plantago lanceolata</i>	H		1	1	1	1	1	1	7	1	2	2	2
10	10	Curled Dock	<i>Rumex crispus</i>	H								0	1	1	1	1
11	11	Buck's horn Plantain	<i>Plantago coronopus</i>	H	1		1					2	2	1	2	1
12	12	Ragwort	<i>Senecio jacobaea</i>	H								0	1	1	1	1
13	13	Dandelion	<i>Taraxacum officinale</i>	H								0	1	1	1	1
14	14	Red Clover	<i>Trifolium pratense</i>	H						1		1	1	1	1	1
15	15	Orache	<i>Atriplex hastata</i>	MS								0	1	1	1	1
16	16	Thrift	<i>Armeria maritima</i>	MS	1	1	1	1	1	1	1	8	2	2	2	2
17	17	Sea Beet	<i>Beta vulgaris</i>	MS								0	1	1	1	1
18	18	Sea Bindweed	<i>Calystegia soldanella</i>	MS								0	1	1	1	1
19	19	Sea Carrot	<i>Daucus carota</i>	MS		1	1	1	1	1	1	6	1	2	2	2
20	20	Viper's Bugloss	<i>Echium vulgare</i>	MS								0	1	1	1	1
21	21	Red Fescue	<i>Festuca rubra</i>	MS				1		1	1	3	1	1	1	2
22	22	Sea Plantain	<i>Plantago maritima</i>	MS		1			1			2	1	2	1	1
23	23	Sea Radish	<i>Raphanus maritimus</i>	MS								0	1	1	1	1
24	24	Sea Campion	<i>Silene maritima</i>	MS	1	1	1	1	1	1	1	6	2	2	2	1
25	25															
26	2	Rock Samphire	<i>Crithmum maritimum</i>	P									0	0	0	0
27	3	Sand Couch Grass	<i>Elymus farctus</i>	P									0	0	0	0
28	4	Sea Spurge	<i>Euphorbia paralias</i>	P									0	0	0	0
29	5	Sea Mayweed	<i>Tripleurospermium</i> spp.	P									0	0	0	0
30	6	Yellow Composites	<i>Hypochoeris/Leodon</i>	H									0	0	0	0
31	7	Bird's foot Trefoil	<i>Lotus corniculata</i>	H									0	0	0	0
32	8	Rest Harrow	<i>Ononis repens</i>	H									1	1	1	1
33	9	Ribwort Plantain	<i>Plantago lanceolata</i>	H									0	1	1	1
34	10	Curled Dock	<i>Rumex crispus</i>	H									0	0	0	0
35	11	Buck's horn Plantain	<i>Plantago coronopus</i>	H									1	0	1	0
36	12	Ragwort	<i>Senecio jacobaea</i>	H									0	0	0	0
37	13	Dandelion	<i>Taraxacum officinale</i>	H									0	0	0	0
38	14	Red Clover	<i>Trifolium pratense</i>	H									0	0	0	0
39	15	Orache	<i>Atriplex hastata</i>	MS									0	0	0	0
40	16	Thrift	<i>Armeria maritima</i>	MS									1	1	1	1
41	17	Sea Beet	<i>Beta vulgaris</i>	MS									0	0	0	0
42	18	Sea Bindweed	<i>Calystegia soldanella</i>	MS									0	0	0	0

Incidence of inaccuracies

	Stations 234					Stations 789			
Group Number	1	2	3	4		1	2	3	4
Number of duplicate quadrats	0	1	1	0		0	0	0	0
Number of corrected quadrats	0	0	7	0		0	0	0	1
<hr/>									
Number of observations on pda but not on form	2	0	1	5		9	7		1
Number of observations on form but not on PDA	3	0	0	9		1	3	1	3
<i>Number of presences</i>	147	188	170	159		100	94	113	118
errors as % of presences^a	3.4	0	5.9	8.8		10.0	10.6	0.9	3.3
Total number of potential records	384	384	384	408		408	384	312	408
errors as % of total	1.3	0	0.3	3.4		2.4	2.6	0.3	1.0

a – both types of error/total presences*100

Recording sheet 2006

Recording sheet 2006

GROUP NAMES.....	SHINGLE RIDGE STATION				
	1	2	3	4	5
Quadrat Number					
Bare ground (%)					
Sea Kale	<i>Crambe maritima</i>	P			
Rock Samphire	<i>Crithmum maritimum</i>	P			
Sand couch grass	<i>Elymus farctus</i>	P			
Sea Spurge	<i>Euphorbia paralias</i>	P			
Yellow Horned Poppy	<i>Glaucium flavum</i>	P			
Sea Mayweed	<i>Tripleurospermium sp.</i>	P			
Yarrow	<i>Achillea millefolia</i>	H			
Halberd-leaved orache	<i>Atriplex hastata</i>	H			
Common Orache	<i>Atriplex patula</i>	H			
Mouse eared chickweed	<i>Cerastium sp.</i>	H			
Hogweed	<i>Heracleum spodylum</i>	H			
Yellow composites	<i>Hypochoeris/Leodon</i>	H			
Birds foot Trefoil	<i>Lotus corniculata</i>	H			
Rest Harrow	<i>Ononis repens</i>	H			
Ribwort Plantain	<i>Plantago lanceolata</i>	H			
Curled Dock	<i>Rumex crispus</i>	H			
Ragwort	<i>Senecio jacobaea</i>	H			
Dandelion	<i>Taraxacum officinale</i>	H			
Hop Trefoil	<i>Trifolium campestre</i>	H			
Red Clover	<i>Trifolium pratense</i>	H			
Thrift	<i>Ameria maritima</i>	MS			
Frosted Orache	<i>Atriplex sabulosa</i>	MS			
Sea Beet	<i>Bea vulgaris</i>	MS			
Sea Bindweed	<i>Calyptega sodanella</i>	MS			
Sea Carrot	<i>Daucus carota</i>	MS			
Vipers Bugloss	<i>Echinum vulgare</i>	MS			
Red Fescue	<i>Festuca rubra</i>	MS			
Sea Plantain	<i>Plantago maritima</i>	MS			
Sea Radicle	<i>Raphanus maritimus</i>	MS			
Sea Campion	<i>Silene maritima</i>	MS			
Other grasses					
Kilney Vetch	<i>Achillea millefolia</i>	MC			
Ragwort	<i>Achillea millefolia</i>	MC			
Hairy Bitter cress	<i>Cardamine hirsuta</i>	MC			
Black Knapweed	<i>Centaurea nigra</i>	MC			
Chervil	<i>Chaerophyllum sp.</i>	MC			
Field Bindweed	<i>Convolvulus arvensis</i>	MC			
Foxglove	<i>Digitalis purpurea</i>	MC			
Common Stork's bill	<i>Egypus sicula</i>	MC			
Eye bright	<i>Euphrasia nemorosa</i>	MC			
Hedge Bedstraw	<i>Gallium mollugo</i>	MC			
Lady's bedstraw	<i>Gallium verum</i>	MC			
Dovesfoot Crane's bill	<i>Geranium molle</i>	MC			
Herb Robert	<i>Geranium robertianum</i>	MC			
Meadow Veitching	<i>Lathyrus pratensis</i>	MC			
Toadflax	<i>Linaria vulgaris</i>	MC			
Bright Saxifrage	<i>Plantago saxifraga</i>	MC			
Creepling Cinquefoil	<i>Potentilla reptans</i>	MC			
Sorrel	<i>Rumex acetosa</i>	MC			
Bittersweet	<i>Solanum dulcamara</i>	MC			
Lesser Trefoil	<i>Trifolium dubium</i>	MC			
White clover	<i>Trifolium repens</i>	MC			
Field Vetch	<i>Vicia cracca</i>	MC			
Hairy Vetch	<i>Vicia hirsuta</i>	MC			
Common Vetch	<i>Vicia sativa</i>	MC			
Old Man's beard	<i>Clematis sp.</i>	SC			
Goosegrass	<i>Gallium aparine</i>	SC			
Hvy	<i>Hedera helix</i>	SC			
Honeyuckle	<i>Lonicera sp.</i>	S			
Blackberry	<i>Rubus sp.</i>	S			
Strawberry	<i>Rubus fruticosus</i>	S			
Elder	<i>Sambucus nigra</i>	S			
Wood sage	<i>Teucrium scordonia</i>	S			
Goose	<i>Ulex sp.</i>	S			
Nettle	<i>Urtica dioica</i>	S			

P – pioneers; MS – maritime specialists; H – hardy grass

SHINGLE RIDGE STATION NUMBER.....

GROUP NAMES.....	SHINGLE RIDGE STATION NUMBER.....									
Quadrat Number	1	2	3	4	5	6	7	8	Total	
Bare ground (%)										
Sea Kale	<i>Crambe maritima</i>	P								
Rock Samphire	<i>Crithmum maritimum</i>	P								
Sand couch grass	<i>Elymus farctus</i>	P								
Sea Spurge	<i>Euphorbia paralias</i>	P								
Yellow Horned Poppy	<i>Glaucium flavum</i>	P								
Sea Mayweed	<i>Tripleurospermium sp.</i>	P								
Yarrow	<i>Achillea millefolia</i>	H								
Halberd-leaved orache	<i>Atriplex hastata</i>	H								
Common Orache	<i>Atriplex patula</i>	H								
Mouse eared chickweed	<i>Cerastium sp.</i>	H								
Hogweed	<i>Heracleum spodylum</i>	H								
Yellow composites	<i>Hypochoeris/Leodon</i>	H								
Birds foot Trefoil	<i>Lotus corniculata</i>	H								
Rest Harrow	<i>Ononis repens</i>	H								
Ribwort Plantain	<i>Plantago lanceolata</i>	H								
Curled Dock	<i>Rumex crispus</i>	H								
Ragwort	<i>Senecio jacobaea</i>	H								
Dandelion	<i>Taraxacum officinale</i>	H								
Hop Trefoil	<i>Trifolium campestre</i>	H								
Red Clover	<i>Trifolium pratense</i>	H								
Thrift	<i>Ameria maritima</i>	MS								
Frosted Orache	<i>Atriplex sabulosa</i>	MS								

Summary sheet 2005 – SHINGLE RIDGE VEGETATION : enter no. of quadrats recorded at each station for each species

STATION NUMBER -	1	2	3	4	5	6	7	8	9	10	
Bare ground (%)											
Sea Kale	<i>Crambe maritima</i>	P									
Rock Samphire	<i>Crithmum maritimum</i>	P	10								
Sand couch grass	<i>Elymus farctus</i>	P	19								
Sea Spurge	<i>Euphorbia paralias</i>	P	2	18							
Yellow Horned Poppy	<i>Glaucium flavum</i>	P	3	1		1					
Sea Mayweed	<i>Tripleurospermium sp.</i>	P	2	17	1	5	1				
Yarrow	<i>Achillea millefolia</i>	H	3	28	32	21	12	5	5	1	
Halberd-leaved orache	<i>Atriplex hastata</i>	H							1		
Common Orache	<i>Atriplex patula</i>	H									
Mouse eared chickweed	<i>Cerastium sp.</i>	H				1					
Hogweed	<i>Heracleum spodylum</i>	H				1	3	14	19	19	
Yellow composites	<i>Hypochoeris/Leodon</i>	H		16	7	14	25	23	10	4	
Birds foot Trefoil	<i>Lotus corniculata</i>	H			6	12	8	4	19	16	4
Rest Harrow	<i>Ononis repens</i>	H		23	27	24	24	10	8	11	5
Ribwort Plantain	<i>Plantago lanceolata</i>	H		16	28	30	25	3	1	6	
Curled Dock	<i>Rumex crispus</i>	H						1			
Buck's-horn plantain	<i>Plantago coronopus</i>	H									
Dandelion	<i>Taraxacum officinale</i>	H					1				
Hop Trefoil	<i>Trifolium campestre</i>	H					7	1			
Red Clover	<i>Trifolium pratense</i>	H				5	16	26	3	2	4
Thrift	<i>Ameria maritima</i>	MS				20	26	27	23	8	
Frosted Orache	<i>Atriplex sabulosa</i>	MS							1		
									4	3	
									4	4	3
									23	30	29
									1	7	4
									15	27	32
									5	2	1
									1	6	8
									21	22	24
											12
											18
											30
											31
											28
											32
											8
Hairy Bitter cress	<i>Cardamine hirsuta</i>	MC									

- gained lab time to evaluate and discuss the changes in plant community structure.

Outcome – technology increased student time for learning



another outcome – more beach time

Thanks to the HEFCE e-learning funding via e-LAG.
Students and teaching staff of the Field Biology unit.

No handouts just a link

<http://193.61.20.125/cyber/bienvenue.html>

PDA/Cybertracker training exercise

Tap the group number

Group 3

Wheatgrass sample 3	
measurement 1	000
measurement 2	019
measurement 3	000
measurement 4	000
measurement 5	000
measurement 6	000
measurement 7	000
measurement 8	000
measurement 9	000
measurement 10	000
measurement 11	000
measurement 12	000
measurement 13	000



Wheatgrass grown to 4 different heights – plants sampled and length measured.

wheatgrass - CyberTracker Professional v3.048

File Edit View Tools Help

Sequences Sequence 3 PocketPC Zoom 100% Element Name

New Screen New Subscreen Delete Screen Test Run Synchronize PocketPC Synchronize Palm Lock Delete Control Sequence Properties Manage Sequences

Screen

- Wheatgrass measurement Group 3
 - Group 3
 - sample 3

Properties

Name	sample 3
Panel	
Caption	Wheatgrass sample 3
Element List	measurement 1; measurement 2; measurement 3; measurement 4; measurement 5; measurement 6; measurement 7; measurement 8; measurement 9; measurement 10; measurement 11; measurement 12; measurement 13
Navigator	<input type="checkbox"/> Show GPS <input type="checkbox"/> Show Next <input checked="" type="checkbox"/> Show Options <input checked="" type="checkbox"/> Show Save 1 <input type="checkbox"/> Show Save 2 <input type="checkbox"/> Take GPS Reading <input checked="" type="checkbox"/> Save 1 Target

(None)
Click on a property above to see a description.

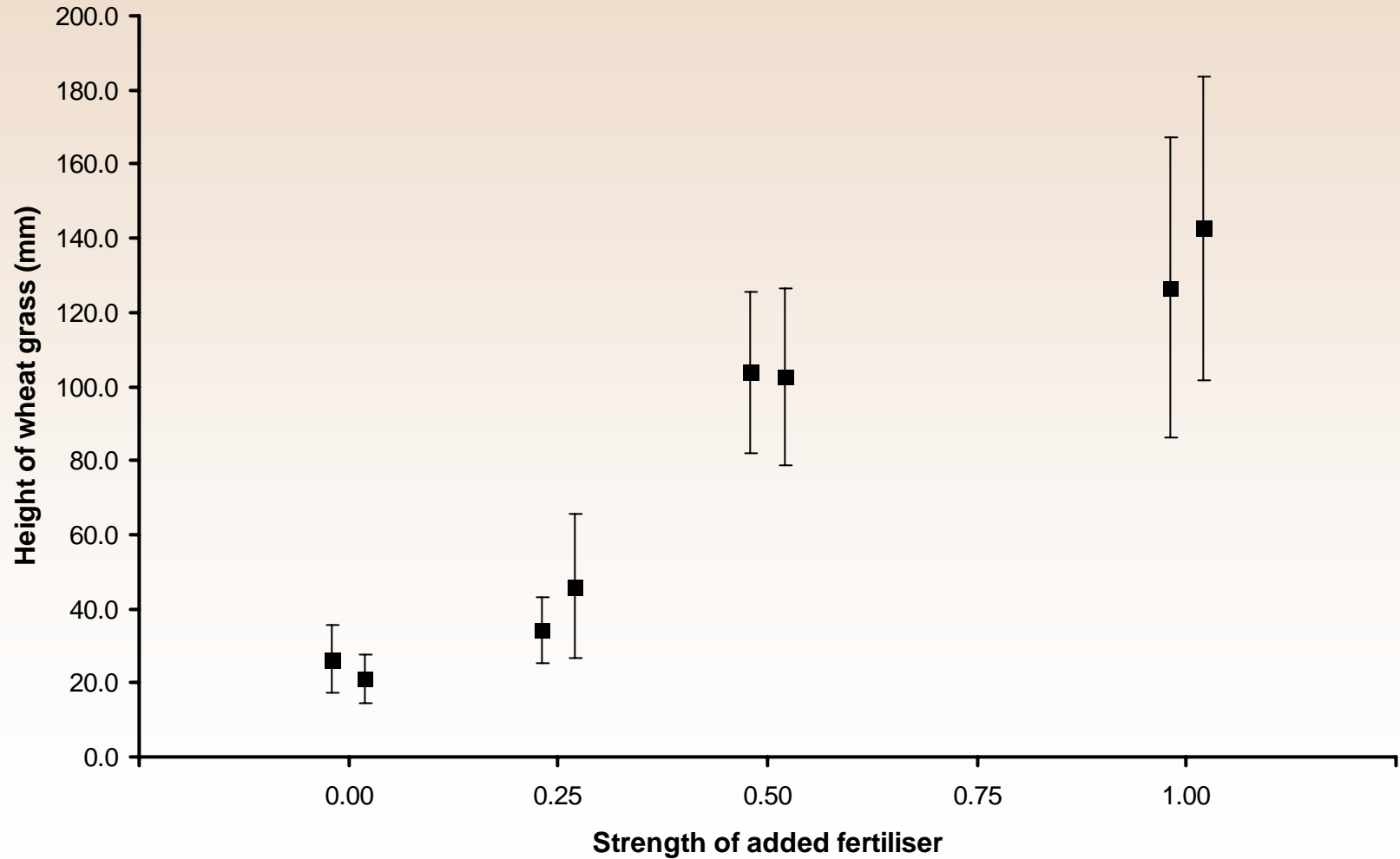
Wheatgrass sample 3	
measurement 1	000
measurement 2	000
measurement 3	000
measurement 4	000
measurement 5	000
measurement 6	000
measurement 7	000
measurement 8	000
measurement 9	000
measurement 10	000
measurement 11	000
measurement 12	000
measurement 13	000

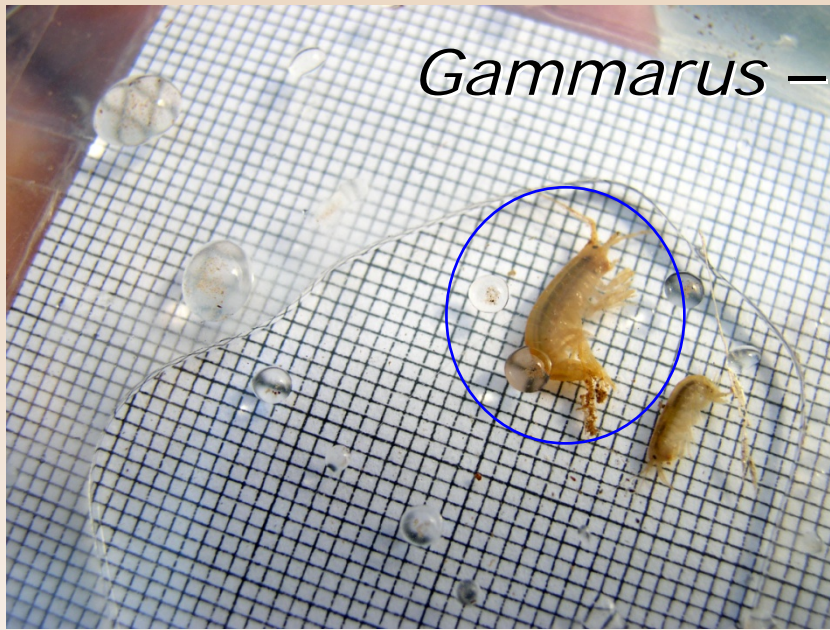
- individual lengths (mm) recorded in PDAs Cybertracker forms
- transfer to Excel, compute means and standard deviations, plot graph

Form structure

With 8 groups this plot produced in < 10 minutes

Figure. The effect of application of different strengths of fertiliser on the mean height (+/- SD) of wheat grass 7 days after germination (two groups per treatment, n=13 per group)





Gammarus – a cautionary tale

Objective

- to measure change in *Gammarus* length (mm) along a stream

- hypothesis - possible link to water velocity
- use individual lengths recorded by 'wheatgrass' forms
- GPS to measure altitude



PDA's and field biology – Glenn Baggott

mm no.

1

2

3 1

4 1111

5

6 111

7

8 111111

9 111

10

11 11

12 1111

13

14 1

Microsoft Excel - gammarus

File Edit View Insert Format Tools Data PopTools FlashPaper Window Help

Arial 10 B I U

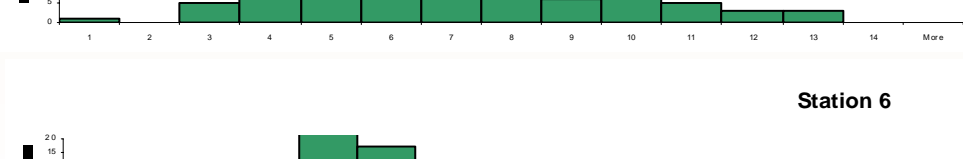
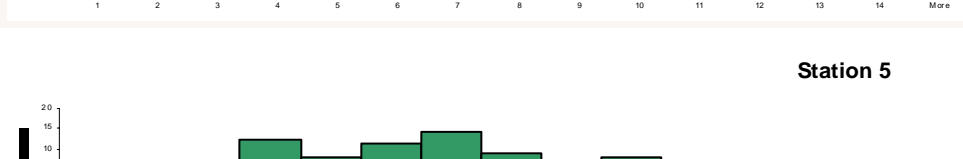
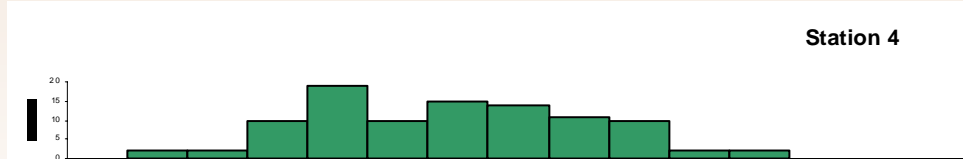
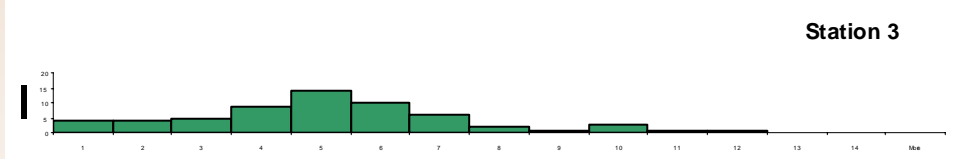
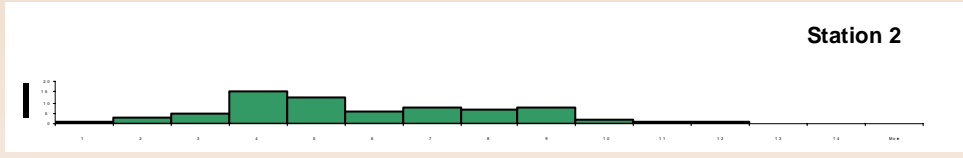
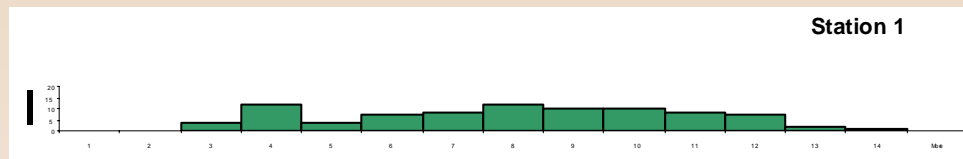
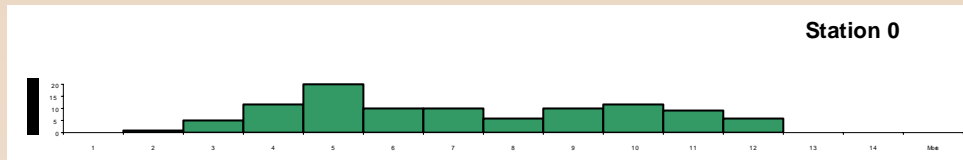
N15 =

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Date	38924	38924	38924	38924	38924	38924	38924	38924	38924	38924	38924	38924	38924	38924	38924	38924	38924	38924	38924
2	Time	0.512523	0.513715	0.518588	0.518623	0.521424	0.56963	0.571574	0.571863	0.63463	0.634641	0.636296	0.678819	0.678854	0.678947	0.714907	0.714919	0.715139	0.745208	0.745
3	Sequence 1																			
4	Longitude					-3.656747			-3.655545			-3.655655			-3.654405			-3.65297		
5	Latitude					50.30413			50.30219			50.3008			50.30045			50.29988		
6	Altitude					109			11.6			74			35.4			37.6		
7	Accuracy					3			1.8			1.8			2.7			1.1		
8	Station 1	1	1	1	1	1														
9	Station 2						1	1	1											
10	Station 3									1	1	1								
11	Station 4												1	1	1					
12	Station 5															1	1	1		
13	Station 6																			1
14	Station 7																			
15	Station 8																			
16	Station 9																			
17	Station 10																			
18	measurement 1																			
19	measurement 2						2	2	2				1	1	1					1
20	measurement 3						4	4	4				2	2	2	4	4	4	4	1
21	measurement 4						13	13	13	1	1	1	10	10	10	8	8	8	8	2
22	measurement 5						9	9	9	3	3	3	17	17	17	6	6	6	6	5
23	measurement 6						5	5	5	3	3	3	9	9	9	8	8	8	8	7
24	measurement 7						5	5	5	1	1	1	9	9	9	8	8	8	8	3
25	measurement 8						4	4	4	1	1	1	6	6	6	5	5	5	5	1
26	measurement 9						5	5	5				6	6	6	5	5	5	5	
27	measurement 10						1	1	1				6	6	6	6	6	6	6	
28	measurement 11						1	1	1	1	1	1								1
29	measurement 12																1	1	1	
30	measurement 13	2	2	2	2															
31	measurement 14																			
32	measurement 15																			
33	measurement 16																			
34	measurement 17																			
35	measurement 18																			
36	measurement 19																			
37	measurement 20																			
38	measurement 21																			1
39	measurement 22												1	1			1	1		
40	measurement 23				1	1										1	1			4
41	measurement 24			1	4	4										4	4			9
42	measurement 25							3		11				2			2			17

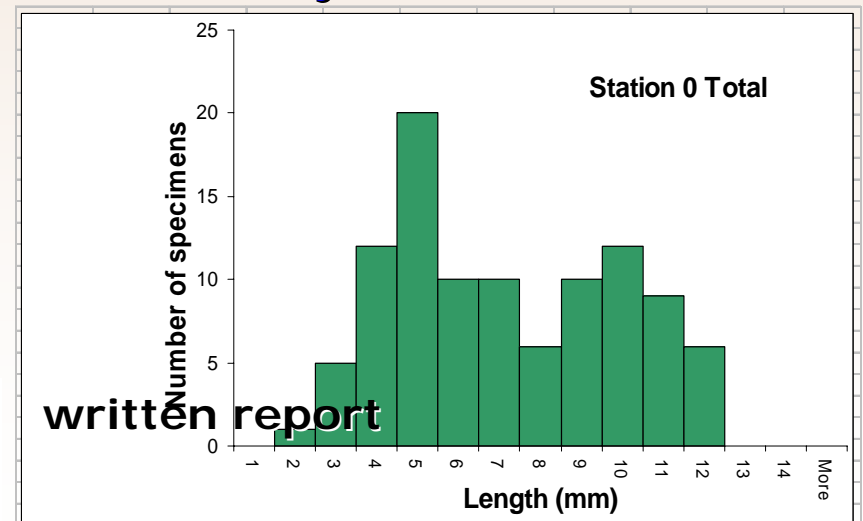
Sheet1 / gammarus /

Ready

Gammarus lengths tallied; **NOT** recorded singly as for wheatgrass



Project outcomes



database structure

shingle234 - CyberTracker Professional v3.048

File Edit View Tools Help

Sequences Group 1 PocketPC Zoom 100% Element Name

New Screen New Subscreen Delete Screen Test Run Synchronize PocketPC Synchronize Palm Lock Delete Control Sequence Properties Manage Sequences

Screen

- group members
 - group 1
 - Stations
 - Station 2 select quadrat**
 - Station 2 quadrat 1
 - Station 2 quadrat 2
 - Station 2 quadrat 3
 - Station 2 quadrat 4
 - Station 2 quadrat 5
 - Station 2 quadrat 6
 - Station 2 quadrat 7
 - Station 2 quadrat 8
 - Station 3 select quadrat
 - Station 3 quadrat 1
 - Station 3 quadrat 2
 - Station 3 quadrat 3
 - Station 3 quadrat 4
 - Station 3 quadrat 5
 - Station 3 quadrat 6
 - Station 3 quadrat 7
 - Station 3 quadrat 8
 - Station 4 select quadrat
 - Station 4 quadrat 1
 - Station 4 quadrat 2
 - Station 4 quadrat 3
 - Station 4 quadrat 4
 - Station 4 quadrat 5
 - Station 4 quadrat 6
 - Station 4 quadrat 7
 - Station 4 quadrat 8


Properties

Name	Station 2 select quadrat
Panel	
Caption	Station 2 -select quadrat
Element List	
✓ Elements	Quadrat 1; Quadrat 2; Quadrat
→ Quadrat 1	Station 2 quadrat 1
→ Quadrat 2	Station 2 quadrat 2
→ Quadrat 3	Station 2 quadrat 3
→ Quadrat 4	Station 2 quadrat 4
→ Quadrat 5	Station 2 quadrat 5
→ Quadrat 6	Station 2 quadrat 6
→ Quadrat 7	Station 2 quadrat 7
→ Quadrat 8	Station 2 quadrat 8
Navigator	
Show GPS	<input type="checkbox"/>
Show Next	<input checked="" type="checkbox"/>
Show Options	<input checked="" type="checkbox"/>
Show Save 1	<input checked="" type="checkbox"/>
Show Save 2	<input type="checkbox"/>
Take GPS Reading	<input type="checkbox"/>
→ Save 1 Target	Stations
→ Save 2 Target	
→ Next Screen	

(None)
Click on a property above to see a description.

Station 2 -select quadrat

Quadrat 1
Quadrat 2
Quadrat 3
Quadrat 4
Quadrat 5
Quadrat 6
Quadrat 7
Quadrat 8



within station-8 quadrats