

# Zmap User Manual

## Table of Contents

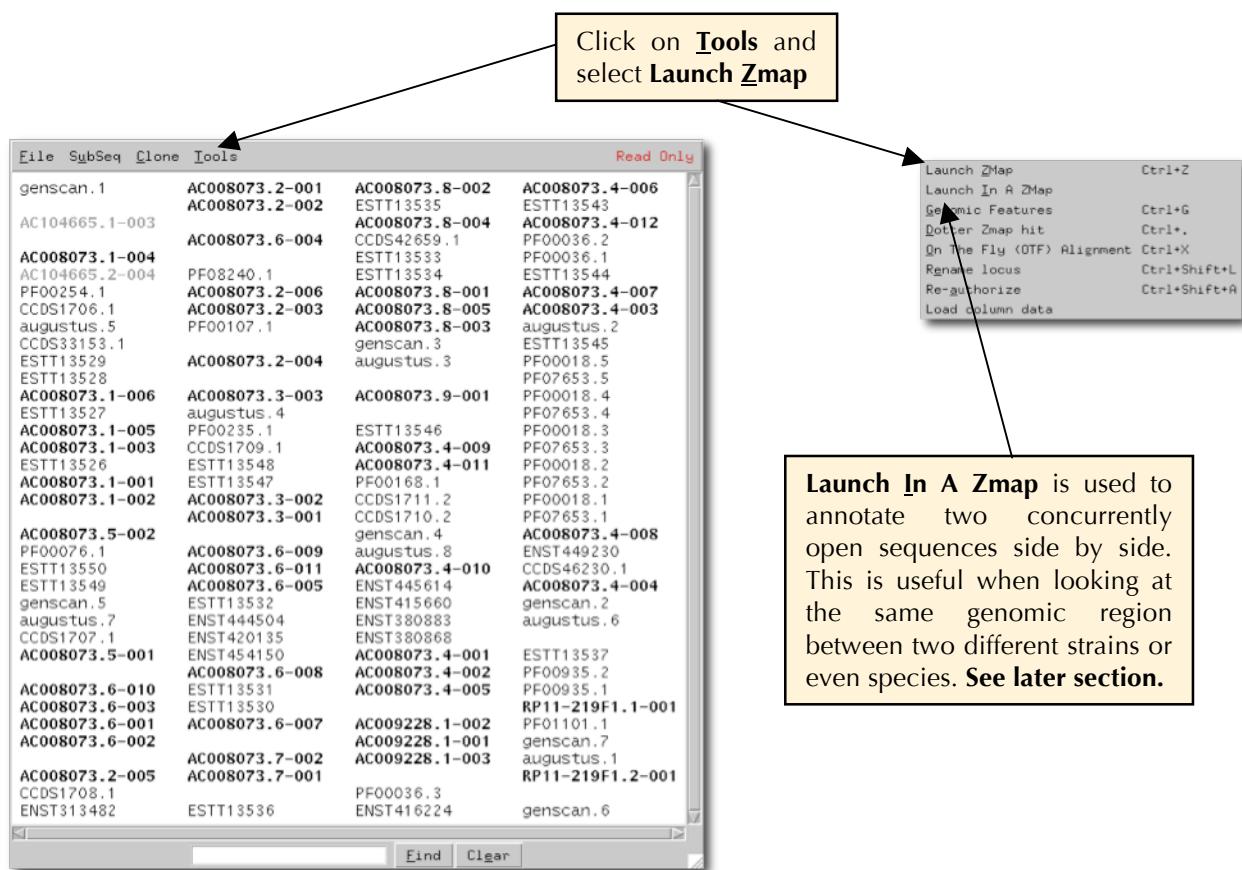
<b>Table of Contents .....</b>	<b>1</b>
<b>Zmap .....</b>	<b>2</b>
<b>Opening Zmap .....</b>	<b>2</b>
<b>Main Zmap interface .....</b>	<b>3</b>
<b>Navigating in Zmap and zooming options .....</b>	<b>4</b>
<b>The Focus Feature vs the Marked Feature.....</b>	<b>6</b>
<b>General Zmap display features.....</b>	<b>8</b>
<b>Functionality of the features at the top of the Zmap display.....</b>	<b>10</b>
<b>Show feature details .....</b>	<b>12</b>
<b>Exporting features for gene objects.....</b>	<b>13</b>
<b>Bumping features .....</b>	<b>14</b>
<b>Searching for a sequence in Zmap.....</b>	<b>16</b>
<b>Searching for a feature in Zmap.....</b>	<b>17</b>
<b>Selecting single or multiple features and hiding/showing them.....</b>	<b>19</b>
<b>Rapid variant construction.....</b>	<b>19</b>
<b>Splitting windows in Zmap.....</b>	<b>21</b>
<b>Launching in a Zmap.....</b>	<b>23</b>
<b>Zmap keyboard and mouse shortcuts. ....</b>	<b>24</b>
<b>Tips for a speedier Zmap.....</b>	<b>26</b>

## Zmap

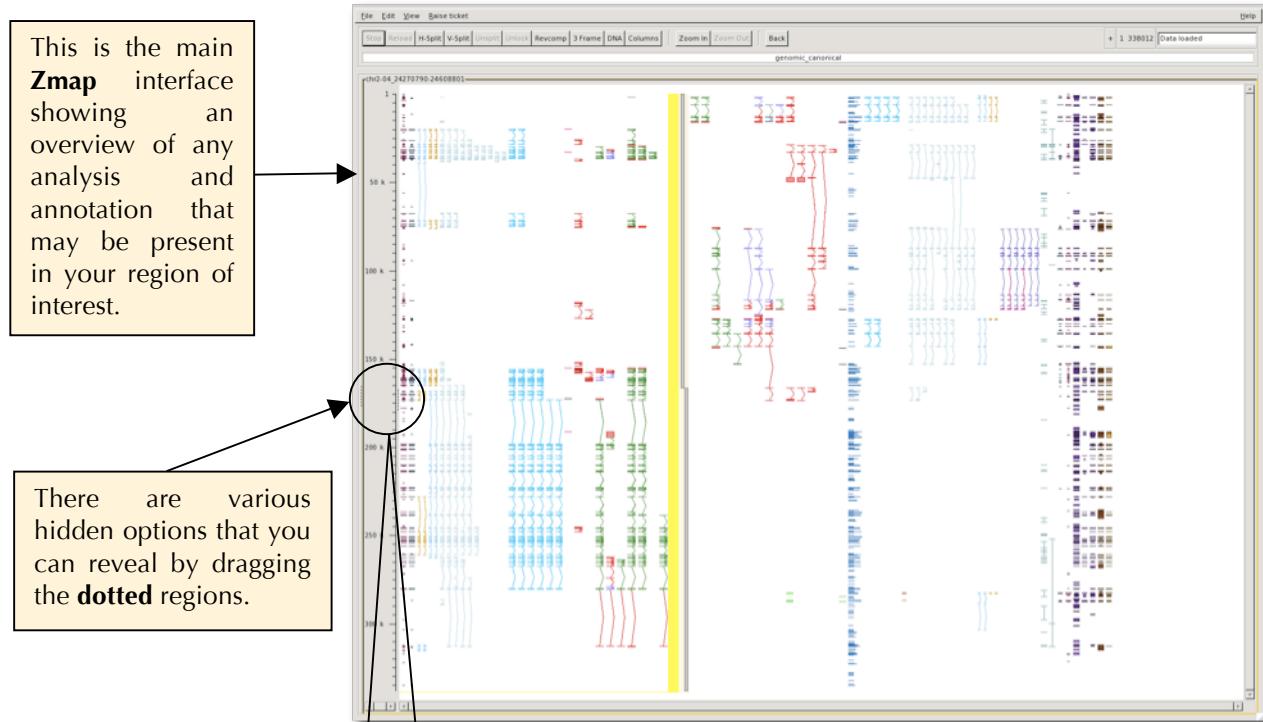
Zmap is a software package that provides a visualisation tool for genomic features. The software is written in C, utilising the gnome toolkit (GTK2) to draw features on a canvas. Zmap accepts input from multiple sources in multiple formats across multiple genomes and is written in a way so that the addition of further formats is made as trivial as possible. Currently the list of formats includes GFF and DAS, which may reside in any one of; a file, an acedb instance, an http server. Multiple genomes and their associated features can be displayed in a single view as aligned blocks providing support for comparative annotation. Zmap does not include any utility for editing the features that it displays. It does however provide a powerful external interface with which to modify the features displayed on the canvas. Using this interface, Otterlace is used to annotate sequences present in the Otter database. This in turn updates to the Vertebrate Genome Annotation (VEGA) website (<http://vega.sanger.ac.uk/index.html>)

## Opening Zmap

Zmap is opened via the Tools menu bar in Otterlace.

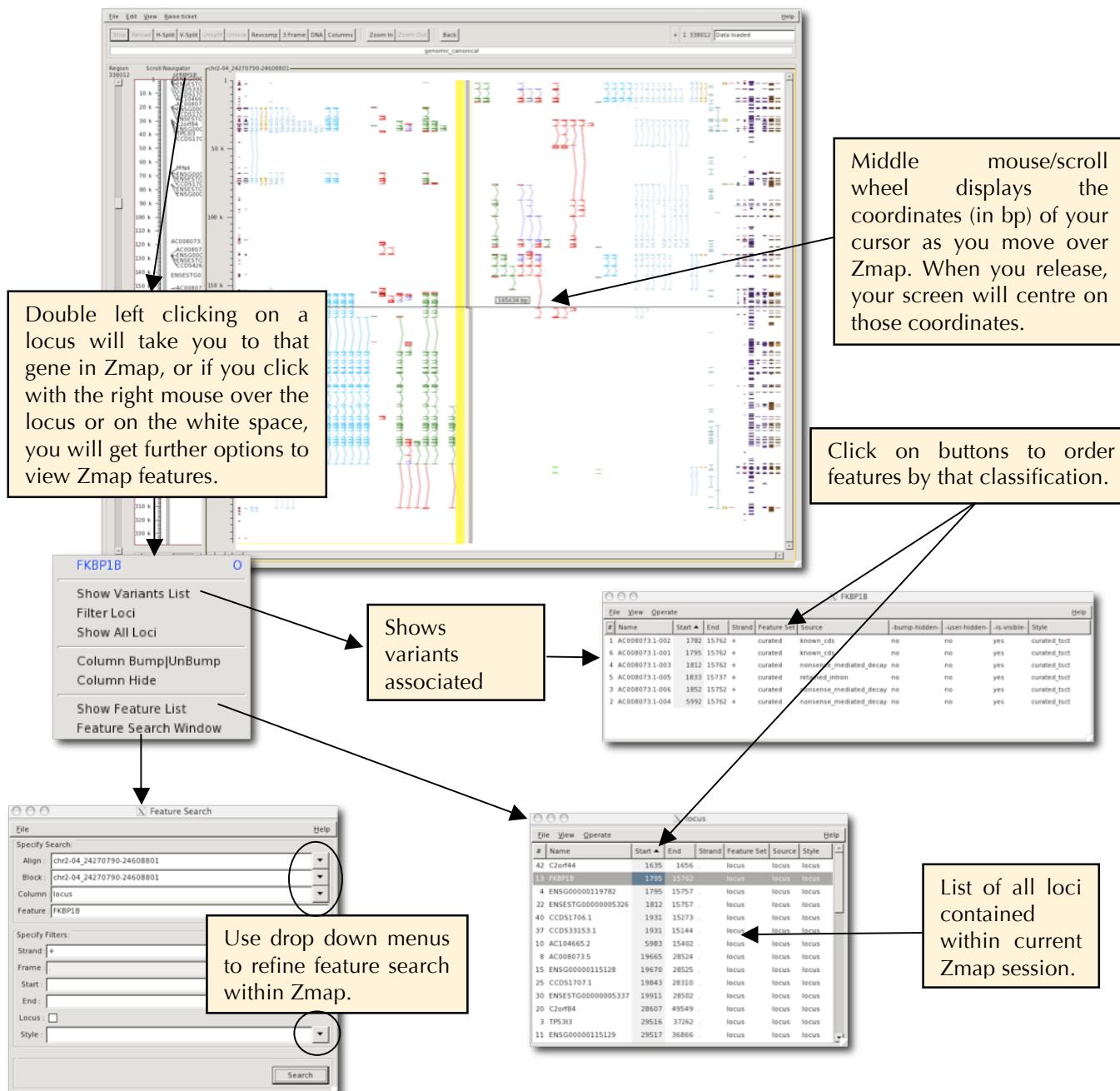


## Main Zmap interface



## Navigating in Zmap and zooming options

1) Navigate by using the scroll bars or the middle mouse button. By clicking the middle mouse anywhere in Zmap you will see a horizontal line. You can move this up and down and the relative position in bp will be displayed along the line. When the button is released, the window will refresh, centering on the position of the line. You can also click in the window to make it active and use the scroll wheel to navigate up and down or achieve the same result using the scroll bar on the right hand side of the window. If you release the mouse outside the Zmap window, you can then check the sequence position displayed, without re-centering.



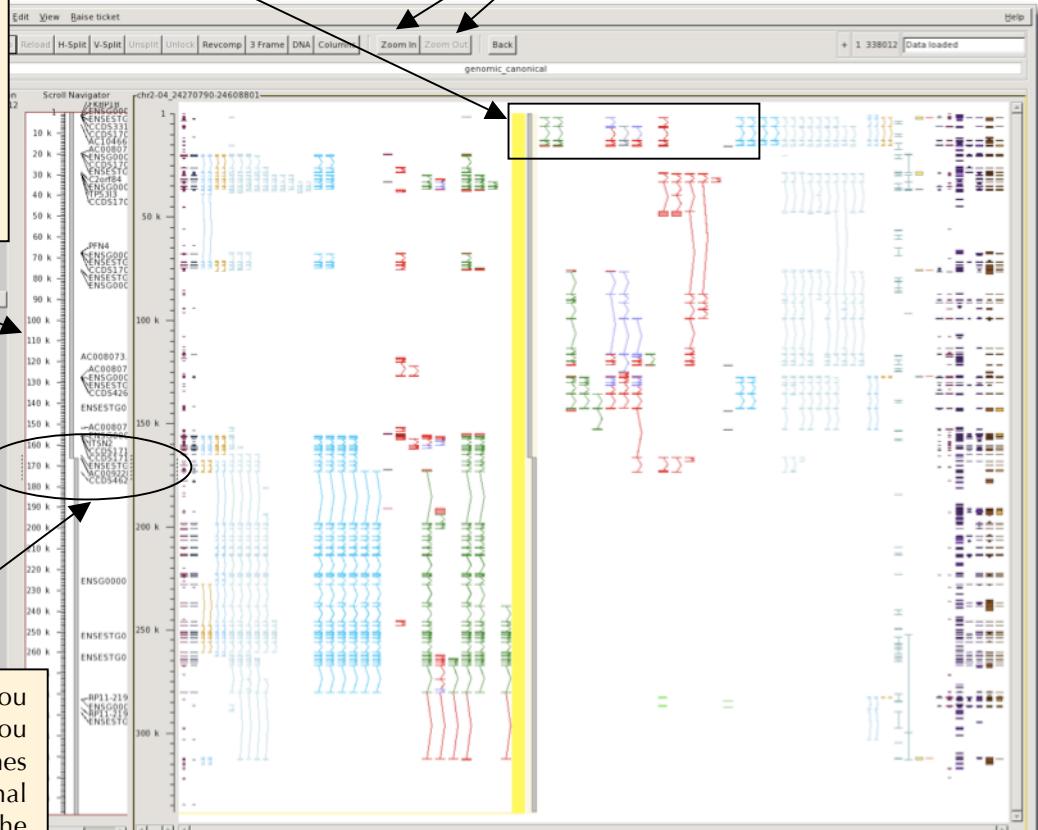
2) Zoom in by using the Zoom in/Zoom out buttons at the top, or by drawing a rectangle around the area of interest with the left mouse button. Use the "z" key on the keyboard to zoom to whatever feature is highlighted. Use the "Z" key to zoom to a whole transcript if you have an exon (s) highlighted or all HSPs if you have one HSP highlighted (HSPs are the "blocks" that you see in the homology columns, such as ESTs and protein hits).

To mark the rectangle click and hold the left mouse button at the top left of the area you want to outline and then drag out the outline until it encloses the area you want to zoom to. When you release the button, Zmap zooms in to that rectangle.

Use these buttons to Zoom in to a region or to Zoom out.

The red box is draggable. You can use the left mouse to alter the bounds of the display in the main window and the scrollbar to the right of the main window to scroll through the data quickly.

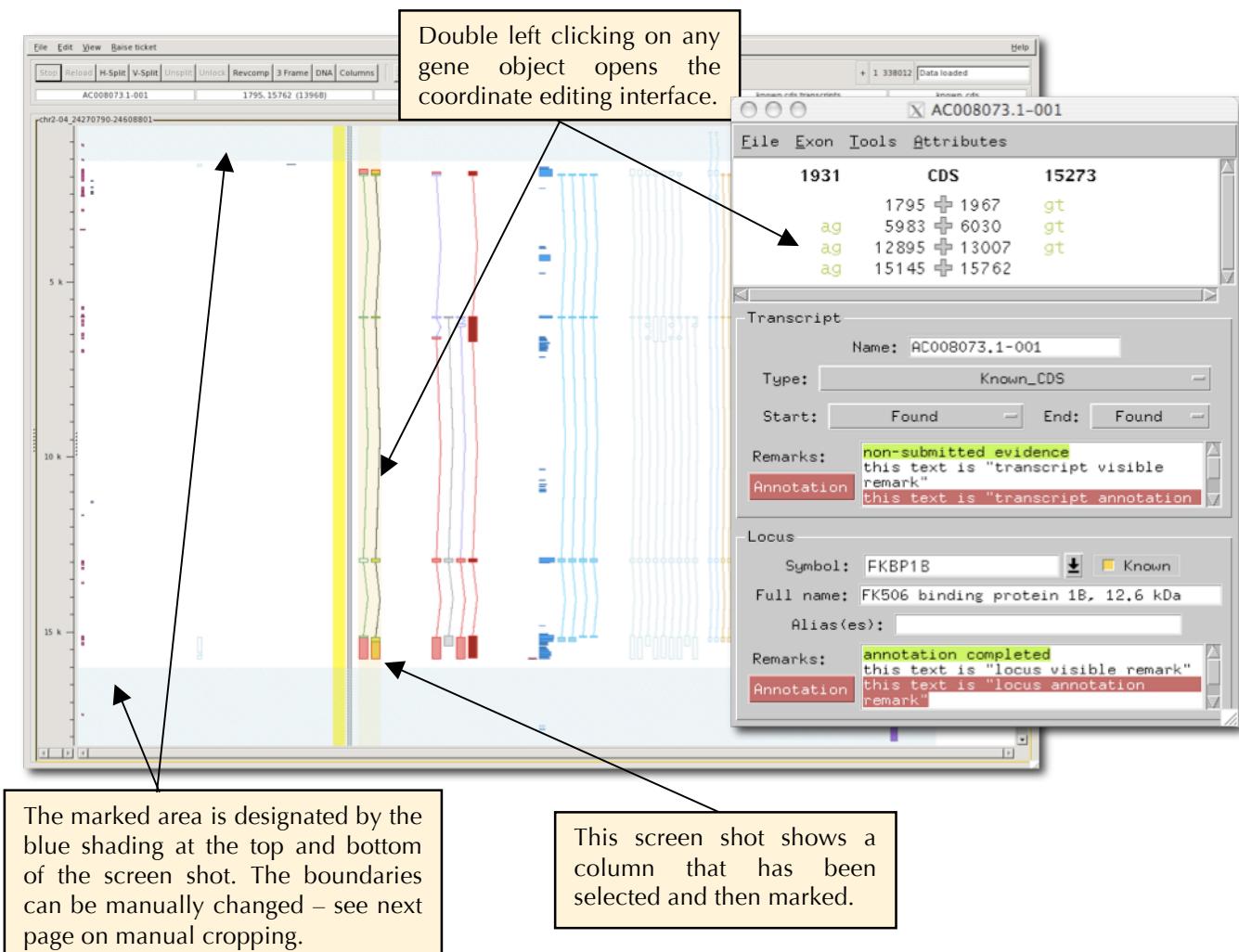
To save space when you are inspecting a region you can drag the dotted lines back to their original position to remove the scroll bar and locus panel information. Note, it is not necessary to have any of these panels open while you work.



## The Focus Feature vs the Marked Feature

If you click on a column background then that column becomes the "focus" column and you can do various short cut operations on it such as pressing "b" to bump it. If you click on a feature then that feature becomes the "focus" feature and similarly you can do various short cut operations on it such as zooming in to it. (Note when you select a feature then its column automatically becomes the focus column.)

While the focus facility is useful, the focus changes every time you click on a new feature. Sometimes you want to select a "working" feature or area more permanently. To do this you can "mark" the feature or area and it will stay "marked" until you unmark it. "Marking" an area within Zmap to work on is essential, allowing you to work much faster. The "marked" area is left clear while the unmarked area above and below is marked with a blue overlay (see screen shot below):



## **Mark a feature**

- 1) Select a feature to make it the focus feature.
- 2) Press "m" to mark the feature, the feature will be highlighted with a blue overlay.

Feature marking behaves differently according to the type of feature you highlighted prior to marking and according to whether you press "m" or "M" to do the marking:

- 1) If you press "m", the mark is made around all features you have highlighted, e.g. a whole transcript, a single exon, several HSPs.
- 2) If you press "M" to do the marking around transcripts the whole transcript becomes the marked feature and the marked area extends from the start to the end of the transcript.
- 3) If you press "M" to do the marking around alignments all the HSPs for that alignment become the marked feature and the marked area extends from the start to the end of all the HSPs.
- 4) If you press "M" to do the marking around all other features: the feature becomes the marked feature and the marked area extends from the start to the end of the feature.
- 5) If no feature is selected but an area was selected using the left button rubberband then that area is marked.
- 6) If no feature or area is selected then the visible screen area minus a small top/bottom margin is marked.

## **Mark an area**

- 1) Select an area by holding down the left mouse button and dragging out a box to focus on that area.
- 2) Press "m" to mark the area.

## **Manual cropping of the marked borders**

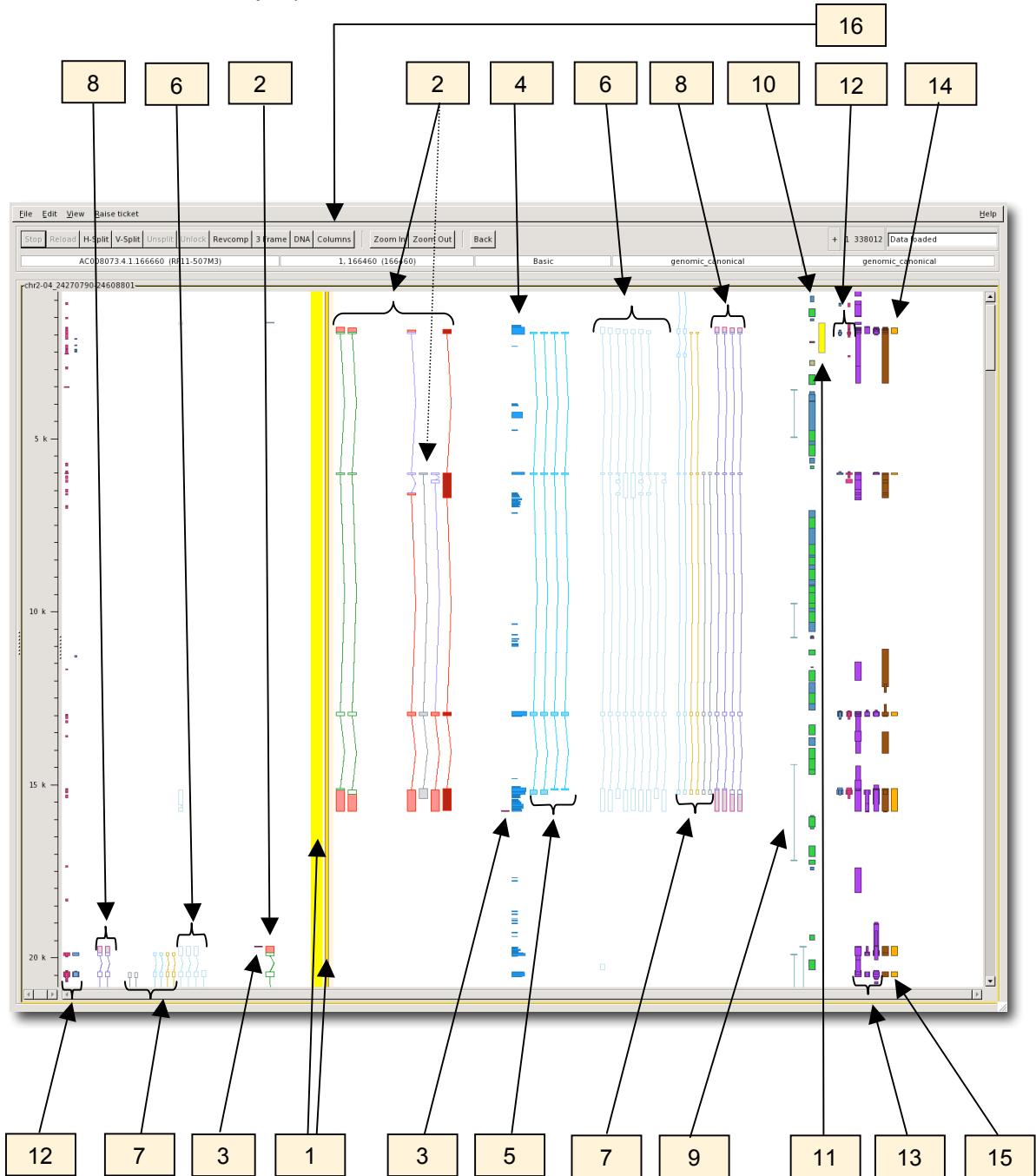
You can manually change the borders of the marked area by putting your cursor over this area and using the cropping tool by clicking and holding with the left mouse button and dragging to make the area bigger or smaller.

## **Unmark a feature**

Press "m" or "M" again, i.e. the mark key toggles marking on and off.

## General Zmap display features

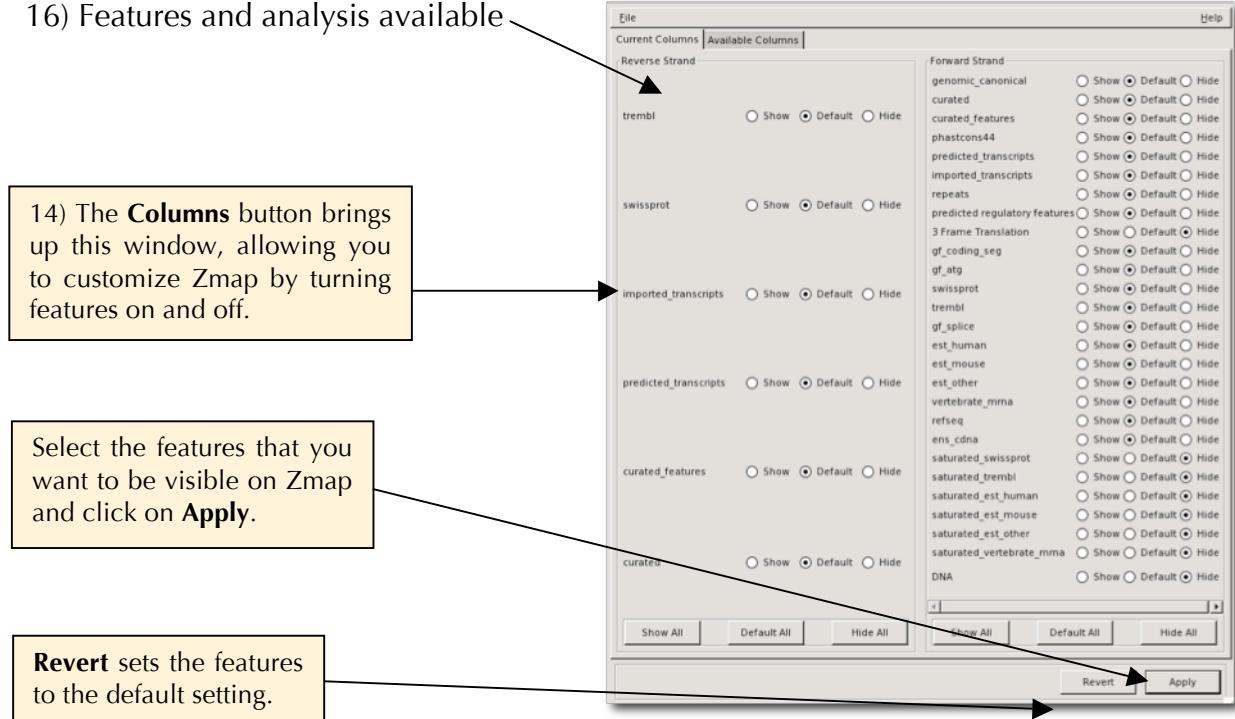
Different features are displayed in distinct columns as follows:



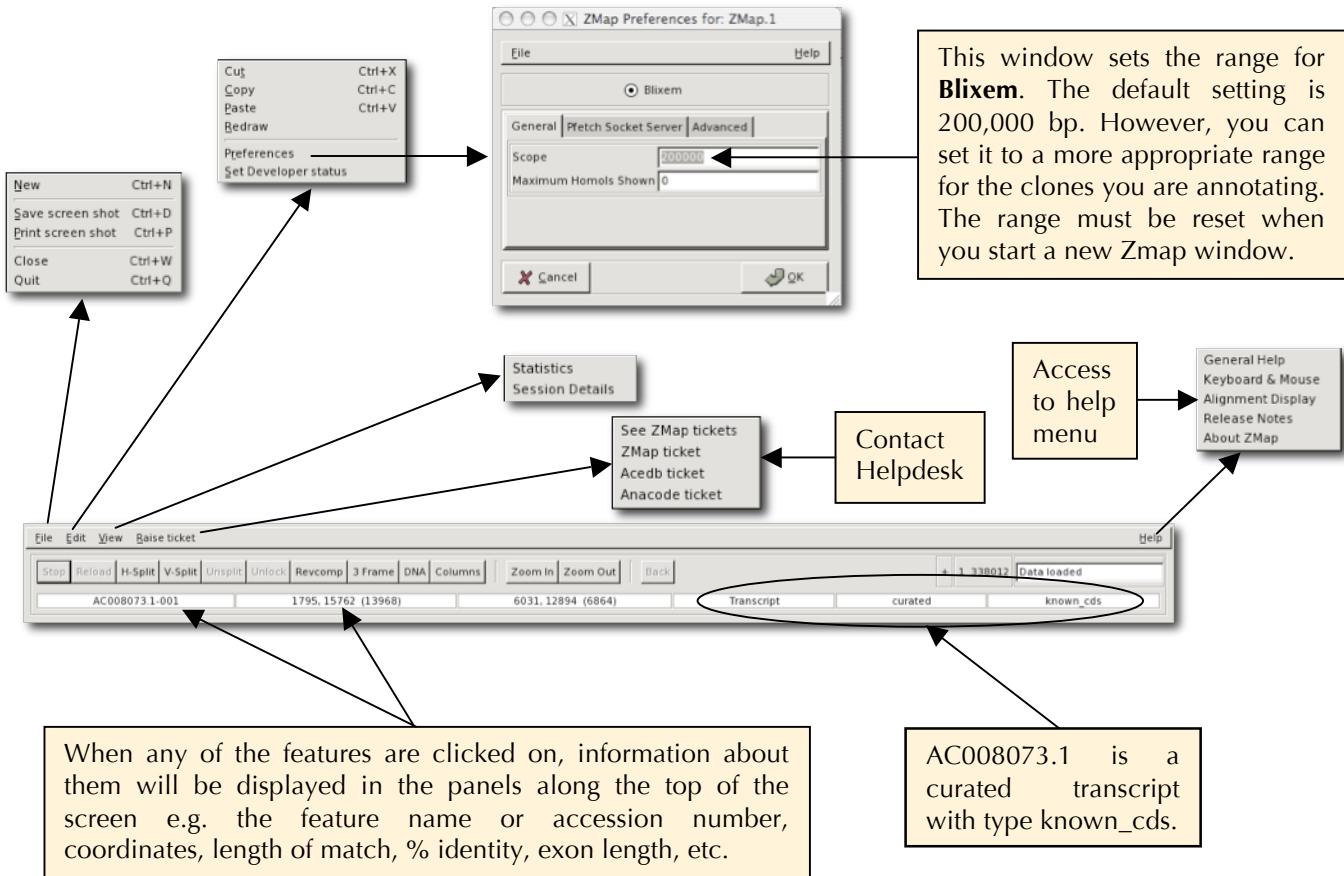
Note - you may see more or fewer features and columns depending on how your preferences are set up. For descriptions of all column types such as DAS sources, visit this URL -

[http://scratchy.internal.sanger.ac.uk/wiki/index.php/Otterlace\\_filter\\_descriptions](http://scratchy.internal.sanger.ac.uk/wiki/index.php/Otterlace_filter_descriptions)

- 1) The thick yellow line represents the genomic sequence; everything to the left represents the negative strand and everything to the right the positive strand. DNA matches (i.e. ESTs, mRNAs and RefSeq) and repeats are all displayed to the right of the center although they may align to either strand. The thin bar to the right is the clone that the genomic sequence is made up from. Double click on this to access the DE editing window.
- 2) Annotated transcripts; green is coding (CDS), red is non-coding (UTR and transcript variants) and purple shows the “coding” region of NMD variants. Grey transcripts (see dotted line) contain exons outside the sequence slice being viewed and should not be confused with Halfwise hits.
- 3) Curated features, such as PolyA features are seen as horizontal black lines.
- 4) Phastcons44 – conserved regions detected using multiple sequence alignments of 44 organisms.
- 5) Imported annotation from CCDS (human and mouse only).
- 6) Imported transcripts via DAS source. Here PASA\_ESTs are shown.
- 7) Predicted transcripts such as Genscan (pale blue), Augustus (gold) and Halfwise predictions of Pfam (grey).
- 8) Imported annotation from Ensembl.
- 9) gis\_pet\_ditags and chip\_pet\_ditags are indicators of transcript boundaries.
- 10) Repeats ( blue=Line , light green=Sine , gold=other ), tandem repeats are red.
- 11) CpG islands appear as yellow boxes.
- 12) Protein matches are strand specific - SwissProt are light blue and Trembl pink.
- 13) EST matches are displayed as purple blocks and are broken down into human ESTs, mouse ESTs, and other ESTs from other organisms. 5' reads are on the left and 3' on the right.
- 14) mRNA matches contains all species and are displayed as brown blocks,
- 15) RefSeq matches are the orange blocks.
- 16) Features and analysis available

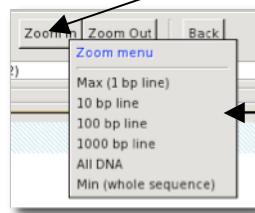
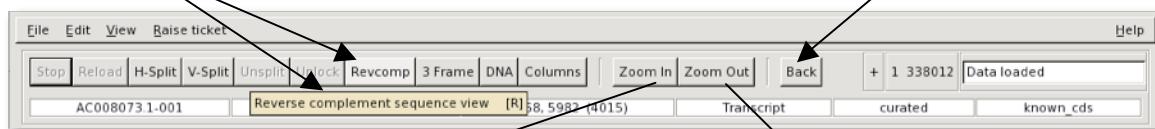


## Functionality of the features at the top of the Zmap display.

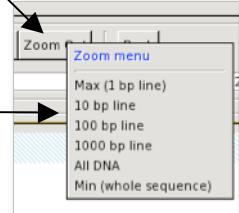


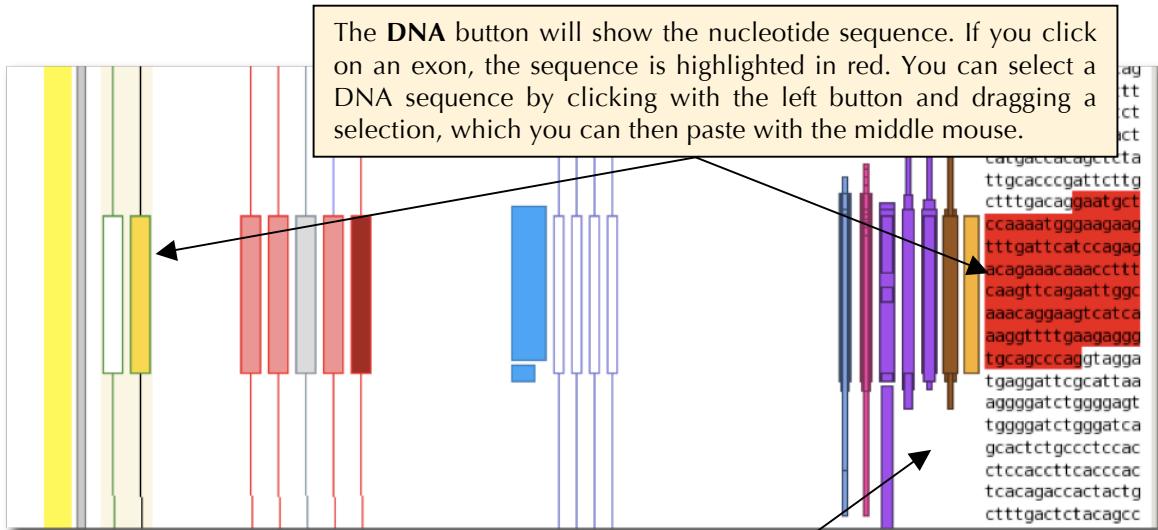
Place the mouse over the buttons to get further information about its function, such as to **reverse complement** your sequence.

Use the **Back** button to undo the last marking or zooming action.

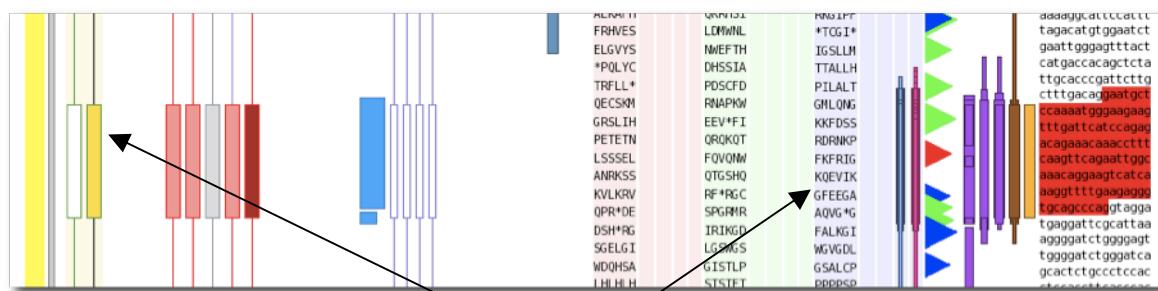
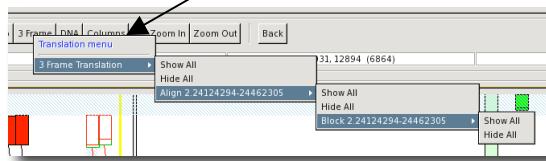
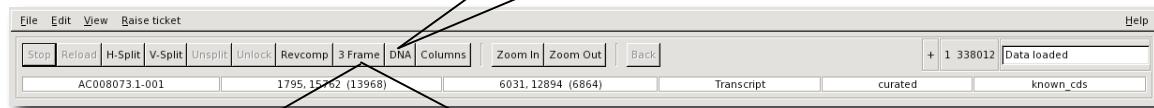
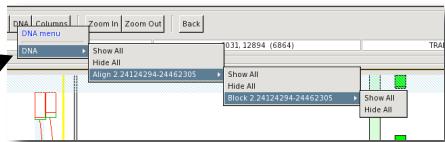


Some buttons have further options when you right click over them.





Click the buttons with the left mouse to operate the **DNA** and **3 Frame** translation options. Right click over the buttons for further options. To remove these displays from Zmap, click on the button again.



The **3 Frame** button will show the amino acid sequence in each of the three reading frames. If you click on an exon, the sequence is highlighted in red.

## Show feature details

Right click on a gene object or 'o' key when highlighted to see information on otter IDs and Ensembl IDs. For BLAST hits, double click on the HSP to get the feature interface where you will find details on alignment and on what HAVANA object the HSP has been assigned to, if any:

The screenshot shows the ZMap software interface with several windows open. A main window displays genomic tracks for chromosome 2 (chr2-04\_24270790-24680801). A secondary window titled "ZMap (0.1.65) Feature Show - Em L37086.1" provides detailed information about a specific feature. A third window titled "ZMap (0.1.65) Feature Show - AC008073.1-001" shows transcript details. Arrows point from various UI elements to callout boxes containing explanatory text.

**Preserve Close Ctrl+W** Prevents window from being reloaded.

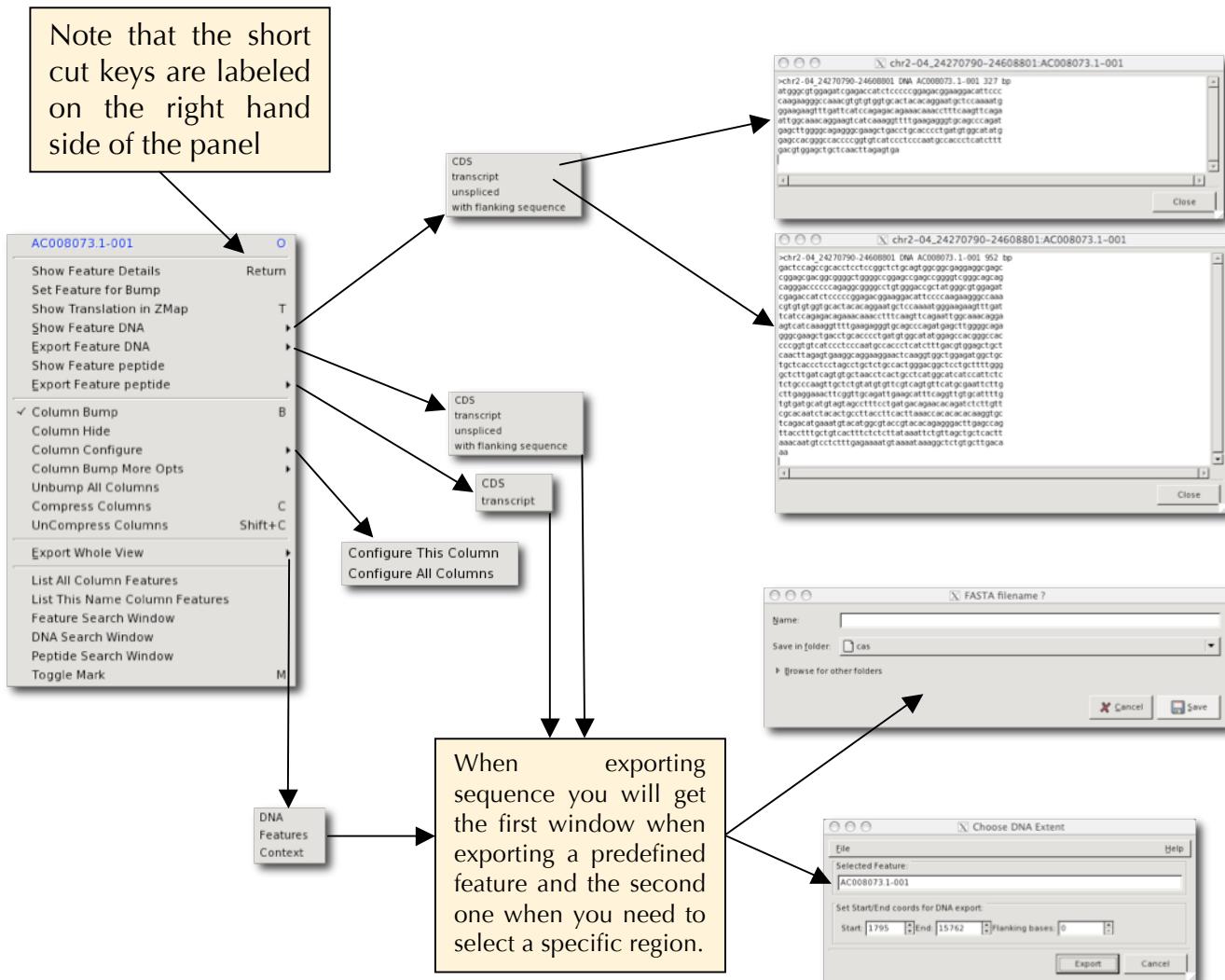
**Feature Details** for an HSP will show alignment information as well as any gene object it has been assigned to as evidence.

Left click once on a gene object and hit return to reveal the **Feature Details** interface, where you can see the stable IDs (also available by right clicking and selecting **Show Feature Details** from the popup menu).

Select the Exon tab to see Stable IDs and coordinates for the exons.

## Exporting features for gene objects

As described on the previous page, if you right click over any feature (or type "o" when a feature is highlighted) you get further information. These screen shots show how you can view and export an annotated sequence to your home directory in various different ways, such as dumping features directly. In the main Zmap window, right click on an annotated gene object. From the drop down menu select **Export Feature DNA** and choose sequence required from CDS, transcript, unspliced and with flanking sequence. Alternatively select **Export Feature peptide** and choose either CDS or transcript. Here you can see how to **Show Feature DNA** for annotated gene object AC008073.1-001 in FASTA format; firstly, the section of the transcript that corresponds to the CDS and secondly the whole transcript, including the untranslated region (UTR).



## Bumping features

This section describes how to select a feature, mark it and then zoom in to it and examine evidence that overlaps that feature. The default setting for Zmap is to show HSPs drawn on top of each other. This saves space on the canvas making it easier to see the general features of the region of interest. The bump option allows you to see the HSPs as multiple alignments.

1. Click on the feature you are interested in (perhaps a transcript)
2. Mark it by pressing "m"
3. Zoom in to the feature by pressing either "z" or "Z" (as described previously).

Now when you bump an evidence column to look at matches that overlap the feature you will find that bumping is much faster because only those matches that overlap the feature get bumped and you also have fewer matches to look at. The quickest way to bump a column is:

1. Click on the column to select it.
2. Bump it by pressing "b" (if you press "b" again the column will be unbumped). If you have marked a feature then bumping is restricted to matches that overlap that feature, otherwise bumping is for the whole column.

If you use the default bumping mode (i.e. you pressed "b") then you will find all matches from the same piece of evidence are joined by coloured bars, the colours indicate the level of colinearity between the matches (see next screen shot).

1. **Green**: the matches at either end are perfectly contiguous, e.g. 100, 230 ---> 231, 351
2. **Orange**: the matches at either end are colinear but not perfect, e.g. 100, 230 ---> 297, 351. Matches may also be this color when there are extra bases in the alignment, e.g. around clone boundaries.
3. **Red**: the matches are not colinear, e.g. 100, 230 ---> 141, 423

Alignment quality of the HSPs is depicted by the width of every alignment displayed since the width is a measure of that HSP's score. Therefore, the wider it is the closer the score is to 100%. The precise score is displayed in the Zmap details bar by clicking on the alignment. If HSPs are missing either the first or last Blast alignments in the set, they are marked with a red diamond at their start/end respectively. This indicates if they do not start at the first base/amino acid and/or do not end with the last base/amino acid of the alignment sequence. The screen shot below shows what options you get when you right click over a homology – note that you can also select an HSP and type "o". You also get further options such as retrieving the EMBL file for that homology using pfetch and starting **Blixem**, see later section (note, HSPs do not need to be bumped to use **Blixem**).

Note the different coloured lines for bumped homologies. The colouring allows you to see all matches for a piece of evidence instantly but also how good the alignment is for the feature you bumped.

Note the red diamonds warning of missing sequence that cannot be aligned.

Right click on the Blast match of interest (in this case an EST) for more menu features.

Pfetch returns the EMBL flatfile for that sequence.

The  shows that the column is bumped. Select it again to unbump it.

Allows you to inspect the sequence of just the chosen feature or all of the columns, aligned horizontally down to either the nucleotide or amino acid level against the genome. See later section on **Blixem**.

The Compress function removes excess white space by hiding columns that have no features in them, apart from those that have been set to "Show" in the "Columns" menu.

This menu allows you to change the way that bumping is displayed. There are multiple bump options, but the default is the most useful.

**File Edit View Baise ticket Stop Refresh H-Split V-Split Delete Undo Revcomp 3 Frame DNA Columns Zoom In Zoom Out Back swissprot**

**ch2-04\_24270790-24608801**

**2 k  
3 k  
4 k  
5 k  
6 k  
7 k  
8 k  
9 k  
10 k  
11 k  
12 k  
13 k  
14 k  
15 k  
16 k**

**EM-BX442352.2**

**ID: BX442352; SV: 2; Ismer: mRNA; EST; HU: 954 BP.  
AX: BX442352  
XX: 23-APR-2003 (Rel. 75, Created)  
DT: 11-MAR-2004 (Rel. 75, Last updated, Version 2)  
DE: human full-length cDNA 5'-PRIME end of clone C500P029H20 of FETAL BRAIN of  
DE: Homo sapiens (human)  
KW: EST  
XX: Homo sapiens (human)  
SC: Eukaryota; Metazoa; Chordata; Craniata; Vertebrata; Euteleostomi; Mammalia;  
SC: Eutheria; Euarchontoglires; Primates; Haplorrhini; Catarrhini; Hominoidea;  
OG: Plasmid pNVSPIRT\_6  
AE: BX442352  
MM: [1] 1154  
GN: Genoscope  
BT: Submitted (22-APR-2003) to the INRA/Genoscope (OB) database.  
RL: Genoscope - Centre National de Séquençage - BP 131 91000 EVRY Cedex -  
FRANCE (E-mail : secrétariatgenoscope@cnrs.fr - Web : www.genoscope.cnrs.fr).  
RN: [2]  
RC: Contact: Feng Liang Email: fliang@itcastech.com URL:  
RC: http://fulllength.invitrogen.com Invitrogen Corporation 1600 Faraday  
RC: Avenue  
RC: CA 90064-3500 USA  
RA: Li W.R., Gruber C., Jesse J., Polayes D.;  
RA: "Full-length cDNA Libraries and normalization";  
RL: Unpublished**

**Show Feature Details**  
**Set Feature for Bump**  
**Pfetch this feature**  
**Blixem DNA - all matches for this feature**  
**Blixem DNAs - all matches for this column**  
**Show Feature DNA**  
**Export Feature DNA**

**✓ Column Bump**  
**Column Hide**  
**Column Configure**  
**Column Bump More Opts**  
**Unbump All Columns**  
**Compress Columns**  
**UnCompress Columns**

**Shift+A**  
**A**

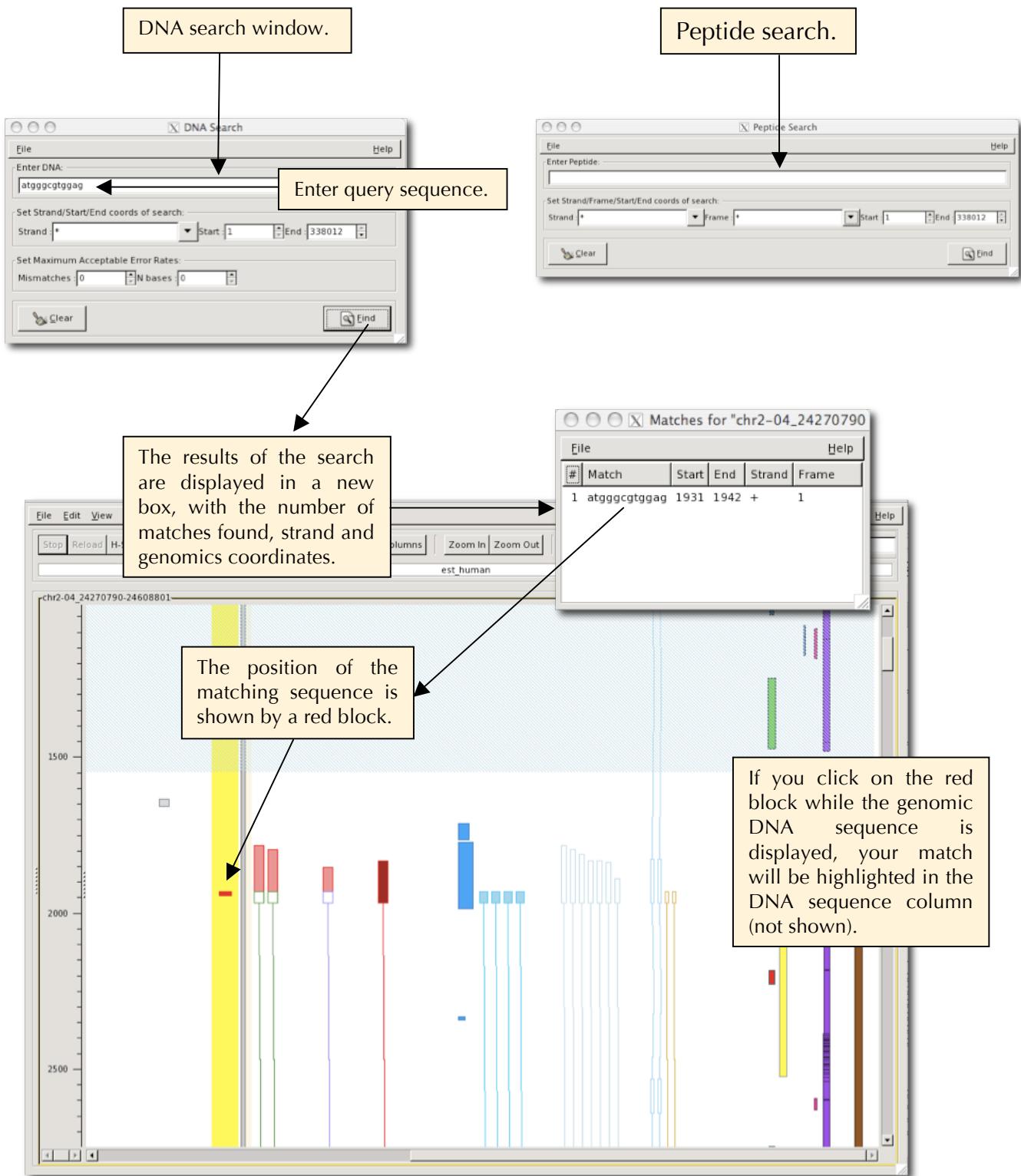
**Shift+C**  
**C**

**M**

**Name Interleave**  
**Name No Interleave**  
**Name No Interleave & Colinear**  
**Name and Best 5' & 3' Matches**  
**Name**  
**• Overlap**  
**Start Position**  
**Alternating**  
**Bump All**  
**Unbump**

## Searching for a sequence in Zmap

DNA and peptide search windows are provided from within Zmap and can be accessed by right clicking on Zmap space and selecting the option at the bottom of the menu. Both search windows are shown below:



## Searching for a feature in Zmap

This option allows you to list all the features contained in a column in one window. There are further options for you to search within these results to find a specific feature. The list of column features can be exported as a GFF file via the File menu.

**Context Menu (Top Left):**

- vertebrate\_mrna
- Column Bump
- Column Hide
- Column Configure
- Column Bump More Opts
- Unbump All Columns
- Compress Columns
- UnCompress Columns
- Shift+C
- Export Whole View
- Show Feature List
- Feature Search Window
- DNA Search Window
- Peptide Search Window
- Toggle Mark
- Show Style
- Blixem DNA Alignments
- Blixem DNA Alignments - All Columns Shift+A

**Feature Search Window (Bottom Left):**

Specify Search:

- Align: chr2-04\_24270790-24608801
- Block: chr2-04\_24270790-24608801
- Column: vertebrate\_mrna
- Feature: Em:U61167.1

Specify Filters:

- Strand: +
- Frame:
- Start:
- End:
- Locus:
- Style:

Search

To search for a feature, enter your query here and click on search.

**Result Window 1 (Top Right):**

Click over a column with the right mouse to activate this menu. Select **Show feature List**.

#	Name	Start	End	Strand	Query Start	Query End	Query Strand	Score	Feature Set	Source	Style
1	Em:U61167.1	191013	194286	+	746	4018	+	99.699997	vertebrate_mrna	vertebrate_mrna	mrna_align
2	Em:U61167.1	198209	198400	-	554	745	+	100.000000	vertebrate_mrna	vertebrate_mrna	mrna_align
3	Em:U61167.1	198877	198973	-	457	553	+	99.000000	vertebrate_mrna	vertebrate_mrna	mrna_align
4	Em:U61167.1	200709	200830	-	335	456	+	100.000000	vertebrate_mrna	vertebrate_mrna	mrna_align
5	Em:U61167.1	200917	200962	-	289	334	+	100.000000	vertebrate_mrna	vertebrate_mrna	mrna_align
6	Em:U61167.1	204425	204593	-	122	288	+	100.000000	vertebrate_mrna	vertebrate_mrna	mrna_align
7	Em:U61167.1	206447	206511	-	57	121	+	100.000000	vertebrate_mrna	vertebrate_mrna	mrna_align
8	Em:U61167.1	209968	210003	-	21	56	+	100.000000	vertebrate_mrna	vertebrate_mrna	mrna_align

Export results as GFF file.

**Result Window 2 (Bottom Right):**

This lists all the accession numbers and associated information for the column "vertebrate\_mrna". The results can be ordered using the buttons at the top.

#	Name	Start	End	Strand	Query Start	Query End	Query Strand	Score	Feature Set	Source	Style
1	Em:U61167.1	191013	194286	+	746	4018	+	99.699997	vertebrate_mrna	vertebrate_mrna	mrna_align
2	Em:U61167.1	198209	198400	-	554	745	+	100.000000	vertebrate_mrna	vertebrate_mrna	mrna_align
3	Em:U61167.1	198877	198973	-	457	553	+	99.000000	vertebrate_mrna	vertebrate_mrna	mrna_align
4	Em:U61167.1	200709	200830	-	335	456	+	100.000000	vertebrate_mrna	vertebrate_mrna	mrna_align
5	Em:U61167.1	200917	200962	-	289	334	+	100.000000	vertebrate_mrna	vertebrate_mrna	mrna_align
6	Em:U61167.1	204425	204593	-	122	288	+	100.000000	vertebrate_mrna	vertebrate_mrna	mrna_align
7	Em:U61167.1	206447	206511	-	57	121	+	100.000000	vertebrate_mrna	vertebrate_mrna	mrna_align
8	Em:U61167.1	209968	210003	-	21	56	+	100.000000	vertebrate_mrna	vertebrate_mrna	mrna_align

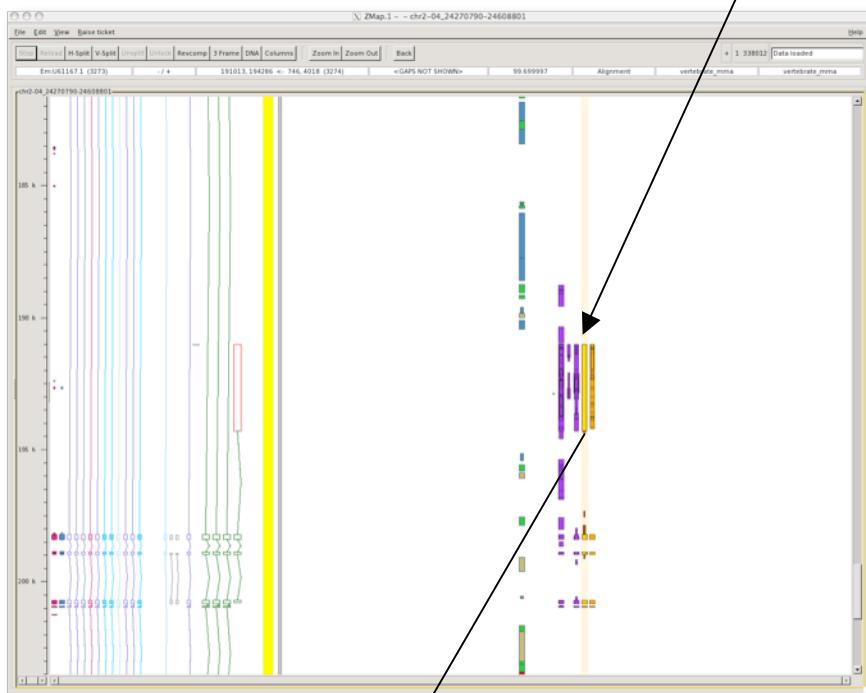
The result lists all the exons and associated match information for query accession Em:U61167.1.

Note, the format needs to be correct for Zmap, so use \* as a wild card. For example accession numbers may have a database prefix and version suffix such as Em:U61167.1, so use the following format \*accession\_number\*, if you are not sure about the database and version.

**vertebrate\_mrna**

#	Name	Start	End	Strand	Query Start	Query End	Query Strand	Score	Feature Set	Source	Style
6	Em.U61167.1	191013	194286	-	746	4018	+	99.659997	vertebrate_mrna	vertebrate_mrna	mma_align
1	Em.U61167.1	198209	198400	-	554	745	+	100.000000	vertebrate_mrna	vertebrate_mrna	mma_align
4	Em.U61167.1	198877	198973	-	457	553	+	99.000000	vertebrate_mrna	vertebrate_mrna	mma_align
5	Em.U61167.1	200709	200830	-	335	456	+	100.000000	vertebrate_mrna	vertebrate_mrna	mma_align
7	Em.U61167.1	200917	200962	-	289	334	+	100.000000	vertebrate_mrna	vertebrate_mrna	mma_align
8	Em.U61167.1	204425	204591	-	122	288	+	100.000000	vertebrate_mrna	vertebrate_mrna	mma_align
2	Em.U61167.1	206447	206511	-	57	121	+	100.000000	vertebrate_mrna	vertebrate_mrna	mma_align
3	Em.U61167.1	209968	210003	-	21	56	+	100.000000	vertebrate_mrna	vertebrate_mrna	mma_align

If you now left double click on the match you want to inspect, Zmap will zoom straight to it. Note, this may not work if you are searching for a feature outside of an area that is actively marked.



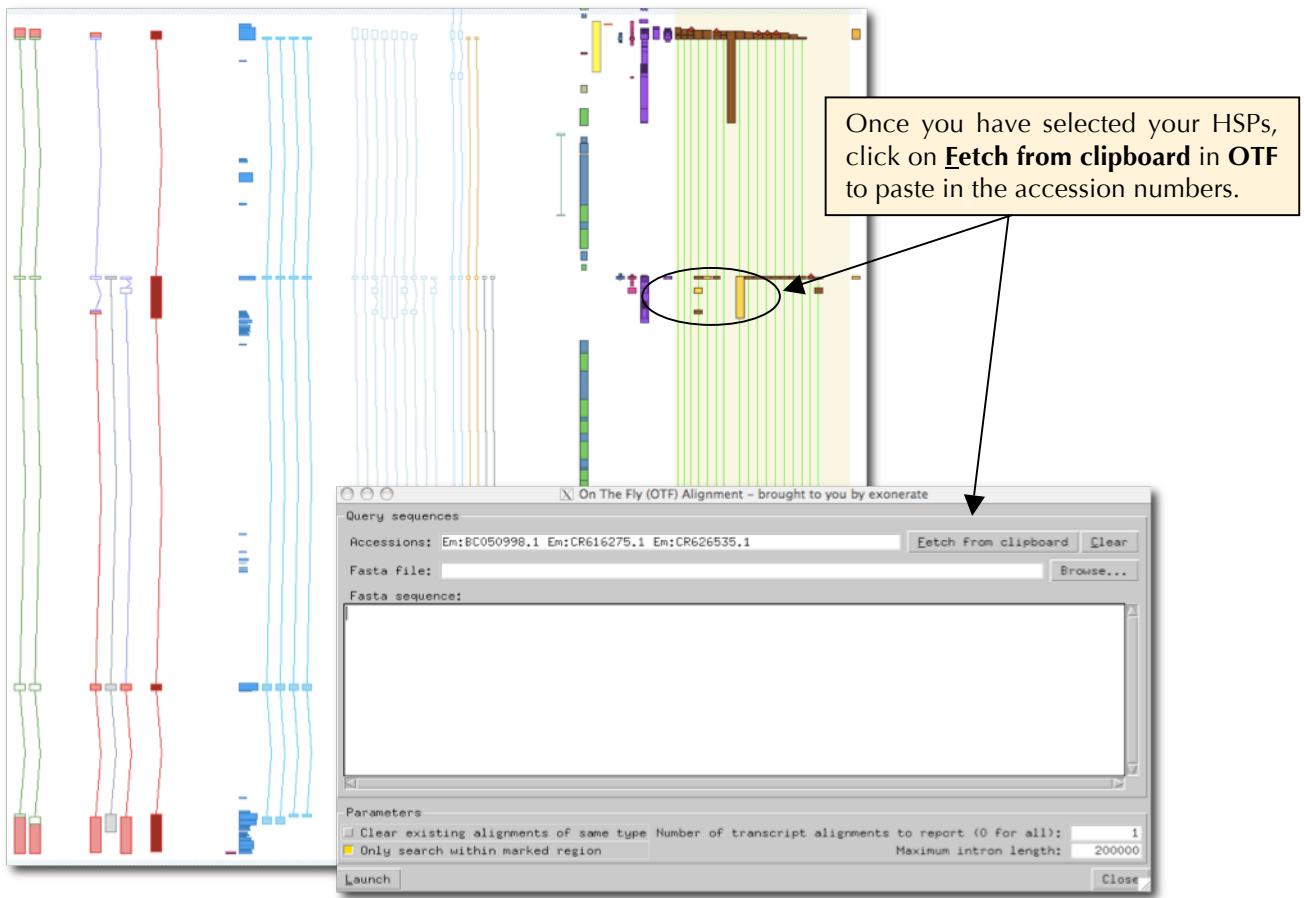
A further window will appear containing information about the feature.

**ZMap (0.1.65) Feature Show - Em.U61167.1**

Align								
Align Type	dna							
Query length	4053							
Matches								
#	Sequence	Strand	Sequence/Match	Sequence Start	Sequence End	Match Start	Match End	Score
1	<NOT SET>	-/+		198209	198400	554	745	100.000000
2	<NOT SET>	-/+		206447	206511	57	121	100.000000
3	<NOT SET>	-/+		209968	210003	21	56	100.000000
4	<NOT SET>	-/+		198877	198973	457	553	99.000000
5	<NOT SET>	-/+		200709	200830	335	456	100.000000
6	<NOT SET>	-/+		191013	194286	746	4018	99.659997
7	<NOT SET>	-/+		200917	200962	289	334	100.000000
8	<NOT SET>	-/+		204425	204591	122	288	100.000000

## Selecting single or multiple features and hiding/showing them

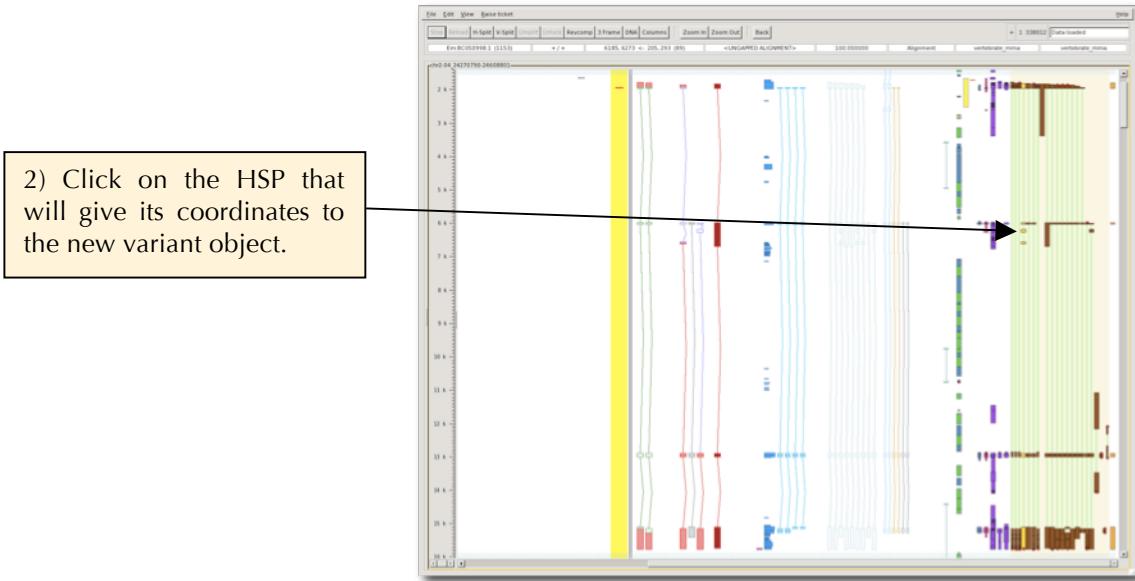
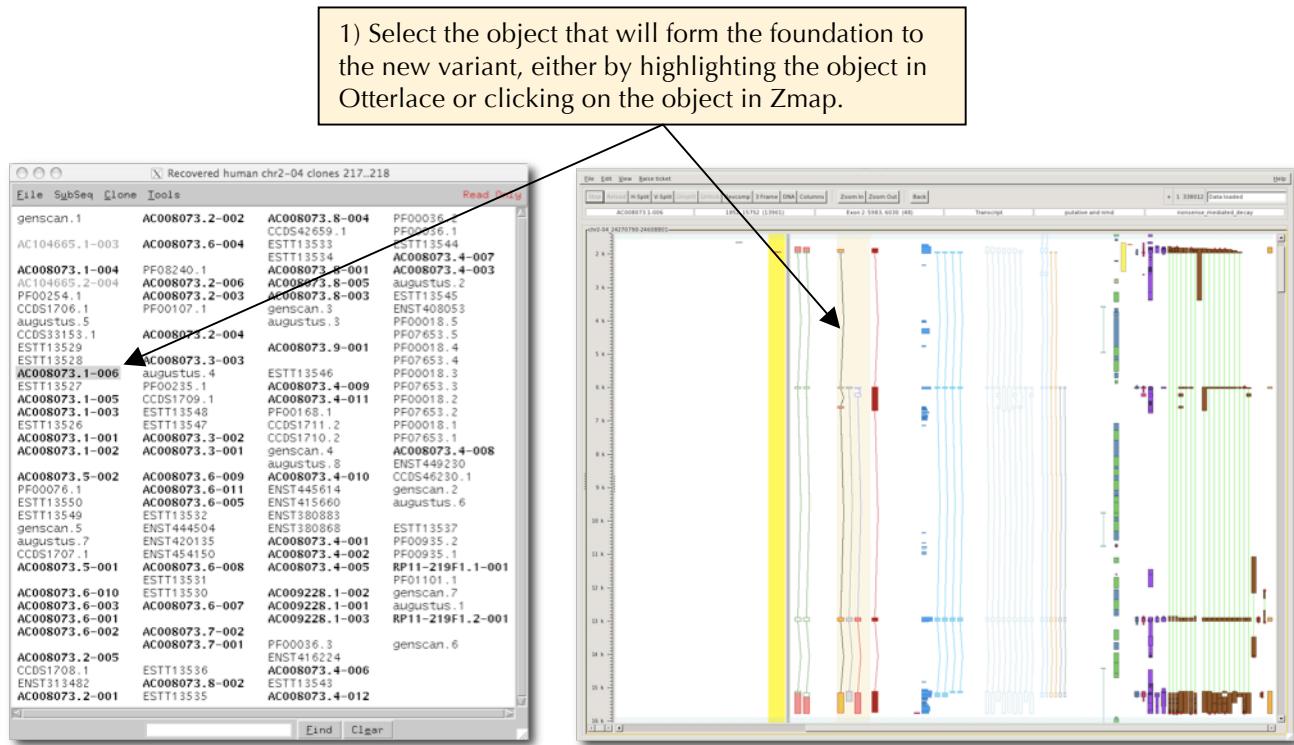
- 1) If you left click once on a feature in Zmap, you will highlight all of its exons, the coordinates of which are now stored in the paste buffer and can be copied elsewhere, such as into the transcript editing window in Otterlace.
- 2) You can select multiple features by holding the Shift key down and left clicking with mouse (same as for multi select on the Mac, Windows etc). This option will highlight a single exon at a time for each feature, but the accession numbers of each feature and the individual exon coordinates are held in the paste buffer. This is a particularly useful way of selecting Zmap hits to use in the OTF alignment tool, as all selected homologies will be held in the paste buffer and automatically pasted into the OTF accession window. Each of the exon coordinates can also be pasted into the transcript editing window in Otterlace.



- 3) You can remove selected features in Zmap by pressing **Delete** on the keyboard and restore them by pressing **Shift-Delete** (note on the Mac you need to press **Fn-Delete** and **Shift-Fn-Delete**). This is a particularly useful way of removing evidence that you have already assigned to a transcript object.

## Rapid variant construction

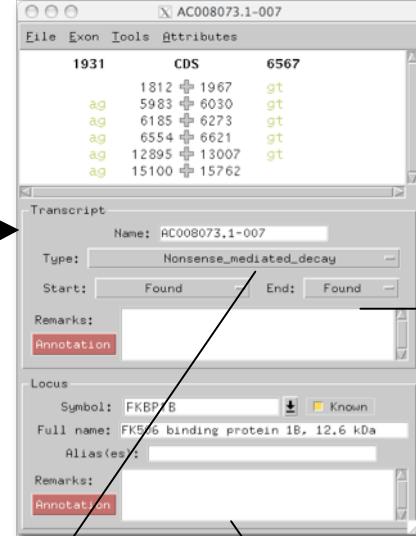
Otterlace and Zmap can be used together to generate variant objects quickly. Existing transcript objects can be used as a template for a new object while a Zmap HSP can be used to provide the coordinates for the new variant. The new object will take its transcript type from the parent.



Edit Ctrl+E  
 Close all F4  
 Copy Ctrl+C  
 Paste Ctrl+V  
 New Ctrl+N  
 Variant Ctrl+I  
 Delete Ctrl+D

3) Now either use the key-stroke short cut or click on Variant. You will see a new object appear in your main window.

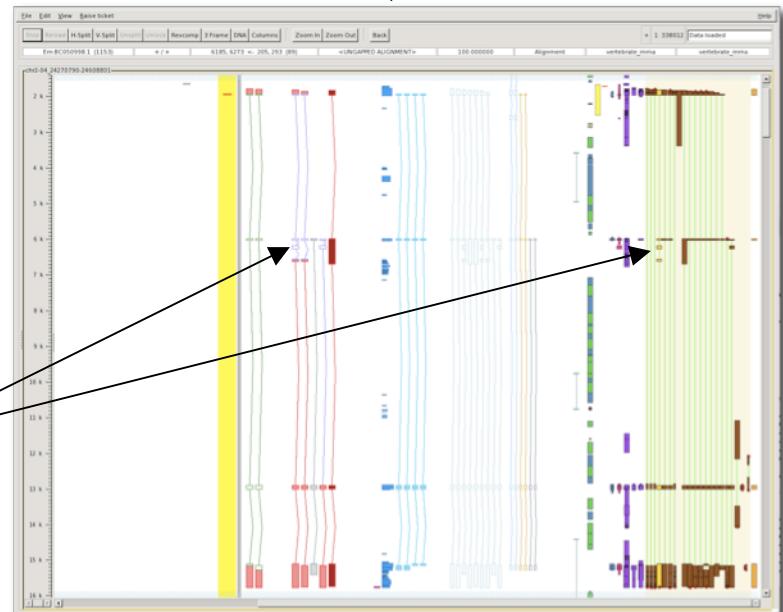
	Recovered human chr-04 clones 217_218			
	File	SubSeq	Clone	Tools
genscan.1	AC008073.2-001	ESTT13532	AC008073.8-004	AC008073.4-012
AC104665.1-003	AC008073.2-002	CC002659.1	PF00036.2	PF00036.1
AC008073.1-004	AC008073.6-004	ESTT13534	ESTT13534	ESTT13534
AC008073.1-004	AC008240.1	AC008073.4-007	AC008073.4-003	AC008073.4-003
AC008073.1-004	PF00254.1	AC008073.2-006	AC008073.8-005	AC008073.8-005
CCDS1706.1	AC008073.2-003	AC008073.8-003	augustus.2	augustus.2
augustus.5	PF00107.1	genscan.3	ENST408053	ENST408053
CCDS33153.1	AC008073.2-004	augustus.3	augustus.3	augustus.3
ESTT13529	AC008073.3-004	AC008073.3-001	PF00018.5	PF00018.5
ESTT13528	AC008073.1-006	AC008073.3-003	PF00018.4	PF00018.4
ESTT13527	AC008073.1-005	ESTT13546	PF00018.3	PF00018.3
AC008073.1-007	AC008240.1	AC008073.4-009	PF00018.2	PF00018.2
AC008073.1-003	AC008073.1-002	AC008073.4-011	PF00018.1	PF00018.1
AC008073.1-002	No evidence attached	No evidence attached	PF00018.0	PF00018.0
AC008073.5-002	AC008073.6-002	Start/End found in translation	ENST449230	ENST449230
PF00076.1	AC008073.6-011	Translation does not end with stop, and 'End not found' is	CC0046230.1	CC0046230.1
ESTT13550	AC008073.6-005	not set	ENST45614	ENST45614
ESTT13549	ENST45660	AC008073.4-001	genscan.2	genscan.2
genscan.5	ENST45660	ENST45660	augustus.6	augustus.6
augustus.7	ENST45660	ENST45660	PF00093.5	PF00093.5
CCDS1707.1	ENST45660	AC008073.4-002	RP11-219F1.1-001	RP11-219F1.1-001
AC008073.5-001	AC008073.6-008	AC008073.4-005	PF01101.1	PF01101.1
ESTT13531	ESTT13530	ESTT13531	genscan.7	genscan.7
AC008073.6-010	AC008073.6-003	AC008073.6-007	AC009228.1-001	AC009228.1-001
AC008073.6-001	AC008073.6-002	AC008073.7-002	RP11-219F1.2-001	RP11-219F1.2-001
AC008073.6-002	AC008073.7-001	AC008073.6-009	genscan.6	genscan.6
AC008073.2-005	ESTT13536	AC008073.4-006	PF00036.3	PF00036.3
CCDS1708.1	AC008073.8-002	ESTT13543	ESTT13543	ESTT13543
ENST313482				



4) The evidence is attached automatically to the new gene object.

cDNA Em:BC050998.1

4) The new object will inherit its structure from the HSP. **However, you must always check the splice sites of your object in Blixem in case the alignment is incorrect.** Start/end coordinates (if a coding object) and transcript type are inherited from the parent, so these may not be relevant and may need to be changed. Note, that the new object is coloured red due to a number of errors. The checking software will not recognise evidence until the object is saved.



5) Once the errors have been removed, save the object to see it appear on Zmap (the evidence used has been highlighted).

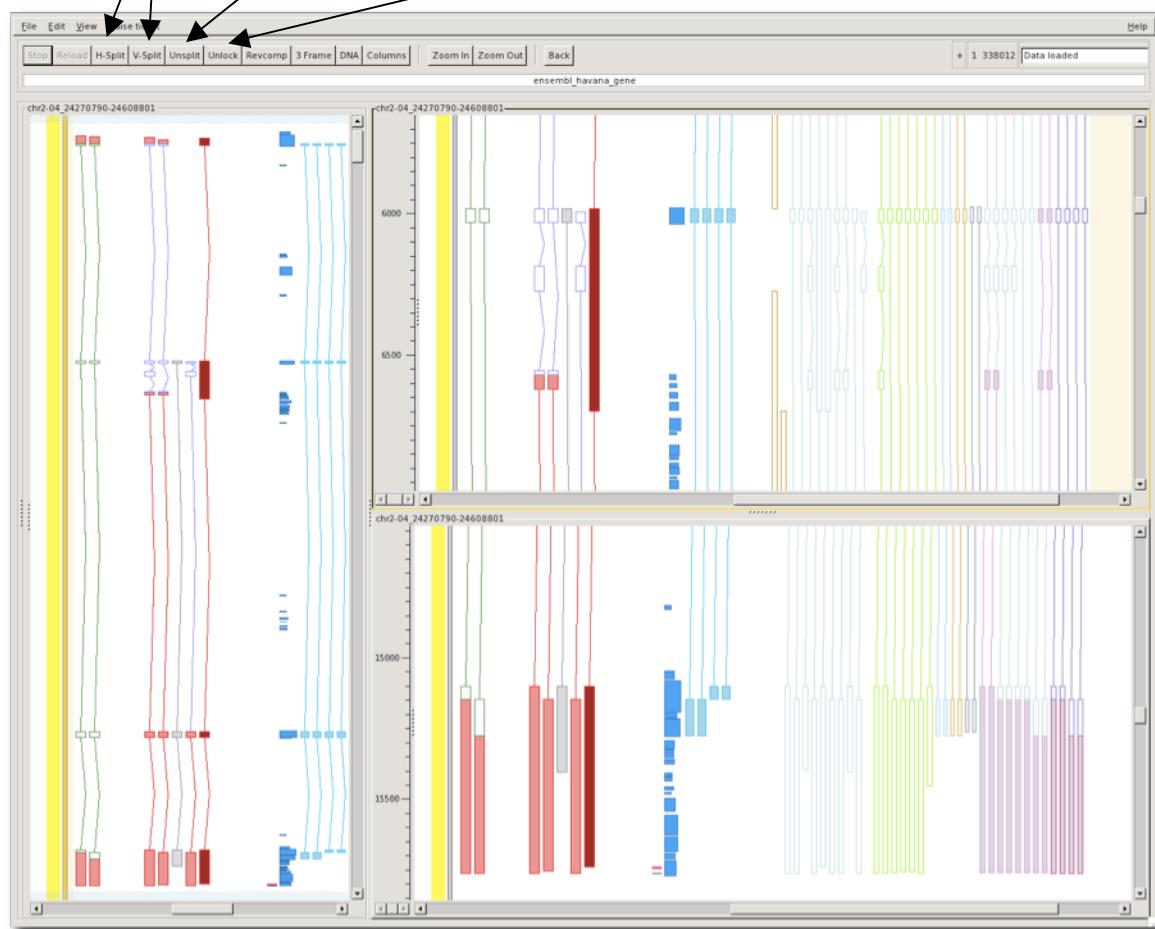
## Splitting windows in Zmap

Use the **split** window function to effectively reduce the size of the window when looking at homologies. This is of particular use when you have to deal with very large introns because you can essentially reduce the introns to whatever size you wish, or when there are very many HSPs, because you can keep your gene object in view and static, but still scroll across the evidence.

The screen can be split horizontally or vertically (as shown) multiple times. An active window must be selected for **splitting**.

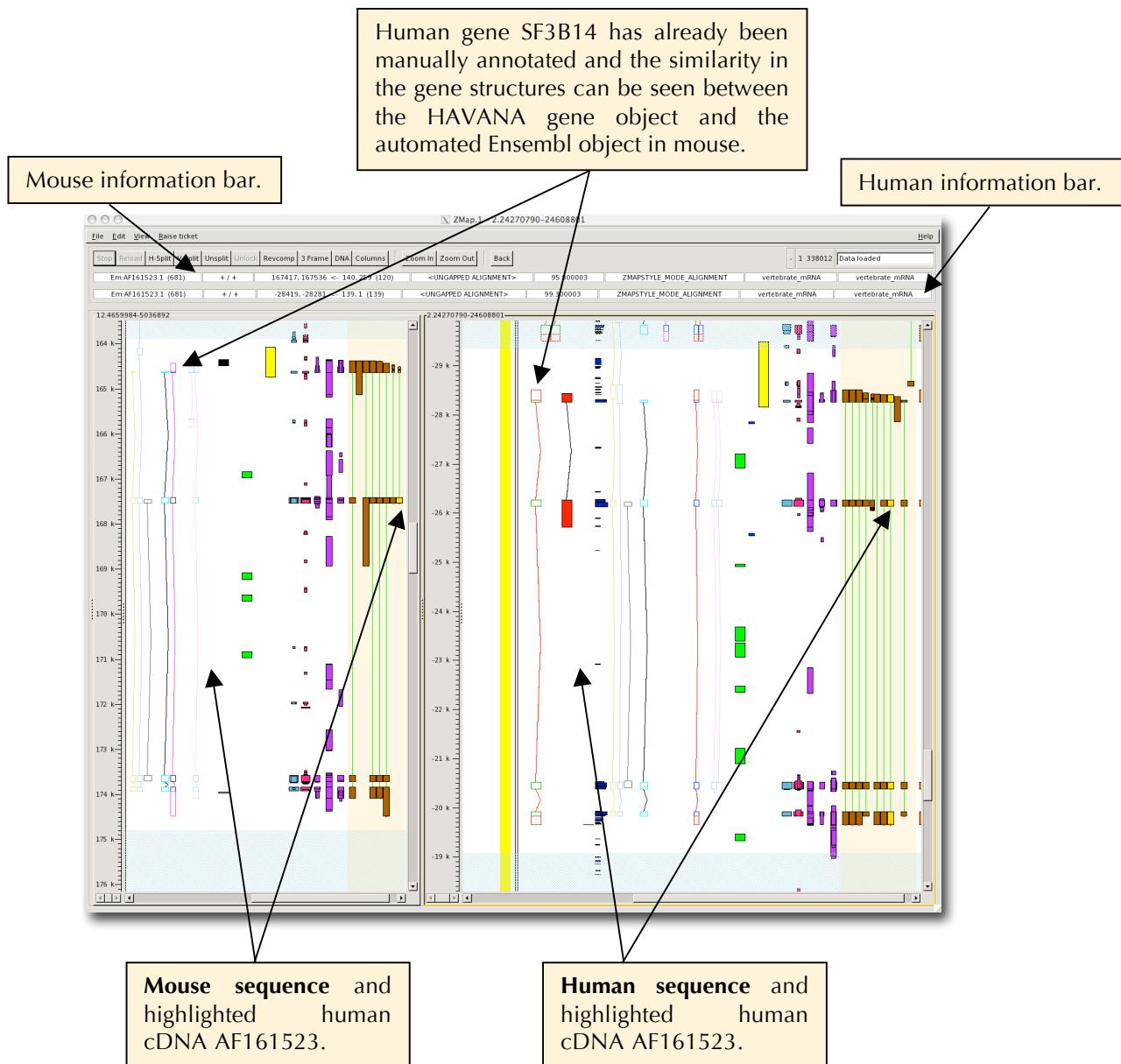
**Unsplit** will remove the last split window.

The windows will be locked together when you first open them. To scroll independently within each window, use the **Unlock** button.



## Launching in a Zmap

This function allows you to open two or more sequences alongside each other (such as a human region and the syntenic region in mouse, or two haplotypes), so that simultaneous investigation can be carried out. To do this you will need to open both sets of clones in the same Otterlace session. To open both Zmap windows in one window as shown below, you need to select “Launch In A Zmap” option in one clone set. These clones will open to the left of the already open Otterlace session. This screen shot shows human gene SF3B14 and the syntenic region in mouse. The gene copy and paste function (referred to in the Otterlace section) is of much use here, saving time when building gene objects.



## Zmap keyboard and mouse shortcuts.

In general Zmap will be faster for zooming, bumping etc if you make good use of the built in short cuts. These can often avoid the need for Zmap to redraw large amounts of data that you may not even be interested in. For example, click once (highlight) on a feature and a carriage return will bring up evidence. Another example is to press T for translation.

### All windows

Short Cut	Action
Cntl-W	close this window
Cntl-Q	quit ZMap

### Zmap Window

Short Cut	Action
<b>Control keys</b>	
+ (or =), -	zoom in/out by 10%
Cntl + (or =), Cntl -	zoom in/out by 50%
up-arrow, down-arrow	scroll up/down slowly bit
Cntl up-arrow, Cntl down-arrow	scroll up/down more quickly
left-arrow, right-arrow	scroll left/right slowly
Cntl left-arrow, Cntl right-arrow	scroll left/right more quickly
page-up, page-down (Mac users should use fn and up/down arrow)	up/down by half a "page"
Cntl page-up, Cntl page-down	up/down by a whole "page"
Home, End (Mac users should use fn and left/rights arrows)	Go to far left or right
Cntl Home, Cntl End (Mac users will have to configure their keyboards for this)	Go to top or bottom
Delete, Shift Delete	Hide/Show selected features.
Enter	Show feature details for highlighted feature.
Shift up-arrow, Shift down-arrow	Jump from feature to feature within a column.
Shift left-arrow, Shift right-arrow	Jump from column to column.

### Alpha-numeric keys

a	Blixem all sequences in column
A	Blixem only highlighted sequence in column
b	Bump/unbump current column within limits of mark if set, otherwise bump the whole column.

B	Bump/unBump current column within limits of the visible feature range.
c	compress/uncompress columns: hides columns that have no features in them either within the marked region or if there is no marked region within the range displayed on screen. Note that columns set to "Show" will not be hidden.
C	Compress/unCompress columns: hides all columns that have no features in them within the range displayed on screen regardless of any column, zoom, mark etc. settings.
h	Toggles highlighting (good for screen shots).
m	mark/unmark a range which spans whichever features or subparts of features are currently selected for zooming/smарт bumping
M	Mark/unMark the whole feature corresponding to the currently selected subpart (e.g. the whole transcript of an exon or all HSPs of the same sequence as the highlighted one) for zooming/smарт bumping
o or O	show menu Options for highlighted feature or column, use cursor keys to move through menu, press ESC to cancel menu.
r	reverse complement current view, complement is done for all windows of current view.
t or T	translate highlighted item, T hides Translation.
w or W	zoom out to show whole sequence
z	zoom to the extent of any selected features (e.g. exon/introns, HSPs etc) or any rubberbanded area if there was one.
Z	Zoom to whole transcript or all HSPs of a selected feature.

### Zmap Mouse Usage

Left	Middle	Right
<i>Single mouse button click</i>		
highlight a feature or column  Plus drag: draw a rectangle around an object for zoom	horizontal ruler with sequence position displayed, on button release centre on mouse position.  Release mouse outside Zmap window to prevent re-centering.	show feature or column menu – for options such as pfetch, show feature DNA, show peptide, export peptide
<i>Double mouse button click</i>		
display details of selected feature. Double click on object to get edit window	same as single click	same as single click
<i>Shift + mouse button click</i>		
highlight a subpart of a feature (e.g. a single exon or alignment match)  OR multiple highlight	same as single click	same as single click

## Tips for a speedier Zmap

1. Specifically: zoom and mark within Zmap early on after launching. Either select a gene object and press 'z' to zoom OR select a rectangle to zoom in by dragging the left mouse button around it. Reverse complement now if necessary, then press 'm' to mark the region.
2. The quickest way to zoom out of Zmap again is to right mouse click on the 'zoom out' buttons at the top of zmap and choose one of the options (this is definitely much quicker than doing individual 'zoom outs' with the left mouse button). Likewise for 'zooming in' again (or use keyboard equivalents).
3. Bump within a marked region only. Bumping without marking is slow and removes the lines connecting Blast matches.
4. When you have finished working within a marked region, unbump the evidence you have been working on (e.g. ESTs) and unmark that region before you go on to select the next region to mark and bump – or you could miss visualising the evidence in the new region.
5. If you want to get rid of some white space try the compress 'c' function or alternatively toggle off some of the columns. **Warning – this may hide features as well.** If a column (e.g ESTs) is bumped and you want to lose it temporarily, it is quicker to turn the column off (when you turn it on again it will still be bumped when it reappears) than unbump then rebump again later.
6. Jumping to genes/objects: If you expand the left hand 'scroll navigator' overview' you can jump directly to genes and objects by double-clicking on them.