

# **RicENcode: the knowledge of cloned rice genes lost in the information of rice functional genomic studies**

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We have collected more than 2204 cloned rice genes and 303 gene families comprised of 3381 genes. For each gene, various information concerning the gene symbol, the genomic locus in the Nipponbare reference genome, the Genbank accession number, the title, journal, year, author affiliation, abstract of related publications and the text mining result of the publications were provided.

The data were deposited in Github as a repository (<https://github.com/andrewhzau/RICENCODE>). New publications on rice gene cloning are added to this repo as soon as these publications were included in PubMed. You are welcome to “fork” or “clone” this repo and contribute to the improvement of this database!

The companied web pages for this repository could be accessed at <http://andrewhzau.github.io/RICENCODE/>. Static web pages concerning all the information for a gene were created for every collected gene. This static website is created based on data deposited in the repository and will be updated every two weeks.

The data were also deployed as an R Shiny application and could be accessed at <http://211.69.128.148:3838/ricencode/>. You can query this database with easy-to-use query interface. In addition, you can also contribute new information to this database by filling in forms and submitting!

If you encounter any problem using this database or have any suggestion, please send me an email (ywhzau at gmail.com).

\* Let's use the Shiny application accessible at <http://211.69.128.148:3838/ricencode/> to query this database first!

Figure 1 shows the “Homepage” of this Shiny App, which displays the general information about this database.

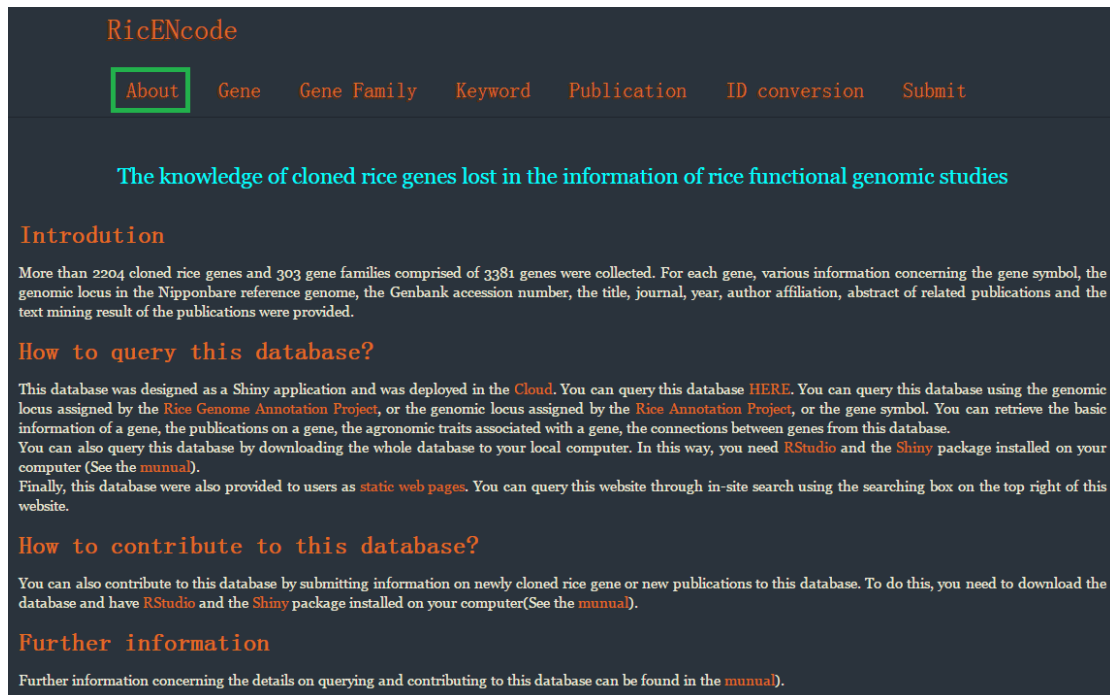


Figure 1. The Homepage of the Shiny application.

Following the link to “Gene” on the navigation bar opens the page of “Gene” query interface for cloned genes’ information(Figure 2).

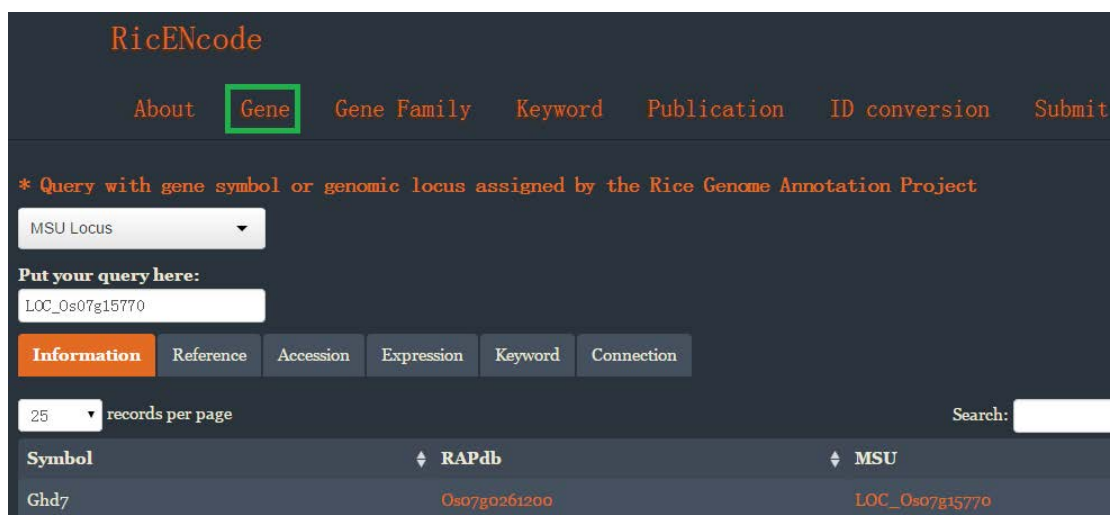
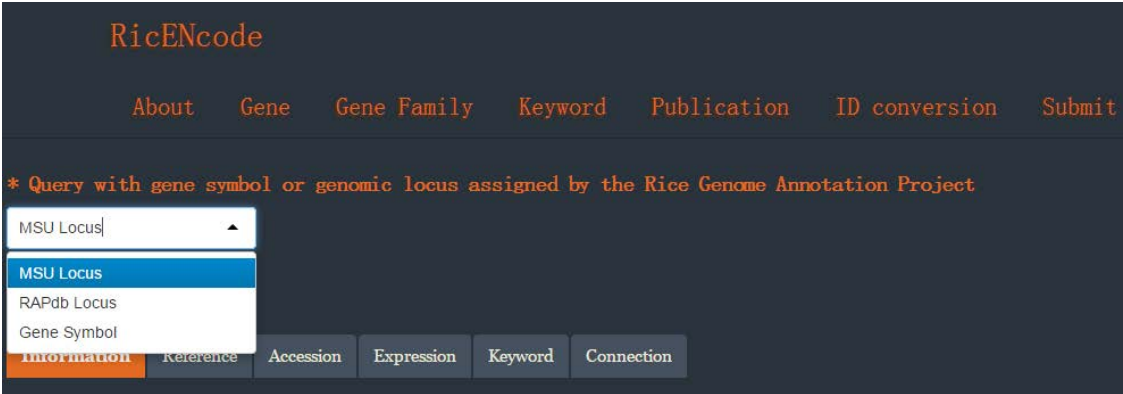


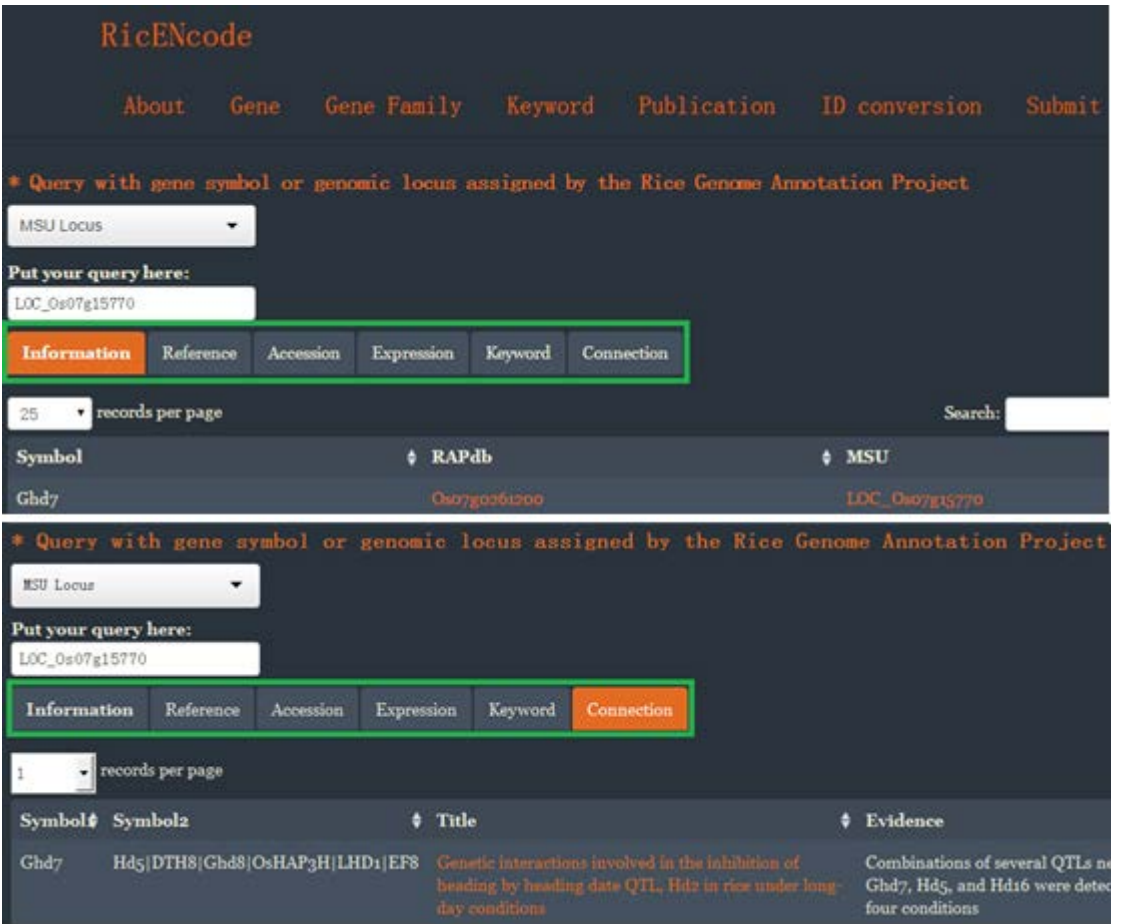
Figure 2. The “Gene” query interface to fetch cloned genes’ information.

Either gene symbol or genomic locus is available to fetch genes' information using the drop-down menu (**Figure 3**).



**Figure 3.** The drop-down menu for query in this database.

The links labeled “Information, Reference, Accession, Expression, Keywords, and Connection “lead to the corresponding information available for a given gene(**Figure 4**).



**Figure 4.** The corresponding information available for a specific gene.

The information on rice gene families can be accessed through the item “Gene Family” on the navigation bar, which allows for searching by the gene symbol or genomic locus(**Figure 5**).

RicENcode

About Gene **Gene Family** Keyword Publication ID conversion Submit

\* Query gene family using gene symbol or genomic locus

MSU Locus

Put your query here:  
LOC\_Os10g41510

Information Reference

25 records per page Search:

Symbol	RAPdb	MSU
CBL1	Os10g0564800	LOC_Os10g41510

**Figure 5.** The “Gene family” query interface to fetch information on rice gene families.

You can also use the “Keyword” query interface on the navigation bar to search this database. Accordingly, the available keywords are listed in <http://andrewhzau.github.io/RICENCODE/tags.html>. For example, using the keyword “heading date” will get the results indicated in **Figure 6**.

RicENcode

About Gene Gene Family **Keyword** Publication ID conversion Submit

\* Query with keyword to characterize agronomic trait

heading date

Information Reference

2 records per page

Symbol	RAPdb	MSU	Title
CK1 EL1 Hd16	Os03g0793500	LOC_Os03g57940	Genetic interactions involved in the inhibition of heading by heading date QTL, Hd2 in rice under long-day conditions
CK1 EL1 Hd16	Os03g0793500	LOC_Os03g57940	Hd16, a gene for casein kinase I, is involved in the control of rice flowering time by modulating the day-length response

Showing 1 to 2 of 104 entries

Previous 1 2 3 4 5 Next

**Figure 6.** The “Keyword” query interface to fetch information in relation with the queried keyword.

The database provides alternative approaches to obtain information on cloned rice genes based on the “Publication” query interface on the navigation bar (**Figure 7**). You can use any keyword to search the title and the abstract of all collected

publications.

RicENcode

About Gene Gene Family Keyword **Publication** ID conversion Submit

\* Query the title or abstract of collected publications

grain number

Result

1 records per page

Title	Year	Journal	Affiliation	Abstract	Gene
Cytokinin oxidase regulates rice grain production	2005	Science	Bioscience and Biotechnology Center, Nagoya University, Nagoya 464-8601, Japan.	Most agriculturally important traits are regulated by genes known as quantitative trait loci (QTLs) derived from natural allelic variations. We here show that a QTL that increases grain productivity in rice, Gn1a, is a gene for cytokinin oxidase/dehydrogenase (OsCKX2), an enzyme that degrades the phytohormone cytokinin. Reduced expression of OsCKX2 causes cytokinin accumulation in inflorescence meristems and increases the number of reproductive organs, resulting in enhanced grain yield. QTL pyramiding to combine loci for grain number and plant height in the same genetic background generated lines exhibiting both beneficial traits. These results provide a strategy for tailormade crop improvement.	Gn1a OsCKX2

Showing 6 to 6 of 11 entries

Previous 4 5 6 7 8 Next

**Figure 7. The “Publication” query interface to fetch information from publications in rice functional genomics.**

Besides fetching information from this database, you can also submit newly cloned genes or new publications on cloned genes to this database using “Submit” on the navigation bar (**Figure 8**).

RicENcode

About Gene Gene Family Keyword Publication ID conversion **Submit**

\* Submit new Genbank accession to this database

Gene symbol Accession

Submit

\* Submit new Expression information to this database

Gene symbol Expression Overexpression RNAi

Submit

\* Submit new connection to this database

Gene symbol 1 Gene symbol 2 Title Evidence

Submit

\* Submit new phenotype and expression figures to this database

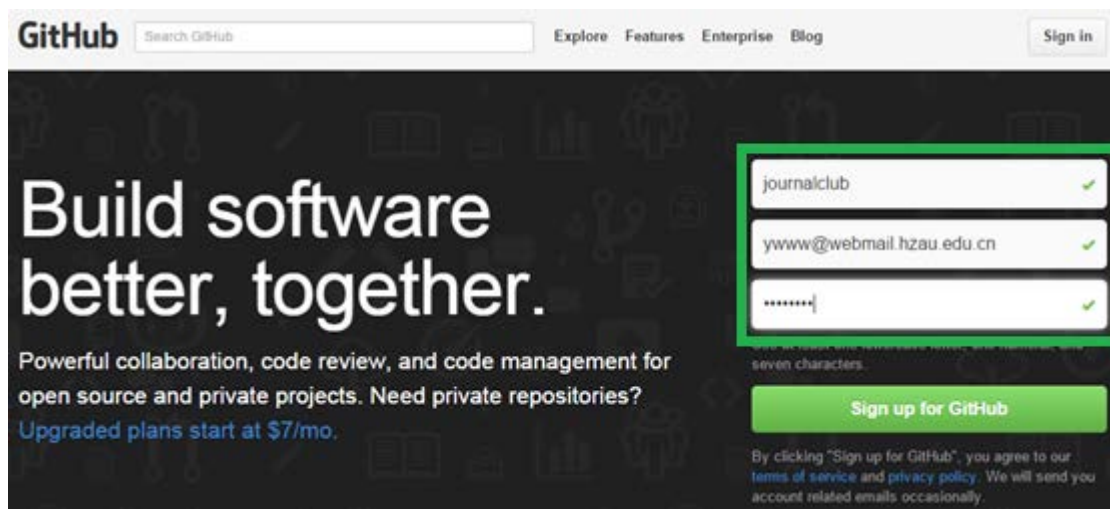
Gene symbol Phenotype Figure Expression Figure

Submit

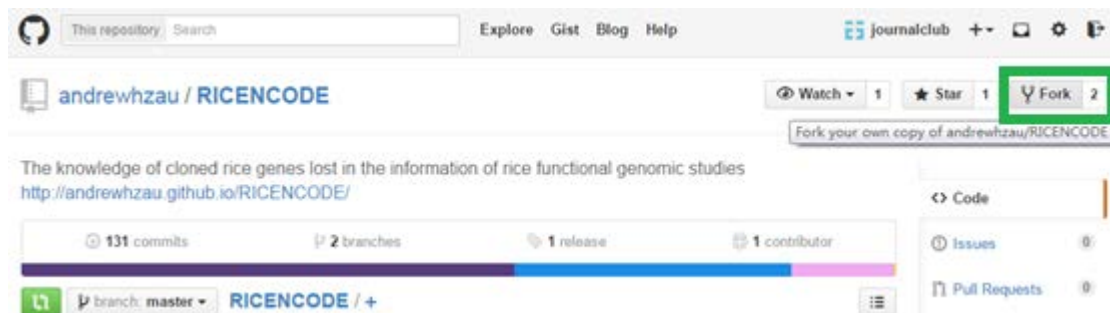
**Figure 8. The interface for users to submit new information.**

**\* An alternative way to query or contribute to this database is to clone this database to your local computer. The following parts focus on this approach step by step.**

1. Go to <https://github.com/>, register a new account if you didn't have one. Here I created a new account named "journalclub".

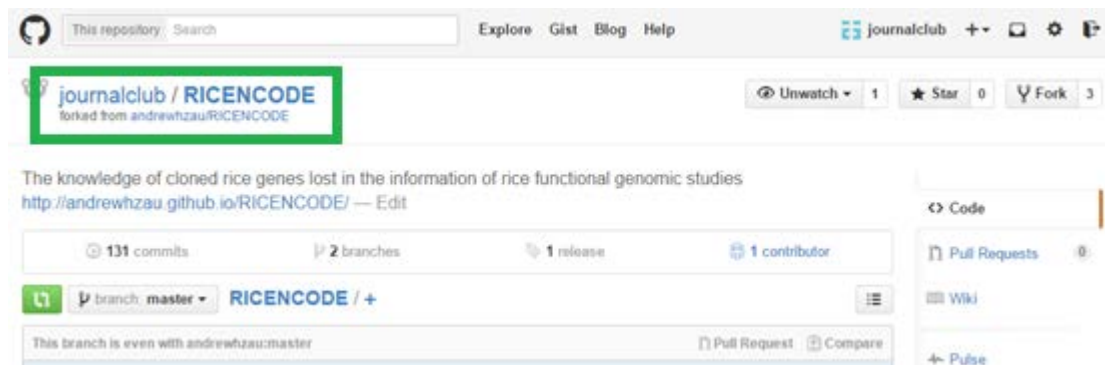


2. Sign in your Github account and then go to <https://github.com/andrewhzau/RICENCODE>. Fork this repo by clicking the "Fork" on the top right.

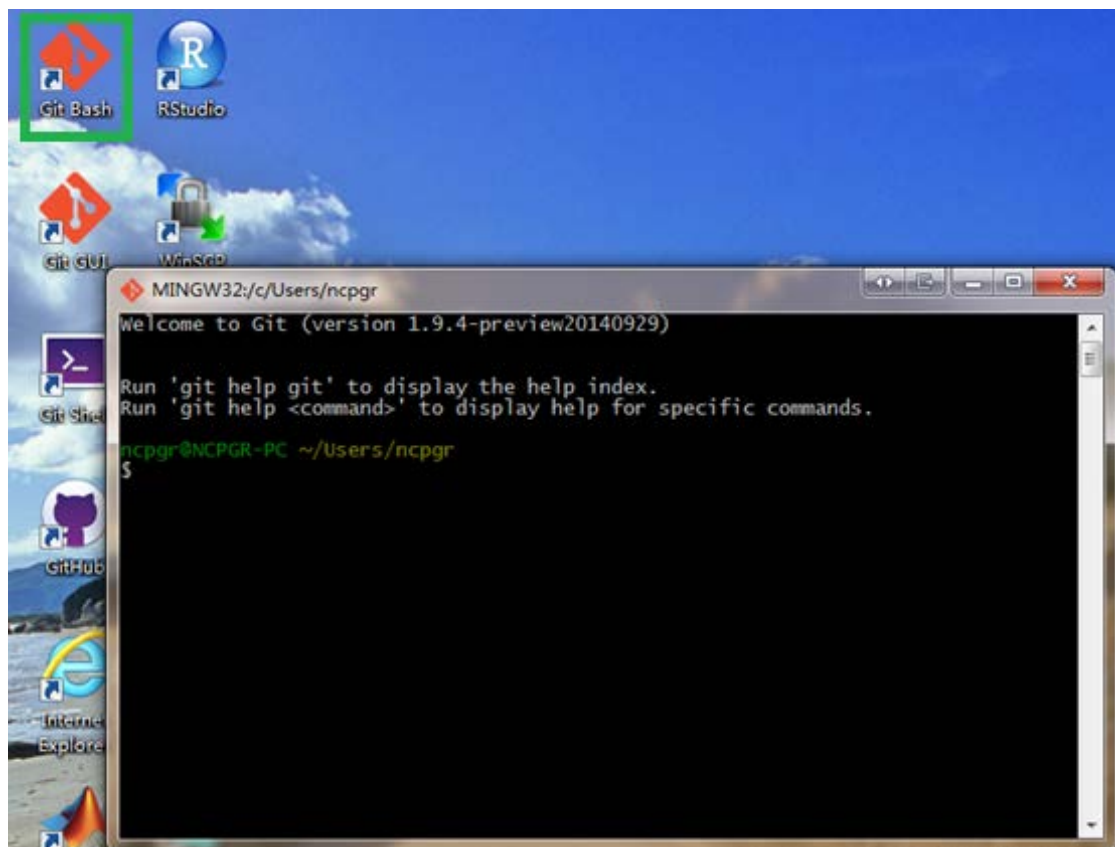




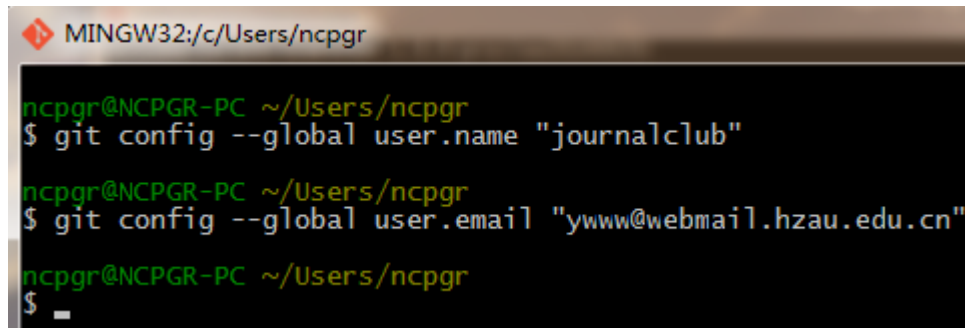
When the “fork” was done, you will see the repo “RICENCODE” under your account: <https://github.com/journalclub/RICENCODE>.



3. Go to <http://msysgit.github.io/>, download Git and install it on your local computer. Follow the instructions on this [page](#) if you are not sure about how to install Git. When it's done, open “Git Bash” which might probably be on the Desktop of your computer (For Windows users). For Linux or Mac users, open the terminal and use git on the command line.

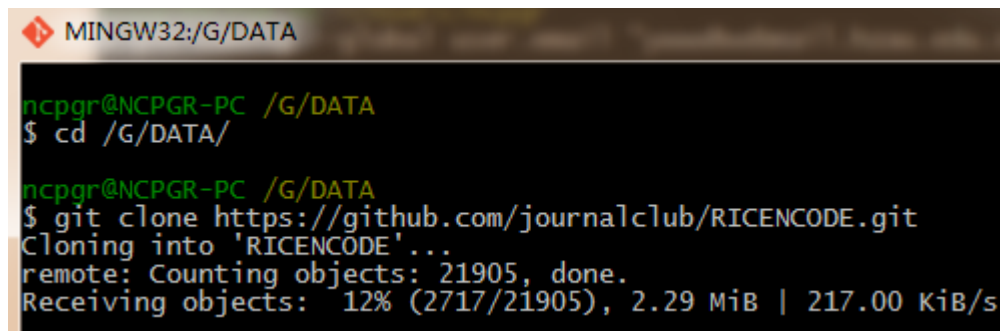


4. Configure **your** Github account information (**should be different from mine**) using the following commands.

A screenshot of a Windows command prompt window titled 'MINGW32:/c/Users/ncpgr'. The prompt shows the user 'ncpgr@NCPGR-PC' at the directory '~/Users/ncpgr'. The user enters two commands: '\$ git config --global user.name "journalclub"' and '\$ git config --global user.email "ywww@webmail.hzau.edu.cn"'. The prompt then shows the user at the same directory with a new '\$' prompt.

```
ncpgr@NCPGR-PC ~/Users/ncpgr
$ git config --global user.name "journalclub"
ncpgr@NCPGR-PC ~/Users/ncpgr
$ git config --global user.email "ywww@webmail.hzau.edu.cn"
ncpgr@NCPGR-PC ~/Users/ncpgr
$
```

5. Clone the RICENCODE repo to your local computer using the following commands.

A screenshot of a Windows command prompt window titled 'MINGW32:/G/DATA'. The prompt shows the user 'ncpgr@NCPGR-PC' at the directory '/G/DATA'. The user enters two commands: '\$ cd /G/DATA/' and '\$ git clone https://github.com/journalclub/RICENCODE.git'. The output shows the repository being cloned into 'RICENCODE' and progress information: 'remote: Counting objects: 21905, done. Receiving objects: 12% (2717/21905), 2.29 MiB | 217.00 KiB/s'.

```
ncpgr@NCPGR-PC /G/DATA
$ cd /G/DATA/
ncpgr@NCPGR-PC /G/DATA
$ git clone https://github.com/journalclub/RICENCODE.git
Cloning into 'RICENCODE'...
remote: Counting objects: 21905, done.
Receiving objects: 12% (2717/21905), 2.29 MiB | 217.00 KiB/s
```

6. Go to <http://cran.r-project.org/>, download the newest R program and install it on your local computer.
7. Go to <http://www.rstudio.com/>, download the newest RStudio and install it on your local computer.
8. Open Rstudio on your local computer and install the Shiny package by typing the following command in your R console.

```
install.packages("shiny", dep=T); install.packages("RCurl", dep=T)
install.packages("XML", dep=T); install.packages("stringr", dep=T)
install.packages("plyr", dep=T)
```

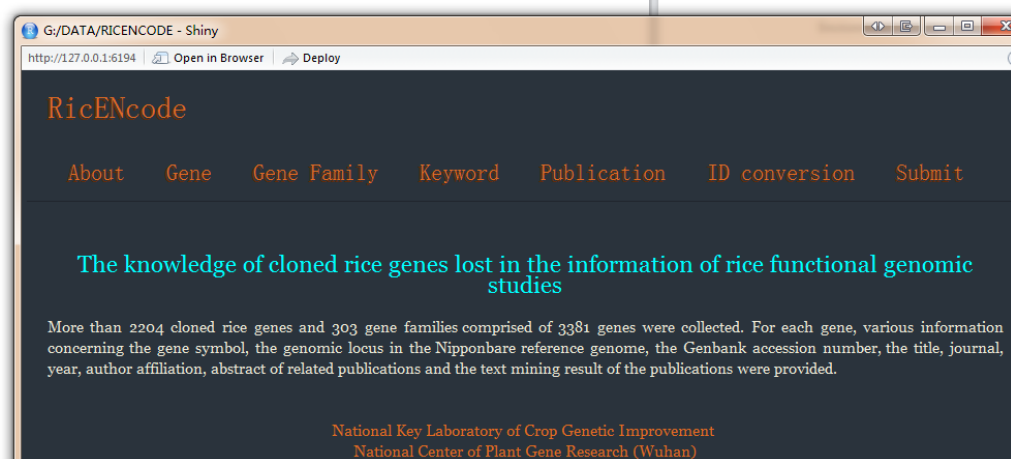
9. Run the following command in Rstudio.

```
library(shiny)
```

```
runApp("G:/DATA/RICENCODE") # The path of "RICENCODE" on your computer
might be different from mine
```



```
> runApp("G:/DATA/RICENCODE")
Listening on http://127.0.0.1:6194
```



10. Let's submit a newly cloned rice gene in the following publication to this database.

**Note: Since this gene would appear in this database after this submission, you may want to submit another newly cloned rice gene absent from this database. Before submit a new cloned gene to this database, you should first query this database and make sure it is indeed not included in this database.**

*Mol Genet Genomics*, 2014 Nov 4. [Epub ahead of print]

**The rice (*Oryza sativa* L.) LESION MIMIC RESEMBLING, which encodes an AAA-type ATPase, is implicated in defense response.**

Fekih R<sup>1</sup>, Tamiru M, Kanzaki H, Abe A, Yoshida K, Kanzaki E, Saitoh H, Takaqi H, Natsume S, Undan JR, Undan J, Terauchi R.

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#### Abstract

Lesion mimic mutants (LMMs) provide a useful tool to study defense-related programmed cell death (PCD) in plants. Although a number of LMMs have been identified in multiple species, most of the candidate genes are yet to be isolated. Here, we report the identification and characterization of a novel rice (*Oryza sativa* L.) lesion mimic resembling (lmr) mutant, and cloning of the corresponding LMR gene. The LMR locus was initially delineated to 1.2 Mb region on chromosome 6, which was further narrowed down to 155-kb using insertions/deletions (INDELs) and cleavage amplified polymorphic sequence markers developed in this study. We sequenced the open reading frames predicted within the candidate genomic region, and identified a G-A base substitution causing a premature translation termination in a gene that encodes an ATPase associated with various cellular activities type (AAA-type) protein. RNA interference transgenic lines with reduced LMR transcripts exhibited the lesion mimic phenotype similar to that of lmr plants. Furthermore, expression of the wild-type LMR in the mutant background complemented the lesion phenotype, confirming that the mutation identified in LMR is responsible for the mutant phenotype. The pathogenesis-related (PR) genes PBZ1 and PR1 were induced in lmr, which also showed enhanced resistance to rice blast (*Magnaporthe oryzae*) and bacterial blight (*Xanthomonas oryzae* pv. *oryzae*), suggesting LMR is a negative regulator of cell death in rice. The identification of lmr and cloning of the corresponding LMR gene provide an additional resource for the study of PCD in plants.

PMID: 25367283 [PubMed - as supplied by publisher]

Fill in some forms and then click “submit”.

\* Submit new publication to this database

Gene symbol	Title	Year	Journal	Affiliation	Abstract
LEE	The rice ( <i>Oryza sat</i>	2014	Mol Genet Genomics	Iwate Biotechnology	Lesion mimic mutant

Submit

**11.** You can also submit newly cloned genes, add new publication for existing genes, or add new publications focusing on other aspects of rice functional genomics progress, using the “Submit” button under the item “Gene” on the navigation bar.

(1) To submit a new publication focused on other aspects of rice functional genomics progress, only fill in the fourth form (“PubMed ID”).

(2) To submit a new publication for existing genes, fill in the first (“Gene symbol”) and the fourth (“PubMed ID”) forms.

(3) To submit a newly cloned gene, fill in all the four forms.

**This is all that you need to do!**

\* Submit new Gene or add new information for existing genes in one shot

Gene symbol	MSU genomic locus	RAPdb genomic locus	Pubmed ID
LMR	LOC_Os06g03940	Os06g0130000	25367283

Submit

12. Open “Git Bash” and “push” the newly add data to the Cloud.

```
ncpgr@NCPGR-PC /G/DATA/ricencode (master)
$ cd /G/DATA/ricencode

ncpgr@NCPGR-PC /G/DATA/ricencode (master)
$ git add -A

ncpgr@NCPGR-PC /G/DATA/ricencode (master)
$ git status
On branch master
Your branch is up-to-date with 'origin/master'.

Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        new file:   data/Gene/Abstract/L/LMR/Keyword.trait
        new file:   data/Gene/Abstract/L/LMR/LMR.exp.png
        new file:   data/Gene/Abstract/L/LMR/LMR.pheno.png
        new file:   data/Gene/Abstract/L/LMR/acc-AK070084
        new file:   data/Gene/Abstract/L/LMR/expression.info
        new file:   data/Gene/Abstract/L/LMR/gene.info
        new file:   data/Gene/Abstract/L/LMR/reference.info
        modified:   geneInfo.table
        modified:   geneKeyword.table
        modified:   reference.table

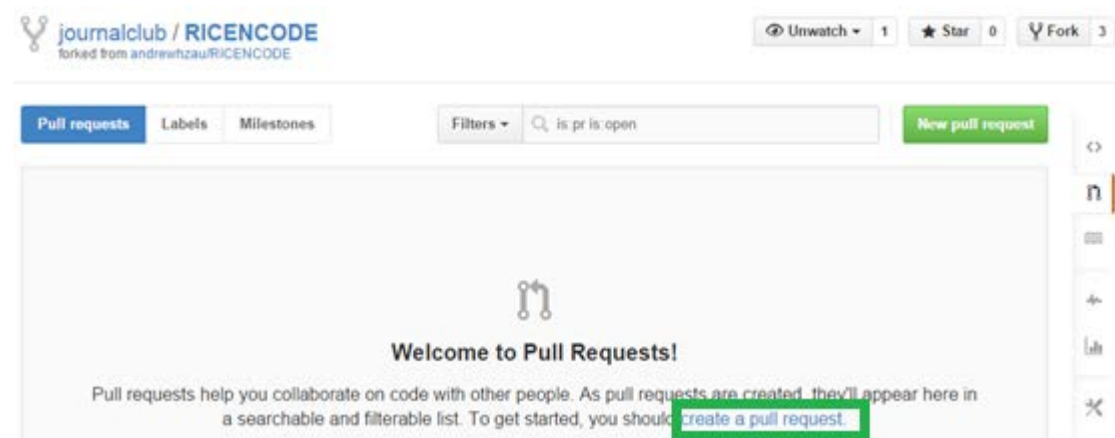
ncpgr@NCPGR-PC /G/DATA/ricencode (master)
$ git commit -m "add new gene LMR"
[master 0fbc099] add new gene LMR
10 files changed, 19 insertions(+)
create mode 100644 data/Gene/Abstract/L/LMR/Keyword.trait
create mode 100644 data/Gene/Abstract/L/LMR/LMR.exp.png
create mode 100644 data/Gene/Abstract/L/LMR/LMR.pheno.png
create mode 100644 data/Gene/Abstract/L/LMR/acc-AK070084
create mode 100644 data/Gene/Abstract/L/LMR/expression.info
create mode 100644 data/Gene/Abstract/L/LMR/gene.info
create mode 100644 data/Gene/Abstract/L/LMR/reference.info

ncpgr@NCPGR-PC /G/DATA/ricencode (master)
$ git push -u origin master
Username for 'https://github.com': journalclub
Password for 'https://journalclub@github.com':
```

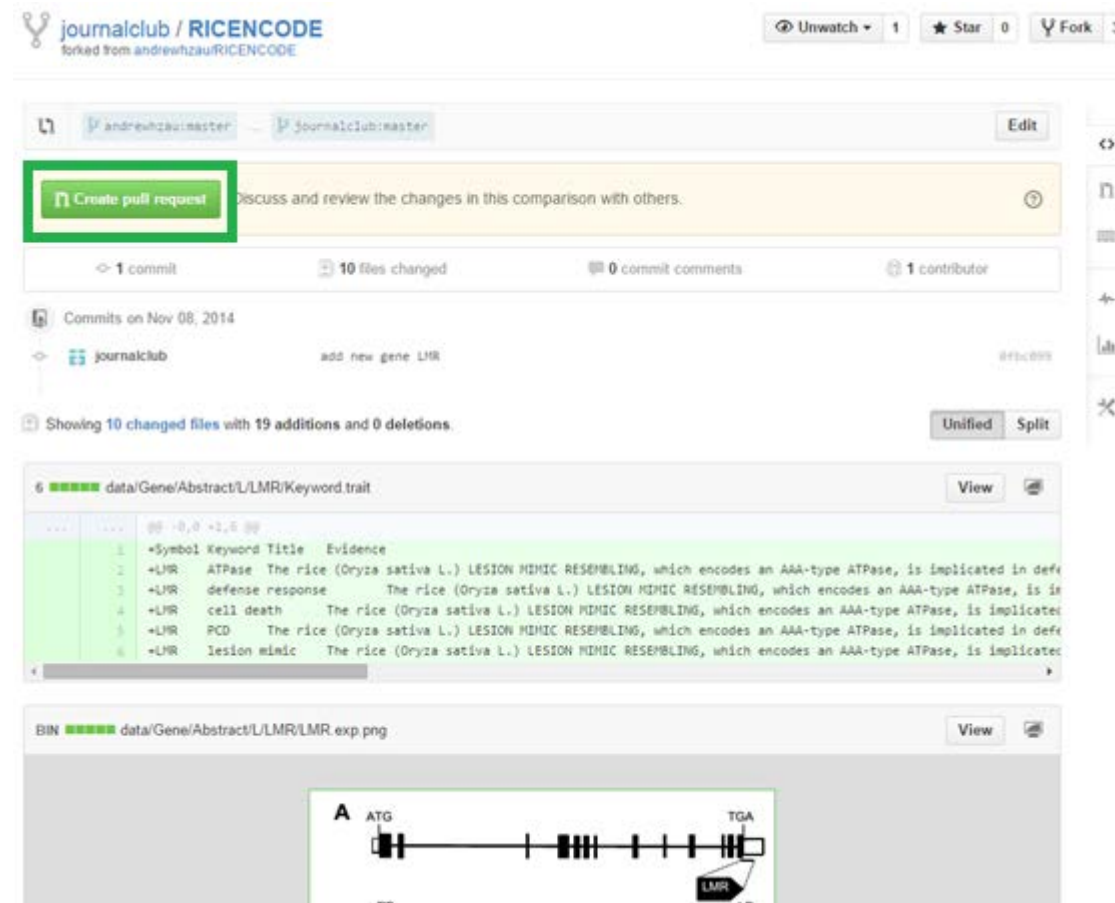
13. Sign in your Github account and go to the repo: <https://github.com/journalclub/RICENCODE>. Click “Pull Requests”.



Then click “create a pull request” in the new page.



Then you will see the newly add data not in my original repo (andrewhzau). Click “Create pull request” on the top left.



14. Finally, when I login my Github account (andrewhzau), I can merge your pull request into my repo and all the data were updated.

The knowledge of cloned rice genes lost in the information of rice functional genomic studies  
<http://andrewhzau.github.io/RICENCODE/> — Edit

133 commits
2 branches
1 release
1 contributor

branch: master
RICENCODE / +

Merge pull request #1 from journalclub/master  
add new gene LMR

andrewhzau authored just now
latest commit 96a0a3f184

data
add new gene LMR
12 minutes ago