OBSERVATIONS

ON THE

SEA- *or* PILE-WORMS

Which have been lately discover'd to have made great Ravages in the Pile- or Wood-Works on the Coast of HOLLAND, &c.

CONTAINING

A particular ACCOUNT of their Make and Nature, and of the Use of their several Parts in Boreing and Feeding; with a particular Desciption of their Cells or Lodgements in the Wood.

By Mr. ROUSSET,

Of the Royal Academy of Sciences at Berlin

Done from the Original Low-Dutch,

And

Illustrated with Copper - Plates.

LONDON:

Printed, and sold by J. ROBERTS, near the Oxford-Arms in Warwick-Lane. 1733.

[Price Six-pence]

Fig. A.

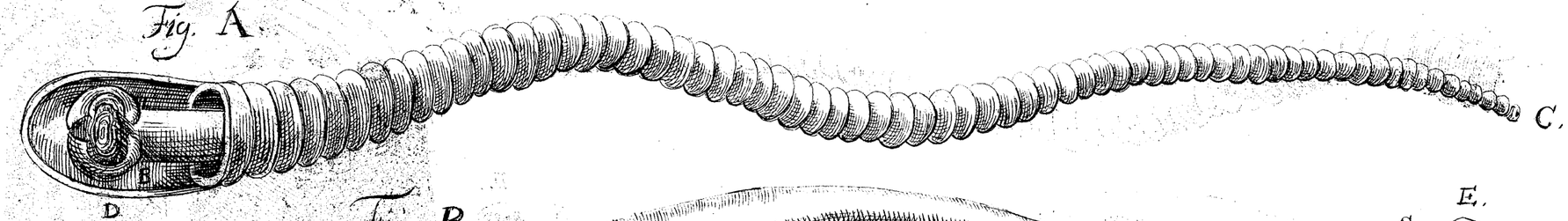


Fig. B.

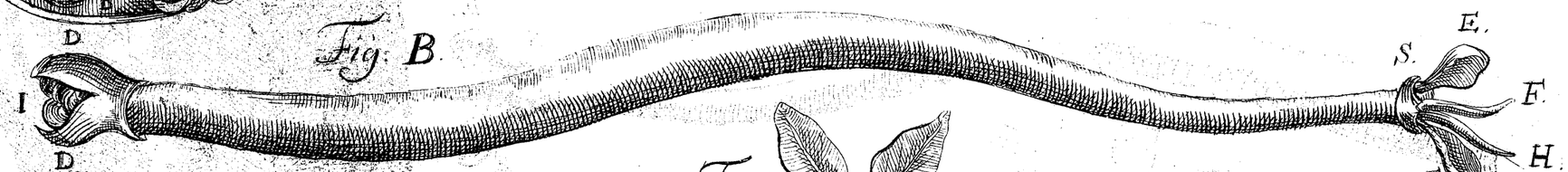


Fig C

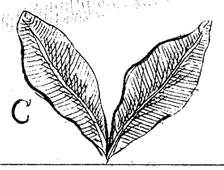


Fig 7.

Fig 1.

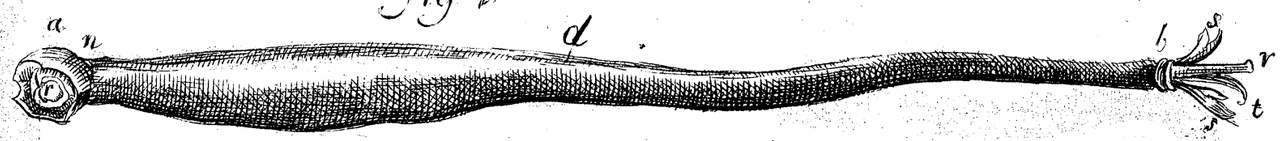


Fig. 8.

Fig 2.

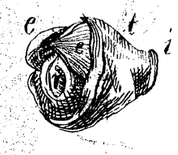


Fig. 3.

Fig 5.

Fig. 4.

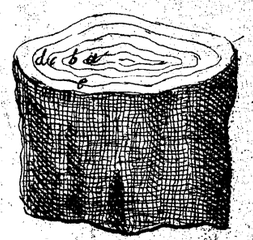


Fig. 9

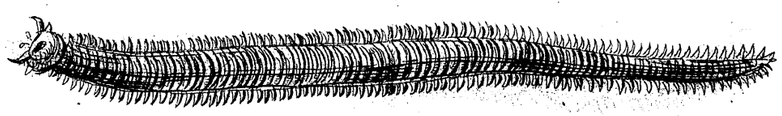
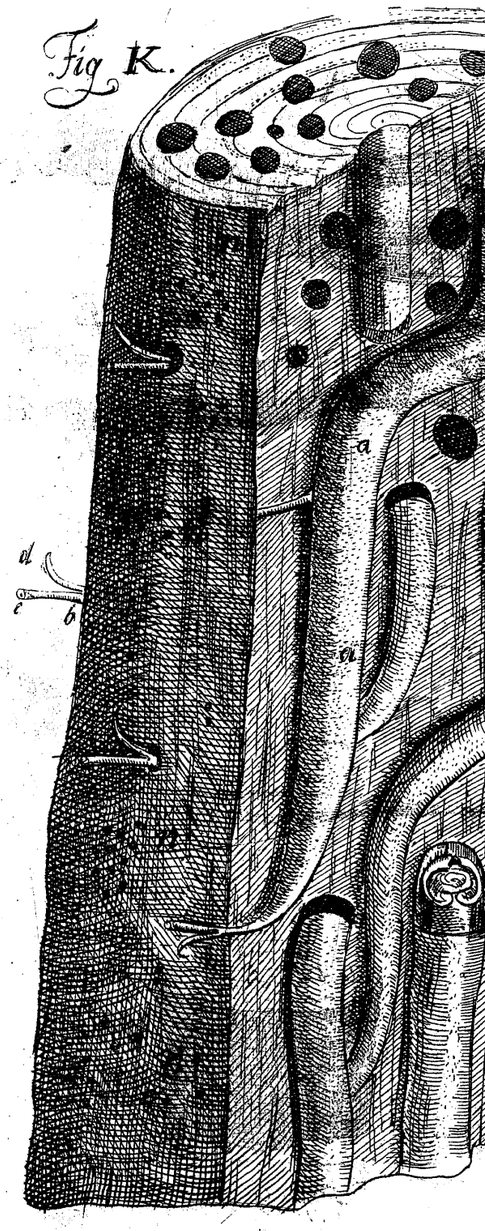


Fig. 6.

Fig K.



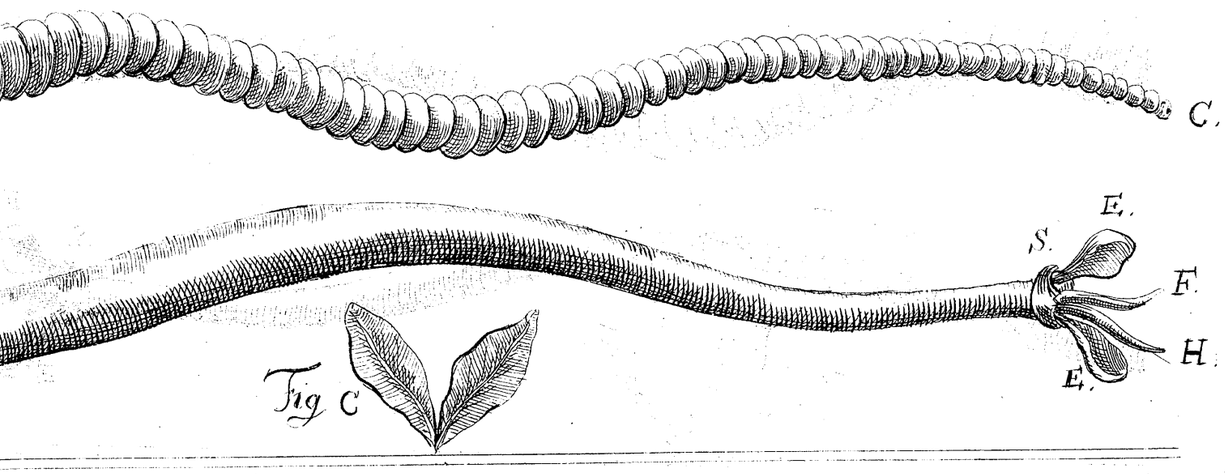


Fig C

Fig 1.

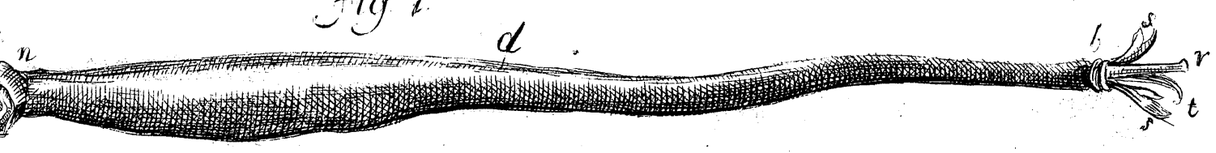


Fig 2.

Fig. 3.

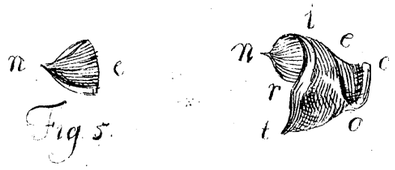


Fig 5.

Fig. 4.

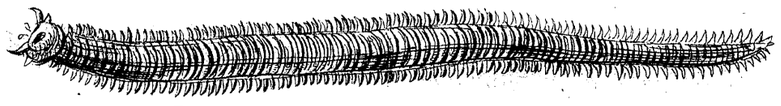
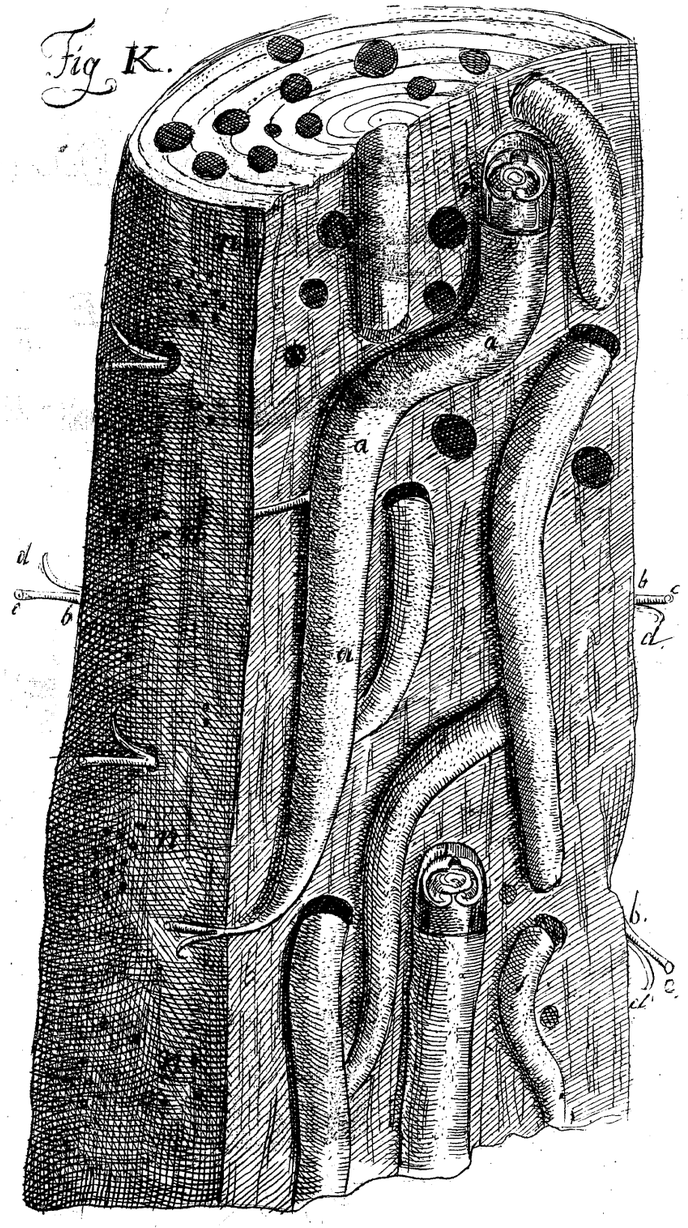


Fig. 6.

Fig K.



Obſervations

ON THE

SEA- *or* PILE-WORMS, *&c.*

THe Damage, which hath been caus'd by certain Sea-Worms, to the Pile-Works of the Dykes of *Zealand*, North-*Holland*, *Frieſland*, and the Coaſt of *Flanders*, hath made ſo much Noiſe, that it is no Wonder the Curioſity of the Publick, and particularly of Gentlemen who employ themſelves in the Study of Natural Philoſophy, hath been awaken'd to look narrowly into this *Phænomenon.*

The Concern and Attention, with which my Duty, as a Subject, inſpires me for every Thing that affects the State, have put me upon ſearching after proper Means for preventing, in Times to come, the Miſchief, which hath been occaſion'd by theſe Vermin. But as, before an Engagement for Victory, it is proper to get acquainted with the Nature

and

and Manner of our Adverſary, I have collected and preſented to the Government a Set of Obſervations, concerning this Vermicular Enemy. The following is a more ample or particular Account of thoſe Obſervations, and is intended more eſpecially for the Peruſal of Such as have not ſeen thoſe Worms, and would be inform'd particularly concerning them, as likewiſe for the refuting and ſtifling of the falſe Reports on this Subject, which have been ſpread either by the Enemies or the Enviers of the Wealth, Proſperity and Happineſs of the Republick.

Of theſe falſe Reports, which have been ſpread from all Quarters, not only by private Letters, but likewiſe by Publick Prints, I ſhall here only give Two Specimens. In the *Bern* Courant under the *Hague* Article of *November* 24th 1732, there is the following Account:

" They labour with the utmoſt Diligence " on the Repair of the Dykes of the Coun- " tries, which are moſt damag'd; and up- " wards of Six Thouſand Men are employ'd " in that Work. The Inhabitants of thoſe " Villages which are moſt threaten'd by the " Danger, are remov'd with their Goods to " Places of Security. There are found from " Time to Time, under the Dykes, very " large Cavities, which have been made by " the Sea-Worms; the Heads of which " Creatures are ſo hard, that they are not to " be

" be ſhatter'd without a Hammer. And the " Swarming of theſe Vermin is a Prodigy " bejond Expreſſion.

In all this Account there is not one Word of Truth. The Writer not only betrays his great Ignorance in the Matter of the Structure or Contrivance of the Dykes, but likewiſe his Want of any one true Idea relating to the Nature and Make or Shape of theſe Worms. But a more extravagant Account of the Matter is the following, which comes from the Pen of a celebrated *German* News-Writer, whoſe Papers are to be met with in almoſt all the Courts of *Germany*.

* " The City of *Amſterdam* is on the " Brink of Ruin, in Regard the Houſes, " which are all rais'd upon Piles, are in " great Danger of Falling, occaſion'd by the " Worms, which have eaten through the " Piles, and thereby render'd them unfit for " the Support of ſuch a Weight of Build- " ings: Inſomuch that all the coſtly Movea- " bles and Merchandiſe, to prevent their " being involv'd in the Deſtruction with " which the Houſes are threaten'd, which " already begin to ſhake and ſink into the " Water, are remov'd to Places of moſt Se- " curity. And the Danger is ſo far aug- " mented, that the principal Merchants be- " gin to talk of removing from thence in or- " der to ſettle elſewhere. The Inhabitants " of Two Hundred Villages, great and ſmall, toga-

* Dated Hague, Nov. 14th 1732. the Original I have in my Poſſeſſion.

" together with those of Six fine Cities, " have been warn'd by the States General to " quit them without Delay, and remove " with their Effects to Places of Safety, " abandoning their Houses and Lands, which, " by the First Flood of the Winter, will be " in Danger of being totally ruin'd and swal- " low'd up by the Waters. The Dykes " are not sufficient to withstand the Weight " and Fury of the Waters any longer. This, " Sir, is a Punishment, &c. —— —— ——

I purposely omit what follows, as containing Remarks that are equally extravagant and ridiculous.

The Contents of this Letter are every one of them false. Notwithstanding the tempestuous Winds, which, in the Months of *October*, *November*, and in the Beginning of *December* we had from the North-West, the Wind at which Quarter is at all Times dangerous to our Coast; notwithstanding, I say, these Storms, neither our Dykes, nor our Pile-Works, receiv'd any Injury from them, Nothing, in any Part of the Works, having been discover'd to be shatter'd, or to give Way. Nor were any more, or any other Workmen employ'd upon the Dykes than Those who are employ'd upon them the Year round. And for what I have recited here concerning the Piles under the Houses of *Amsterdam*, a Man must certainly be bereav'd of his Senses to publish such Stuff, since

since the Pile-Worms cannot live in Fresh Water, such as is the Water about *Amsterdam*; nor do they live either in Water or the Earth, but in Wood only. And, finally, touching the Piles, under the Houses, being damag'd by the Worms, the Houses must certainly have been pull'd down before any Discovery could be made of such a Matter.

These Worms are no new Things on our Coast. Many Persons remember to have seen Worms of the same Kind about Fifty Years ago. But These appear'd not till after the Dog-Days: And a severe Winter following, it destroy'd both them and the Seeds of them, before they became of any considerable Bigness. They are known likewise upon the Coasts of *France* and *Italy*: And I find they have been taken Notice of by some learned Writers. The History of the *French* Academy of Sciences for 1720, gives an Account of the Observations made by M. *Deslandes*, a Physician, on the Worms at *Brest*, which Worms the *French* think were brought thither from the Islands of the *Antilles*. The Account runs thus: * " He took " some of the Outward Planks of a Ship, " which were about 10 or 12 Feet long, and " about 4 or 5 Inches thick. He observ'd, " that small Holes, of about the Diameter " of a ‖ Half-Line, were gnawn † into the " Super-

* *See the Part for* 1720. *printed at* Amsterdam *in Duod.* p. 34.

† See Fig. K. *n, n.*

‖ *NB.* The Pack-thread-Spinners make a Sort of Line which they call *a Line*; another Sort they call *a half Line*; and another which they call *a Quarter-Line*.

" Superficies or Outſides. And upon his tak-
" ing off the Outſides, he ſaw, that the In-
" ſides were wholly waſted by theſe Worms;
" and there likewiſe he found the Worms
" themſelves. They are, ſays he, Half a Foot
" long, or ſomewhat leſs. The whole Body
" conſiſts of divers Rings. On each Side of
" the Belly they have innumerable Legs,
" which are all arm'd with little Hooks.
" But the moſt remarkable Part is the Head,
" which is cover'd or guarded with Two
" Shells, of equal Dimenſions, fix'd one on
" one ſide, the other on the other, and run-
" ning out, forward, each to a ſharp Point,
" with each of which theſe Worms can
" work, while the other lies ſtill. This Sort
" of Helmet, which covereth the Head of
" the Worm, is very hard, compar'd with the
" Conſiſtence of the Reſt of the Body, which
" is very ſupple and tender; dries in the Air
" in a little Time, and turns at laſt to Duſt.
" The Head, by Means of the abovemen-
" tion'd Defence, is of the longeſt Duration."

The Worm here deſcribed reſembles ours in Nothing but the Head, and the Manner of Life, which the Author proceeds to deſcribe, and which we ſhall relate after him in another Place. We have found here in open Places, and likewiſe in Timber, a Worm with innumerable Legs, and the Body of which conſiſted of divers Rings or Circles. This Worm is delineated at the full Length

Length and Breadth in Fig. 6. But the Head of it is quite different from the Head of That deſcrib'd above, after M. *Deſlandes*. And this Sort of Worm we found, upon due Search, to harbour moſtly in Fir-Wood; and that this Wood agrees the beſt with them. We have found others of this Sort, which were much leſs, but perfectly agreeing in the Make of every Part: And Thoſe we diſcover'd in Old Planks and Deal-Boards, which had never been in the Water.

The learned Sr. *Antonio Valliſnieri*, Profeſſor of Phyſick at *Padua*, deſcribes a Worm, * which differs very little from ours, if it is not the ſame, as the ſeeming Difference may be owing to the greater or leſs Accuracy of the Obſervations on one Side. The Reader may compare the Worm, Fig. *B*. which is that of *Valliſnieri*, with that delineated Fig. 1. which is ours.

* The Firſt Collection of the Remarks of Sr. *Valliſnieri*, printed at *Venice* 1710. in *Octavo*, p. 229.

He calls the Sort he deſcribes, the Vermin of Ships, and ſays (*a*) " it is a Sort of Sea-Worm
" which neſtles into thoſe Parts of a Ship,
" which are always under Water, and chiefly
" into the Planks which are neareſt the Sur-
" face of the Water; that they faſten them-
" ſelves up in the Wood, each in its particu-

B lar

(*a*) Una razza di tarli, o Vermi di Mare, che annida in tutte quelle Tavole delle navi che ſtanno ſempre ſott' acqua, le più vicine al livello della medeſima, è colà ſtanno rinchiuſe, ciaſcuna da per ſe in proprio (*) tubo, o cannello di materia teſtacea

* Figura di A

" lar Cell or Channel, which runs winding " and tapering to a Point, after the Manner " of a Sea-Shell; is open at both Ends, and " always as long as the Worm that inhabits " it; that these Worms are of divers Sizes, " according to Diversity of Age; but that " the Longest of them exceed not the Half " of a Florence-Ell; and that these are of " about the Thickness of the Little Finger.

" At that End of the Worm, where the " Head is (continueth this Author) there " are Two little Bones, of a semi-cir- " cular Form, *D D*, concave on one Side, and " convex on the other, running out some- " what disproportionately towards the Ends. " In the Middle, between these Two Bones, " the Head is discover'd. At the Tail-End " there are seen a Couple of a Kind of Fins, " of a bony Substance, *E E*, which are fas- " ten'd to a Sort of String or Binding, *S*, of " a sinewy or fibrous Consistence. Between " these Fins there are two long, round, fleshy " Tails, *F H*, hollow and open at the Ends. Ex-

di figura di cono, da ambedue l'estremitá aperto, e lungo, quanto le Brume stesse, delle quali, secondo l'etá, vene sono di grandezze diverse, ma le maggiori non passavano la langhezza di un mezzo Braccio Fiorentino, ed erano grosse in circa quanto il dito minor della mano.

‡ Page 221. † Fig. B. ‡ Nella estremita anteriore, scorgonsi † due ossa semi circulari *D. D*, da una parte concave, e dall' altra convesse, aventi alcune appendici irregolari, in mezzo di quali ossi sta situata la testa. Dall' altra estremità opposta miransi due pinne ossee *E E* impiantate nell' un certo cordone *S* composto di fibre nervose, nel

" Excepting the two little Bones at the " Head, and the two Fins at the Tail-End, " this Vermin hath neither Bone, Fin, nor " Gristle. Both great and small are of the " like Matter or Substance, which nearly re- " sembles that of an Oyster, having an Oy- " ster-like Colour and Taste, but not the " like Firmness, for the Substance or Body " of this Worm is so extremely soft and ten- " der, that it can hardly be touch'd without " Breaking, or losing its Continuity." The Author then proceeds to describe the Trunk or Cell, which this Worm, in its Marches, prepares for its Lodging.

Let us now consider a little the Difference between these Worms describ'd by this learned Author, and which were found in the *Venetian* Sea, and the Worms which we now see upon our own Coasts.

I have not only at several proper Places made careful Remarks on this Vermin of ours, by narrowly considering more than a Thousand of them, of different Dimensions, which I discover'd in the several Pieces of Wood I open'd at those Places, but I now

 like-

nel mezzo delle quali pinne sono situate due lunghe e retonde appendici carnose *F H* internamente scanellate, ciascuna delle quali ha la sua propria apertura in punta. Tolti via i due ossi della testa e le sudette due pinne, non ha in se la Bruma altri ossi, ne spina, ne cartilagini; ma tanto le Brume piu picciole quanto le più grandi sono tutte d'una sostanza muscosa, simile a quella delle Ostriche, del medesimo colore e sapore, ma pero piu gentile, e d'una molezza e fragilita cosi grande, che per poco che si maneggiano, con grandissima facilità si disfano.

likewiſe keep ſeveral of them by me, which I feed, and ſtill carefully conſider, in order to give the greater Extent and Accuracy to the Obſervations I ſhall lay before the World concerning them.

On the Surface of the Wood that is inhabited by theſe Creatures, Nothing is to be perceiv'd beſides little Holes or Inlets, of Diameters no larger than that of a Quarter-Line. * By theſe Holes the Worms enter the Wood; and being enter'd, they never return: They attack as well Oak as Fir and Elder; are very ravenous and deſtructive, and grow in a ſmall Time to their ordinary Bigneſs. But I cannot as yet ſay any Thing of the Manner in which they are generated, whether it is done by *Ova*, or whether they are the Iſſue of Putrefaction or of any other known Means of Generation. We ſhall perhaps have an Opportunity after the Dog-Days (when we ſhall have the propereſt Seaſon for making Obſervations on this Head) to make a clear Diſcovery of it.

* Fig. K. *n, n. n.*

It appears from the Report of the Deputies, † appointed to inſpect the State of the Dykes, that on the 12th of *November* 1731, being met together near ſeveral Parts where it was ſuſpected this Vermin was lodg'd, they caus'd a Pile, which had been driven down in the Sea in the Year 1718, to be drawn out. When it was brought aſhore, it appear'd to be ſound and perfect; but, being ſplit in Two,

† The Report of *Drechterlandt.* Jan. 12th 1731.

Two, it was found to be gnaw'd through and through by Worms which were lodg'd in it; ſome of which were of an extraordinary Size, being Fourteen Inches in Length, *Amſterdam* Meaſure: And the Channel or Burrow which they had made in the Pile, and which ran along evenly with the Grain of it, was large enough for a Man to lodge his Finger in it.

The Inſpectors of another Quarter reported, *that having caus'd a large Pile, which was almoſt new, to be taken out of the Sea and ſplit, they found it from End to End pierc'd through in little Holes, of about the Diameter of the Shaft of a Tobacco-pipe.

* Report Feb. 29th 1732.

Among all the Worms which I ſaw on the Coaſt of *North Holland*, I found none that were more than Eight Inches in Length. The Bodies of Theſe were the Diameter of a Fathom Line from the Head, and a Quarter of an Inch thick; their Helmets, or Head Armour, near one third Part of an Inch thick; and their Shape ſuch as is delineated in Fig. 1.

The Head is ſomewhat like a Navel inverted, but in Length not above the Diameter of a Line 'Tis of a ſinewy Subſtance, like that wherewith the Muſcle-Fiſh is faſten'd to the Shell. The Part *r* repreſents the Mouth of the Worm, which reſembles the Mouth of a Man that grins and diſtorts his Lips into Wrinkles. This Part is encompaſs'd, but not cover'd, as *Valliſ-*

† Fig. L.

Vallisnieri says of the Worms he describes,
* Fig. 1. with a Sort of Helmet *n*, *a*, * which Helmet doth not consist of Two Bones, as *Vallisnieri* says of the Helmets of his Worms, but of Two separate Shells, each having the Form of a Half Snail-Shell; that is, they look, together, like a Snail-Shell cut in Two. One of these Shells is on the right Side the Head, the other on the left: And they are exactly of the like Dimensions. Each of them may be divided into three Parts.
‡ Fig. 3. The Part *o*, *e*, *c*, ‡ may be reckon'd the Gorget, or Neck-piece; *e*, *o*, *t*, *i*, the Head-piece; and the Triangle *i*, *r*, *n*, the Crest or Crown of the Helmet. The Outside of the Neck-and Head-piece, both which Parts are distinctly delineated in Fig. 3. corresponds exactly with that of a Snail or Sea-Shell. But
† Fig. 5. the Triangle *i*, *r*, *n*, † has a different Face, being whiter than the other Parts, and cover'd with little Notchings which run Stripewise from the Angle *n* to the Angles *i*, *r*. So that it seems to the Touch of the Finger to be somewhat round, and to have the Roughness of a File or Rasp. The two Shells united compose the whole Helmet, the Use of which we shall explain hereafter. It may be observ'd from the two Figures *B* and 1, that this Helmet is somewhat different from that describ'd by *Vallisnieri*. The said
|| Fig. 1. two Shells are fasten'd to the Body at *n*, || which Part I call the Neck, by a sinewy Sub-

Substance or Skin, like that which holds the Muscle to the Shell. They are again conjoin'd at the Hind part of the Head, by a Skin or Substance of the same Kind. And they are so dispos'd, and the two Angular Points * at *n*, are contriv'd in such Manner, * Fig. 3.
that when the Worm turns its Head, they play or describe reverting curve Lines, like the Fly of a Watch, One of these angular Points is somewhat more extended than the other: The Rest of the Worm, from the Helmet backwards, is divided into two very unequal Parts. The Fore-part *n*, *d*, may be call'd the Body or Trunk, because it contains the Entrails. This Part consists of a white, fattish, and Marrow-like Matter, nothing near so firm as that of an Oyster, and is in Thickness, two Thirds of the Diameter of the Helmet. The Hind-part, *d*, *b*, which is lean, of a Grizzle Colour, and of but half the Bigness of the Fore-part, which I have call'd the Body or Trunk, may be term'd the Tail; which terminates with a Binding or Girdle-like Protuberance, *b*, of a Substance nearly approaching to that of the Head, but not of that Make or Shape, which *Vallisnieri* describes on the same Parts of his Worms, *S*, Fig. *B*. At this Girdle begins an Appendix, consisting of Two Branches, †
(*s. s.*) which by *Vallisnieri* are call'd Fins; † Fig 1.
but they are very different from what he describes under that Appellation, Fig. *C*, or *E E*,

E E, in Fig. *B*. For he ſays (*a*) " Their " Tails are remarkable, being arm'd with " two Blades or Swords, each in the Figure of " a Leaf, and towards the Inſide ſomewhat " concave." What I term the * Branches in our Worms, are in Length the Diameter and half Diameter of a Line; very narrow near the Girdle, to which they are faſten'd. They are ſplit at each Extremity about the Diameter of a Line, after the Manner of a Goats Foot. Their Outſides are convex, and their Inſides a little concave. They are ſo white, ſmooth and bright, that they may be taken for Ivory. They are of a ſhelly Subſtance, and harder than the Helmet. Between theſe two Branches, are two little Tails † (*o*, *r*, and *o*, *t*) one of which is ſtreight and open; the other is ſomewhat bent at the Extremity, after the Manner of a Horn. Each of theſe little Tails is one Fourth of the Diameter of a Line, The Worm can lengthen, flatten, inflate and contract them as he pleaſes. I haveſ ometimes ſeen the Worm lengthen the Tail *o*, *r*, near an Inch; but the Tail *o*, *t*, is never extended to ſuch a Length as the other.

* Fig. 1. & Fig. 4.

† Fig. 1.

I have open'd ſeveral of our Worms, but never diſcover'd in them a Heart, or any Thing that correſponds with the following Ac-

(*a*) La loro coda è conſiderabile, eſſendo armata di due lamine di figura come foglia aliquanto concave verſo la parte interna.

Account which Sr. *Valliſnieri* gives of what he diſcover'd in the Bodies of the *Venetian* Worms. " They have (ſays he, *b*) a Heart " under the Maw, pretty nearly of an " Oval Figure, appearing like two little Pil- " lars; which contracts and dilates it ſelf, " in order to drive the pure refin'd Blood " through the Arteries, which Blood circu- " lates throughout the whole Body, and re- " turns again to the Heart." I have only diſcover'd a little oblong Bag, about an Inch long, a little more or leſs, according to the Bigneſs of the Worm: And underneath this little Bag, towards the Back, I diſcover'd another ſmall Veſſel, which is, perhaps, the Receptacle of the Eggs of this Creature. This little Bag, which is probably the Maw, was fill'd with what might be eaſily diſcern'd to be the Powder of Wood, but which reſembled the Flower of Bucks-Horn. Between this little Bag and the other ſmall Veſſel, there runs a long Gut from the Head to (*o*). And all along the Tail there runs a ſquare Channel, which is fill'd with Matter of the ſame Kind with that which is found in the Maw; but it takes a different Colour at *d*, where it is reddiſh; and from thence

* Fig. 1.

(*b*) Hanno il loro Cuore, il quale è ſotto il Ventricello, di figura ritonduſtra bislongo, in forma quaſi di due Colonnette, che ad occhi veggenti ſi dilata, e ſi ſtrigne e caccia fuora, per le ſue arterie, un ſangue diafano e tranſparante, che circola per tutto il corpo per li neceſſari biſogni, o per le vene ritorna al Cuore.

thence to the Girdle *b*, it falleth away gradually into a brown, and, finally, into a dark Colour: And this, without Doubt, is the Cause, that the Tail is of a different Colour from that of the Body or Trunk. Such is my anatomical Account of this Worm. We will now consider a little his Operations in a Piece of Timber.

But it were proper to deliver in this Place, if we were able to do it, a regular Account of the original Residence of those Worms, or from whence they were transported to us, and of the Manner in which they are generated. We have Nothing to advance on the First Head, but what is merely conjectural. Some are of Opinion, that these Worms were brought by our Ships from *America*. But we may firmly conclude, that this Opinion is groundless, since we do not hear, that ever those Worms were seen in the *American* Seas. But the Sort of which M. *Deslandes* speaks *, and which our Carpenters and Seamen term *Thousand Legs*, is very well known there. 'Tis by far more probable, that they come from the Seas far Northward; for they are found in mighty Numbers upon the Coast of *Iceland*: And such an Opinion might be supported by the following Matter, namely, that this Vermin spawns not but in the Dog-Days; that is to say, only at the Season when the Sea-Waters this Way are most warm'd by the Sun; for if, on the

* *See the Place before referr'd to.*

the other Hand, they come from a Climate that is between our own and the *Torrid Zone*, it should seem an indifferent Point to Nature, whether this Vermin was produc'd in the Dog-Days or any other Part of the Summer, or Year, the Heat in a nearer Climate being nearly always as great as it is within the Dog-Days.

As I have observ'd these Creatures only since September last, I have not had an Opportunity to remark any Thing of Weight, touching the Manner in which they are generated: So that, as I have hinted already, whether they are produc'd by *Ova*, or some slimy Matter, or whether they are the Issue of some Putrefaction, is a Matter in the Dark to me, But I shall endeavour, if I live, to discover it next Summer, as well from Observations on Worms on the Coast, as from those which, for that Purpose, I carefully preserve in my own Chamber. 'Tis true, that among the various Kinds of strange Matter, which have been found sticking to the Timber drawn out of the Sea, there have been discover'd Something like empty Eggs. But this helps not a great Deal at present; for this Egg-Shell-like Matter may as well be the Produce of any other Vermin as of those in Question. *Vallisnieri*, who ventures farther on this Article than we have the Courage to do, explains

 the

the Matter thus: (*a*) " Theſe Worms are to " be rank'd with that Sort of Animals " which generate without Coition with a " Male, and are term'd Hermaphrodites. " Their round tranſparent Eggs, which are " cover'd with a ſlimy Matter, drive upon " the Surface of the Water till they meet " with ſome Wood; to which, by Means of " the ſlimy Matter, they ſtick faſt. After- " wards, ſays he, while the Eggs are ſo " faſten'd, they break, and ſet the Young " at Liberty, which, inſtantly thereupon, " cling to the Wood, and fall a boring; thus " beginning that Work the very Moment " they break the Shell." This Account, however, is ſo probable, that I think it ought to be admitted for Truth, till we are authoriz'd by Experience to reject it. As ſoon as they are faſten'd to the Wood, they uſe their utmoſt Efforts to get into it; and at ſuch time the Breadth of their Helmets can hardly exceed the Diameter of a Quarter-Line. They are ſometimes found from two to ten together in a cloſe Body, faſten'd to and forcing their Way into a Piece of Timber. It has been remark'd, that the Piles of

(*a*) Di quegli che generanno ſenza conſortio del Maſchio, e come gli chicamao Ermoſroditi - - - - - , ove ronde, diafane, anch, eſſe accompagnate e circondate da un poco di mucela gine viſcoſetta, le quali galligiano, e vengono poi gittate dall' onda del maré apreſſo le Tavole alle quali col loro viſco s'attaccano, e naſcono, e le nate picoliſſime Brume ſi rivolgono poco, dopo verſo la tavola, e preſo fiato, incomminciano atrapanarla ed a fare il medeſimo lavoro delli deſcritte loro madri.

of the *Suyder*-Sea are moſtly penetrated at the Lower Ends, about a Foot from the Ground. Holes indeed are found all the Way up the Piles; but the nearer the Top, the fewer they are, and at a greater Diſtance from one another. The Boreings at the lower Ends of ſome Piles were ſo cloſe and numerous, that, as in a Sieve, little was to be ſeen beſides Holes; by which they were ſo weaken'd, that a very ſmall Force demoliſh'd them, while at the ſame Time the upper Parts of the Piles ſeem'd ſound and perfect. The Inſide of the Parts that were thick bor'd ſhew'd a great Reſemblance to the Crum or Inſide of light Bread, or the Inſide of thoſe Biſcuits, which abound with Eyes, as they are call'd, or little Cavities and Openings.

When a Worm hath enter'd a Pile, he bores his Way ſtreight forward, or horizontally, till he meets with a Vein or *Stratum* of Wood that is to his Liking. He then turns and marches up the Pile perpendicularly, unleſs he meets with the Path or Channel of another Worm, for, in ſuch a Caſe, he departs from the Line, without boreing in the Channel of the other, and ſtrikes up by a new one. And *M. Deslandes*, already quoted, is certainly out where he ſays, that when two Worms meet, the One kills the other.

They are very ravenous, and make quick Advances in their Boreings, eſpecially the young

young ones; which make wonderful Dispatch: tho' I found, that some young ones, which had enter'd Wood last Summer, and which were then no longer than the Worm represented by *Fig.* 7 had advanc'd but Two Inches by the End of October; at which Time they were of the Dimensions of *Fig.* 8.

* Fig. 2. 'Tis with their Helmets *, or, more strictly,
† *r.* Fig. 3. the Points of them † (the Motion of which, when employ'd is like that of the Ballance of a Watch,) that they penetrate or bore the Wood. And the Dust or Powder of the Wood or Boreings, falling into the Mouth
|| Fig. 1. *r.* or Receiver, || is the Food of the Worms. As they advance in their Boreings, the Channels become gradually wider, by Reason of the increasing Growth of the Bodies and Helmets of the Worms, till the Creatures are come to their full Bigness.

As they advance likewise in their Tubes or Channels, a white slimy Matter comes from them, with which they line their Channels quite throughout, to the Thickness of a Card, leaving it very smooth. This slimy Matter, so left, becomes as hard as a Crust, preserving its Whiteness, and looking like a long Shell, or the long Tube or Shaft of a Tobacco-Pipe within another Tube; but it is then exceeding brittle, insomuch that the smallest Force will shatter it, yet it dissolves not in Spirits of Wine. Such are the Mansions of these Worms: And this Sort of Lining

ning or Plaistering is a Defence for their most tender Bodies against the Roughness of the Wood, which might otherwise tear or hurt them: So that they slide upwards and downwards, or backwards and forwards, withour any Incommoding or Embarrassment. And it is not unlikely, that this shelly or crustaceous Lining may defend them likewise against Injuries from Excess of Moisture in the Wood they are lodg'd in, when it stands in Water. *Vallisnieri* * gives a quite different Description of this Crust or Shell. (*a*) " It may be observ'd (says he) that they
" (these Shells) consist of several *Strata* or
" Beds, like the Shells of Oysters or other
" Shell-Fish; and externally they appear
" compos'd in the Fashion of so many Rings
" which are thickest at the upper End, that
" is, at the Widest of the Channel; from
" whence downwards they become gradual-
" ly smaller and tenderer. And the thickest
" Part of the Rings are close fasten'd or fitted
" up to the Channel || in several *Strata* of
" the same shelly Substance, which are very
" hard. And being fitted one upon another,
" they

* p. 220. & 221.
† Fig. A.
|| See Fig. A B.

(*a*) E si vede, che sono fatti suoli, o fulde, come i giusci delle Ostriche è di altre conchiglie marine. Esternamente pero apparisono composti in foggia di tanti anelli, i quali principiando dal l'estremità anteriore, cioe della base del cono si scargono molto radi, ma avicinandosi verso l'altra estremita piú sottile, si osservano molto spessi; ed in quella parte appunto, dove i principali anelli cominciano ad apparire cosi folti corrispondono loro internamente attaccate al medesimo canello altratante lamelle

" they defend the whole Channel. And tho'
" it ſeemeth that the Reſt of the Shell, with-
" in, ſhould be uneven, yet is the Inſide-Su-
" perficies ſmooth, and not at all rough, as
" is the Outſide.

When the Shell is looſen'd from the Wood and open'd, it is found to be ſmooth both on the In- and the Out-ſide, without any Joints or Rings, as will be manifeſt to Any one who ſhall examine the Shell carefully. What I ſay here, has Place in Oak and Elder-Wood, the Veins or ſeveral *Strata* of which are not very plainly diſtinguiſh'd. But Sr. *Valliſnieri* made his Obſervations in Plank; and conſequently his Account of the Matter we are upon may on that Side be true. And we muſt confeſs likewiſe, that the Matter differs ſomewhat in Fir from the Account we have already given of it: For the *Strata* or Beds in Fir (like *ab, bc, cd*) are ſeparated by a Kind of Cruſt, which is of a harder, redder, and more reſinous Subſtance than the Beds. * While the Worm meets with no Interruption, he bores upwards in a right Line; and all the Way makes a ſmooth Tube or Shell, without any Roughneſs either on the Out- or the Inſide. But when he meets with any Obſtruction, as, for In-

* See the Lines *d, e,* Fig. 9.

lamelle duriſſime della ſteſſa materia teſtacea, le quali ſopra ponendo, ſi l'una all' altra guerniſcono all' intorno tutta quella eſtremita del Tubo, i quale, ſe bene in tutto il reſtante della ſua concavita raſſembri aliquanto inegale, con tutto ciò la ſua ſuperficie interna e liſcia, e non iſcabroſa come l'eſterna.

Inſtance, with the Channel of another Worm, or with a Knot in the Wood, a Nail, or the like, then doth he alter his Courſe, boreing horizontally, through Cruſts, if there are any in the Way, till he arrives in another Bed; when he again directs his Courſe right upwards. The Trouble and Inconvenience he meets with in Cruſts makes him paſs through them with the utmoſt Expedition. His Channel in Cruſts is narrower than before, and the Ring which he next makes after his coming out of a Cruſt, is wider; which is the Reaſon the Shell, in that Part, ſeems compos'd of diſtinct Rings or Circles. But theſe Rings are ſo few, that they are hardly perceivable, becauſe the Way of the Worm horizontally, in which Way only theſe Rings are perceiv'd, is never beyond the Extremity of the Cruſt or other Matter he paſſes through for the gaining a new Bed, or the ſhunning an Obſtruction; which when he has done, his Channel then, which he makes forthwith right upwards, is lin'd with one continued ſmooth Shell, as before, without Rings or Circles.

The Worm forms his Shell according to the Size or Dimenſions he is of. The Shell extends it ſelf from the little Opening *b*, *Fig.* 10. where the Worm enter'd, to *r*, where the Helmet works for the Boreing of the Wood. But it muſt be obſerv'd, that even in the largeſt Piles, or thoſe which are moſt bor'd, not ſo much as a ſingle Opening can

be found, out of which might come a Worm. The Worms having once taken Poſſeſſion of a Piece of Timber, never peep out of it; the Air and the Water being equally fatal to them; for if either the one or the other penetrates them, they die.

We have given an Account of the Structure and Employment of the Fore-part of this Creature: We will now conſider the Uſes to which his Hind-parts are deſtin'd. This Worm hath almoſt always its little Tails * in the Water. He ſlips them out at the little Opening where he enter'd the Wood; which now only ſerves him for this Purpoſe, and as a Vent to reſpire by, for he has no other viſible Means of Reſpiration. Tho' he be advanc'd 4 Feet in the Timber, he ſlides back preſently, and dabbles his Tail in Water. *Valliſnieri* is of Opinion, " that the little " Tail *o*, *r*, ſerves as a Pipe or Pump for con- " veying the Sea-Water to the Head or " Mouth of the Creature, in order to his " moiſtening, and thereby ſoftening the Mat- " ter he is to bore; and that by this Means " he prevents the Wearing out of his Hel- " met." This, though not truly judg'd, is very ingeniouſly imagin'd. I preſerve ſeveral of our Worms in a Piece of Timber that ſtands in Water in my own Chamber; and have obſerv'd, that they keep their little Tails almoſt conſtantly out at the little Holes by which they enter'd the Wood; and that they ſometimes lengthen and ſometimes ſhorten

ten one of the Tails, ſometimes more, and ſometimes leſs. *b*, *c*, is always ſtreight, and may be much lengthen'd; but *b*, *d*, the crooked Tail, remains, as I have already ſaid, always in the ſame State. *b*, *c* is ſometimes ſeen moving and ſhaking. But upon the leaſt Motion that is given to the Wood or the Water, both the Tails are ſeen to be drawn gradually in; but not always entirely, for the extreme Part *e*, after ſuch Drawing in, is frequently ſeen to remain out the Diameter of a Line, flabbing upon the Side of the Timber, like an empty Gut. When the Motion ceaſeth, the End of the Tail, which remains out, is inflated and borne up again; and both the Tails are again ſlipt out, as before.

Through one of theſe little Tails (I take it to be *b*, *d*) the Worm diſcharges its Excrements, which are of a browniſh Colour, and like fine *Vermicelli*. Through the other he reſpires, and draws up what Moiſture he hath Occaſion for. And I fancy it is by Means of the Tail *b*, *d*, that theſe Creatures perform the Buſineſs of Generation. I ſhall, as I have ſaid, if I live, endeavour to come at Certainties on this Head the next Dog-Days. In the mean Time I affirm the following Matter for a Truth. The laſt Dog-Days, I ſaw, on the Side of a Frigate in the Harbour of *Medenblick*, the little Tails of two Worms out at Two Openings which were cloſe to one another; and the Tails cloſed

 and

and folded with one another. The Tails being thus join'd, their extreme Parts were cover'd with a reddiſh Sort of Froth or Foam; and in a few Minutes after, the Tails were ſeparated and drawn in again. This looks to me like the Act of Copulation; and the more ſo, in Regard I have never once at any other Time ſeen theſe Worms ſhoot out their little Tails, when the Timber, on the Part they were lodg'd in, was out of Water; as was the Frigate where I ſaw this Matter, for ſhe was refitting.

If my Conjecture upon this Matter be right, the Opinion of Sr. *Valliſnieri*, that theſe Worms are Hermaphrodites, or both Sexes in one Body, is deſtroy'd. The Opinion of *Valliſnieri* is likewiſe that of M. *Deſlandes*, who conjectures, that the Eggs, by which thoſe Vermin are propagated, are laid on the Superficies of Wood by Worms of the ſame Claſs. " For (ſays he) it is not likely " that thoſe Worms which have once en- " ter'd Wood, ſhould generate by Copulation, " ſince every one is, as it were, lock'd up in " the Wood, as in a Priſon, out of which " it is not likely that they ſhould come out " and appear upon the Superficies. 'Tis " probable, the Sea-Worms I ſpeak of can " live as well in Water as in Wood; but " that in Wood only, they find that Food " which is moſt agreable to their Palates, " and moſt promotive of their Growth. " For this Reaſon it is, that Water-Worms, " which

" which are impregnated by Copulation in " that Element, look for Wood to lay their " Eggs on; and that the Worms which are " produc'd from thoſe Eggs, give up, by en- " tering the Wood, their natural Right of " Copulation. So that this Wood-Species is " propagated by the Species inhabiting the " Water, which is not perhaps but little " known to be the ſame.

This is like a Man's breaking his Neck to rid himſelf of all Trouble. Parents and Children that are but little known to be the ſame Species is a knocking down Argument, that will do the Buſineſs of every Oppoſer without a *Perhaps* at the Back of it.

The Fiſhermen upon the Coaſt affirm, they never ſaw any of theſe Worms in the Water alive. They have indeed ſeen ſome that were dead; but theſe were ſuch as had come out of broken demoliſh'd Piles.

Touching the Uſe of the little Legs or Claws *s*, *s*, it is not improbable, that they are provided with them for the Purpoſes of clinging their Bodies to the Inſide of their Cells, or Channels, and of aſcending and deſcending, by that Action, from the Top of the Cells to the ſmall Opening or Vent at the Bottom, and thence back again, whenever they have Occaſion to diſcharge their Excrement (for Nothing like Excrement is found in the Cells) or want, as Sr. *Valliſnieri* will have it, to pump up Water, (for None can enter at the Top) or whenever they want a free Reſpiration,

tion (for not the leaſt Breath of Air can enter their Cells but at the Vent or Bottom) or whenever they ſeek for Copulation, if they are propagated that Way. Theſe Claws and and the Helmet are the only Parts of this Vermin that can be term'd hard or firm. All that lyes between, which may be term'd the Body, reſembles the Fleſh of an Oyſter, but falls ſhort even of that in Conſiſtence or Firmneſs.

I muſt now obſerve, that in all the Pieces of Timber which have been ſplit for the Diſcovery of theſe Worms, not a ſingle Cell or Channel has been found which paſs'd through, broke in upon, or was perplex'd or entangled with another. The Channels run all perfectly clear of one another; but they are ſometimes at no greater Diſtance than the Thickneſs of a Card, Where I have ſaid, that theſe Worms bore in a right Line or Perpendicular from the Bottom to the Top, I muſt be underſtood of ſuch of them as enter Piles that ſtand erect in the Sea; upon which Piles the Seed or Eggs of this Vermin are plac'd at about a Foot from the Ground for the loweſt; and in that very Place where the Seed or Egg is fix'd, the Worm enters. From about a Foot from the Ground upwards, the Vents or Openings decreaſe in Number gradually, ſo as that at the Height of 3 or 4 Feet from the Ground but very few are to be ſeen, The Channels in theſe Piles run up to about the Diſtance of a Foot from the ordinary Height of the Water; between

tween which Part and the Parts where the Vermin enter'd, the Piles on the Inſide abound with Holes, like a Sieve. Sometimes there is not ſufficient Room and Suſtenance in theſe Piles for all the Worms that are produc'd from the Seed or Eggs that are fix'd on them, which, as I have ſaid, is done nearly or moſtly at the ſame Diſtance from the Ground. This is the Cauſe that ſome periſh in the Piles: And thoſe only have the beſt Chance, or are the beſt accommodated and provided, which enter the Piles firſt. In the Timber which lies flat, as do the Beams of the Dykes, lying either acroſs the Piles, or being driven end-ways between them, the Worms bore and make all their Way horizontally, at whatever Part they enter. I once found a Piece of Lath, an Inch and a half thick, in which were Thirty Two Worms, which had bor'd thirty two Channels, all of the like Dimenſions, and as ſtreight and regular, as if they had been made with the Wimble.

When theſe Worms enter the Outſide Planks of Ships, they bore fore and aft in a Path right along with the Grain of the Wood. And as they never bore quite through, or abandon or come out of the Wood they have enter'd, but periſh with it, if not ſome of them ſooner for Want of Suſtenance, they are, on that Account, of leſs Danger to Shipping, than it may be generally apprehended.

I have now deliver'd the Total of the Obſervations I have hitherto made concerning this

this Vermin, and which I made in order to pave the Way for a Discovery of proper Means to rid our Coasts, that is to say, our Dykes and Pile-Works, of this troublesome Enemy. And as it abundantly appears, that these Creatures live wholly in Timber, not one of them having been found alive in the Water, the Earth, or the open Air, or in any other Matter than Wood; and that they never abandon or come out of the Piece they have enter'd, Nothing can be more false and ridiculous, than the Reports that have been spread concerning the Damage the Country hath sustain'd, and the Danger to which it hath been expos'd by these Vermin, as if they had devour'd or demolish'd its Fences, and set it on the very Brink of Ruin. It might as well be said, that they can undermine or eat their Way through the Dykes, or devour Stone or Iron.

I have but one Remark to add; and that is, that as the Eggs or Spawn of these Creatures is only yielded, or appears only in the Dog-Days; it then being to be seen sticking on the Outside of Timber; so Ships are in no Danger of being invaded or attack'd by them at any other Time of the Year, though they should lye in an Harbour that abounds with this Vermin.

FINIS.